GENERAL CATALOG

Safety

Cutting Tool Solutions

Safety

With 80 years of experience under its belt, Safety develops and produces standard cutting tools for the major industrial sectors such as automotive, aerospace, energy and die & mold. Our turning, milling, drilling and boring programs all contribute to our drive to offer you the ideal solution. From roughing to finishing, regardless of the materials being machined, Safety has the right solution.

If you are seeking a specific solution for a more complex machining condition, Safety's experience with special tools could be the answer. Our design office is at your disposal to help craft a customized solution perfectly adapted to your needs. Safety can ensure significant benefits to your operation.

The availability of expert staff is the safeguard of our high level of quality service. Providing you with the best machining solution is the shared goal of all our specialist teams. No matter what your machining problem, our teams are on hand to establish a fast and precise diagnostic and then lay out the appropriate response.

In choosing Safety, you are opting for the best solution. Our technical support unit will accompany you, every step of the way, in setting up the most efficient machining strategy for your company and helping to shape your future.

Your Safety Team

For more information, visit us at www.safety-cuttingtools.com

e-SHOP
Order your products on-line in a few clics simply!

e-Shop gives you access to **10000 references in our standard tool and insert program**.
It includes prices, stock levels, current invoices, a history of your orders, etc.
Our electronic commerce solution is a **totally free** service,
accessible via the homepage of our website: www.safety-cuttingtools.com

Maximum advantages

- **Current price rates**
View our list prices and net prices instantaneously.

- **Stock availability**
Consult our stock status for each of our standard products.

- **Online delivery follow-up**
Follow the routing of your order between our distribution centre and your delivery address.

- **Delivery**
Tools and inserts in stock are delivered within 24 hours for any order confirmed before 4 p.m. from Monday to Thursday. For any other arrangement, please contact us.

- **Order details and easy re-ordering**
Access the history of your orders placed online or via our customer service department.
For re-ordering, duplicate all or part of an existing order to avoid any typing error.

- **Invoicing details**
Display the history of your invoices.

How can I benefit from this service?

To benefit from this online order service, you must:

- Be a **customer already registered with our sales department,**
- Contact your usual correspondent now
and ask to be **allocated a personal user name and password.**
- To log in from the e-Shop section of the website : www.safety-cuttingtools.com

CEROC
Optimize your machining concepts

› The CEROC (Studies and Research Center for Cutting Tools) partner to develop the tooling technologies for tomorrow.

CEROC is the resulting collaboration between the University of Tours and the Safety Research and Development Department. Created at the Safety Fondettes plant in 2005, CEROC's mission is to link the industrial world with the research community.

The combined expertise of material and production technology makes CEROC your preferred partner for optimizing your machining concepts and increasing your productivity. Our solution will exceed your expectations.

Machining equipment

PCI METEOR10
high-speed machining centre

- 47 kW - 24000 rpm - HSK63
- 4 axes - External MQL

DMG DMU60T
high-speed machining centre

- 35 kW - 18000 rpm - HSK63
- 3 axes

HERMLE C40U
high-speed machining centre

- 23 kW - 28000 rpm
- 5 axes - MQL internal and external

AXA VSC50
machining centre

- 56 kW - 4000 rpm
- 3 axes - MQL external

Lathe SOMAB UNIMAB500

- 24 kW - 2500 rpm

Machining operations

- Milling
- Turning
- Drilling

Materials

- Metal
- Composite
- Bi-metal

Machining concepts

- Dry machining
- Hard machining
- High speed machining
- New materials machining, etc.

Research and application

- Surface finish integrity
- Material fatigue
- Surface roughness
- Finite element method simulation
- Dynanometer and vibration analysis
- Load and power consumption
- Cutting condition improvement
- Tool wear analysis

FORMASAF
Improve knowledge and get the best from tools

Courses in turning, milling, drilling and other machining techniques. If you wish to optimize your production, improve the performance of your cutting tools and increase your employees' awareness of their correct functioning, Formasaf offers you courses adapted to your company's needs.

Course objectives
Choosing the most appropriate tool, insert, grade and coatings. Determine the cutting conditions.
Assessing wear. Maintening the tool in optimum working conditions.

Pre-requisites
There is no pre-requisite level. The courses can be adapted on request

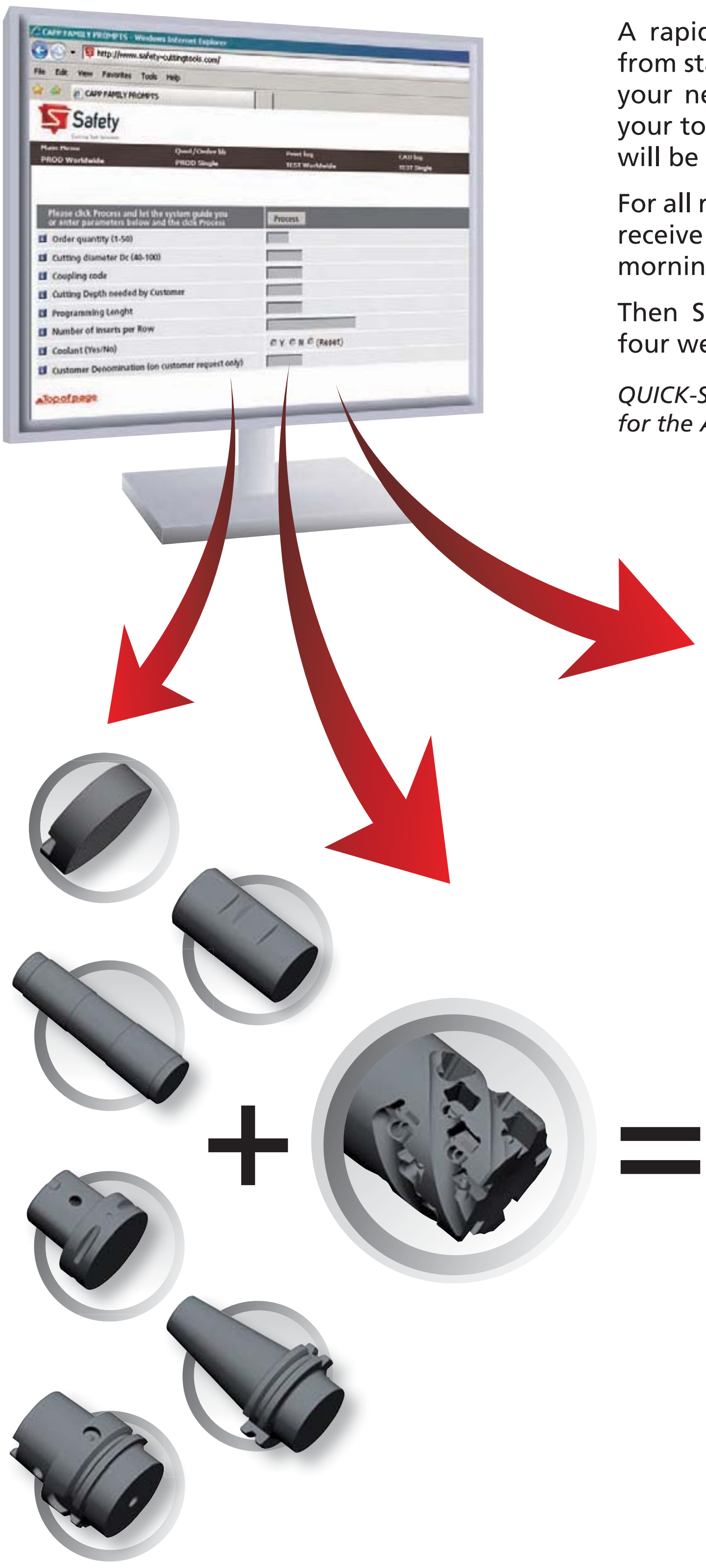
Profile of trainees
Workshop, methods department and design office technicians.
Programmers. Lathe operators, milling operators, setters, machineoperators, etc...

Training personnel
Instructor with 15 years' experience in cutting tools. Safety experts and engineers in accordance with the theme.

FORMASAF offers you two courses formulas
- Personalized courses
- Inter-company courses

Administration of courses in Fondettes (Tours/France)
The courses take place in Fondettes factory B, in a specially reserved room equipped with video systems.
Lunch taken together in the SAFETY self-service restaurant.
Hotel booked by the customer at the SAFETY preferential rate from a list supplied with the training agreement

QUICK-SAF
The quickest way for you to obtain a special tool

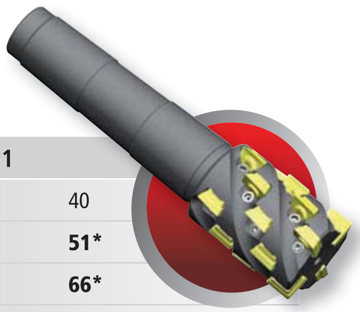


A rapid method to design engineered tools derived from standard products. Once the parameters defining your needs are entered in **QUICK-SAF**, the design of your tool will be generated automatically and the tool will be ready to be produced.

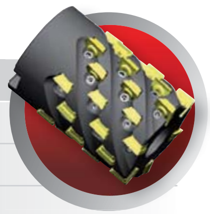
For all request for quote received before noon, you will receive our offer before 17h (or the day after in the morning if your request is received after noon).

Then Safety commits to deliver the products within four weeks, from the receipt of your order.

QUICK-SAF is available for COMPACT 90 and will be available for the AEROLONG cutter from September 2011.



Example 1	
D_c	40
a_p	**51***
L_1	**66***
Z_n	**20***
Type of shank	**Morse taper**



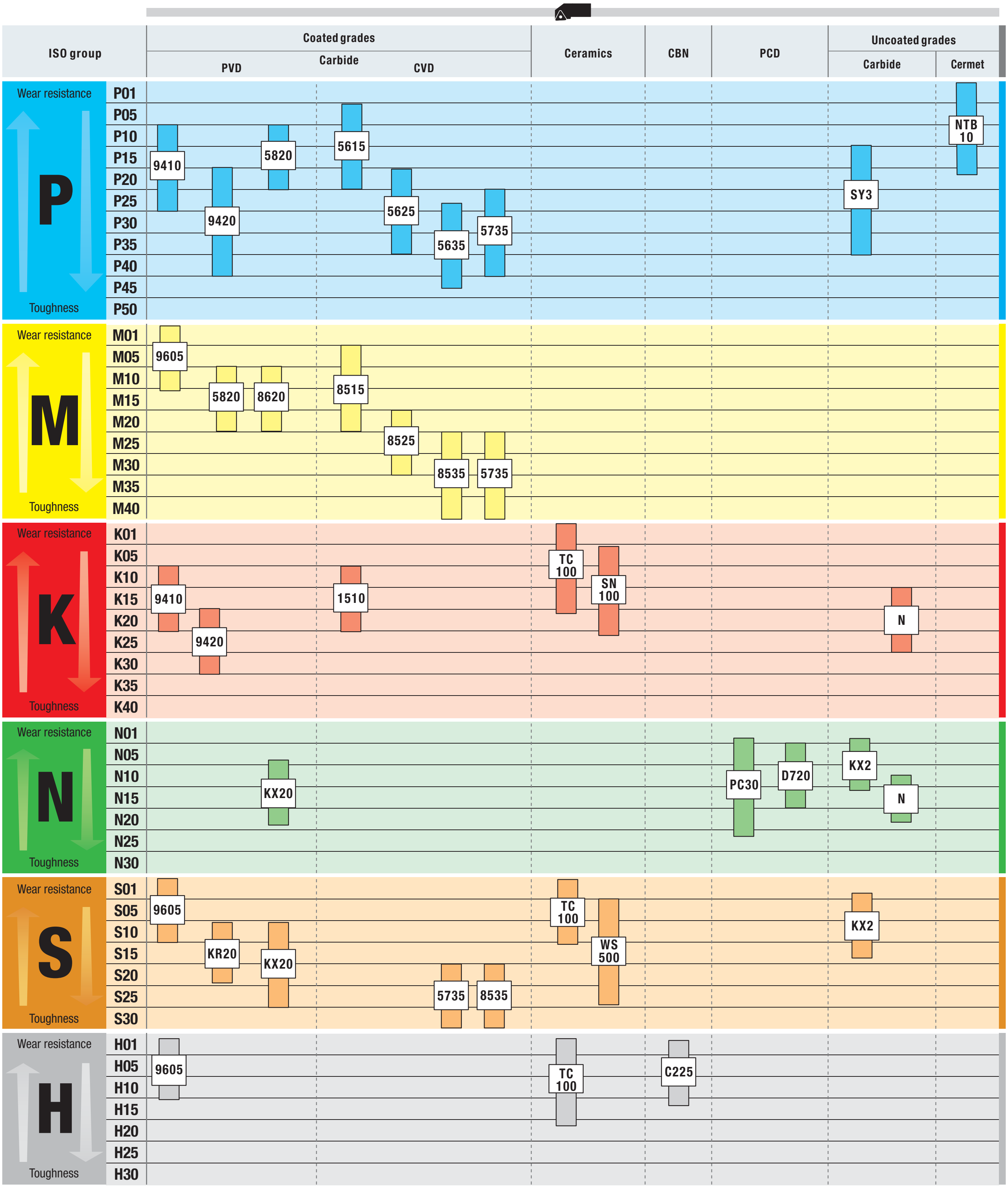
Example 2	
D_c	**64.2***
a_p	65.7
L_1	90
Z_n	36
Type of shank	**Arbor**

Example 3	
D_c	**96***
a_p	**105***
L_1	**150***
Z_n	**100***
Type of shank	**SAF-Capto**

* Non standard values

NOTES

PRIMARY GRADES



TOP FORM GEOMETRY OVERVIEW

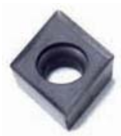
Increasing edge strength →

Positive	Finishing			**PF2** 			**PF4** 	**PF5** 
	Medium machining		**PM2** 	**PM3** 	**PM4** 	**PM5** 		
Negative	Finishing		**F2** 		**F4** 	**F5** 		
	Medium machining	**M2** 	**M3** 	**M4** 	**M5** 		**M7** 	**M8** 
	Roughing			**R3** 	**R6** 	**R7** 		**R9** 

Increasing feed rate →

TOP FORM GEOMETRY OVERVIEW

Increasing edge strength →

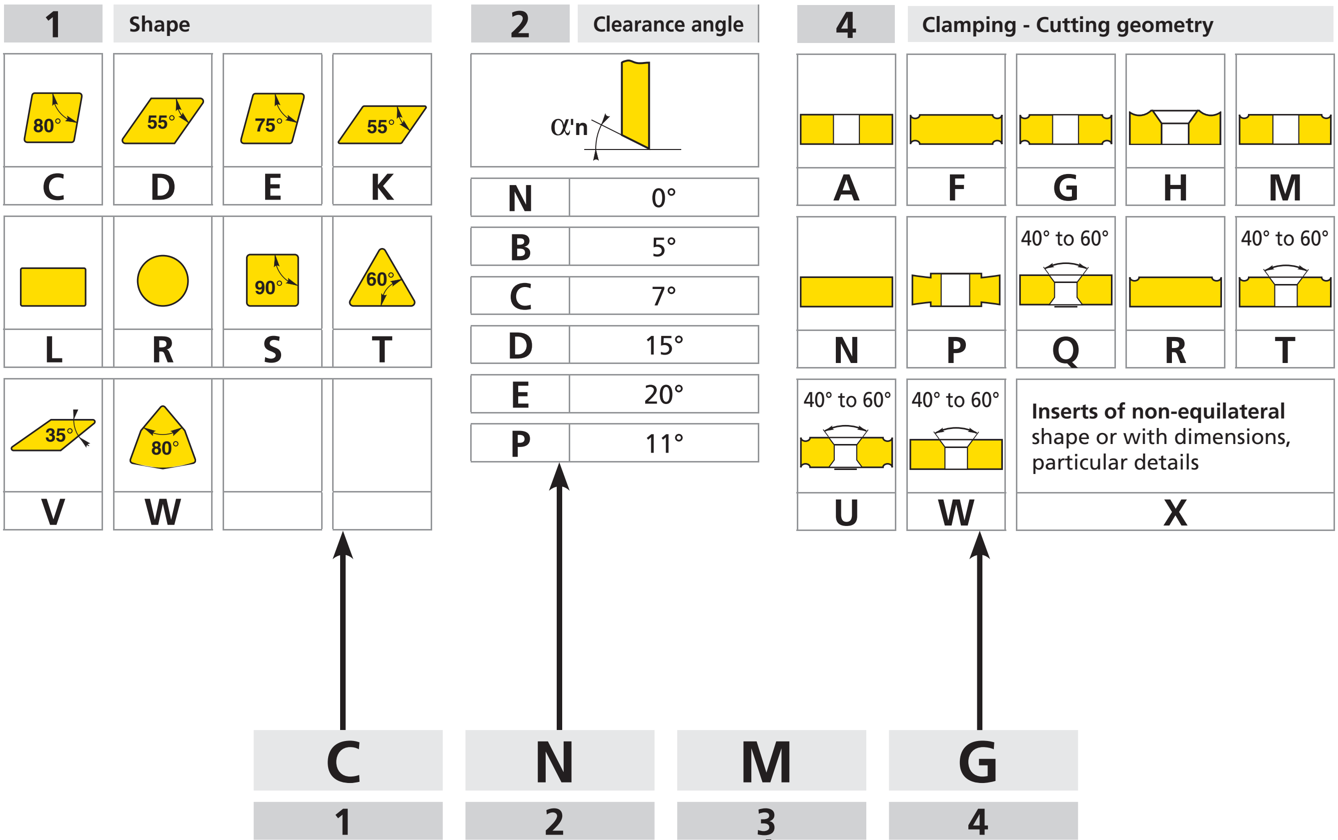
Complementary geometries								
Positive rounds					RP5 			
Complementary		25 	3C 					
Special geometries	1L 	2L 			5G Double sided 		JR JZ JQ 	
High productivity wipers					6W 			

Increasing feed rate →

TURNING

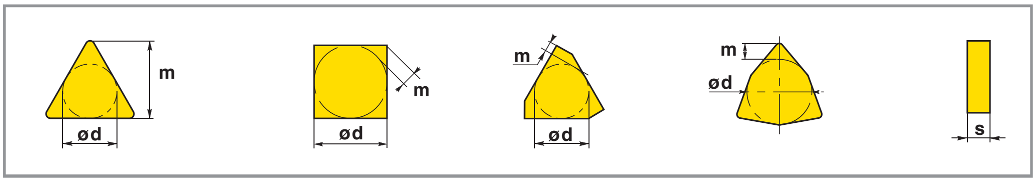
TURNING

CARBIDE INSERT DESIGNATION



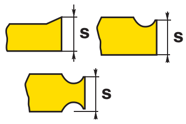
3	Tolerance ISO (mm)		
Symbol	d (Inscribed Circle)	s (Thickness)	m
C	± 0.025	± 0.025	± 0.013
E	± 0.025	± 0.025	± 0.025
F	± 0.013	± 0.025	± 0.005
G	± 0.025	± 0.13	± 0.025
H	± 0.013	± 0.025	± 0.013
M*	±0.05 - ±0.15	± 0.13	±0.08 - ±0.20
U*	±0.08 - ±0.25	± 0.13	±0.13 - ±0.38

*Exact tolerance is determined by size of insert



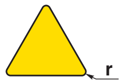
CARBIDE INSERT DESIGNATION

6 Thickness



Symbol (ISO)	Dimensions (mm)
T1	1.98
02	2.38
03	3.18
T3	3.97
04	4.76
06	6.35
07	7.94
09	9.52

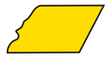
7 Radius



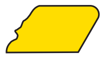
Symbol (ISO)	Dimensions (mm)
01	0 - 0.1
02	0.2
04	0.4
08	0.8
12	1.2
16	1.6
20	2.0
24	2.4
32	3.2

8 Edge finish

OPTIONAL



F



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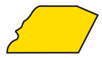
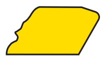


T



S

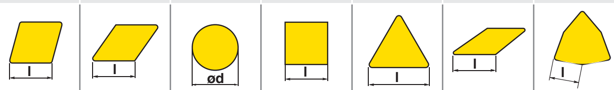
10 Geometry

OPTIONAL

Identification of cutting geometry, specific to the manufacturer

12	04	08	-	-	M5
5	6	7	8	9	10

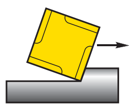
5 Inscribed circle and cutting edge length



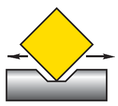
IC mm	C	D	R	S	T	V	W
3.97	**S4**	**04**	**03**	**03**	**06**	**07**	**02**
4.76	**04**	**05**	**04**	**04**	**08**	**08**	**S3**
5.56	**05**	**06**	**05**	**05**	**09**	**09**	**03**
6.35	**06**	**07**	**06**	**06**	**11**	**11**	**04**
7.94	**08**	**09**	**07**	**07**	**13**	**13**	**05**
9.52	**09**	**11**	**09**	**09**	**16**	**16**	**06**
12.70	**12**	**15**	**12**	**12**	**22**	**22**	**08**
15.88	**16**	**19**	**15**	**15**	**27**	**27**	**10**
19.05	**19**	**23**	**19**	**19**	**33**	**33**	**13**
25.40	**25**	**31**	**25**	**25**	**44**	**44**	**17**
8.00			**08**				
10.00			**10**				
12.00			**12**				
16.00			**16**				

9 Hand of tool

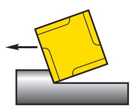
OPTIONAL



R



N



L

GRADE DESIGNATION

5 6 35

Material to be cut
1 - Cast irons
2 - Hardened steels > 45 HRC
3 - (Reserved)
4 - Titanium
5 - Steels and alloyed steels
6 - Low carbon (Cermet)
7 - Non-ferrous metals
8 - Stainless steels
9 - High temperature alloys

Application
0 - Milling
1 - Milling
2 - Drilling
3 - Drilling
4 - Threading
5 - Turning
6 - Turning
7 - Grooving
8 - Grooving
9 - (Reserved)

ISO Range
01 - 10 Finishing
10 - 20 Semi-finishing
20 - 30 General cutting
30 - 40 Roughing
40 - 50 Heavy roughing

GEOMETRY DESIGNATION

Positive inserts

P M 2

- P — Positive
- M — **Operation**: F - Finishing; M - Medium
- 2 — **Cutting edge strength**: 1 2 3 4 5 6 7 8 9 → Strength and feed

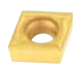
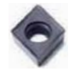
Negative inserts

M 7

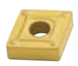
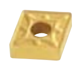
- M — **Operation**: F - Finishing; M - Medium; R - Roughing; C - Complementary
- 7 — **Cutting edge strength**: 1 2 3 4 5 6 7 8 9 → Strength and feed

Summary table

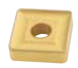
Positive inserts

Designation		Application
	PF2	Finishing
	PF4	
	PF5	
	PM2	Medium
	PM3	
	PM4	
	PM5	
	1L	Complementary
	2L	
	JR	
	JQ	
	JZ	

Negative inserts

Designation		Application
	6W	**Wiper**
	F2	**Finishing**
	F4	
	F5	
	M2	Medium
	M3	
	M4	
	M5	
	M7	
	M8	

Negative inserts

Designation		Application
	R3	Roughing
	R6	
	R7	
	R9	
	25	Complementary
	3C	
	5G	

INSERT SELECTION METHOD

Step1: Answer the following three questions to help you
Step 2: Choose the correct tool from this catalog

Example: Steel

Question 1:	What material are you cutting?
Answer:	**CK45 steel**
Question 2:	What is the hardness of the material?
Answer:	**600 N/mm²**
Question 3:	What is your operation?
Answer:	**Finishing**

Use the guide to **Guide to Workpiece Material** chart on **page 586** to locate your workpiece material or closest to it.

Note the material group (color) and category for your workpiece.
Example: CK45 is a steel (blue) in the medium carbon & high carbon steels category.

Turn to the **Carbide grade selection/Application guide** for steel on **page 56**, (Note: pages are color coded for each material group).
Choose the grade whose mid-point is closest to your operation (heavy roughing, roughing, general purpose or finishing).
If more than one grade is applicable, choose the first grade displayed.
Example: **5615**.
Locate the grade you chose in the last step.
Find the column for the category of steel being cut.
At the intersection where the grade and the category meet, you will find the recommended **cutting speed (Vc)** and geometry (chip-breaker).
Bold and red lettering indicates first choice for chipbreaker.
Example for ISO: **494 m/min** and an **F2** geometry.

To determine Depth of Cut (DOC), go back to the first column in the **Application guide**.
A range is given.
To select a DOC, start at mid-point for a **12.7 mm** I.C. insert (such as SNMG **120408**).
Reduce for smaller inserts (SNMG **090404**) or increase for larger inserts (SNMG **190616**).
Example: **0.9 mm**
Note: DOC should never exceed ½ of the insert I.C. or cutting edge length.

To determine the feed rate (millimeter per revolution), go back to the second column.
A range is given.
In general, lighter feed is used for finishing operations and heavier feed rate for roughing or heavy stock removal.
Example: **0.1 mm/rev**

You now have your starting parameters (Vc, DOC, and Feed) and the recommended grade and geometry.

You may increase/decrease cutting conditions to optimize your application depending on many factors including:
- Work piece hardness,
- Surface finish required,
- Insert size, shape and nose radius,
- Lead angle, chipbreaker,
- Cycle time required,
- Desired tool life,
- Desired failure mode and reason for indexing.

See **GENERAL INFORMATION** on **page 342 & 577** to optimize your application.

INSERT TEMPLATES

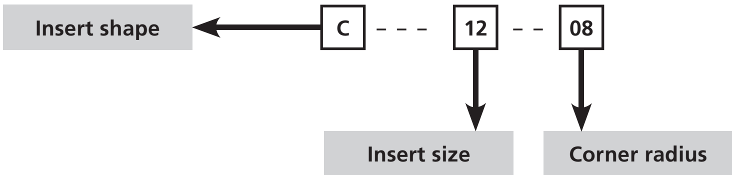
Instructions for using insert templates

ISO standard part numbers (insert identification) usually have 4 letters and 6 digits.

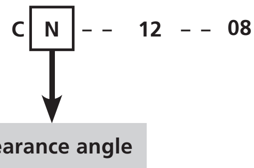
Example: **CNMG 12 04 08**

To determine the part number for a given insert

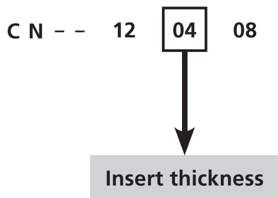
Step 1: Determine insert shape (1st letter of part number), Insert size (1st and 2nd digit of part number) and corner radius (5th and 6th digit of part number).
Lay the insert flat on the appropriate template shape (square, rhombic, trigon, etc.), size and corner radius. Sides (perimeter) of insert should line up to lines of correct template. Pay special attention to the corner radius area. When you have the correct template, write down the information.



Step 2: Determine insert relief angle (2nd letter of part number). Stand insert on edge and line up to appropriate template. Add the appropriate letter to the 2nd position of the part number.

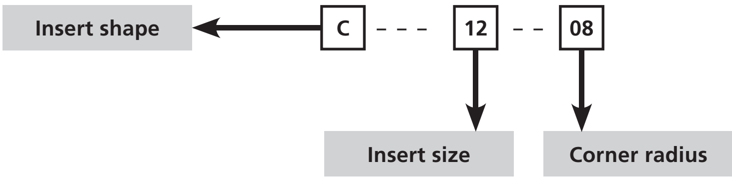


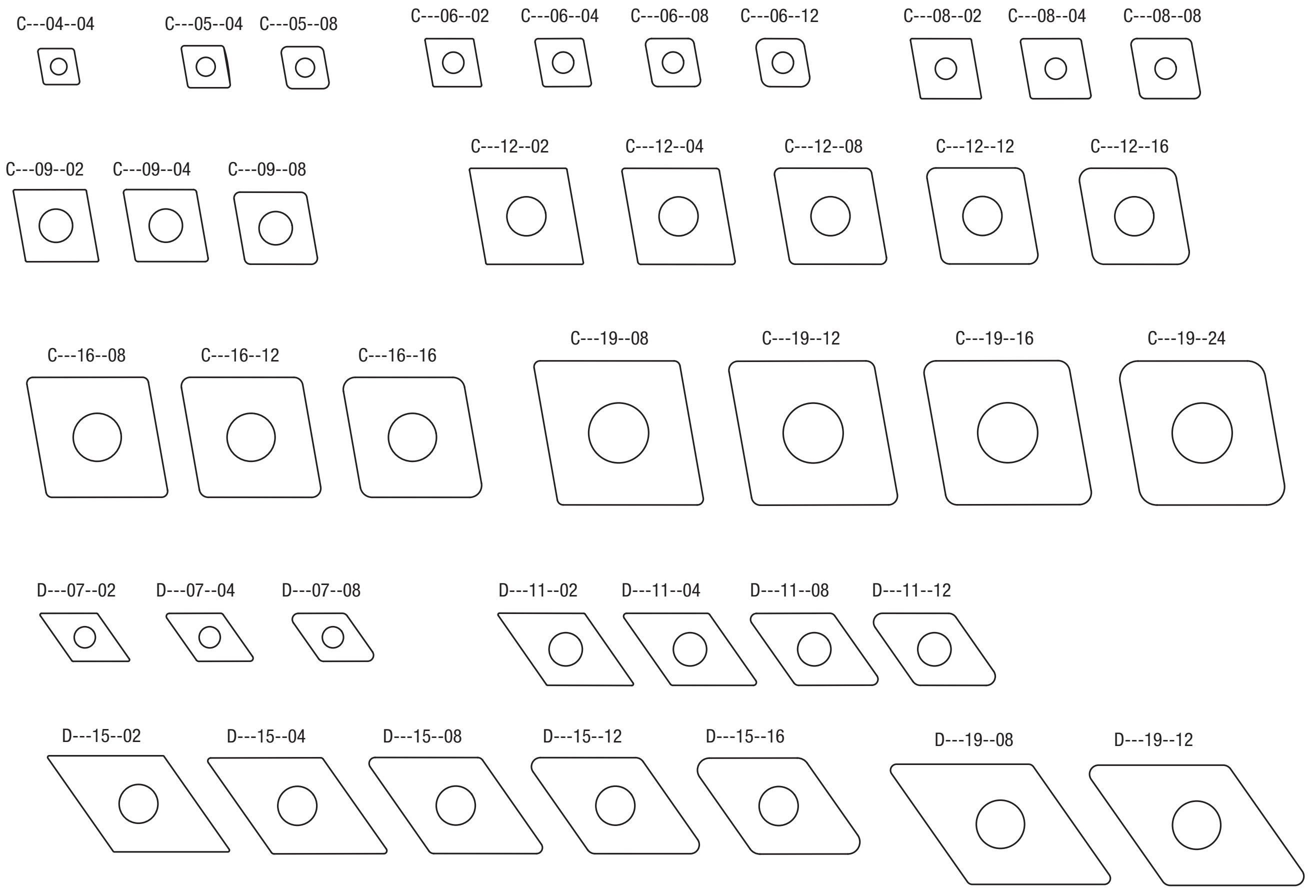
Step 3: Determine insert thickness (3rd and 4th digit of part number). Stand insert on edge and line up to appropriate template. Add the correct number to the second digit of the part number.

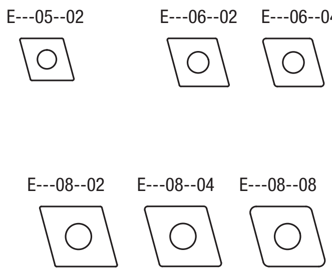


Letters 3 and 4 refer to tolerances and insert characteristics such as hole and/or chipbreaker.
See ISO codification page 12 for more details.

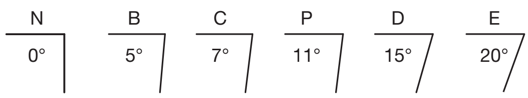
INSERT TEMPLATES





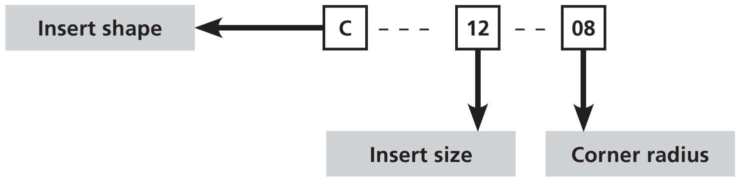


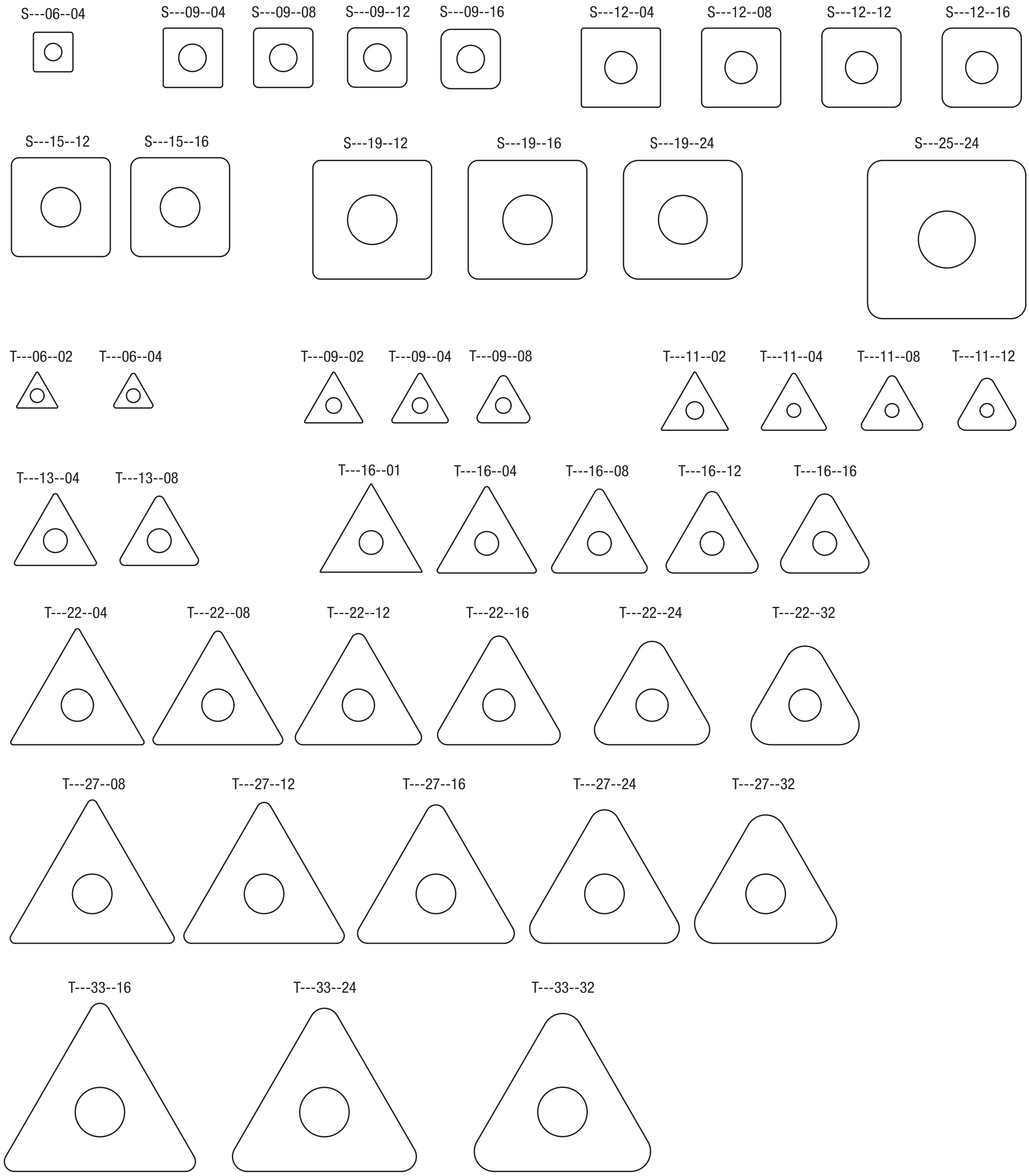
Relief angle = Second letter of part number



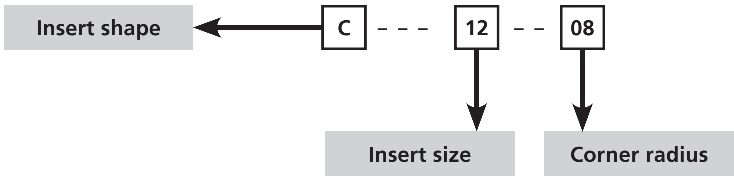
Thickness = Middle digit of part number

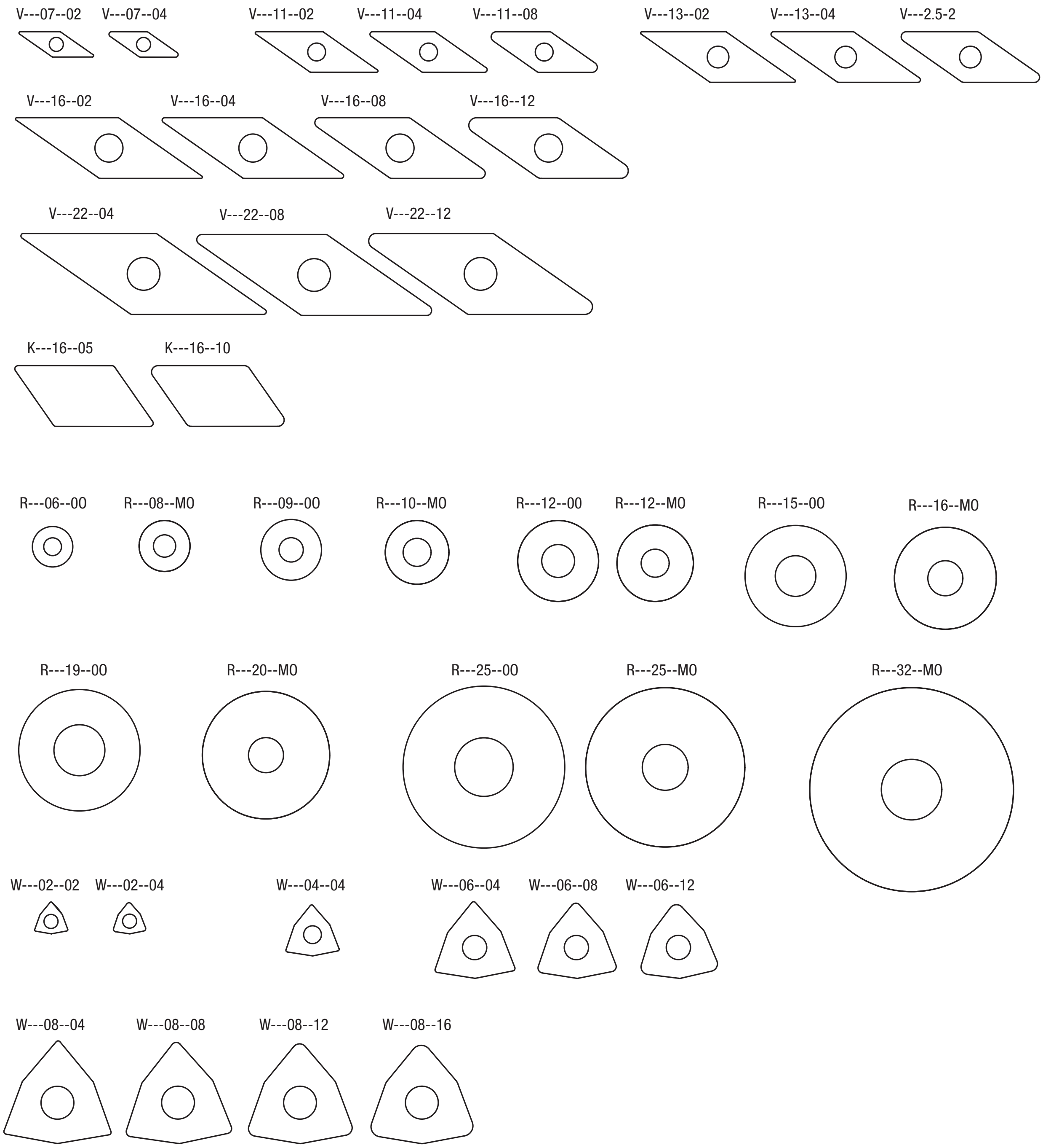
INSERT TEMPLATES





INSERT TEMPLATES





CARBIDE INSERTS

Chipbreaker		Reference	MTCVD grades								PVD grades					Uncoated grades					Cermet
			1505	1510	5615	5625	5635	8515	8525	8535	8620	9605	KX20	KR20	KX05	KX2	N	S15	S4	SY3	NTB10
CCGT 1L		CCGT 060202-1L										✓	✓			✓					
		CCGT 060204-1L										✓	✓			✓					
		CCGT 080302-1L										✓	✓								
		CCGT 080304-1L										✓	✓			✓					
		CCGT 09T302-1L										✓	✓			✓					
		CCGT 09T304-1L										✓	✓			✓					
		CCGT 09T308-1L										✓	✓			✓					
		CCGT 120408-1L										✓	✓			✓					
CCGT PF4		CCGT 09T302-PF4				✓															
CCGT PM2		CCGT 060204-PM2				✓						✓									
		CCGT 060208-PM2				✓		✓				✓									
		CCGT 09T304-PM2				✓						✓									
		CCGT 09T308-PM2						✓				✓									
CCMT PF4		CCMT 060202-PF4		✓	✓	✓															✓
		CCMT 060204-PF4		✓	✓	✓	✓														✓
		CCMT 080302-PF4				✓															✓
		CCMT 080304-PF4				✓															✓
		CCMT 080308-PF4				✓															
		CCMT 09T304-PF4		✓	✓	✓	✓														✓
		CCMT 09T308-PF4		✓	✓	✓															✓
CCMT PM3		CCMT 060204-PM3			✓	✓	✓														
		CCMT 080304-PM3				✓															
		CCMT 09T304-PM3			✓	✓	✓														
		CCMT 09T308-PM3			✓	✓	✓														
CCMT PM4		CCMT 080304-PM4				✓	✓														
		CCMT 080308-PM4				✓	✓														
		CCMT 09T308-PM4		✓	✓	✓	✓														
		CCMT 120408-PM4				✓	✓														
CCMT PM5		CCMT 060202-PM5		✓	✓	✓			✓	✓		✓					✓				
		CCMT 060204-PM5		✓	✓	✓	✓	✓	✓	✓		✓					✓		✓		
		CCMT 060212-PM5								✓											
		CCMT 080304-PM5		✓	✓	✓	✓		✓	✓							✓		✓		
		CCMT 080308-PM5		✓	✓	✓				✓							✓				
		CCMT 09T304-PM5		✓	✓	✓	✓	✓	✓	✓		✓					✓				
		CCMT 09T308-PM5		✓	✓	✓	✓	✓	✓	✓		✓					✓				
		CCMT 120404-PM5		✓	✓	✓															
		CCMT 120408-PM5		✓	✓	✓		✓	✓	✓											
		CCMT 120412-PM5		✓		✓				✓											
CCMX L/R RC		CCMX 060202 RC L														✓					
		CCMX 060202 RC R														✓					
		CCMX 080304 RC L														✓					
		CCMX 080304 RC R														✓					

✓: Article which can be ordered
Ordering example: CCGT 060202-1L 9605

CARBIDE INSERTS

TURNING

Chipbreaker		Reference	MTCVD grades								PVD grades					Uncoated grades				Cermet
			1505	1510	5615	5625	5635	8515	8525	8535	8620	9605	KX20	KR20	KX05	KX2	N	S15	S4	SY3	NTB10
CNGG M2		CNGG 120402-M2											✓			✓					
		CNGG 120404-M2											✓								
CNMA		CNMA 120408		✓								✓				✓					
		CNMA 120412		✓								✓									
		CNMA 120416		✓								✓									
		CNMA 160612										✓									
		CNMA 160616										✓									
		CNMA 190612										✓									
		CNMA 190616		✓								✓									
CNMG 25		CNMG 120408-25		✓																	
CNMG 6W		CNMG 120408-6W			✓	✓															
		CNMG 120412-6W			✓	✓															
CNMG F2		CNMG 120404-F2		✓	✓	✓															
		CNMG 120408-F2			✓	✓															
CNMG F4		CNMG 120404-F4				✓															✓
		CNMG 120408-F4				✓															
		CNMG 120412-F4				✓															
CNMG F5		CNMG 120404-F5				✓		✓		✓	✓	✓			✓	✓					
		CNMG 120408-F5				✓		✓		✓	✓	✓	✓		✓	✓					
CNMG L/R 5G		CNMG 120404L-5G								✓				✓							
		CNMG 120404R-5G								✓				✓							
		CNMG 120408L-5G								✓				✓							
		CNMG 120408R-5G								✓				✓							
CNMG M2		CNMG 120404-M2								✓		✓	✓								
		CNMG 120408-M2								✓	✓	✓	✓		✓	✓					
		CNMG 120412-M2								✓			✓								
		CNMG 160612-M2										✓									
		CNMG 190612-M2											✓								
CNMG M3		CNMG 120408-M3				✓															
		CNMG 120412-M3			✓																

✓: Article which can be ordered
Ordering example: CNGG 120402-M2 KX20

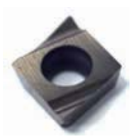
CARBIDE INSERTS

Chipbreaker	Reference	MTCVD grades								PVD grades					Uncoated grades					Cermet
		1505	1510	5615	5625	5635	8515	8525	8535	8620	9605	KX20	KR20	KX05	KX2	N	S15	S4	SY3	NTB10
CNMG M4 	CNMG 120404-M4						✓				✓									
	CNMG 120408-M4						✓	✓			✓									
	CNMG 120412-M4						✓	✓			✓									
	CNMG 160612-M4						✓	✓			✓									
	CNMG 190612-M4						✓	✓			✓									
CNMG M5 	CNMG 090304-M5				✓															
	CNMG 090308-M5				✓				✓											
	CNMG 120404-M5		✓	✓	✓	✓	✓	✓	✓	✓	✓									
	CNMG 120408-M5		✓	✓	✓	✓	✓	✓	✓	✓	✓									
	CNMG 120412-M5		✓	✓	✓	✓	✓	✓	✓		✓									
	CNMG 120416-M5				✓															
	CNMG 160608-M5				✓															
	CNMG 160612-M5		✓		✓	✓			✓											
	CNMG 160616-M5		✓																	
	CNMG 190608-M5				✓						✓									
	CNMG 190612-M5		✓		✓	✓			✓		✓									
	CNMG 190616-M5		✓																	
CNMG M7 	CNMG 120404-M7		✓			✓														
	CNMG 120408-M7		✓		✓	✓		✓	✓	✓	✓	✓								
	CNMG 120412-M7		✓		✓	✓					✓	✓								
	CNMG 160608-M7		✓			✓														
	CNMG 160612-M7		✓		✓															
	CNMG 190608-M7					✓					✓									
	CNMG 190612-M7								✓											
	CNMG 190616-M7									✓										
CNMG M8 	CNMG 120404-M8			✓		✓														
	CNMG 120408-M8			✓	✓	✓														
	CNMG 120412-M8			✓	✓	✓														
	CNMG 160612-M8			✓	✓	✓														
	CNMG 160616-M8				✓															
	CNMG 190612-M8			✓	✓	✓														
CNMG R3 	CNMG 120408-R3	✓	✓	✓	✓	✓														
	CNMG 120412-R3		✓	✓	✓	✓														
	CNMG 120416-R3		✓																	
	CNMG 160612-R3		✓	✓	✓						✓									
	CNMG 160616-R3		✓		✓	✓														
	CNMG 190612-R3				✓						✓									
	CNMG 190616-R3			✓	✓	✓					✓									
CNMM R3 	CNMM 160616-R3				✓															
CNMM R6 	CNMM 120408-R6			✓	✓															
	CNMM 120412-R6			✓	✓															
	CNMM 160612-R6			✓	✓															
	CNMM 160616-R6			✓	✓															
	CNMM 190612-R6			✓	✓	✓														
	CNMM 190616-R6			✓	✓	✓														
	CNMM 190624-R6			✓	✓	✓														

✓: Article which can be ordered
Ordering example: CNMG 120404-M4 8515

TURNING

CARBIDE INSERTS

Chipbreaker		Reference	MTCVD grades								PVD grades					Uncoated grades					Cermet
			1505	1510	5615	5625	5635	8515	8525	8535	8620	9605	KX20	KR20	KX05	KX2	N	S15	S4	SY3	NTB10
CNMM R7		CNMM 190616-R7					✓														
CNMX S1		CNMX 190740-S1		✓	✓																
CPGX L/R JQ		CPGX 080304FL-JQ														✓					
		CPGX 080304FR-JQ														✓					
		CPGX 09T304FL-JQ														✓					
CPGX L/R JR		CPGX 060204FL-JR														✓					
		CPGX 060204FR-JR														✓					
		CPGX 080304FL-JR														✓					
		CPGX 080304FR-JR														✓					
CPGX L/R JZ		CPGX 060202FL-JZ														✓					
		CPGX 060202FR-JZ														✓					
DCGT 1L		DCGT 070202-1L										✓	✓			✓					
		DCGT 070204-1L										✓	✓			✓					
		DCGT 11T302-1L										✓				✓					
		DCGT 11T304-1L										✓	✓			✓					
		DCGT 11T308-1L										✓	✓			✓					
DCGT 2L		DCGT 150408-2L															✓				
DCGT PF4		DCGT 070202-PF4				✓															
		DCGT 11T302-PF4				✓															✓
DCGT PM2		DCGT 070204-PM2						✓													
		DCGT 11T304-PM2						✓				✓									
		DCGT 11T308-PM2						✓				✓									
DCMT PF4		DCMT 070202-PF4			✓	✓															✓
		DCMT 070204-PF4		✓	✓	✓															
		DCMT 070208-PF4		✓		✓															
		DCMT 11T304-PF4		✓	✓	✓	✓														✓
		DCMT 11T308-PF4		✓	✓	✓	✓														✓

✓: Article which can be ordered
Ordering example: CNMM 190616-R7 5635

CARBIDE INSERTS

Chipbreaker	Reference	MTCVD grades								PVD grades					Uncoated grades					Cermet
		1505	1510	5615	5625	5635	8515	8525	8535	8620	9605	KX20	KR20	KX05	KX2	N	S15	S4	SY3	NTB10
DCMT PM3 	DCMT 11T304-PM3				✓															
	DCMT 11T308-PM3				✓															
DCMT PM4 	DCMT 070204-PM4				✓		✓	✓												
	DCMT 11T304-PM4		✓	✓	✓	✓	✓	✓												
	DCMT 11T308-PM4		✓	✓	✓	✓	✓	✓												
	DCMT 11T312-PM4				✓															
	DCMT 150408-PM4			✓		✓														
DNMA 	DNMA 150604										✓				✓					
	DNMA 150608		✓								✓				✓					
	DNMA 150612		✓								✓									
DNMG 3C 	DNMG 110404-3C								✓											
	DNMG 110408-3C								✓											
DNMG 6W 	DNMG 150608-6W				✓															
	DNMG 150612-6W				✓															
DNMG F2 	DNMG 110404-F2		✓																	
	DNMG 110408-F2		✓																	
	DNMG 150604-F2		✓																	✓
	DNMG 150608-F2		✓																	
DNMG F4 	DNMG 150604-F4				✓															✓
	DNMG 150608-F4		✓		✓															✓
	DNMG 150612-F4				✓															
DNMG F5 	DNMG 150604-F5				✓		✓	✓	✓	✓	✓				✓					
	DNMG 150608-F5				✓		✓	✓	✓	✓	✓				✓					
DNMG L/R 5G 	DNMG 150604L-5G						✓		✓				✓							
	DNMG 150604R-5G						✓		✓				✓							
	DNMG 150608L-5G						✓		✓				✓							
	DNMG 150608R-5G						✓		✓				✓							
DNMG M2 	DNMG 110408-M2											✓								
	DNMG 150608-M2								✓	✓	✓	✓			✓					
	DNMG 150612-M2											✓								

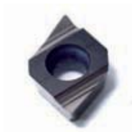
✓: Article which can be ordered
Ordering example: DCMT 11T304-PM3 5625

CARBIDE INSERTS

Chipbreaker	Reference	MTCVD grades								PVD grades					Uncoated grades					Cermet
		1505	1510	5615	5625	5635	8515	8525	8535	8620	9605	KX20	KR20	KX05	KX2	N	S15	S4	SY3	NTB10
DNMG M3 	DNMG 110408-M3			✓																
	DNMG 150608-M3			✓	✓															
	DNMG 150612-M3			✓	✓															
DNMG M4 	DNMG 150608-M4						✓	✓			✓									
	DNMG 150612-M4						✓	✓			✓									
DNMG M5 	DNMG 110404-M5				✓				✓											
	DNMG 110408-M5		✓		✓			✓	✓											
	DNMG 110412-M5				✓															
	DNMG 150604-M5		✓	✓	✓	✓		✓	✓	✓										✓
	DNMG 150608-M5		✓	✓	✓	✓	✓	✓	✓	✓										
	DNMG 150612-M5		✓		✓				✓											
	DNMG 150616-M5				✓															
	DNMG 190612-M5				✓															
DNMG M8 	DNMG 150608-M8			✓	✓															
	DNMG 150612-M8			✓	✓															
DNMG R3 	DNMG 150608-R3		✓		✓	✓														
	DNMG 150612-R3			✓	✓															
	DNMG 150616-R3				✓															
DPMW 	DPMW 11T308		✓																	
ECGT 1L 	ECGT 060202-1L														✓					
	ECGT 080304-1L														✓					
ECGT 2L 	ECGT 060202-2L														✓					
	ECGT 060204-2L														✓					
	ECGT 080302-2L														✓					
	ECGT 080304-2L														✓					
ECMT PM3 	ECMT 080304-PM3					✓														

✓: Article which can be ordered
Ordering example: DNMG 110408-M2 KX20

CARBIDE INSERTS

Chipbreaker	Reference	MTCVD grades								PVD grades					Uncoated grades					Cermet
		1505	1510	5615	5625	5635	8515	8525	8535	8620	9605	KX20	KR20	KX05	KX2	N	S15	S4	SY3	NTB10
ECMT PM4 	ECMT 060204-PM4				✓	✓														
	ECMT 080304-PM4		✓		✓	✓	✓	✓										✓		
	ECMT 080308-PM4				✓	✓														
ECMW 	ECMW 060204														✓					
	ECMW 080304														✓					
	ECMW 080308														✓					
EPGX L/R JZ 	EPGX 050202FL-JZ														✓					
	EPGX 050202FR-JZ														✓					
EPMT PM5 	EPMT 050202-PM5			✓	✓	✓	✓	✓	✓						✓					✓
KNUX L/R 22 	KNUX 160405L-22		✓		✓	✓		✓	✓											
	KNUX 160405R-22		✓		✓	✓			✓								✓			
	KNUX 160410L-22					✓														
	KNUX 160410R-22					✓														
KNUX L/R 32 	KNUX 160405L-32		✓		✓	✓		✓	✓											
	KNUX 160405R-32		✓		✓	✓		✓	✓											
	KNUX 160410L-32				✓	✓														
	KNUX 160410R-32				✓	✓														
RCMT PM5 	RCMT 0803M0-PM5		✓					✓												
	RCMT 10T3M0-PM5		✓												✓					
	RCMT 1204M0-PM5		✓						✓						✓					
	RCMT 1605M0-PM5								✓						✓					
	RCMT 2006M0-PM5								✓						✓					
	RCMT 2507M0-PM5														✓					
RCMT RP5 	RCMT 0803M0-RP5				✓						✓									
	RCMT 10T3M0-RP5				✓	✓					✓									
	RCMT 1204M0-RP5				✓						✓									
	RCMT 1605M0-RP5				✓						✓									
	RCMT 2006M0-RP5										✓									
RNMG M7 	RNMG 120400-M7		✓		✓															
SCGT 1L 	SCGT 09T304-1L										✓	✓			✓					
	SCGT 09T308-1L										✓	✓								

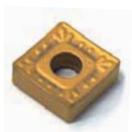
✓: Article which can be ordered
Ordering example: ECMT 060204-PM4 5625

CARBIDE INSERTS

Chipbreaker	Reference	MTCVD grades								PVD grades					Uncoated grades					Cermet
		1505	1510	5615	5625	5635	8515	8525	8535	8620	9605	KX20	KR20	KX05	KX2	N	S15	S4	SY3	NTB10
SCGT PM2 	SCGT 09T308-PM2						✓				✓									
	SCGT 120408-PM2										✓									
SCMT PF4 	SCMT 09T304-PF4				✓															
	SCMT 09T308-PF4				✓															✓
SCMT PM3 	SCMT 120412-PM3				✓															
SCMT PM4 	SCMT 09T304-PM4				✓															
	SCMT 09T308-PM4	✓	✓		✓	✓	✓	✓												
SCMT PM5 	SCMT 120408-PM5		✓		✓	✓			✓			✓						✓		
	SCMT 120412-PM5				✓															
SNMA 	SNMA 090308										✓									
	SNMA 120408		✓								✓									
	SNMA 120412		✓								✓				✓					
	SNMA 120416		✓																	
	SNMA 150612										✓									
	SNMA 150616										✓									
	SNMA 190612										✓									
	SNMA 190616		✓								✓									
SNMG F2 	SNMG 090308-F2				✓															
SNMG F4 	SNMG 120412-F4				✓															
SNMG F5 	SNMG 120408-F5						✓	✓	✓		✓	✓			✓					

✓: Article which can be ordered
Ordering example: SCGT 09T308-PM2   8515

CARBIDE INSERTS

Chipbreaker	Reference	MTCVD grades								PVD grades					Uncoated grades					Cermet
		1505	1510	5615	5625	5635	8515	8525	8535	8620	9605	KX20	KR20	KX05	KX2	N	S15	S4	SY3	NTB10
SNMG M2 	SNMG 120408-M2								✓		✓	✓								
SNMG M3 	SNMG 120412-M3				✓															
	SNMG 120416-M3			✓																
SNMG M4 	SNMG 120408-M4							✓			✓									
	SNMG 190612-M4										✓									
	SNMG 190616-M4										✓									
SNMG M5 	SNMG 090308-M5		✓		✓															
	SNMG 120404-M5				✓															
	SNMG 120408-M5		✓	✓	✓	✓		✓	✓											
	SNMG 120412-M5		✓	✓	✓				✓											
	SNMG 150616-M5				✓															
	SNMG 190612-M5				✓	✓			✓											
	SNMG 190616-M5				✓				✓						✓					
SNMG M7 	SNMG 090308-M7		✓						✓											
	SNMG 120404-M7		✓						✓		✓									
	SNMG 120408-M7		✓		✓	✓		✓	✓		✓	✓								
	SNMG 120412-M7	✓	✓			✓			✓		✓									
	SNMG 120416-M7								✓											
	SNMG 150612-M7										✓									
	SNMG 190612-M7		✓			✓					✓									
	SNMG 190616-M7		✓						✓	✓	✓	✓								
SNMG M8 	SNMG 120408-M8			✓	✓															
	SNMG 190616-M8				✓															
SNMG R3 	SNMG 120408-R3		✓		✓	✓														
	SNMG 120412-R3		✓																	
	SNMG 150612-R3			✓							✓									
	SNMG 150616-R3				✓															
	SNMG 190612-R3				✓						✓									
	SNMG 190616-R3					✓					✓									
	SNMG 250924-R3										✓									
SNMM R6 	SNMM 190612-R6			✓	✓	✓														
	SNMM 190616-R6			✓	✓	✓														
	SNMM 190624-R6			✓	✓	✓														
SNMM R7 	SNMM 190616-R7					✓														
	SNMM 190624-R7					✓														
	SNMM 250724-R7					✓														

✓: Article which can be ordered
Ordering example: SNMG 120408-M2 8535

TURNING

CARBIDE INSERTS

Chipbreaker	Reference	MTCVD grades								PVD grades					Uncoated grades					Cermet
		1505	1510	5615	5625	5635	8515	8525	8535	8620	9605	KX20	KR20	KX05	KX2	N	S15	S4	SY3	NTB10
SNMM T2-R9 	SNMM 120408 T2-R9					✓														
	SNMM 120412 T2-R9							✓												
	SNMM 190616 T2-R9					✓		✓												
	SNMM 250724 T2-R9										✓									
	SNMM 250924 T2-R9										✓									
SNUN 	SNUN 120412																		✓	
SPMR PF2 	SPMR 090304-PF2																			✓
SPMR PF5 	SPMR 090304-PF5				✓															
	SPMR 120304-PF5				✓	✓														
	SPMR 120308-PF5				✓	✓														
SPUN 	SPUN 120304					✓									✓					
	SPUN 120308		✓			✓									✓				✓	
	SPUN 120312																		✓	
TCGT 1L 	TCGT 110202-1L										✓	✓								
	TCGT 110204-1L										✓	✓			✓					
	TCGT 16T304-1L										✓	✓			✓					
	TCGT 16T308-1L										✓	✓			✓					
TCGT PF4 	TCGT 06T102-PF4																			✓
	TCGT 090202-PF4																			✓
TCGT PM2 	TCGT 110204-PM2										✓									
TCMT PF4 	TCMT 06T102-PF4			✓																
	TCMT 06T104-PF4				✓															
	TCMT 090204-PF4		✓		✓															
	TCMT 110204-PF4		✓	✓	✓	✓														
	TCMT 110208-PF4		✓		✓															
	TCMT 16T304-PF4			✓	✓	✓														✓
	TCMT 16T308-PF4		✓		✓	✓														
	TCMT 16T312-PF4		✓																	

✓: Article which can be ordered
Ordering example: SNMM 120408 T2-R9 5635

TURNING

CARBIDE INSERTS

Chipbreaker		Reference	MTCVD grades								PVD grades					Uncoated grades					Cermet
			1505	1510	5615	5625	5635	8515	8525	8535	8620	9605	KX20	KR20	KX05	KX2	N	S15	S4	SY3	NTB10
TCMT PM3		TCMT 16T304-PM3				✓															
TCMT PM4		TCMT 110204-PM4				✓															
		TCMT 110208-PM4				✓	✓														
		TCMT 16T308-PM4				✓	✓		✓												
TCMT PM5		TCMT 16T304-PM5		✓	✓	✓	✓		✓	✓		✓							✓		
		TCMT 16T308-PM5		✓	✓	✓	✓		✓	✓		✓							✓		
TCMX L/R RC		TCMX 16T304 RCL														✓					
		TCMX 16T304 RCR																✓			
TNMA		TNMA 160308										✓									
		TNMA 160408	✓	✓								✓									
		TNMA 160412		✓																	
		TNMA 220408		✓								✓				✓					
TNMG 25		TNMG 160408-25		✓																	
TNMG 3C		TNMG 160404-3C								✓											
TNMG F2		TNMG 160404-F2			✓	✓															✓
		TNMG 160408-F2				✓															
TNMG F4		TNMG 160404-F4																			✓
		TNMG 160408-F4				✓															✓
		TNMG 220408-F4				✓															
TNMG F5		TNMG 160404-F5						✓	✓	✓		✓				✓					
		TNMG 160408-F5				✓		✓	✓	✓	✓	✓				✓					

✓: Article which can be ordered
Ordering example: TCMT 16T304-PM3 5625

CARBIDE INSERTS

Chipbreaker	Reference	MTCVD grades								PVD grades					Uncoated grades					Cermet
		1505	1510	5615	5625	5635	8515	8525	8535	8620	9605	KX20	KR20	KX05	KX2	N	S15	S4	SY3	NTB10
TNMG L/R 5G 	TNMG 160404L-5G								✓											
	TNMG 160404R-5G								✓				✓							
	TNMG 160408L-5G								✓				✓							
	TNMG 160408R-5G								✓				✓							
TNMG M2 	TNMG 160408-M2								✓		✓	✓			✓					
	TNMG 220408-M2										✓									
TNMG M3 	TNMG 110308-M3				✓															
	TNMG 160408-M3			✓																
	TNMG 160412-M3			✓																
TNMG M4 	TNMG 160408-M4						✓	✓												
TNMG M5 	TNMG 110304-M5				✓															
	TNMG 160404-M5		✓	✓	✓	✓		✓	✓	✓	✓									✓
	TNMG 160408-M5		✓	✓	✓	✓	✓	✓	✓	✓	✓									
	TNMG 160412-M5		✓	✓	✓				✓											
	TNMG 220404-M5			✓	✓						✓									
	TNMG 220408-M5		✓	✓	✓	✓		✓	✓		✓									
	TNMG 220412-M5				✓				✓		✓									
TNMG M7 	TNMG 160404-M7		✓						✓											
	TNMG 160408-M7		✓		✓	✓			✓	✓										
	TNMG 160412-M7					✓														
	TNMG 220404-M7		✓		✓				✓		✓									
	TNMG 220408-M7				✓	✓			✓		✓									
	TNMG 220412-M7					✓					✓									
	TNMG 270612-M7							✓	✓											
	TNMG 270616-M7								✓											
	TNMG 270624-M7								✓									✓		
	TNMG 270632-M7								✓											
	TNMG 330924-M7								✓									✓		
	TNMG 330932-M7																	✓		
TNMG M8 	TNMG 160408-M8			✓	✓															
TNMG R3 	TNMG 160408-R3		✓		✓	✓														
	TNMG 160412-R3		✓		✓															
	TNMG 220408-R3				✓	✓														

✓: Article which can be ordered
Ordering example: TNMG 160404L-5G 8535

CARBIDE INSERTS

Chipbreaker	Reference	MTCVD grades								PVD grades					Uncoated grades					Cermet
		1505	1510	5615	5625	5635	8515	8525	8535	8620	9605	KX20	KR20	KX05	KX2	N	S1S	S4	SY3	NTB10
TNMM R6 	TNMM 160412-R6			✓																
TPGX L/R JQ 	TPGX 090204FL-JQ																			✓
	TPGX 110204FL-JQ														✓					
	TPGX 110204FR-JQ														✓					
TPGX L/R JR 	TPGX 16T304FL-JR																			✓
TPGX L/R JZ 	TPGX 090202FL-JZ														✓					
	TPGX 090202FR-JZ														✓					
TPMR PF2 	TPMR 110304-PF2																			✓
	TPMR 110308-PF2																			✓
	TPMR 160304-PF2																			✓
TPMR PF5 	TPMR 110304-PF5		✓		✓	✓														
	TPMR 110308-PF5		✓		✓	✓														
	TPMR 160304-PF5		✓	✓	✓	✓														
	TPMR 160308-PF5		✓	✓	✓	✓														
TPUN 	TPUN 110304		✓												✓					
	TPUN 110308		✓																	
	TPUN 160304		✓			✓									✓					
	TPUN 160308		✓			✓									✓					
	TPUN 160312		✓																	
	TPUN 220408					✓														
TPUX L/R RC 	TPUX 160304 RC L														✓					
	TPUX 160304 RC R														✓					
	TPUX 160308 RC R														✓					
VBMT PF4 	VBMT 160404-PF4		✓	✓	✓	✓														
VBMT PM3 	VBMT 160408-PM3				✓															

✓: Article which can be ordered
Ordering example: TNMM 160412-R6 5615

TURNING

CARBIDE INSERTS

Chipbreaker	Reference	MTCVD grades								PVD grades					Uncoated grades					Cermet
		1505	1510	5615	5625	5635	8515	8525	8535	8620	9605	KX20	KR20	KX05	KX2	N	S15	S4	SY3	NTB10
VBMT PM4 	VBMT 160404-PM4		✓	✓	✓	✓	✓	✓												
	VBMT 160408-PM4		✓	✓	✓	✓	✓	✓												
	VBMT 160412-PM4		✓		✓	✓														
VCGT 1L 	VCGT 070202-1L										✓				✓					
	VCGT 070204-1L										✓									
	VCGT 110202-1L										✓	✓			✓					
	VCGT 110204-1L										✓	✓			✓					
	VCGT 130302-1L										✓	✓			✓					
	VCGT 130304-1L										✓	✓			✓					
	VCGT 130308-1L										✓	✓			✓					
	VCGT 160404-1L										✓	✓			✓					
	VCGT 160408-1L										✓	✓			✓					
	VCGT 160412-1L										✓				✓					
VCGT 2L 	VCGT 130302-2L										✓				✓					
	VCGT 130304-2L										✓				✓					
	VCGT 130308-2L										✓				✓					
VCGT PF4 	VCGT 070202-PF4												✓							
	VCGT 070204-PF4												✓							
	VCGT 130302-PF4		✓	✓	✓															✓
	VCGT 130304-PF4		✓	✓	✓															✓
	VCGT 130308-PF4		✓		✓															✓
VCGT PM4 	VCGT 130308-PM4				✓															
VCGT PM5 	VCGT 130302-PM5		✓		✓	✓		✓	✓						✓					✓
	VCGT 130304-PM5		✓	✓	✓	✓	✓	✓	✓						✓					✓
	VCGT 130308-PM5		✓	✓	✓	✓		✓	✓											✓
VCGW 	VCGW 130302														✓					
	VCGW 130304														✓					
	VCGW 130308														✓					
VCGX L/R PF4 	VCGX 130300FL-PF4											✓								✓
	VCGX 130300FR-PF4											✓								✓
	VCGX 130301 FR-PF4					✓														
	VCGX 130301FL-PF4											✓								
	VCGX 130301FR-PF4											✓								✓
VNMG 3C 	VNMG 160404-3C								✓											

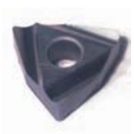
✓: Article which can be ordered
Ordering example: VBMT 160404-PM4 1510

CARBIDE INSERTS

Chipbreaker	Reference	MTCVD grades								PVD grades					Uncoated grades					Cermet
		1505	1510	5615	5625	5635	8515	8525	8535	8620	9605	KX20	KR20	KX05	KX2	N	S15	S4	SY3	NTB10
VNMG F5 	VNMG 160408-F5				✓															
VNMG M2 	VNMG 160404-M2										✓									
	VNMG 160408-M2										✓									
VNMG M5 	VNMG 160404-M5		✓	✓	✓	✓			✓											
	VNMG 160408-M5		✓	✓	✓	✓					✓									
WCGT PF4 	WCGT 020102-PF4														✓					✓
	WCGT 020104-PF4														✓					✓
WCGX L/R JZ 	WCGX 020102 FL-JZ														✓					
	WCGX 020102FL-JZ																			✓
WNMA 	WNMA 080408		✓								✓									
	WNMA 080412		✓																	
WNMG 6W 	WNMG 080408-6W			✓																
WNMG F2 	WNMG 080404-F2			✓	✓															
	WNMG 080408-F2				✓															
WNMG F5 	WNMG 080404-F5				✓		✓	✓	✓	✓	✓				✓					✓
	WNMG 080408-F5						✓	✓	✓	✓	✓				✓					
WNMG L/R 5G 	WNMG 080404L-5G								✓				✓							
	WNMG 080404R-5G								✓				✓							
	WNMG 080408L-5G								✓				✓							
	WNMG 080408R-5G								✓				✓							

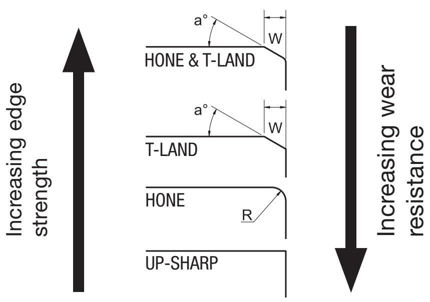
✓: Article which can be ordered
Ordering example: VNMG 160408-F5 5625

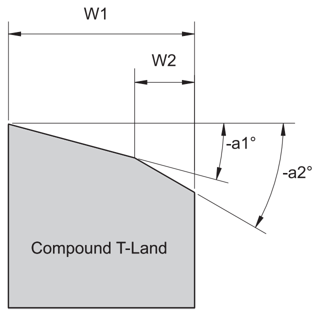
CARBIDE INSERTS

Chipbreaker	Reference	MTCVD grades								PVD grades					Uncoated grades					Cermet
		1505	1510	5615	5625	5635	8515	8525	8535	8620	9605	KX20	KR20	KX05	KX2	N	S15	S4	SY3	NTB10
WNMG M2 	WNMG 060404-M2								✓		✓				✓					
	WNMG 060408-M2								✓		✓	✓								
	WNMG 080408-M2								✓	✓	✓	✓			✓					
WNMG M3 	WNMG 080408-M3			✓	✓															
WNMG M4 	WNMG 080408-M4						✓	✓			✓									
	WNMG 080412-M4										✓									
WNMG M5 	WNMG 060404-M5		✓	✓	✓				✓											
	WNMG 060408-M5		✓		✓	✓		✓	✓		✓									
	WNMG 060412-M5				✓															
	WNMG 080404-M5		✓	✓	✓	✓		✓	✓	✓	✓									
	WNMG 080408-M5		✓	✓	✓	✓	✓	✓	✓	✓	✓									
	WNMG 080412-M5		✓	✓	✓	✓	✓	✓	✓											
WNMG M7 	WNMG 080408-M7		✓			✓														
	WNMG 080412-M7										✓									
WNMG M8 	WNMG 060408-M8			✓																
	WNMG 080408-M8			✓	✓	✓														
	WNMG 080412-M8			✓	✓															
WNMG R3 	WNMG 080408-R3		✓	✓	✓	✓														
	WNMG 080412-R3		✓	✓	✓	✓														
	WNMG 080416-R3				✓															
WNMX L/R 37 	WNMX 080404 L-37																	✓		
	WNMX 080404 R-37																	✓		
	WNMX 080408 L-37																	✓		
WNMX L/R 37AL 	WNMX 080408 L-37-AL															✓				
	WNMX 080408 R-37-AL	✓														✓				

✓: Article which can be ordered
Ordering example: WNMG 060404-M2 8535

EDGE PREPARATION DESIGNATION



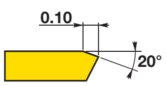


Edge preparation code		T-Land (mm)	Angle (degrees)
ISO	Safety		
T 00510	TB1	0.05	10°
T 00515	TB2	0.05	15°
T 00520	TB3	0.05	20°
T 01020	TC3	0.10	20°
T 01315	T1	0.13	15°
T 00820	T3	0.08	20°
T 01325	T5	0.13	25°
T 01530	T6	0.15	30°
T 02020	TF3	0.20	20°
T 02025	TF4	0.20	25°
T 02520	TG3	0.25	20°
T 15015	TS2	1.50	15°
T 20015	TX2	2.00	15°

Edge preparation code		T-Land (mm)	Angle (degrees)
ISO	Safety		
S 01315	S1	0.13	15°
S 00820	S3	0.08	20°
S 01020	SC3	0.10	20°
S 01325	S5	0.13	25°
S 01530	S6	0.15	30°
S 02020	SF3	0.20	20°
S 05020	SK3	0.50	20°

Edge preparation code		T-Land (mm)	Angle (degrees)
ISO	Safety		
K 15015	KS2	1.50	15°
K 20015	KX2	2.00	15°

RNGN 12 04 00 **T01020** =>



Edge finishing
Chamfer width
Chamfer angle

Sharp edge **F**
ER treated edge **E**
Negative chamfering **T**
Negative double chamfering **K**
Chamfered and ER treated edge **S**

ADVANCED MATERIALS GRADE SELECTION

Premium high performance cutting tools for your most demanding applications

TC100 - Mixed ceramic - Used extensively in steel and bearing markets and for cast iron finishing operations	
Features	**Benefits**
■ Composed of Al_2O_3 - TiC. ■ High temperature hardness and good thermal shock resistance.	■ General turning, boring and grooving of cast iron. ■ Turning of hard materials (under 65 HRC). ■ Turning of heat resistant alloys.

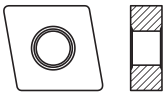
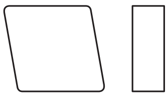
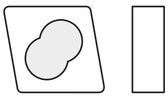
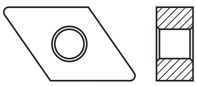
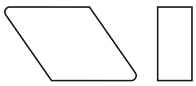
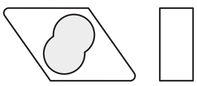
SN100 - Silicon nitride - Exceptional tool life when high speed machining of cast iron	
Features	**Benefits**
■ Remarkable wear resistance and offers drastic improvements in tool life and stability. ■ Low thermal expansion makes this range very resistant to thermal shock.	■ High speed rough turning of cast iron. ■ Offers exceptional tool life. ■ Cutting speeds up to 1000 m/min, feeds of 1 mm/rev.

WS500 - Whiskers - Ideal for high speed machining for nickel based aerospace alloys	
Features	**Benefits**
■ Combines alumina and a whisker reinforced compound offering extreme fracture toughness and notch resistance. ■ Added tensile strength and fracture toughness even at elevated temperatures.	■ Turning and milling of heat resistant alloy (Inconel 718) and semi-finish and finish turning of cast iron. ■ High speed turning of steel.

C225 - Multi-cornered coated PCBN – For machining materials with a hardness (> 45 HRC)	
Features	**Benefits**
■ Unique grade development.	■ Resists cratering and impact type fracturing. ■ Ultra hard cutting tool material. ■ Chemically resistant. ■ Thermal stability.
■ Carbide backed segment.	■ Dissipate heat generated during machining. ■ Stops craks from progressing. ■ Increases brazing contact area.

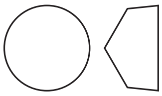
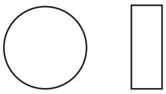
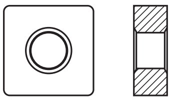
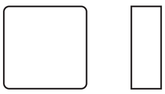
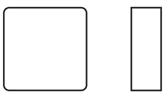
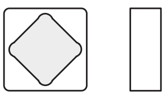
D720 / PC30 - Polycrystalline diamond (PCD) - Engineered for your most demanding non-ferrous applications	
Features	**Benefits**
■ Polycrystalline diamond grade with medium granulometry. ■ Tipped and full edge inserts.	■ Recommended for finishing and light roughing of aluminum and other non-ferrous materials. ■ Permits the removal of large quantities of chips. ■ Excellent surface finish. ■ For long tool life.

CERAMIC

Style	Reference	Grades			Edge preparation code	
		SN100	TC100	WS500	Safety	ISO
CNGA 	CNGA 120404 T02020		✓		T02020	T02020
	CNGA 120408 T01020		✓		T01020	T01020
	CNGA 120408 T02020	✓			T02020	T02020
	CNGA 120412 T01020		✓		T01020	T01020
	CNGA 120412 T02020	✓			T02020	T02020
	CNGA 120416 T02020	✓			T02020	T02020
CNGN 	CNGN 120404 T01020		✓		T01020	T01020
	CNGN 120408 T01020		✓		T01020	T01020
	CNGN 120408 T02020	✓			T02020	T02020
	CNGN 120408 TB3			✓	TB3	T00520
	CNGN 120408 TF3			✓	TF3	T02020
	CNGN 120412 T01020		✓		T01020	T01020
	CNGN 120412 T02020	✓			T02020	T02020
	CNGN 120412 TB3			✓	TB3	T00520
	CNGN 120416 T02020	✓			T02020	T02020
	CNGN 120708 T01020		✓		T01020	T01020
	CNGN 120708 TB3			✓	TB3	T00520
	CNGN 120712 T01020		✓		T01020	T01020
	CNGN 120712 TB3			✓	TB3	T00520
	CNGN 120712 TF3			✓	TF3	T02020
	CNGN 160716 T02020		✓		T02020	T02020
CNGX 	CNGX 120712 TF4	✓			TF4	T02025
	CNGX 120716 TB1	✓			TB1	T00510
	CNGX 120716 TF4	✓			TF4	T02025
DNGA 	DNGA 150404 T01020		✓		T01020	T01020
	DNGA 150408 S02020		✓		S02020	S02020
	DNGA 150408 T00520		✓		T00520	T00520
	DNGA 150408 T01020	✓			T01020	T01020
	DNGA 150412 T01020		✓		T01020	T01020
	DNGA 150412 T02020		✓		T02020	T02020
DNGN 	DNGN 150404 T01020		✓		T01020	T01020
	DNGN 150408 T01020		✓		T01020	T01020
	DNGN 150408 T02020	✓			T02020	T02020
	DNGN 150408 TB3			✓	TB3	T00520
	DNGN 150412 T02020	✓			T02020	T02020
	DNGN 150412 TB3			✓	TB3	T00520
	DNGN 150416 TB3			✓	TB3	T00520
	DNGN 150708 TB3			✓	TB3	T00520
	DNGN 150708 TF3			✓	TF3	T02020
	DNGN 150712 TB3			✓	TB3	T00520
	DNGN 150716 T02020		✓		T02020	T02020
DNGX 	DNGX 150716 TF4	✓			TF4	T02025

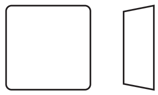
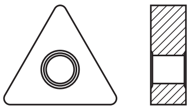
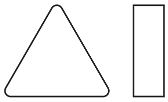
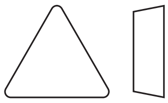
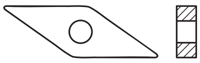
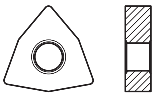
✓: Article which can be ordered
Ordering example: CNGA 12 04 04 T02020 TC100

CERAMIC

Style	Reference	Grades			Edge preparation code	
		SN100	TC100	WS500	Safety	ISO
RCGX 	RCGX 060400 TF3			✓	TF3	T02020
	RCGX 060600 K15015		✓		K15015	K15015
	RCGX 060600 TB3			✓	TB3	T00520
	RCGX 090700 K15015		✓		K15015	K15015
	RCGX 090700 TB3			✓	TB3	T00520
	RCGX 120700 K15015		✓		K15015	K15015
	RCGX 120700 TB3			✓	TB3	T00520
	RCGX 120700 TF3			✓	TF3	T02020
RNGN 	RNGN 090300 T01020		✓		T01020	T01020
	RNGN 090400 TB3			✓	TB3	T00520
	RNGN 120400 SF3			✓	SF3	S02020
	RNGN 120400 SK3			✓	SK3	S05020
	RNGN 120400 T01020		✓		T01020	T01020
	RNGN 120400 T02020	✓			T02020	T02020
	RNGN 120400 TB3			✓	TB3	T00520
	RNGN 120400 TF3			✓	TF3	T02020
	RNGN 120700 T01020		✓		T01020	T01020
	RNGN 120700 T02020		✓		T02020	T02020
	RNGN 120700 T15015		✓		T15015	T15015
	RNGN 120700 TB3			✓	TB3	T00520
	RNGN 120700 TF3			✓	TF3	T02020
	RNGN 190700 T20015		✓		T20015	T20015
	RNGN 190700 TB3			✓	TB3	T00520
	RNGN 250700 TX2			✓	TX2	T20015
SNGA 	SNGA 120408 T01025		✓		T01025	T01025
	SNGA 120408 T02020	✓			T02020	T02020
	SNGA 120412 T01020		✓		T01020	T01020
	SNGA 120412 T02020	✓			T02020	T02020
	SNGA 120416 T02020	✓			T02020	T02020
SNGN 	SNGN 090308 T01020		✓		T01020	T01020
	SNGN 090312 T01020		✓		T01020	T01020
	SNGN 090316 T01020		✓		T01020	T01020
	SNGN 120404 T01020		✓		T01020	T01020
	SNGN 120408 T01020		✓		T01020	T01020
	SNGN 120408 T02020	✓			T02020	T02020
	SNGN 120408 TB3			✓	TB3	T00520
	SNGN 120408 TF3			✓	TF3	T02020
	SNGN 120412 SF3			✓	SF3	S02020
	SNGN 120412 T01020		✓		T01020	T01020
	SNGN 120412 T02020	✓	✓		T02020	T02020
	SNGN 120412 TB3			✓	TB3	T00520
	SNGN 120412 TF3			✓	TF3	T02020
	SNGN 120416 T00520		✓		T00520	T00520
	SNGN 120416 T01020		✓		T01020	T01020
	SNGN 120416 TB3			✓	TB3	T00520
	SNGN 120416 TF3			✓	TF3	T02020
	SNGN 120708 T01020		✓		T01020	T01020
SNGN 	SNGN 120708 TB3			✓	TB3	T00520
	SNGN 120712 S02020		✓		S02020	S02020
	SNGN 120712 T01020		✓		T01020	T01020
	SNGN 120712 TB3			✓	TB3	T00520
	SNGN 120716 T02020	✓			T02020	T02020
SNGX 	SNGX 120712 TF4	✓			TF4	T02025
	SNGX 120716 TB1	✓			TB1	T00510
	SNGX 120716 TF4	✓			TF4	T02025
	SNGX 150716 TF4	✓			TF4	T02025

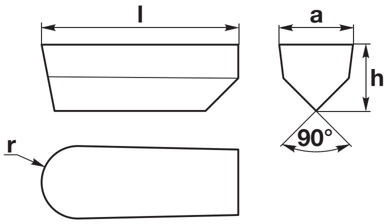
✓: Article which can be ordered
Ordering example: RCGX 06 04 00 TF3   WS500

CERAMIC

Style	Reference	Grades			Edge preparation code	
		SN100	TC100	WS500	Safety	ISO
SPGN 	SPGN 090308 T01020		✓		T01020	T01020
	SPGN 120308 T01020		✓		T01020	T01020
	SPGN 120408 T01020		✓		T01020	T01020
	SPGN 120412 T01020		✓		T01020	T01020
TNGA 	TNGA 160408 T01020		✓		T01020	T01020
	TNGA 160408 T02020	✓			T02020	T02020
	TNGA 160412 T01020		✓		T01020	T01020
	TNGA 160412 T02020	✓			T02020	T02020
TNGN 	TNGN 110308 T01020		✓		T01020	T01020
	TNGN 160404 T01020		✓		T01020	T01020
	TNGN 160408 T01020		✓		T01020	T01020
	TNGN 160408 T02020	✓			T02020	T02020
	TNGN 160412 T01020		✓		T01020	T01020
	TNGN 160412 T02020	✓			T02020	T02020
	TNGN 160416 T01020		✓		T01020	T01020
	TNGN 160420 T01020		✓		T01020	T01020
	TNGN 160708 T02020		✓		T02020	T02020
	TNGN 160712 T02020		✓		T02020	T02020
TPGN 	TPGN 110304 T01020		✓		T01020	T01020
	TPGN 110308 T01020		✓		T01020	T01020
	TPGN 160304 T01020		✓		T01020	T01020
	TPGN 160308 T01020		✓		T01020	T01020
	TPGN 160312 T01020		✓		T01020	T01020
VNGA 	VNGA 160404 T01020		✓		T01020	T01020
	VNGA 160408 T01020		✓		T01020	T01020
WNGA 	WNGA 080408 T02020	✓			T02020	T02020
	WNGA 080412 T02020	✓			T02020	T02020
	WNGA 080416 T02020	✓			T02020	T02020

✓: Article which can be ordered
Ordering example: SPGN 09 03 08 T01020 TC100

CERAMIC

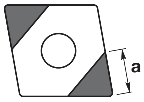
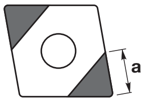
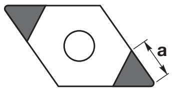
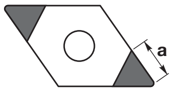
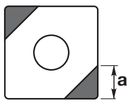
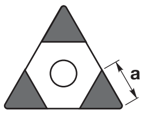
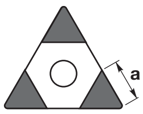
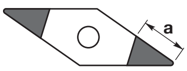


Style		Reference	Grades			Dimensions (mm)			
			SN100	TC100	WS500	a	l	h	r
WG6 … RENA		WG6 250 RENA			✓	6.35	19.05	6.35	3.17
		WG6 281 RENA			✓	7.13	19.05	6.35	3.56
WG8 … RENA		WG8 344 RENA			✓	8.73	25.4	8.55	4.36
		WG8 375 RENA			✓	9.52	25.4	8.55	4.76

✓: Article which can be ordered
Ordering example: WG6 250 RENA WS500

TURNING

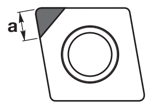
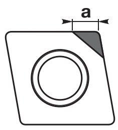
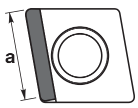
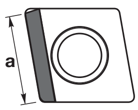
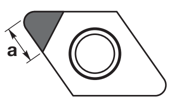
CBN

Style		ISO reference	Grade	Cutting edges	Dimensions (mm)
			C225		a
CCGW		CCGW 060204 M2-S5	✓	2	2.9
		CCGW 060208 M2-S5	✓	2	2.8
CNGA		CNGA 120404 M2-S5	✓	2	2.9
		CNGA 120408 M2-S1	✓	2	2.8
		CNGA 120408 M2-S5	✓	2	2.8
		CNGA 120408 WM2S1	✓	2	2.7
		CNGA 120408 WM2S5	✓	2	2.7
		CNGA 120412 M2-S1	✓	2	2.7
		CNGA 120412 M2-S5	✓	2	2.7
CPGW		CPGW 060204 M2-S5	✓	2	2.9
		CPGW 09T304 M2-S5	✓	2	2.9
		CPGW 09T308 M2-S5	✓	2	2.8
		CPGW 09T308WM2-S5	✓	2	2.7
DCGW		DCGW 070204 M2-S5	✓	2	3.4
		DCGW 070208 M2-S5	✓	2	3.1
DNGA		DNGA 150404 M2-S5	✓	2	3.4
		DNGA 150408 M2-S5	✓	2	3.1
		DNGA 150412 M2-S5	✓	2	2.7
SNGA		SNGA 120404 M2-S5	✓	2	2.7
		SNGA 120408 M2-S5	✓	2	2.7
		SNGA 120412 M2-S5	✓	2	2.7
TCGW		TCGW 110204 M3-S5	✓	3	3.3
		TCGW 110208 M3-S5	✓	3	3
TNGA		TNGA 160404 M3-S5	✓	3	3.3
		TNGA 160408 M3-S5	✓	3	3
		TNGA 160412 M3-S5	✓	3	2.7
VNGA		VNGA 160404 M2-S5	✓	2	4.4
		VNGA 160408 M2-S5	✓	2	3.6

✓: Article which can be ordered
Ordering example: CCGW 06 02 04 M2-S5 C225

TURNING

PCD

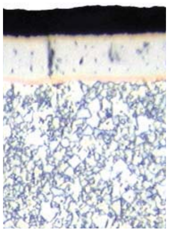
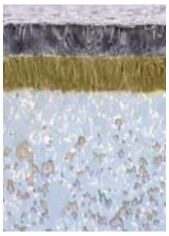
Style		ISO reference	Grades		Dimensions (mm)
			PC30	D720	a
CPGW … F CPGW … FN-30		CPGW 060204 F		✓	3.0
		CPGW 060208 F		✓	3.0
		CPGW 080304 F		✓	3.0
		CPGW 060202 FN-30-1	✓		3.0
		CPGW 060204 FN-30-1	✓		3.0
		CPGW 060208 FN-30-1	✓		3.0
		CPGW 080302 FN-30-1	✓		3.0
		CPGW 080304 FN-30-1	✓		3.0
		CPGW 080308 FN-30-1	✓		3.0
CPGW … FN-30G		CPGW 060204 FN-30G-1	✓		3.0
CPGW … FL/R-60 CPGW … FL/R-70 CPGW … FL/R-90 CPGW … HL CPGW … HR		CPGW 060202 FL-60-1	✓		6.0
		CPGW 060204 FL-60-1	✓		6.0
		CPGW 060208 FL-60-1	✓		6.0
		CPGW 080302 FL-70-1	✓		7.5
		CPGW 080304 FL-70-1	✓		7.5
		CPGW 080308 FL-70-1	✓		7.5
		CPGW 09T304 FL-90-1	✓		9.0
		CPGW 060202 FR-60-1	✓		6.0
		CPGW 060204 FR-60-1	✓		6.0
		CPGW 080304 FR-70-1	✓		7.5
		CPGW 080308 FR-70-1	✓		7.5
		CPGW 060204 HL		✓	
		CPGW 080308 HL		✓	
		CPGW 09T304 HL		✓	
		CPGW 080304 HR		✓	
CPGW … FL/R-60G CPGW … HRG		CPGW 060204 FR-60G1	✓		6.0
		CPGW 060204 HRG		✓	
DCGW … FN-30		DCGW 070208 FN-30-1	✓		3.0

✓: Article which can be ordered
Ordering example: CPGW 06 02 04 F D720

TURNING

GRADE DESCRIPTION

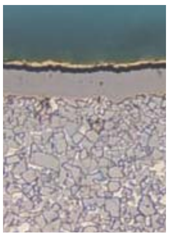
MTCVD

Grade	Description	Performance	ISO material	Applications
1505 	**MTCVD coated carbide** Thick TiCN/Al_2O_3/TiC coating Micrograin substrate Unique gray/black insert Polished rake surface High hardness	**High speed grade** Enhanced flaking resistance Excellent wear resistance Enhanced plastic deformation resistance Easy identification of used edges Reduces build-up of ferritic nodular iron	**K05**	Cast irons: gray, ductile, malleable & powder metals Finishing and semi-finishing Continuous cuts
			P05	Steels: carbon, alloy Finishing operations ; continuous cuts
			H10	Tool & die & hardened steels Finishing operations ; continuous cuts
1510 	**MTCVD coated carbide** TiCN+Al_2O_3 coating Fine grain substrate Polished rake surface	**General machining grade** Excellent wear resistance Enhanced toughness Enhanced build-up resistance	**K10**	Cast irons: gray, ductile, malleable & powder metals Finishing, semi-finishing & general machining Continuous & light interrupted cuts
			P10	Steel: carbon, alloy, tool & die Finishing & semi-finishing, continuous cuts
			H20	Tool & die & hardened steels Semi-finishing operations ; continuous cuts
5615 	**MTCVD coated carbide** TiCN/Al_2O_3 Gradient substrate Post-coating treatment Bi-color	**High speed grade** Enhanced wear resistance Chipping resistance Enhanced build-up resistance	**P15**	Steels: carbon, alloy, tool & die Finishing, semi-finishing & general machining Continuous cuts
			K15	Cast irons: gray, ductile, malleable Semi-finishing, general machining & light roughing Continuous & mild interrupted cuts
5625 	**MTCVD coated carbide** TiCN/Al_2O_3 Gradient substrate Post-coating treatment Bi-color	**Light machining grade** Enhanced wear resistance Chipping resistance Build-up resistance	**P25**	Steels: carbon, alloy, tool, & die Semi-finishing, general machining & light roughing Continuous & light interrupted cuts
			M20	Stainless steels: ferritic, martensitic Semi-finishing ; continuous cuts
			K20	Cast irons: gray, ductile & malleable Roughing ; interrupted cuts

K05 = main choice K05 = additional choice

GRADE DESCRIPTION

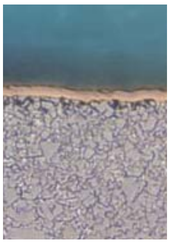
MTCVD (continued)

Grade	Description	Performance	ISO material	Applications
5635 	**MTCVD coated carbide** TiCN/Al$_2$0$_3$ High cobalt substrate Gradient substrate Post-coating treatment Bi-color	**Roughing grade** Very high toughness Enhanced chipping resistance Build-up resistance	**P35**	Steels: carbon, alloy, tool & die General machining, roughing Continuous & interrupted cuts
			M30	Stainless steels: ferritic, martensitic General machining & roughing Short continuous & interrupted cuts
8515 	**MTCVD coated carbide** TiCN/Al$_2$0$_3$/TiN coating Gradient substrate Thin coating Polished edge	**High speed grade** Chipping resistance Build-up resistance Notch wear resistance Flaking resistance	**M15**	Stainless steels: ferritic, austenitic, PH & duplex Finishing & semi-finishing Continuous & light interrupted cuts
			P20	Steels: low carbon, alloy General machining ; continuous cuts
			S10	High temperature alloys Semi-finishing ; continuous cuts
8525 	**MTCVD coated carbide** TiCN/Al$_2$0$_3$/TiN coating High cobalt substrate Thin coating Polished edge	**General machining grade** Enhanced plastic deformation resistance High toughness Chipping resistance Enhanced build-up resistance Notch wear resistance Flaking resistance	**M25**	Stainless steels: ferritic, austenitic, PH & duplex General machining & roughing Continuous & interrupted cuts
			P30	Steels: low carbon, alloy General machining ; interrupted cuts
			S15	High temperature alloys Semi-finishing ; continuous cuts
8535 	**MTCVD coated carbide** TiCN/Al$_2$0$_3$/TiN coating High cobalt substrate Thin coating	**Roughing grade** Enhanced wear resistance Very high toughness Notch wear resistance Flaking resistance	**M35**	Stainless steels: ferritic, austenitic, PH & duplex Roughing & heavy roughing Interrupted cuts
			P40	Steels: carbon, alloy Roughing ; interrupted cuts
			S25	High temperature alloys Roughing ; interrupted cuts

K05 = main choice   K05 = additional choice

GRADE DESCRIPTION

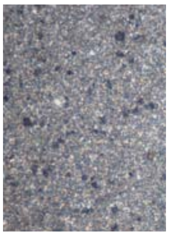
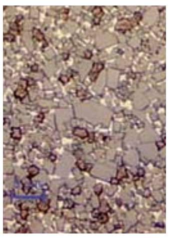
PVD

Grade	Description	Performance	ISO material	Applications
9605 	**PVD coated carbide** TiAlN coating ≈ 2000 Hv Grain size < 1.0 µm	**Hard duty grade** High strength and improved wear resistance Great thermal chocks resistance	**S10** N10 H10 M10	Nickel-based alloys, cobalt-based alloys, heat-resistant super alloys, high-strength stainless steels, titanium alloys, non-ferrous and aluminium alloys, bi-metal machining Semi-finishing, finishing
KX20 	**PVD coated carbide** TiCN coating Fine grain substrate	**General machining** Abrasive wear resistance Enhanced build-up resistance Enhanced notch wear resistance Toughness on edge	**S15**	High temperature alloys & titanium General machining ; continuous cuts
			M10	Stainless steels: ferritic, austenitic Finishing ; continuous cuts
			N10	Aluminum & non-ferrous materials Roughing ; interrupted cuts
KR20 	**PVD coated carbide** TiAlN coating Micrograin substrate Dense smooth coating	**Light duty grade** Enhanced crater resistance Outstanding wear resistance Without any loss in toughness Less build-up and friction at cutting edge	**M10** S10 N10 K05 P05	Aluminium, steels, stainless steels, podwer metal, bi-metal, High temperature alloys, cast irons, titanium alloys and non-ferrous alloys Light to general purpose machining Medium to high speeds where cutting conditions are good
8620 	**PVD coated carbide** TiAlN coating Micrograin substrate High cobalt substrate	**Medium Duty Grade** Enhanced crater resistance Less build-up and friction at cutting edge Excellent toughness with chipping resistance	**M20** S20 N20 K15 P15	Steels, stainless steels, high temperature alloys, cast irons, titanium alloys and non-ferrous alloys General purpose machining Low to medium speeds Interruptions and high feed rates

K05 = main choice K05 = additional choice

GRADE DESCRIPTION

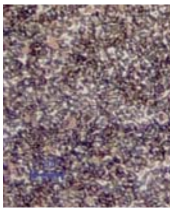
Uncoated

Grade	Description	Performance	ISO material	Applications
S1S 	**Uncoated carbide** Fine grain substrate Low cobalt substrate	**Finishing grade** High abrasive wear resistance	**K10**	Cast irons: gray, ductile, malleable & powder metals Finishing & light machining
			N10	Aluminium & non-ferrous materials Finishing & light machining
N 	**Uncoated carbide** Fine grain substrate Medium hardness	**Roughing grade** Excellent toughness Good wear resistance and Chipping resistance	**K20**	Cast Irons: gray, ductile, malleable General machining with good surface finish Low to medium speed under a wide range of conditions Continuous and interrupted cuts
			M25	Stainless steels: ferritic, austenitic, PH & duplex
			N20	Aluminium & non-ferrous materials
			S25	High temperature alloys, titanium alloys
			P20	Steels
KX2 	**Uncoated carbide** Micrograin substrate High hardness	**Finishing grade** Enhanced notch resistance Excellent wear resistance Enhanced edge strength	**S10**	High temperature alloys, titanium alloys Finishing type applications Continuous cuts
			N10	Aluminum & non-ferrous materials Finishing to semi-finishing Continuous cuts
			M10	Stainless steels: ferritic, austenitic, PH & duplex Finishing type applications, continuous cuts
SY3 	**Uncoated carbide** Fine grain substrate	**Roughing grade** Good abrasive wear resistance Good toughness	**P30**	Steels Roughing & general machining
			M25	Stainless steels, ferritic, austenitic, PH & duplex Roughing & general machining
			S25	High temp alloys, titanium alloys Roughing & general machining
S4 	**Uncoated carbide** High cobalt substrate	**Low speed grade** High toughness	**P40**	Steels: carbon, alloy General machining ; interrupted cuts
			M30	Stainless steels: ferritic, martensitic General machining ; interrupted cuts

K05 = main choice K05 = additional choice

GRADE DESCRIPTION

Cermet

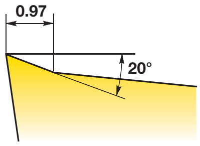
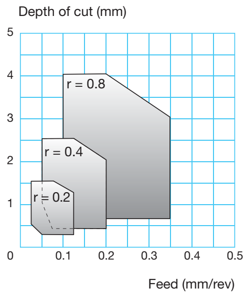
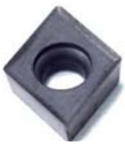
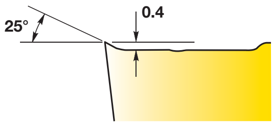
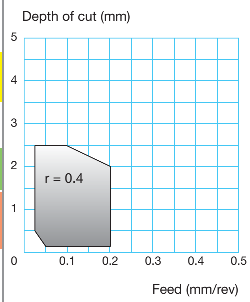
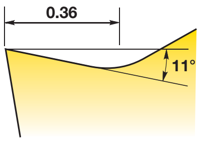
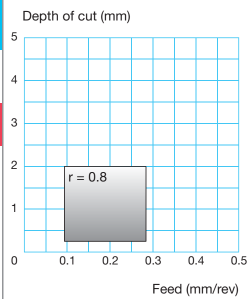
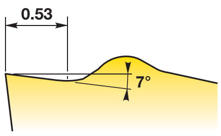
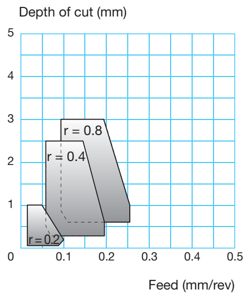
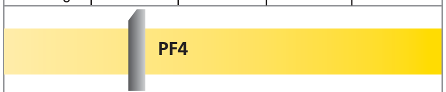
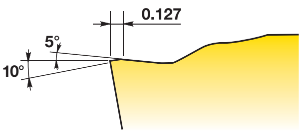
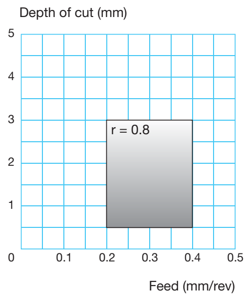
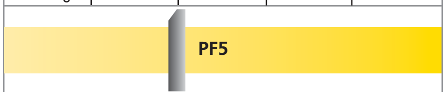
Grade	Description	Performance	ISO material	Applications
NTB10 	**Uncoated cermet**	**High finishing grade** Enhanced surface finish High wear resistance	**P01**	Steels: carbon, alloy, tool & die Finishing ; continuous cuts
			M01	Stainless steels: ferritic, martensitic Finishing ; continuous cuts

Advanced materials description

Grade	Description	Performance	ISO material	Applications
SN100	**Ceramic** Silicon nitride base ceramic grade (Si_3N_4)	**Top quality grade for high speed** Outstanding wear resistance Stable tool life at very high speed	**K10**	Cast iron turning (up to 1000 m/min) Continuous or slightly interrupted cutting Medium batch and large volume production Suitable for both roughing and semi-finishing operations Stable machining conditions
TC100	**Ceramic** Alumina base (Al_2O_3) and titanium carbide (TiC)	**High speed finish grade** High heat resistance Allows cutting with or without coolant	**K05**	Basic choice under stable cutting conditions for turning of grey and nodular cast irons
			S05	Suitable for cutting heat resistant alloys (Ni or Co base) and titanium alloys
			H10	Alternative to CBN, for hard turning of steels and tempered cast irons up to 65 HRC
WS500	**Ceramic** Pure alumina structurally strengthens from introduction of silicon carbide in the form of whiskers	**High speed machining for nickel based** Excellent wear resistance over silicon carbide Added tensile strength and fracture toughness even at elevated temperatures	**S15**	Ideal for high speed machining for nickel based Aerospace alloys e.g. Inconel 718 correspondingly greater metal rates
C225	**CBN** 55% cubic boron nitride (CBN) with a ceramic bonding agent Yellow TiN coating	**Hard part turning grade** High resistance to abrasion Good chemical stability Very good resistance to cratering	**H05**	Finishing turning operations with continuous or slightly cutting in extra-hard steels (45 – 62 HRC hardened steels)
D720 / PC30	**PCD** Polycrystalline diamond grade medium granulometry	**High speed machining grade** Very high wear resistance Resistance to chips and pull out Long tool life	**N10**	Finishing and light roughing of aluminum and other non-ferrous materials such as zinc and manganese alloys as well as highly abrasive non-metallic materials Used extensively in the production of aluminum engine blocks

K05 = main choice K05 = additional choice

GEOMETRY APPLICATION

Positive geometry	Chipbreaker profile	Applications		Description
1L 	 • High positive angle • Low cutting forces, good chip control • Finishing to roughing on aluminum • Finishing on high temp alloys	M N S		Continuous cutting / Run-out / Light / Medium / High  **Main application area:** Depth of cut: a_p = 0.1 - 4.0 mm Feed: f = 0.04 - 0.35 mm/rev
2L 	 • High positive angle • Low cutting forces, good chip control • Finishing on high temp alloys	M N S		Continuous cutting / Run-out / Light / Medium / High  **Main application area:** Depth of cut: a_p = 0.1 - 2.5 mm Feed: f = 0.02 - 0.2 mm/rev
PF2 	 • Single-sided insert for low feed finishing • Positive land reduce cutting forces • Excellent chip control at low depth of cut	P K		Continuous cutting / Run-out / Light / Medium / High  **Main application area:** Depth of cut: a_p = 0.25 - 2.0 mm Feed: f = 0.08 - 0.28 mm/rev
PF4 	 • Fine finishing applications • Positive cutting edge: reduces forces • Excellent chip control at low depths of cut • Produces excellent surface finishes	P M K		Continuous cutting / Run-out / Light / Medium / High  **Main application area:** Depth of cut: a_p = 0.15 - 3.0 mm Feed: f = 0.05 - 0.28 mm/rev
PF5 	 • Single-sided insert for light / medium machining • Negative land for improved edge strength • Unique positive step chipbreaker at corner radius	P K		Continuous cutting / Run-out / Light / Medium / High  **Main application area:** Depth of cut: a_p = 0.5 - 3.0 mm Feed: f = 0.2 - 0.4 mm/rev

GEOMETRY APPLICATION

<table>
<tr><th>Positive geometry</th><th>Chipbreaker profile</th><th>Applications</th><th></th><th>Description</th></tr>
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PM2

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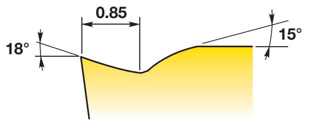

- Finishing / semi-finishing applications
- Positive cutting edge for reduced forces
- Broad chip-control application range
- Excellent profiling capability

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M
K</td>
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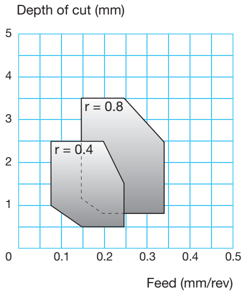

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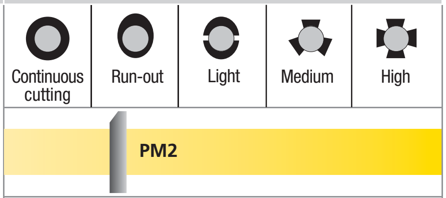

Main application area:

Depth of cut: a_p = 0.5 - 3.5 mm
Feed: f = 0.08 - 0.34 mm/rev

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PM3

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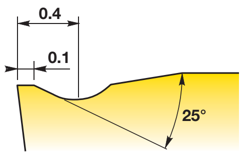

- Finishing and semi-finishing
- High positive cutting angle
- Low cutting forces
- Good chip control at light depth of cut

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<td>P</td>
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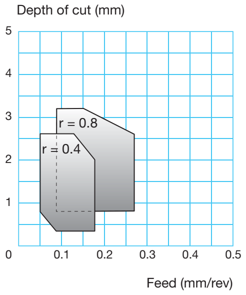

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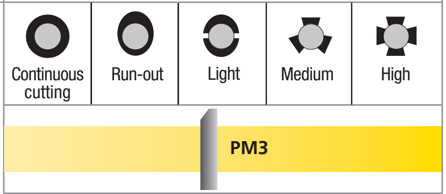

Main application area:

Depth of cut: a_p = 0.4 - 3.0 mm
Feed: f = 0.06 - 0.28 mm/rev

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PM4

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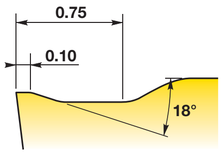

- Semi-finishing to medium machining
- Low to medium feed rates
- Medium depths of cut
- Good chip control

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<td>P
K</td>
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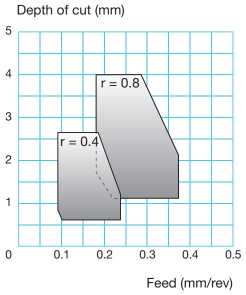

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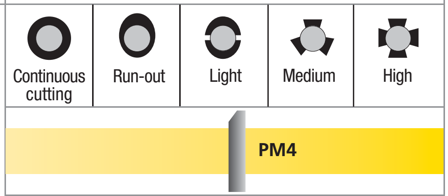

Main application area:

Depth of cut: a_p = 0.6 - 4.0 mm
Feed: f = 0.1 - 0.36 mm/rev

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PM5

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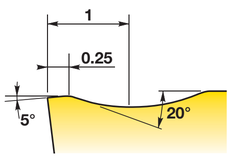

- Semi-finishing to light roughing
- Medium feed rates
- Medium depths of cut

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M
K</td>
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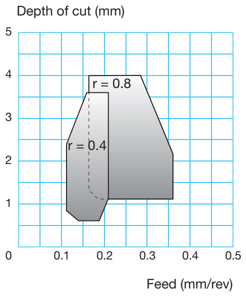

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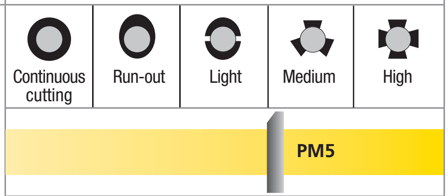

Main application area:

Depth of cut: a_p = 0.6 - 4.0 mm
Feed: f = 0.12 - 0.4 mm/rev

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RP5

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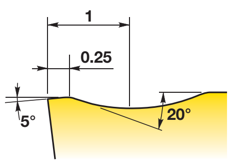

- Semi roughing and roughing
- Neutral cutting angle for strong edge
- Best for interrupted cutting conditions

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K</td>
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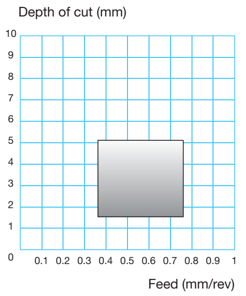

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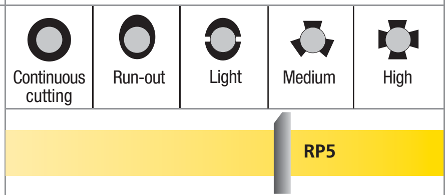

Main application area:

Depth of cut: a_p = 1.5 - 5.1 mm
Feed: f = 0.36 - 0.76 mm/rev

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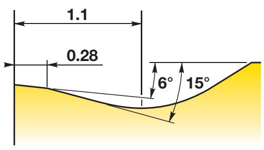
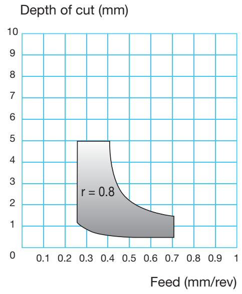
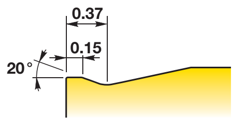
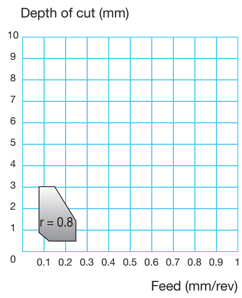
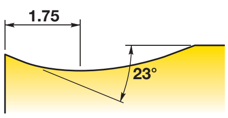
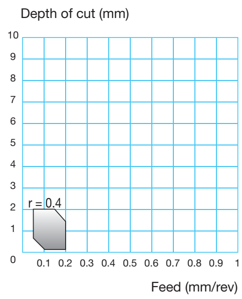
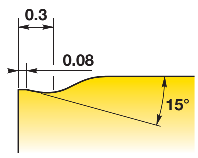
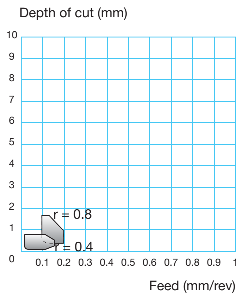
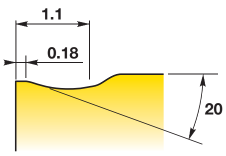
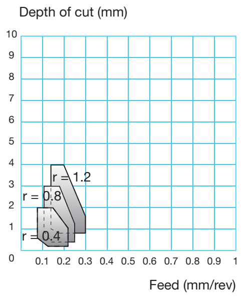
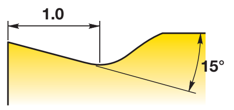
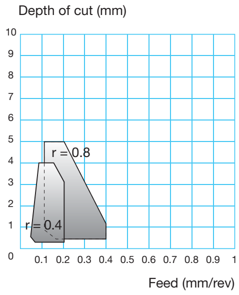
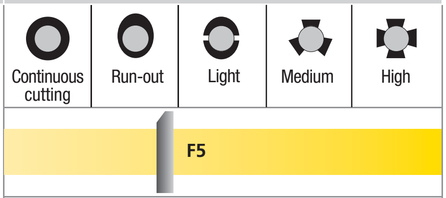
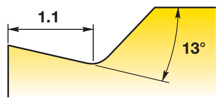
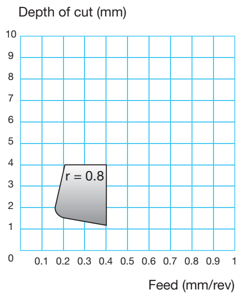
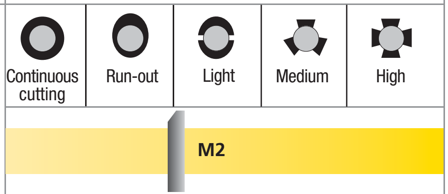
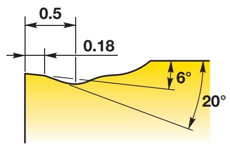
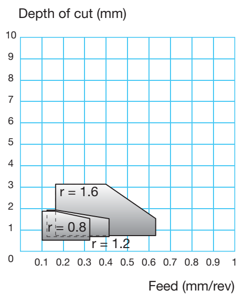
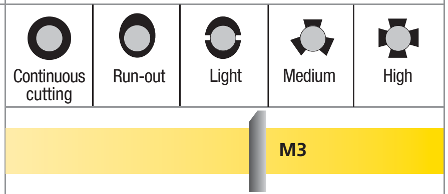
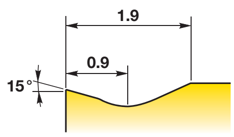
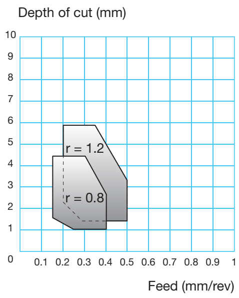
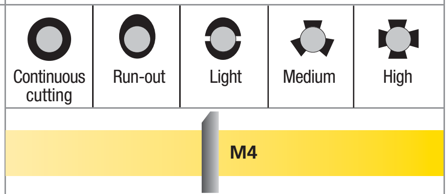
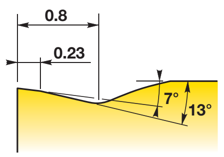
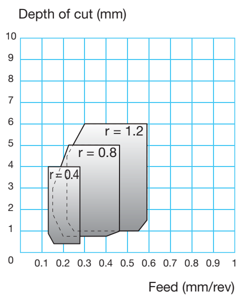
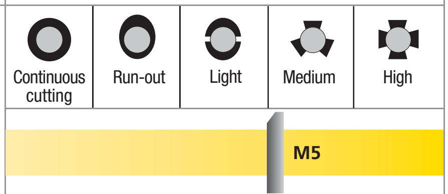
TURNING

GEOMETRY APPLICATION

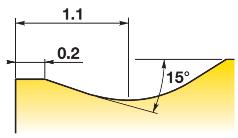
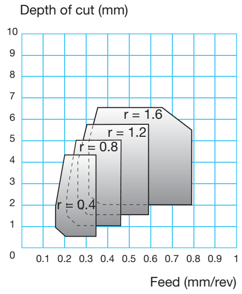
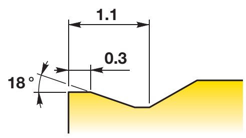
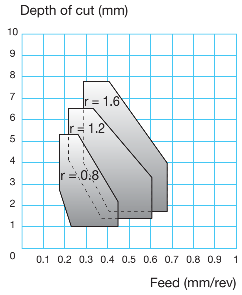
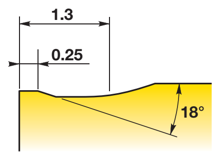
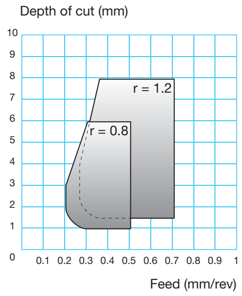
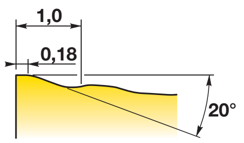
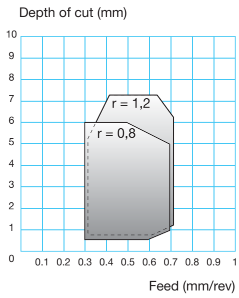
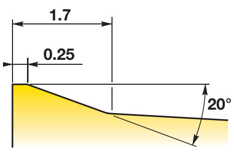
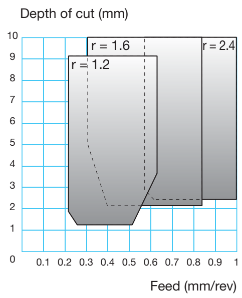
Negative geometry	Chipbreaker profile	Applications		Description
6W 	 • Wiper geometry for semi-finishing and finishing • Good surface finishes at high feed rates • Medium to heavy depths of cut	P M		Continuous cutting / Run-out / Light / Medium / High 6W **Main application area:** Depth of cut: a_p= 0.6 - 5.0 mm Feed: f = 0.25 - 0.7 mm/rev
25 	 • Very good chip control • Excellent surface finishes	P M		Continuous cutting / Run-out / Light / Medium / High 25 **Main application area:** Depth of cut: a_p = 0.5 - 3.0 mm Feed: f = 0.1 - 0.25 mm/rev
3C 	 • High positive cutting angle • Low cutting forces	P M S		Continuous cutting / Run-out / Light / Medium / High 3C **Main application area:** Depth of cut: a_p = 0.1 - 2.0 mm Feed: f = 0.05 - 0.2 mm/rev
F2 	 • Finishing applications • Good chip control on light cuts	P K		Continuous cutting / Run-out / Light / Medium / High F2 **Main application area:** Depth of cut: a_p = 0.1 - 2.0 mm Feed: f = 0.04 - 0.2 mm/rev
F4 	 • Geometry for finishing and semi-finishing	P K		Continuous cutting / Run-out / Light / Medium / High F4 **Main application area:** Depth of cut: a_p = 0.2 - 4.0 mm Feed: f = 0.08 - 0.3 mm/rev

GEOMETRY APPLICATION

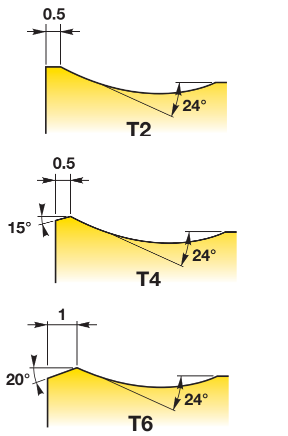
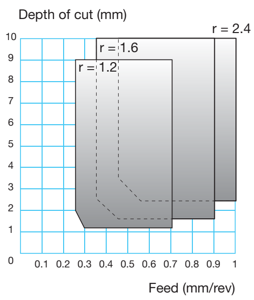
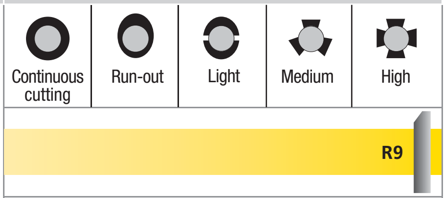
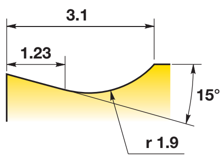
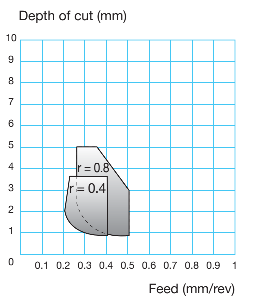
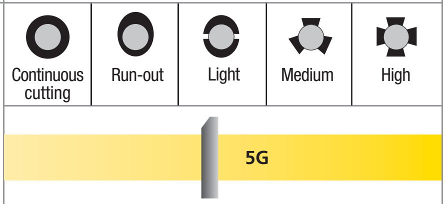
Negative geometry		Chipbreaker profile	Applications		Description
F5		 • Finishing to medium machining • High positive cutting angle • Low cutting forces - ideal for soft materials, work hardening materials	P M S		 **Main application area:** Depth of cut: a_p = 0.3 - 5.0 mm Feed: f = 0.05 - 0.4 mm/rev
M2		 • Semi-finishing to light roughing • High positive cutting angle • Low cutting forces - ideal for soft materials, work hardening materials	P M S		 **Main application area:** Depth of cut: a_p = 0.4 - 4.0 mm Feed: f = 0.1 - 0.4 mm/rev
M3		 • Finishing to semi-finishing • Neutral land for greater edge strength • Medium to high feed rates • Slight to moderate interrupted cuts	P		 **Main application area:** Depth of cut: a_p = 0.5 - 3.0 mm Feed: f = 0.1 - 0.6 mm/rev
M4		 • Multi-purpose geometry for machining of sticky materials	M S		 **Main application area:** Depth of cut: a_p = 1 - 6 mm Feed: f = 0.15 - 0.5 mm/rev
M5		 • General machining • Wide range of materials • Positive cutting angle • Medium feed rates and medium depths of cut	P M K		 **Main application area:** Depth of cut: a_p = 0.5 - 6.0 mm Feed: f = 0.13 - 0.56 mm/rev

TURNING

GEOMETRY APPLICATION

Negative geometry	Chipbreaker profile	Applications		Description
M7 	 • Medium to light roughing • Smooth chipbreaker for soft materials • Neutral land for a good resistance	P M K S		Continuous cutting · Run-out · Light · Medium · High M7 **Main application area:** Depth of cut: a_p = 0.8 - 6.5 mm Feed: f = 0.15 - 0.8 mm/rev
M8 	 • General purpose to light roughing • Strong cutting edge for reliability • Excellent on forged and cast components	P		Continuous cutting · Run-out · Light · Medium · High M8 **Main application area:** Depth of cut: a_p = 1.0 - 7.6 mm Feed: f = 0.18 - 0.65 mm/rev
R3 	 • Roughing applications • Neutral land for strong edge • Suitable for interrupted cuts • Medium to high feed rates and depths of cut	P K		Continuous cutting · Run-out · Light · Medium · High R3 **Main application area:** Depth of cut: a_p = 1.0 - 8.0 mm Feed: f = 0.2 - 0.7 mm/rev
R6 	 • Single sinded, good stability • Positive cutting angle • Reduced cutting forces, smooth chip flow • Primarily for continuous cuts	P M		Continuous cutting · Run-out · Light · Medium · High R6 **Main application area:** Depth of cut: a_p = 0.8 - 8.0 mm Feed: f = 0.3 - 0.7 mm/rev
R7 	 • High feed roughing • Efficient geometry • High cutting depths	P		Continuous cutting · Run-out · Light · Medium · High R7 **Main application area:** Depth of cut: a_p = 1.2 - 12 mm Feed: f = 0.22 - 1 mm/rev

GEOMETRY APPLICATION

Negative geometry	Chipbreaker profile	Applications		Description
R9 	 • High metal removal • Coarse roughing and peeling of steels • Three edge preparation (T2, T4 and T6) for a wide range of use	P M		 **Main application area:** Depth of cut: a_p = 1.5 - 18.0 mm Feed: f = 0.3 - 1.0 mm/rev
5G Double sided 	 • Oriented (right or left) • Good support • Wide chip roller • Soft cutting	P M S		 **Main application area:** Depth of cut: a_p = 1.0 - 5.0 mm Feed: f = 0.2 - 0.5 mm/rev

TURNING

CARBIDE GRADE SELECTION/APPLICATION GUIDE

TURNING

Steels

P Steels						
ISO	**P50**	**P40**	**P30**	**P20**	**P10**	**P01**
Typical failure modes	• Fracture • Chipping • Deformation		• Chipping • Deformation • Crater		• Crater • Deformation • Wear	
Application	**Roughing**		**General purpose**		**Finishing**	
MTCVD coated carbide		***5635**				
			8525			
				***5625**		
				8515		
					***5615**	
						1510
						1505
Uncoated carbide		**S4**				
				SY3		
Cermet					**NTB10**	
Ceramics				**TC100****		

* Indicates preferred grades

** For hardened steel ≥ 45 HRC

CARBIDE GRADE SELECTION/APPLICATION GUIDE

Steels (continued)

P Steels		Operation	a_p Depth of cut mm	f Feed mm/rev	Negative top form geometry											
					Cutting speed / Chipbreaker designation											
					Free machining & low carbon steels			Medium carbon & high carbon steels			Alloy steels & easy to machine tool steels			Tool steels & die steels		
					v_c m/min	Geo. 1st	Geo. 2nd	v_c m/min	Geo. 1st	Geo. 2nd	v_c m/min	Geo. 1st	Geo. 2nd	v_c m/min	Geo. 1st	Geo. 2nd
MTCVD coated	1505	R	-	-	-	-		-	-		-	-		-	-	
		GP	-	-	-	-		-	-		-	-		-	-	
		F	0.5-1.0	0.1-0.2	610	**M5**		488	**M5**		366	**M5**		183	**M5**	
	1510	R	-	-	-	-		-	-		-	-		-	-	
		GP	1.0-3.2	0.15-0.25	457	**R3**	M5	366	**R3**	M5	305	**R3**		152	**R3**	
		F	0.5-1.0	0.1-0.2	518	**M5**	F5	396	**M5**	F5	305	**M5**	F5	160	**M8**	
	5615	R	2.0-7.6	0.25-0.64	288	**R3**	R6	247	**R3**	M8	205	**R3**	M8	165	**R3**	M8
		GP	1.0-3.8	0.2-0.4	535	**M5**	M8	412	**M5**	M8	370	**M5**	M8	205	**M5**	M8
		F	0.5-1.3	0.1-0.2	617	**F2**	F4	494	**F2**	F4	412	**F2**	F4	227	**M5**	M3
	5625	R	2.0-7.6	0.25-0.64	229	**R3**	R6	190	**R3**	M8	153	**R3**	M8	95	**R3**	M8
		GP	1.0-3.8	0.2-0.4	419	**M5**	M8	305	**M5**	M8	266	**M8**	M5	114	**M5**	M8
		F	0.5-1.3	0.1-0.2	458	**F2**	F4	380	**F2**	F4	305	**F2**	F4	135	**M5**	M3
	5635	R	2.0-7.6	0.25-0.64	167	**R3**	M8	134	**R3**	M8	100	**R3**	M8	60	**M8**	M5
		GP	1.0-3.8	0.2-0.4	268	**R3**	M8	201	**R3**	M8	167	**R3**	M8	70	**M8**	M5
		F	-	-	-	-		-	-		-	-		-	-	
	8515	R	2.0-7.6	0.25-0.64	183	**R3**	M8	152	**R3**	M8	-	-		-	-	
		GP	1.0-3.8	0.2-0.4	305	**M8**	M5	244	**M8**	M5	-	-		-	-	
		F	0.5-1.3	0.1-0.2	396	F5		305	F5		-	-		-	-	
	8525	R	2.0-7.6	0.25-0.64	137	**R3**	M8	107	**R3**	M8	-	-		-	-	
		GP	1.0-3.8	0.2-0.4	213	**M8**	M5	152	**M8**	M5	-	-		-	-	
		F	-	-	-	-		-	-		-	-		-	-	
Uncoated	S4	R	2.0-7.6	0.25-0.64	91	**M7**	FT	76	**M7**	FT	-	-		-	-	
		GP	1.0-3.8	0.2-0.4	107	**M7**	FT	91	**M7**	FT	-	-		-	-	
		F	-	-	-	-		-	-		-	-		-	-	
	SY3	R	2.0-7.6	0.25-0.64	91	**M7**	FT	76	**M7**	FT	-	-		-	-	
		GP	1.0-3.8	0.2-0.4	107	**M7**		91	**M7**		-	-		-	-	
		F	-	-	-	-		-	-		-	-		-	-	
Cermet	NTB10	R	-	-	-	-		-	-		-	-		-	-	
		GP	-	-	-	-		-	-		-	-		-	-	
		F	0.3-0.8	0.05-0.15	450	**F4**		360	**F4**		300	**F4**		-	-	

R = Roughing
GP = General purpose
F = Finishing
FT = Flat top

* Continuous cut
** Moderate interruption

Bold print indicates first choice

Cutting parameters provided for positive inserts are based on CCMT 12 04 08
Cutting parameters provided for negative inserts are based on CNMG 12 04 12

You may increase/decrease cutting parameters to optimize your application depending on many factors including: work piece type and hardness, surface finish required, insert size, shape and nose radius, lead angle, chipbreaker, cycle time required, desired tool life, desired failure mode and reason for indexing.

CARBIDE GRADE SELECTION/APPLICATION GUIDE

Steels (continued)

P Steels		Operation	a_p Depth of cut mm.	f Feed mm/rev	Positive top form geometry							
					Cutting speed / Chipbreaker designation							
					Free machining & low carbon steels		Medium carbon & high carbon steels		Alloy steels & easy to machine tool steels		Tool steels & die steels	
					v_c m/min	Geo. 1st 2nd	v_c m/min	Geo. 1st 2nd	v_c m/min	Geo. 1st 2nd	v_c m/min	Geo. 1st 2nd
MTCVD coated	1505	R	-	-	-	-	-	-	-	-	-	-
		GP	-	-	-	-	-	-	-	-	-	-
		F	0.5-1.0	0.1-0.25	610	**PF4***	488	**PF4***	366	**PF4***	-	-
	1510	R	-	-	-	-	-	-	-	-	-	-
		GP	0.8-3.1	0.13-0.5	457	PM2* PM4**	366	PM2* PM4**	305	PM2* PM4**	-	-
		F	0.5-1.0	0.1-0.25	518	**PF4***	396	**PF4***	305	**PF4***	-	-
	5615	R	-	-	-	-	-	-	-	-	-	-
		GP	0.8-3.1	0.13-0.5	535	PM2* PM4**	412	PM2* PM4**	370	PM2* PM4**	-	-
		F	0.5-1.0	0.1-0.25	617	**PF4***	494	**PF4***	412	**PF4***	-	-
	5625	R	-	-	-	-	-	-	-	-	-	-
		GP	0.8-3.1	0.13-0.5	419	PM2* PM4**	305	PM2* PM4**	266	PM2* PM4**	-	-
		F	0.5-1.0	0.1-0.25	458	**PF4***	381	**PF4***	305	**PF4***	-	-
	5635	R	0.3-3.1	0.13-0.5	234	**PM2***	201	**PM2***	167	**PM2***	-	-
		GP	0.8-3.1	0.13-0.5	268	**PM2***	167	**PM2***	151	**PM2***	-	-
		F	-	-	-	-	-	-	-	-	-	-
	8515	R	-	-	-	-	-	-	-	-	-	-
		GP	0.8-3.1	0.13-0.5	305	**PM2**	244	**PM2**	213	**PM2**	-	-
		F	0.5-1.0	0.1-0.25	366	**PM2**	305	**PM2**	244	**PM2**	-	-
	8525	R	0.8-3.1	0.13-0.5	183	**PM2***	168	**PM2***	137	**PM2***	-	-
		GP	0.8-3.1	0.13-0.5	213	**PM2***	152	**PM2***	122	**PM2**	-	-
		F	-	-	-	-	-	-	-	-	-	-
Uncoated	S4	R	0.3-3.1	0.13-0.5	91	**PM5**	76	**PM5**	-	-	-	-
		GP	0.8-3.1	0.13-0.5	107	**PM5**	91	**PM5**	-	-	-	-
		F	-	-	-	-	-	-	-	-	-	-
Cermet	NTB10	R	-	-	-	-	-	-	-	-	-	-
		GP	-	-	-	-	-	-	-	-	-	-
		F	0.3-0.8	0,05-0,15	450	**PF4**	360	**PF4**	300	**PF4**	-	-

R = Roughing
GP = General purpose
F = Finishing
FT = Flat top

* Continuous cut
** Moderate interruption

Bold print indicates first choice

Cutting parameters provided for positive inserts are based on CCMT 12 04 08
Cutting parameters provided for negative inserts are based on CNMG 12 04 12

You may increase/decrease cutting parameters to optimize your application depending on many factors including: work piece type and hardness, surface finish required, insert size, shape and nose radius, lead angle, chipbreaker, cycle time required, desired tool life, desired failure mode and reason for indexing.

CARBIDE GRADE SELECTION/APPLICATION GUIDE

Stainless steels

M Stainless steels				
ISO	M40	M30	M20	M10

Typical failure modes	• Build-up • Fracture • Chipping	• Build-up • Chipping • Fracture	• Wear • Chipping • Build-up
Application	Roughing	General purpose	Finishing
PVD coated carbide		**8620	*9605 **KR20
MTCVD coated carbide	8535	5635 *8525	5625 *8515 5615
Uncoated carbide		N KX2	

* Indicates first choice for high speeds (V_c)

** Indicates first choice for low speeds (V_c)

CARBIDE GRADE SELECTION/APPLICATION GUIDE

Stainless steels (continued)

M Stainless steels		Operation	a_p Depth of cut mm	f Feed mm/rev	Negative top form geometry: Cutting speed / Chipbreaker designation – Ferritic & martensitic			Austenitic			PH & duplex		
					v_c m/min	Geo. 1st	Geo. 2nd	v_c m/min	Geo. 1st	Geo. 2nd	v_c m/min	Geo. 1st	Geo. 2nd
PVD coated	8620	R	2.5-6.4	0.13-0.51	15-60	**M8**	**M5**	15-45	**M8**	**M5**	15-40	**M8**	**M5**
		GP	1.9-4.5	0.18-0.38	15-75	**M5**	**M2**	15-60	**M5**	**M2**	15-40	**M5**	**M2**
		F	0.25-1.3	0.05-0.25	30-84	**M2**		30-69	**M2**		15-46	**M2**	
	KR20	R	2.5-5.1	0.13-0.38	30-122	**M8**	**M5**	30-91	**M8**	**M5**	15-76	**M8**	**M5**
		GP	1.9-3.8	0.18-0.3	46-137	**M5**	**M2**	30-107	**M5**	**M2**	30-76	**M5**	**M2**
		F	0.25-1.3	0.05-0.13	61-152	**M2**		30-122	**M2**		30-91	**M2**	
	9605	R	-	-	-	-		-	-		-	-	
		GP	1.9-3.8	0.18-0.3	-	-		40-120	**M7**	M4	40-90	**M7**	M4
		F	0.25-1.3	0.05-0.13	-	-		40-130	**M2**		40-100	**M2**	
MTCVD coated	5625	R	2.0-5.1	0.2-0.51	76-198	**M8**	R3	61-183	**M8**	R3	61-152	**M8**	R3
		GP	1.0-3.8	0.15-0.3	91-213	**M8**	M5	76-213	**M8**	M5	61-168	**M8**	M5
		F	0.25-1.3	0.13-0.2	91-305	**M2**	**M3**	76-244	**M2**	**M3**	61-198	**M2**	**M3**
	5635	R	2.0-6.4	0.2-0.64	61-183	**R3**	M8	61-152	**R3**	M8	61-137	**R3**	M8
		GP	1.0-3.8	0.15-0.38	76-229	**M8**	**M5**	76-198	**M8**	**M5**	61-152	**M8**	**M5**
		F	0.25-1.3	0.13-0.25	91-259	**M2**	**M3**	76-229	**M2**	**M3**	61-183	**M2**	**M3**
	8515	R	-	-	-	-		-	-		-	-	
		GP	1.0-3.8	0.15-0.3	76-213	**M5**	**M4**	76-183	**M5**	**M4**	61-213	**M5**	**M4**
		F	0.25-1.3	0.13-0.2	122-305	**M4**	**M2**	76-213	**M4**	**M2**	61-183	**M4**	**M2**
	8525	R	2.0-6.4	0.2-0.64	61-168	M8	M7	61-137	M8	M7	61-122	M8	M7
		GP	1.0-3.8	0.15-0.38	76-198	**M5**	**M4**	76-183	**M5**	**M4**	61-137	**M5**	**M4**
		F	0.25-1.3	0.13-0.25	91-229	**M4**	**M2**	76-213	**M4**	**M2**	61-152	**M4**	**M2**
	8535	R	2.0-6.4	0.2-0.64	-	-		61-137	**M7**	M5	61-122	**M7**	M5
		GP	1.0-3.8	0.15-0.38	76-198	**M5**	**M4**	76-183	**M5**	**M4**	61-137	**M5**	**M4**
		F	0.25-1.3	0.13-0.25	-	-		76-213	**F5**		61-152	**F5**	
Uncoated	N	R	2.5-5.1	0.13-0.46	23-91	**M7**		15-76	**M7**		15-46	**M7**	
		GP	1.9-3.8	0.18-0.28	30-107	**M7**		23-91	**M7**		23-76	**M7**	
		F	0.25-1.3	0.05-0.2	30-122	**M7**		23-91	**M7**		23-76	**M7**	
	KX2	R	2.5-5.1	0.13-0.38	23-91	**M5**	**M7**	15-76	**M5**	**M7**	15-46	**M5**	**M7**
		GP	1.9-3.8	0.18-0.3	30-107	**M5**	**M2**	23-91	**M5**	**M2**	23-76	**M5**	**M2**
		F	0.25-1.3	0.05-0.13	30-122	**M5**	**M2**	23-91	**M5**	**M2**	23-76	**M5**	**M2**

R = Roughing
GP = General purpose
F = Finishing
FT = Flat top

* Continuous cut
** Moderate interruption

Bold print indicates first choice

Cutting parameters provided for positive inserts are based on CCMT 12 04 08
Cutting parameters provided for negative inserts are based on CNMG 12 04 12

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CARBIDE GRADE SELECTION/APPLICATION GUIDE

Stainless steels (continued)

M Stainless steels		Operation	a_p Depth of cut mm	f Feed mm/rev	Positive top form geometry								
					Cutting speed / Chipbreaker designation								
					Ferritic & martensitic			Austenitic			PH & duplex		
					v_c m/min	Geo. 1st	Geo. 2nd	v_c m/min	Geo. 1st	Geo. 2nd	v_c m/min	Geo. 1st	Geo. 2nd
PVD coated	8620	R	-	-	-	-		-	-		-	-	
		GP	0.25-2.5	0.13-0.3	15-76	**PM2***		15-61	**PM2***		15-38	**PM2***	
		F	0.13-1.5	0.08-0.2	30-84	**PM2***		30-69	**PM2***		15-46	**PM2***	
	9605	R	-	-	-	-		-	-		-	-	
		GP	0.25-2.5	0.13-0.3	-	-		40-100	**PM2***		40-90	**PM2***	
		F	0.13-1.5	0.08-0.2	-	-		40-130	1L*	2L*	40-100	1L*	2L*
MTCVD coated	5615	R	-	-	-	-		-	-		-	-	
		GP	0.25-2.5	0.13-0.3	76-229	**PM2***	PM4**	76-213	**PM2***	PM4**	61-168	**PM2***	PM4**
		F	0.25-2.0	0.13-0.25	122-366	**PF4***		76-244	**PF4***		61-198	**PF4***	
	5625	R	-	-	-	-		-	-		-	-	
		GP	0.25-2.5	0.13-0.3	76-198	**PM2***	PM4**	76-213	**PM2***	PM4**	61-168	**PM2***	PM4**
		F	0.25-2.0	0.13-0.25	91-305	**PF4***		76-244	**PF4***		61-198	**PF4***	
	5635	R	0.25-2.5	0.13-0.36	76-183	**PM2***		76-168	**PM2***		61-137	**PM2***	
		GP	0.25-2.5	0.13-0.3	76-229	**PM2***		76-198	**PM2***		61-152	**PM2***	
		F	0.13-1.5	0.08-0.2	91-259	**PM2***		76-229	**PM2***		61-183	**PM2***	
	8515	R	-	-	-	-		-	-		-	-	
		GP	0.25-2.5	0.13-0.3	76-213	**PM2**		76-183	**PM2**		61-152	**PM2**	
		F	0.25-2.0	0.13-0.25	122-305	**PM2**		76-213	**PM2**		61-183	**PM2**	
	8525	R	-	-	-	-		-	-		-	-	
		GP	0.25-2.5	0.13-0.3	76-183	**PM2**		76-183	**PM2**		61-152	**PM2**	
		F	0.25-2.0	0.13-0.25	91-244	**PM2**		76-213	**PM2**		61-183	**PM2**	
	8535	R	-	-	-	-		-	-		-	-	
		GP	0.25-2.5	0.13-0.3	76-183	**PM5**		76-183	**PM5**		61-152	**PM5**	
		F	-	-	-	-		-	-		-	-	

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** Moderate interruption

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TURNING

CARBIDE GRADE SELECTION/APPLICATION GUIDE

Cast iron

K Cast irons				
ISO	K30	K20	K10	K01

Typical failure modes	• Fracture • Chipping • Build-up	• Chipping • Wear • Build-up	• Wear • Build-up
Application	Roughing	General purpose	Finishing
MTCVD coated carbide	5625	*5615 *1510 *1505	*1510 *1505
Uncoated carbide	N	N	
Ceramics		SN100	SN100 TC100

* Indicates first choice for high speeds (V_c)

CARBIDE GRADE SELECTION/APPLICATION GUIDE

Cast iron (continued)

K Cast irons		Operation	a_p Depth of cut mm	f Feed mm/rev	Negative top form geometry														
					Cutting speed / Chipbreaker designation														
					Gray cast iron 180 - 220 HB			Gray cast iron 220 - 260 HB			Ductile & malleable cast iron 140 - 180 HB			Ductile & malleable cast iron 220 - 260 HB			Powder metals		
					v_c m/min	Geo. 1st	Geo. 2nd	v_c m/min	Geo. 1st	Geo. 2nd	v_c m/min	Geo. 1st	Geo. 2nd	v_c m/min	Geo. 1st	Geo. 2nd	v_c m/min	Geo. 1st	Geo. 2nd
MTCVD coated	1505	R	2.0-6.4	0.2-0.5	305-366	**R3**	FT	244-305	**R3**	FT	244-305	**R3**	FT	213-274	**R3**	FT	213-274	**R3**	FT
		GP	2.0-5.1	0.2-0.36	366-427	**R3**	M7	305-396	**R3**	M7	305-366	**R3**	M7	244-305	**R3**	M7	244-305	**R3**	M7
		F	0.25-2.0	0.1-0.2	427-549	**M7**		366-488	**M7**		366-427	**M7**		305-366	**M7**		305-366	**M7**	
	1510	R	2.0-6.4	0.2-0.56	274-335	**R3**	FT	213-274	**R3**	FT	213-259	**R3**	FT	183-229	**R3**	FT	183-229	**R3**	FT
		GP	2.0-5.1	0.2-0.4	305-366	**R3**	M7	274-335	**R3**	M7	259-335	**R3**	M7	229-274	**R3**	M7	229-274	**R3**	M7
		F	0.25-2.0	0.1-0.25	366-427	**M8**	M5	335-396	**M8**	M5	335-396	**M8**	M5	274-335	**M8**	M5	274-335	**M8**	M5
	5615	R	2.0-7.6	0.2-0.64	183-244	R3		183-213	R3		183-229	R3		122-168	R3		-	R3	
		GP	2.0-6.4	0.2-0.46	213-274	R3		198-229	R3		198-229	R3		152-183	R3		-	R3	
		F	-	-	-	-		-	-		-	-		-	-		-	-	
	5625	R	2.0-7.6	0.2-0.64	152-213	R3		122-183	R3		122-183	R3		122-168	R3		-	R3	
		GP	-	-	-	-		-	-		-	-		-	-		-	-	
		F	-	-	-	-		-	-		-	-		-	-		-	-	

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TURNING

CARBIDE GRADE SELECTION/APPLICATION GUIDE

TURNING

Cast iron (continued)

	K Cast irons	Operation	a_p Depth of mm	f Feed mm/rev	Positive top form geometry — Cutting speed / Chipbreaker designation: Gray cast iron 180 - 220 HB			Gray cast iron 220 - 260 HB			Ductile & malleable cast iron 140 - 180 HB			Ductile & malleable cast iron 220 - 260 HB			Powder metals		
					v_c m/min	Geo. 1st	Geo. 2nd	v_c m/min	Geo. 1st	Geo. 2nd	v_c m/min	Geo. 1st	Geo. 2nd	v_c m/min	Geo. 1st	Geo. 2nd	v_c m/min	Geo. 1st	Geo. 2nd
MTCVD coated	**1505**	R	-	-	-	-		-	-		-	-		-	-		-	-	
MTCVD coated	**1505**	GP	0.8-2.0	0.13-0.38	366-427	**PM5**		305-396	**PM5**		305-366	**PM5**		244-305	**PM5**		244-305	**PM5**	
MTCVD coated	**1505**	F	0.5-1.0	0.1-0.2	427-549	**PF4***		366-488	**PF4***		366-427	**PF4***		305-366	**PF4***		305-366	**PF4***	
MTCVD coated	**1510**	R	-	-	-	-		-	-		-	-		-	-		-	-	
MTCVD coated	**1510**	GP	0.8-3.1	0.13-0.5	305-366	**PM5**		274-335	**PM5**		259-335	**PM5**		229-274	**PM5**		229-274	**PM5**	
MTCVD coated	**1510**	F	0.5-1.0	0.1-0.25	366-427	**PF4***		335-396	**PF4***		335-396	**PF4***		274-335	**PF4***		274-335	**PF4***	
MTCVD coated	**5615**	R	-	-	-	-		-	-		-	-		-	-		-	-	
MTCVD coated	**5615**	GP	0.8-3.1	0.13-0.5	213-274	**PM2***	PM4**	183-213	**PM2***	PM4**	183-229	**PM2***	PM4**	152-183	**PM2***	PM4**	-	-	
MTCVD coated	**5615**	F	-	-	-	-		-	-		-	-		-	-		-	-	
Uncoated	N	R	-	-	-	-		-	-		-	-		-	-		-	-	
Uncoated	N	GP	0.25-2.5	0.13-0.3	23-69	**PM5**		23-61	**PM5**		23-61	**PM5**		23-53	**PM5**		-	-	
Uncoated	N	F	0.13-1.5	0.08-0.2	23-84	**PM5**		23-69	**PM5**		23-69	**PM5**		23-61	**PM5**		-	-	

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Cutting parameters provided for negative inserts are based on CNMG 12 04 12

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CARBIDE GRADE SELECTION/APPLICATION GUIDE

Aluminum & non-ferrous

N Aluminum - Non-ferrous				
ISO	N40	N30	N20	N10

Typical failure modes	• Chipping • Wear	• Wear • Build-up • Chipping	• Wear • Build-up
Application	Roughing	General purpose	Finishing
PVD coated carbide		8620 *KX20	*KR20
Uncoated carbide		N	KX2
PCD		*D720 / PC30	

* Indicates first choice

CARBIDE GRADE SELECTION/APPLICATION GUIDE

Aluminum & non-ferrous (continued)

N Aluminum & Non-ferrous		Operation	a_p Depth of mm	f Feed mm/rev	Positive top form geometry — Cutting speed / Chipbreaker designation							
					Aluminum alloys < 7% silicon		Aluminum alloys 7- 12% silicon		Aluminum alloys > 12% silicon		Copper alloys	
					v_c m/min	Geo. 1st 2nd	v_c m/min	Geo. 1st 2nd	v_c m/min	Geo. 1st 2nd	v_c m/min	Geo. 1st 2nd
PVD coated	KX20	R	-	-	-	-	-	-	-	-	-	-
PVD coated	KX20	GP	1.3-2.5	0.2-0.5	457-610	**1L***	381-533	**1L***	152-183	**1L***	152-244	**1L***
PVD coated	KX20	F	0.25-1.3	0.08-0.2	610-762	**1L***	533-686	**1L***	183-244	**1L***	244-366	**1L***
PVD coated	8620	R	-	-	-	-	-	-	-	-	-	-
PVD coated	8620	GP	0.5-2.5	0.13-0.46	457-610	**PM2***	381-533	**PM2***	152-183	**PM2***	152-244	**PM2***
PVD coated	8620	F	-	-	-	-	-	-	-	-	-	-
PVD coated	KR20	R	-	-	-	-	-	-	-	-	-	-
PVD coated	KR20	GP	-	-	-	-	-	-	-	-	-	-
PVD coated	KR20	F	0.25-1.3	0.08-0.2	610-762	**PM2***	533-686	**PM2***	183-244	**PM2***	244-366	**PM2***
Uncoated	N	R	-	-	-	-	-	-	-	-	-	-
Uncoated	N	GP	1.3-2.5	0.2-0.5	366-427	**1L***	274-335	**1L***	91-122	**1L***	91-137	**1L***
Uncoated	N	F	0.25-1.3	0.08-0.2	427-518	**1L***	335-427	**1L***	122-152	**1L***	137-229	**1L***
Uncoated	KX2	R	-	-	-	-	-	-	-	-	-	-
Uncoated	KX2	GP	1.3-2.5	0.2-0.5	381-457	**1L***	381-457	**1L***	381-457	**1L***	381-457	**1L***
Uncoated	KX2	F	0.25-1.3	0.08-0.2	457-533	**1L***	457-533	**1L***	457-533	**1L***	457-533	**1L***

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CARBIDE GRADE SELECTION/APPLICATION GUIDE

High temp alloys

S High temp alloys				
ISO	S40	S30	S20	S10

Typical failure modes	• Deformation • Fracture • Build-up	• Chipping • Build-up • Deformation	• Wear • Build-up • Deformation
Application	Roughing	General purpose	Finishing
PVD coated carbide	KX20	KX20 **8620 **9605	**KR20 **9605
MTCVD coated carbide	8535	8535 *8525	8515
Uncoated carbide		**N	**N **KX2
Ceramics	*WS500	*WS500	

* Recommended for roughing
** Recommended for finishing

CARBIDE GRADE SELECTION/APPLICATION GUIDE

High temp alloys (continued)

S High temp alloys		Operation	a_p Depth of cut mm	f Feed mm/rev	Negative top form geometry — Cutting speed / Chipbreaker designation: Iron base alloys A-286 discalloy, incoloy v_c m/min	Iron base alloys Geo. 1st 2nd	Nickel base alloys monel, hastelloy, inconel, waspaloy v_c m/min	Nickel base alloys Geo. 1st 2nd	Cobalt base alloys haynes stellite v_c m/min	Cobalt base alloys Geo. 1st 2nd	Titanium alloys 6Al-4V v_c m/min	Titanium alloys Geo. 1st 2nd
PVD coated	8620	R	-	-	-	-	-	-	-	-	-	-
		GP	1.0-3.8	0.13-0.51	46	M5 M2	30	M5 M2	-	-	46	M5 M2
		F	0.13-2.0	0.08-0.25	61	F5	30	F5	-	-	61	F5
	KR20	R	-	-	-	-	-	-	-	-	-	-
		GP	0.38-1.50	0.1-0.25	91	M5 M2	46	M5 M2	38	M5 M2	91	M5 M2
		F	0.13-0.6	0.05-0.13	99	F5	61	F5	53	F5	107	F5
	9605	R	-	-	-	-	-	-	-	-	-	-
		GP	0.38-1.50	0.1-0.25	100	F5 M2	60	F5 M2	50	FT	100	F5 M2
		F	0.13-0.6	0.05-0.13	110	M2	70	M2	60	FT	110	M2
	KX20	R	-	-	-	-	-	-	-	-	-	-
		GP	0.38-1.50	0.1-0.25	91	M2	46	M2	38	M2	91	M2
		F	0.13-0.6	0.05-0.13	100	F5	61	F5	53	F5	107	F5
MTCVD coated	8515	R	-	-	-	-	-	-	-	-	-	-
		GP	1.0-3.8	0.15-0.3	46-76	M5 M4	30-61	M5 M4	30-46	M5 M4	-	-
		F	0.25-1.3	0.13-0.2	61-107	M4 M2	30-76	M4 M2	30-61	M4 M2	-	-
	8525	R	-	-	-	-	-	-	-	-	-	-
		GP	1.0-3.8	0.15-0.3	30-61	M5 M4	23-46	M5 M4	23-38	M5 M4	-	-
		F	0.25-1.3	0.13-0.25	30-76	M4 M2	23-53	M4 M2	23-46	M4 M2	-	-
	8535	R	2.0-5.1	0.2-0.51	25-40	M7 M5	12-35	M7 M5	18-30	M7 M5	-	-
		GP	1.0-3.8	0.15-0.3	25-55	M5 M4	20-40	M5 M4	20-35	M5 M4	-	-
		F	0.25-1.3	0.13-0.25	25-70	F5	20-50	F5	20-40	F5	-	-
Uncoated	N	R	1.5-3.8	0.15-0.38	-	-	-	-	-	-	46	M7
		GP	0.38-1.50	0.1-0.25	-	-	-	-	-	-	61	M7
		F	-	-	-	-	-	-	-	-	-	-
	KX2	R	-	-	-	-	-	-	-	-	-	-
		GP	0.38-1.50	0.1-0.25	-	-	-	-	-	-	76	M2
		F	-	-	-	-	-	-	-	-	-	-

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CARBIDE GRADE SELECTION/APPLICATION GUIDE

High temp alloys (continued)

S High temp alloys		Operation	a_p Depth of cut mm	f Feed mm/rev	Positive top form geometry											
					Cutting speed / Chipbreaker designation											
					Iron base alloys A-286 discalloy, incoloy			Nickel base alloys monel, hastelloy, inconel, waspaloy			Cobalt base alloys haynes stellite			Titanium alloys 6Al-4V		
					v_c m/min	Geo. 1st	Geo. 2nd	v_c m/min	Geo. 1st	Geo. 2nd	v_c m/min	Geo. 1st	Geo. 2nd	v_c m/min	Geo. 1st	Geo. 2nd
PVD coated	8620	R	-	-	-	-		-	-		-	-		-	-	
PVD coated	8620	GP	0.25-2.5	0.13-0.3	46	**PM2***		23	**PM2***		-	-		46	**PM2***	
PVD coated	8620	F	0.13-1.5	0.08-0.2	61	**PM2***		30	**PM2***		-	-		61	**PM2***	
PVD coated	KR20	R	-	-	-	-		-	-		-	-		-	-	
PVD coated	KR20	GP	0.25-1.0	0.1-0.2	91	**PM2***		46	**PM2***		38	**PM2***		91	**PM2***	
PVD coated	KR20	F	-	-	-	-		-	-		-	-		-	-	
PVD coated	9605	R	-	-	-	-		-	-		-	-		-	-	
PVD coated	9605	GP	0.25-1.0	0.1-0.2	100	**PM2***		60	**1L**	**2L**	50	**PM2***		100	**1L**	**2L**
PVD coated	9605	F	0.13-1.3	0.08-0.2	110	**1L**	**2L**	70	**1L**	**2L**	60	**1L**	**2L**	110	**1L**	**2L**
PVD coated	KX20	R	-	-	-	-		-	-		-	-		-	-	
PVD coated	KX20	GP	-	-	-	-		-	-		-	-		-	-	
PVD coated	KX20	F	0.13-1.3	0.08-0.2	60	**1L**		30	**1L**		20	**1L**				
MTCVD coated	8515	R	-	-	-	-		-	-		-	-		-	-	
MTCVD coated	8515	GP	0.25-2.5	0.13-0.3	46-76	**PM5**		30-61	**PM5**		30-46	**PM5**		-	-	
MTCVD coated	8515	F	0.25-2.0	0.13-0.25	61-107	**PM2**		30-76	**PM2**		30-61	**PM2**		-	-	
MTCVD coated	8525	R	-	-	-	-		-	-		-	-		-	-	
MTCVD coated	8525	GP	0.25-2.5	0.13-0.3	30-61	**PM5**		23-46	**PM5**		23-38	**PM5**		-	-	
MTCVD coated	8525	F	-	-	-	-		-	-		-	-		-	-	
MTCVD coated	8535	R	-	-	-	-		-	-		-	-		-	-	
MTCVD coated	8535	GP	0.25-2.5	0.13-0.3	30-61	**PM5**		23-46	**PM5**		23-38	**PM5**		30-55	**PM5**	
MTCVD coated	8535	F	-	-	-	-		-	-		-	-		-	-	
Uncoated	N	R	-	-	-	-		-	-		-	-		-	-	
Uncoated	N	GP	0.25-1.3	0.13-0.25	-	-		-	-		-	-		61	**PM5**	
Uncoated	N	F	0.13-1.3	0.08-0.2	-	-		-	-		-	-		76	**1L**	**2L**
Uncoated	KX2	R	-	-	-	-		-	-		-	-		-	-	
Uncoated	KX2	GP	0.25-1.	0.13-0.25	-	-		-	-		-	-		76	**PM5**	
Uncoated	KX2	F	0.13-1.3	0.08-0.2	-	-		-	-		-	-		91	**1L**	**2L**

R = Roughing
GP = General purpose
F = Finishing
FT = Flat top

* Continuous cut
** Moderate interruption

Bold print indicates first choice

Cutting parameters provided for positive inserts are based on CCMT 12 04 08
Cutting parameters provided for negative inserts are based on CNMG 12 04 12

You may increase/decrease cutting parameters to optimize your application depending on many factors including: work piece type and hardness, surface finish required, insert size, shape and nose radius, lead angle, chipbreaker, cycle time required, desired tool life, desired failure mode and reason for indexing.

TURNING

CARBIDE GRADE SELECTION/APPLICATION GUIDE

Hardened materials

<table>
<tr><th colspan="7">H
Hardened materials</th></tr>
<tr><th>ISO</th><th>H40</th><th colspan="2">H30</th><th colspan="2">H20</th><th>H10</th></tr>
<tr><td>Typical failure modes</td><td colspan="2">• Chipping
• Wear</td><td colspan="2">• Wear
• Chipping
• Fracture</td><td colspan="2">• Wear
• Build-up
• Deformation</td></tr>
<tr><td>Application</td><td colspan="2">Roughing</td><td colspan="2">General purpose</td><td colspan="2">Finishing</td></tr>
<tr><td>PVD coated carbide</td><td colspan="2"></td><td colspan="2"></td><td colspan="2">*9605</td></tr>
<tr><td>MTCVD coated carbide</td><td colspan="2"></td><td colspan="2"></td><td colspan="2">**1510
**1505</td></tr>
<tr><td>Coated ceramics</td><td colspan="2"></td><td colspan="2"></td><td colspan="2">TC100</td></tr>
<tr><td>CBN</td><td colspan="2"></td><td colspan="2"></td><td colspan="2">*C225</td></tr>
</table>

* Indicates first choice for roughing
** Indicates first choice for finishing

TURNING

CARBIDE GRADE SELECTION/APPLICATION GUIDE

Hardened materials (continued)

H Hardened materials		Operation	a_p Depth of cut mm	f Feed mm/rev	Negative top form geometry — Cutting speed / Chipbreaker designation					
					Alloy steels 40 - 50 HRC		Alloy steels 50 - 62 HRC		Tool & die steels 50 - 60 HRC	
					v_c m/min	Geo. 1st 2nd	v_c m/min	Geo. 1st 2nd	v_c m/min	Geo. 1st 2nd
MTCVD coated	1505	R	-	-	-	-	-	-	-	-
		GP	-	-	-	-	-	-	-	-
		F	0.13-1.0	0.05-.02	183-305	FT	91-244	FT	91-244	FT
	1510	R	-	-	-	-	-	-	-	-
		GP	0.51-2.0	0.13-0.3	183-244	FT	91-152	FT	91-152	FT
		F	0.13-1.0	0.05-.02	183-274	FT	91-183	FT	91-183	FT
PVD coated	9605	R	-	-	-	-	-	-	-	-
		GP	-	-	-	-	-	-	-	-
		F	0.5-1.3	0.13-0.25	70-110	FT	60-90	FT	50-80	FT

H Hardened materials		Operation	a_p Depth of cut mm	f Feed mm/rev	Positive top form geometry — Cutting speed / Chipbreaker designation					
					Alloy steels 40 - 50 HRC		Alloy steels 50 - 62 HRC		Tool & die steels 50 - 60 HRC	
					v_c m/min	Geo. 1st 2nd	v_c m/min	Geo. 1st 2nd	v_c m/min	Geo. 1st 2nd
MTCVD coated	1505	R	-	-	-	-	-	-	-	-
		GP	-	-	-	-	-	-	-	-
		F	0.13-0.8	0.05-0.2	183-305	FT	91-244	FT	91-244	FT
	1510	R	-	-	-	-	-	-	-	-
		GP	-	-	-	-	-	-	-	-
		F	0.13-1.0	0.05-0.2	183-244	FT	91-152	FT	91-152	FT
PVD coated	9605	R	-	-	-	-	-	-	-	-
		GP	-	-	-	-	-	-	-	-
		F	0.5-1.3	0.13-0.25	70-110	FT	60-90	FT	50-80	FT

R = Roughing
GP = General purpose
F = Finishing
FT = Flat top

* Continuous cut
** Moderate interruption

Bold print indicates first choice

Cutting parameters provided for positive inserts are based on CCMT 12 04 08
Cutting parameters provided for negative inserts are based on CNMG 12 04 12

You may increase/decrease cutting parameters to optimize your application depending on many factors including: work piece type and hardness, surface finish required, insert size, shape and nose radius, lead angle, chipbreaker, cycle time required, desired tool life, desired failure mode and reason for indexing.

TURNING

ADVANCED MATERIAL GRADE SELECTION/APPLICATION GUIDE

Cast iron

K Cast iron		Operation	a_p Depth of cut mm	f Feed mm/rev	Negative top form geometry														
					Cutting speed / Chipbreaker designation														
					Gray cast iron 180 - 220 HB			Gray cast iron 220 - 260 HB			Ductile & malleable cast iron 140 - 180 HB			Ductile & malleable cast iron 220 - 260 HB			Powder metals		
					v_c m/min	Geo. 1st	Geo. 2nd	v_c m/min	Geo. 1st	Geo. 2nd	v_c m/min	Geo. 1st	Geo. 2nd	v_c m/min	Geo. 1st	Geo. 2nd	v_c m/min	Geo. 1st	Geo. 2nd
Ceramic silicon nitride	SN100	R	>3.8	0.15-0.41	457-914	-		366-610	-		-	-		-	-		-	-	
		GP	1.3-3.8	0.13-0.36	457-914	-		366-610	-		-	-		-	-		-	-	
		F	.2-1.2	0.1-0.25	457-914	-		366-610	-		-	-		-	-		-	-	

Aluminum & non-ferrous

N Aluminum & non-ferrous		Operation	a_p Depth of cut mm	f Feed mm/rev	Negative top form geometry											
					Cutting speed / Chipbreaker designation											
					Aluminum alloys < 7% silicon			Aluminum alloys 7- 12% silicon			Aluminum alloys > 12% silicon			Copper alloys		
					v_c m/min	Geo. 1st	Geo. 2nd	v_c m/min	Geo. 1st	Geo. 2nd	v_c m/min	Geo. 1st	Geo. 2nd	v_c m/min	Geo. 1st	Geo. 2nd
Polycrystalline Diamond PCD	D720 / PC30	R	1.3-9	0.1-0.6	>914	H or F		762-1372	H or F		457-914	H or F		244-366	H or F	
		GP	1.3-2.5	0.2-0.46	>914	F or H		914-1829	F or H		610-914	F or H		305-610	F or H	
		F	0.25-1.3	0.08-0.2	>1829	F		>1829	F		610-1067	F		457-762	F	

Maximum DOC should not exceed segment length. Refer to catalog for specific insert capability, page 44 .

High temp alloys

S High temp alloys		Operation	a_p Depth of cut mm	f Feed mm/rev	Negative top form geometry											
					Cutting speed / Chipbreaker designation											
					Iron base alloys A-286 discalloy, incoloy			Nickel base alloys monel, hastelloy, inconel, waspaloy			Cobalt base alloys haynes stellite			Titanium alloys 6Al-4V		
					v_c m/min	Geo. 1st	Geo. 2nd	v_c m/min	Geo. 1st	Geo. 2nd	v_c m/min	Geo. 1st	Geo. 2nd	v_c m/min	Geo. 1st	Geo. 2nd
Ceramic	WS500	R	1.5-2.0	0.15-0.38	-	-		90-250	-		50-250	-		-	-	
		GP	0.38-1.5	0.10-0.25	-	-		90-250	-		50-250	-		-	-	
		F	0.10-0.38	-	-	-		250-500	-		-	-		-	-	

ADVANCED MATERIAL GRADE SELECTION/APPLICATION GUIDE

Hardened materials

H Hardened materials		Operation	a_p Depth of cut mm	f Feed mm/rev	Negative top form geometry					
					Cutting speed / Chipbreaker designation					
					Alloy steels 40 - 50 HRC		Alloy steels 50 - 62 HRC		Tool & die steels 50 - 60 HRC	
					v_c m/min	Geo. 1st 2nd	v_c m/min	Geo. 1st 2nd	v_c m/min	Geo. 1st 2nd
CBN	C225	R	0.64-1.0*	0.08-0.25	-	-	107-152	-	76-137	-
		GP	0.25-0.5	0.8-0.2	-	-	122-168	-	91-168	-
		F	<0.25	0.05-0.15	-	-	137-198	-	91-168	-
Ceramic	TC100	R	<2.0	0.08-0.3	46-107	-	-	-	-	-
		GP	0.38-1.0	0.08-0.25	122-229	-	-	-	-	-
		F	<0.38	0.08-0.2	137-259	-	-	-	-	-

*Maximum DOC should not exceed 50% of segment length. Occasional DOC >0.025 can be accomodated for very limited time prior to failure

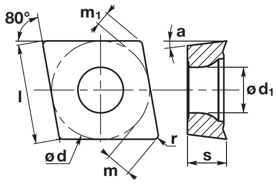
H Hardened materials		Operation	a_p Depth of cut mm	f Feed mm/rev	Positive top form geometry					
					Cutting speed / Chipbreaker designation					
					Alloy steels 40 - 50 HRC		Alloy steels 50 - 62 HRC		Tool & die steels 50 - 60 HRC	
					v_c m/min	Geo. 1st 2nd	v_c m/min	Geo. 1st 2nd	v_c m/min	Geo. 1st 2nd
CBN	C225	R	0.64-1.0*	0.08-0.25	-	-	107-152	-	76-137	-
		GP	0.25-0.5	0.8-0.2	-	-	122-168	-	91-168	-
		F	<0.25	0.05-0.15	-	-	137-198	-	91-168	-

* Continuous cut

TURNING

INSERT DIMENSIONS

C form



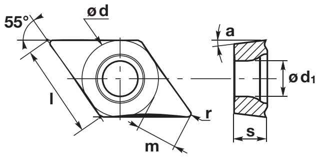
Negative styles		
With hole		Solid
a = 0°		
CNGA	CNMA	CNGN
CNGG	CNMG	CNGX
	CNMM	

Positive styles		
With hole		Solid
a = 7°	a = 11°	a = 11°
CCGT	CPGX	CPGN
CCMT		
CCMW		
CCMX		

Insert designation	d	l	s	r	m	m_1	d_1
CCGT 06 02 02-1L	6.35	6.4	2.58	0.2	1.693	0.942	2.80
CCGT 06 02 04-1L	6.35	6.4	2.58	0.4	1.582	0.881	2.80
C... 06 02 02	6.35	6.4	2.38	0.2	1.652	0.908	2.80
C... 06 02 04	6.35	6.4	2.38	0.4	1.544	0.848	2.80
C... 06 02 08	6.35	6.4	2.38	0.8	1.323	0.727	2.80
C... 06 02 12	6.35	6.4	2.38	1.2	1.103	0.848	2.80
CCGT 08 03 02-1L	7.94	8.1	3.43	0.2	2.143	1.191	3.40
CCGT 08 03 04-1L	7.94	8.1	3.43	0.4	2.033	1.131	3.40
C... 08 03 02	7.94	8.1	3.18	0.2	2.095	1.151	3.40
C... 08 03 04	7.94	8.1	3.18	0.4	1.986	1.091	3.40
C... 08 03 08	7.94	8.1	3.18	0.8	1.765	0.970	3.40
C... 09 03 04	9.525	9.7	3.18	0.4	2.426	1.333	3.81
C... 09 03 08	9.525	9.7	3.18	0.8	2.205	1.212	3.81
CCGT 09 T3 02-1L	9.525	9.7	4.22	0.2	2.581	1.431	4.40
CCGT 09 T3 04-1L	9.525	9.7	4.22	0.4	2.474	1.374	4.40
CCGT 09 T3 08-1L	9.525	9.7	4.22	0.8	2.253	1.252	4.40
C... 09 T3 02	9.525	9.7	3.97	0.2	2.540	1.390	4.40
C... 09 T3 04	9.525	9.7	3.97	0.4	2.426	1.333	4.40
C... 09 T3 08	9.525	9.7	3.97	0.8	2.206	1.212	4.40
CC.. 12 04 04	12.70	12.9	4.76	0.4	3.308	1.818	5.50
CC.. 12 04 08	12.70	12.9	4.76	0.8	3.088	1.697	5.50
CC.. 12 04 12	12.70	12.9	4.76	1.2	2.867	1.576	5.50
CN.. 12 04 02	12.70	12.9	4.76	0.2	3.419	1.879	5.16
CN.. 12 04 04	12.70	12.9	4.76	0.4	3.308	1.818	5.16
CN.. 12 04 08	12.70	12.9	4.76	0.8	3.088	1.697	5.16
CN.. 12 04 12	12.70	12.9	4.76	1.2	2.867	1.576	5.16
CN.. 12 04 16	12.70	12.9	4.76	1.6	2.647	1.455	5.16
C... 12 07 08	12.70	12.9	7.94	0.8	3.308	1.818	5.16
C... 12 07 12	12.70	12.9	7.94	1.2	3.308	1.818	5.16
C... 12 07 16	12.70	12.9	7.94	1.6	3.308	1.818	5.16
C... 16 06 08	15.875	16.1	6.35	0.8	3.970	2.182	6.35
C... 16 06 12	15.875	16.1	6.35	1.2	3.749	2.061	6.35
C... 16 06 16	15.875	16.1	6.35	1.6	3.529	1.939	6.35
C... 16 07 08	15.875	16.1	7.94	0.8	3.970	2.182	6.35
C... 16 07 12	15.875	16.1	7.94	1.2	3.749	2.061	6.35
C... 16 07 16	15.875	16.1	7.94	1.6	3.529	1.939	6.35
C... 19 06 08	19.05	19.3	6.35	0.8	4.852	2.667	7.93
C... 19 06 12	19.05	19.3	6.35	1.2	4.632	2.545	7.93
C... 19 06 16	19.05	19.3	6.35	1.6	4.411	2.424	7.93
C... 19 06 24	19.05	19.3	6.35	2.4	3.970	2.182	7.93

INSERT DIMENSIONS

D form

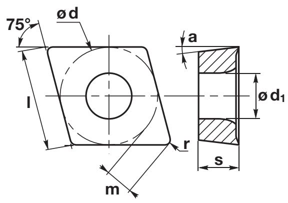


Negative styles		
With hole		Solid
a = 0°		
DNGA	DNMA	DNGN
	DNMG	DNGX
	DNMM	DNMX

Positive styles		
With hole		Solid
a = 7°	a = 11°	a = 11°
DCGT		
DCGW		
DCMT		
DCMW		

Insert designation	d	l	s	r	m	m_1	d_1
DCGT 07 02 02-1L	6.35	7.7	2.58	0.2	3.524	-	2.80
DCGT 07 02 04-1L	6.35	7.7	2.58	0.4	3.292	-	2.80
D... 07 02 02	6.35	7.7	2.38	0.2	3.464	-	2.80
D... 07 02 04	6.35	7.7	2.38	0.4	3.238	-	2.80
D... 07 02 08	6.35	7.7	2.38	0.8	2.768	-	2.80
DCGT 11 T3 02-1L	9.525	11.6	4.22	0.2	5.388	-	4.40
DCGT 11 T3 04-1L	9.525	11.6	4.22	0.4	5.156	-	4.40
DCGT 11 T3 08-1L	9.525	11.6	4.22	0.8	4.693	-	4.40
D... 11 T3 02	9.525	11.6	3.97	0.2	5.321	-	4.40
D... 11 T3 04	9.525	11.6	3.97	0.4	5.089	-	4.40
D... 11 T3 08	9.525	11.6	3.97	0.8	4.626	-	4.40
D... 11 T3 12	9.525	11.6	3.97	1.2	4.163	-	4.40
D... 11 04 04	9.525	11.6	4.76	0.4	5.089	-	3.81
D... 11 04 08	9.525	11.6	4.76	0.8	4.626	-	3.81
D... 11 04 12	9.525	11.6	4.76	1.2	4.163	-	3.81
D... 15 04 04	12.70	15.5	4.76	0.4	6.477	-	5.16
D... 15 04 08	12.70	15.5	4.76	0.8	6.477	-	5.16
D... 15 04 12	12.70	15.5	4.76	1.2	6.477	-	5.16
D... 15 06 04	12.70	15.5	6.35	0.4	6.939	-	5.16
D... 15 06 05	12.70	15.5	6.35	0.5	6.820	-	-
D... 15 06 08	12.70	15.5	6.35	0.8	6.477	-	5.16
D... 15 06 10	12.70	15.5	6.35	1.0	6.237	-	-
D... 15 06 12	12.70	15.5	6.35	1.2	6.014	-	5.16
D... 15 06 16	12.70	15.5	6.35	1.6	5.552	-	5.16
D... 15 07 08	12.70	15.5	7.94	0.8	6.477	-	5.16
D... 15 07 12	12.70	15.5	7.94	1.2	6.477	-	5.16
D... 15 07 16	12.70	15.5	7.94	1.6	6.477	-	5.16

E form

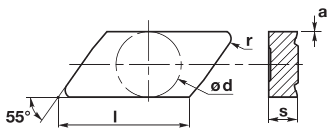


Positive styles		
With hole		Solid
a = 7°	a = 11°	a = 11°
ECGT	EPGX	
ECMT	EPMT	
ECMW		

Insert designation	d	l	s	r	m	m_1	d_1
E... 05 02 02	5.56	5.7	2.38	0.2	1.658	-	2.50
ECGT 06 02 02-1L	6.35	6.5	2.58	0.2	1.954	-	2.80
E... 06 02 02	6.35	6.5	2.38	0.2	1.910	-	2.80
E... 06 02 04	6.35	6.5	2.38	0.4	1.780	-	2.80
E... 08 03 02	7.94	8.2	3.18	0.2	2.420	-	3.40
ECGT 08 03 04-1L	7.94	8.2	3.43	0.4	2.346	-	3.40
E... 08 03 04	7.94	8.2	3.18	0.4	2.290	-	3.40
E... 08 03 08	7.94	8.2	3.18	0.8	2.040	-	3.40

INSERT DIMENSIONS

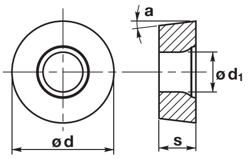
K form



Negative styles	
With hole	Solid
a = 0°	
	KNUX

Insert designation	d	l	s	r	m	m_1	d_1
KNUX 16 04 05	9.525	16.0	4.76	0.5	-	-	-
KNUX 16 04 10	9.525	16.0	4.76	1.0	-	-	-

R form



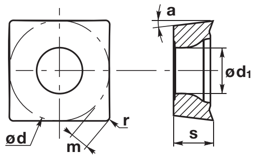
Negative styles	
With hole	Solid
a = 0°	
RNMG	RNGN

Positive styles			
With hole		Solid	
a = 7°	a = 11°	a = 7°	a = 11°
RCMT		RCGX	RPGN
RCMX			RPGX

Insert designation	d	l	s	r	m	m_1	d_1
R... 06 03 00	6.35	-	3.18	3.18	-	-	-
R... 06 04 00	6.35	-	4.76	3.18	-	-	-
R... 06 06 00	6.35	-	6.35	3.18	-	-	-
R... 08 03 MO	8.00	-	3.18	4.00	-	-	3.50
R... 09 03 00	9.525	-	3.18	4.76	-	-	-
R... 09 04 00	9.525	-	4.76	4.76	-	-	-
R... 09 07 00	9.525	-	7.94	4.76	-	-	-
R... 10 T3 MO	10.00	-	3.97	5.00	-	-	4.40
R... 12 04 00	12.70	-	4.76	6.35	-	-	5.16
R... 12 04 MO	12.00	-	4.76	6.00	-	-	4.40
R... 12 07 00	12.70	-	7.94	6.35	-	-	-
R... 15 07 00	15.875	-	7.94	7.94	-	-	-
R... 16 05 MO	16.00	-	5.56	8.00	-	-	5.50
R... 19 07 00	19.05	-	7.94	9.53	-	-	-
R... 20 06 MO	20.00	-	6.35	10.00	-	-	6.35
R... 25 07 00	25.40	-	7.94	12.70	-	-	-
R... 25 07 MO	25.00	-	7.94	12.50	-	-	7.20
R... 32 09 MO	32.00	-	9.52	16.00	-	-	9.50

INSERT DIMENSIONS

S form



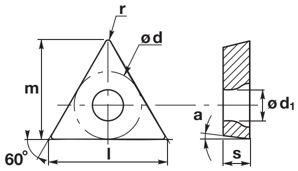
Negative styles		
With hole		Solid
a = 0°		
SNGA	SNMA	SNGN
	SNMG	SNGX
	SNMM	SNUN

Positive styles		
With hole		Solid
a = 7°	a = 11°	a = 11°
SCGT		
SCMT		
SCMW		

Insert designation	d	l	s	r	m	m_1	d_1
S... 09 03 04	9.525	9.525	3.18	0.4	1.808	-	3.81
S... 09 03 08	9.525	9.525	3.18	0.8	1.644	-	3.81
S... 09 03 12	9.525	9.525	3.18	1.2	1.479	-	3.81
S... 09 03 16	9.525	9.525	3.18	1.6	1.315	-	3.81
SCGT 09 T3 04-1L	9.525	9.525	4.22	0.4	1.852	-	4.40
SCGT 09 T3 08-1L	9.525	9.525	4.22	0.8	1.688	-	4.40
S... 09 T3 04	9.525	9.525	3.97	0.4	1.808	-	4.40
S... 09 T3 08	9.525	9.525	3.97	0.8	1.644	-	4.40
S... 12 03 04	12.70	12.70	3.18	0.4	2.466	-	-
S... 12 03 08	12.70	12.70	3.18	0.8	2.301	-	-
S... 12 03 12	12.70	12.70	3.18	1.2	2.137	-	-
SC.. 12 04 08	12.70	12.70	4.76	0.8	2.301	-	5.50
SC.. 12 04 12	12.70	12.70	4.76	1.2	2.137	-	5.50
SN.. 12 04 04	12.70	12.70	4.76	0.4	2.466	-	5.16
SN.. 12 04 08	12.70	12.70	4.76	0.8	2.301	-	5.16
SN.. 12 04 12	12.70	12.70	4.76	1.2	2.137	-	5.16
SN.. 12 04 16	12.70	12.70	4.76	1.6	1.973	-	5.16
S... 12 07 08	12.70	12.70	7.94	0.8	2.301	-	-
S... 12 07 12	12.70	12.70	7.94	1.2	2.137	-	-
S... 12 07 16	12.70	12.70	7.94	1.6	1.973	-	-
S... 15 06 08	15.875	15.875	6.35	0.8	2.959	-	6.35
S... 15 06 12	15.875	15.875	6.35	1.2	2.795	-	6.35
S... 15 06 16	15.875	15.875	6.35	1.6	2.630	-	6.35
S... 15 07 08	15.875	15.875	7.94	0.8	2.959	-	-
S... 15 07 12	15.875	15.875	7.94	1.2	2.795	-	-
S... 15 07 16	15.875	15.875	7.94	1.6	2.630	-	-
S... 19 06 08	19.05	19.05	6.35	0.8	3.616	-	7.93
S... 19 06 12	19.05	19.05	6.35	1.2	3.452	-	7.93
S... 19 06 16	19.05	19.05	6.35	1.6	3.288	-	7.93
S... 19 06 24	19.05	19.05	6.35	2.4	2.959	-	7.93
S... 19 07 12	19.05	19.05	7.94	1.2	3.452	-	-
S... 19 07 16	19.05	19.05	7.94	1.6	3.288	-	-
S... 19 07 24	19.05	19.05	7.94	2.4	2.959	-	-
S... 25 07 24	25.40	25.40	7.94	2.4	4.274	-	9.12
S... 25 09 24	25.40	25.40	9.52	2.4	4.274	-	9.12

INSERT DIMENSIONS

T form



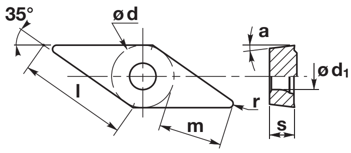
Negative styles		
With hole		Solid
a = 0°		
TNGA	TNMA	TNGN
	TNMG	TNUN
	TNMM	

Positive styles			
With hole		Solid	
a = 7°	a = 11°	a = 11°	a = 20°
TCGT		TPGN	TEEW
TCMT		TPGX	
TCMX		TPMR	
		TPUN	
		TPUX	

Insert designation	d	l	s	r	m	m_1	d_1
T... 06 T1 02	3.97	6.88	1.98	0.2	5.757	-	2.20
T... 06 T1 04	3.97	6.88	1.98	0.4	5.558	-	2.20
T... 09 02 02	5.56	9.52	2.38	0.2	8.136	-	2.50
T... 09 02 04	5.56	9.52	2.38	0.4	7.937	-	2.50
TCGT 11 02 02-1L	6.35	11.00	2.58	0.2	9.376	-	2.80
TCGT 11 02 04-1L	6.35	11.00	2.58	0.4	9.177	-	2.80
T... 11 02 04	6.35	11.00	2.38	0.4	9.128	-	2.80
T... 11 02 08	6.35	11.00	2.38	0.8	8.731	-	2.80
T... 11 03 04	6.35	11.00	3.18	0.4	9.128	-	2.26
T... 11 03 08	6.35	11.00	3.18	0.8	8.731	-	2.26
T... 13 02 04	7.94	13.70	2.38	0.4	11.495	-	3.80
T... 13 02 08	7.94	13.70	2.38	0.8	11.095	-	3.80
T... 16 03 04	9.525	16.50	3.18	0.4	13.891	-	-
T... 16 03 08	9.525	16.50	3.18	0.8	13.494	-	-
T... 16 03 12	9.525	16.50	3.18	1.2	13.097	-	-
TCGT 16 T3 04-1L	9.525	16.50	4.22	0.4	13.953	-	4.40
TCGT 16 T3 08-1L	9.525	16.50	4.22	0.8	13.556	-	4.40
T... 16 T3 04	9.525	16.50	3.97	0.4	13.891	-	4.40
T... 16 T3 08	9.525	16.50	3.97	0.8	13.494	-	4.40
T... 16 T3 12	9.525	16.50	3.97	1.2	13.097	-	4.40
T... 16 04 04	9.525	16.50	4.76	0.4	13.891	-	3.81
T... 16 04 08	9.525	16.50	4.76	0.8	13.494	-	3.81
T... 16 04 12	9.525	16.50	4.76	1.2	13.097	-	3.81
T... 16 04 16	9.525	16.50	4.76	1.6	12.700	-	3.81
T... 16 04 20	9.525	16.50	4.76	2.0	12.288	-	3.81
T... 16 07 08	9.525	16.50	7.94	0.8	13.494	-	-
T... 16 07 12	9.525	16.50	7.94	1.2	13.097	-	-
T... 16 07 16	9.525	16.50	7.94	1.6	12.700	-	-
T... 16 07 20	9.525	16.50	7.94	2.0	12.288	-	-
T... 22 04 04	12.70	22.00	4.76	0.4	18.653	-	5.16
T... 22 04 08	12.70	22.00	4.76	0.8	18.256	-	5.16
T... 22 04 12	12.70	22.00	4.76	1.2	17.859	-	5.16
T... 22 04 16	12.70	22.00	4.76	1.6	17.463	-	5.16
T... 22 07 08	12.70	22.00	7.94	0.8	12.700	-	-
T... 22 07 12	12.70	22.00	7.94	1.2	12.700	-	-
T... 22 07 16	12.70	22.00	7.94	1.6	12.700	-	-
T... 27 06 08	15.875	27.00	6.35	0.8	23.018	-	6.35
T... 27 06 12	15.875	27.00	6.35	1.2	22.622	-	6.35
T... 27 06 16	15.875	27.00	6.35	1.6	22.225	-	6.35
T... 27 06 24	15.875	27.00	6.35	2.4	21.432	-	6.35
T... 27 06 32	15.875	27.00	6.35	3.2	20.638	-	6.35
T... 33 09 16	19.05	33.00	9.52	1.6	26.987	-	7.94
T... 33 09 24	19.05	33.00	9.52	2.4	26.175	-	7.94
T... 44 09 20	25.40	44.00	9.52	2.0	36.100	-	9.12

INSERT DIMENSIONS

V form

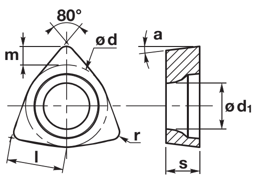


Negative styles		
With hole		Solid
a = 0°		
VNGA	VNMG	
	VNMM	

Positive styles		
With hole		
a = 5°	a = 7°	a = 11°
VBMT	VCGT	VPEX
	VCGW	
	VCGX	

Insert designation	d	l	s	r	m	m_1	d_1
V... 07 02 02	3.97	6.92	2.38	0.2	4.156	-	2.20
V... 07 02 04	3.97	6.92	2.38	0.4	3.693	-	2.20
VCGT 11 02 02-1L	6.35	11.07	2.58	0.2	7.005	-	2.80
VCGT 11 02 04-1L	6.35	11.07	2.58	0.4	6.542	-	2.80
VPEX 11 T2 00	6.35	10.51	2.50	0.0	4.933	-	2.80
VPEX 11 T2 01	6.35	10.51	2.50	0.1	4.933	-	2.80
VPEX 11 T2 02	6.35	10.51	2.50	0.2	4.933	-	2.80
VCGX 13 03 00	7.94	13.84	3.18	0.0	6.280	-	3.40
VCGX 13 03 01	7.94	13.84	3.18	0.1	6.280	-	3.40
VCGT 13 03 02-1L	7.94	13.84	3.43	0.2	8.873	-	3.40
VCGT 13 03 04-1L	7.94	13.84	3.43	0.4	8.410	-	3.40
VCGT 13 03 08-1L	7.94	13.84	3.43	0.8	7.487	-	3.40
V... 13 03 02	7.94	13.84	3.18	0.2	8.767	-	3.40
V... 13 03 04	7.94	13.84	3.18	0.4	8.301	-	3.40
V... 13 03 08	7.94	13.84	3.18	0.8	7.372	-	3.40
VCGT 16 04 04-1L	9.525	15.84	5.01	0.4	10.254	-	4.40
VCGT 16 04 08-1L	9.525	15.84	5.01	0.8	9.331	-	4.40
VCGT 16 04 12-1L	9.525	15.84	5.01	1.2	8.408	-	4.40
V... 16 04 04	9.525	15.84	4.76	0.4	10.152	-	4.40
V... 16 04 08	9.525	15.84	4.76	0.8	9.229	-	4.40
V... 16 04 12	9.525	15.84	4.76	1.2	8.306	-	4.40

W form



Negative styles		
With hole		Solid
a = 0°		
WNGA	WNMA	
	WNMG	
	WNMM	
	WNMX	

Positive styles		
With hole		Solid
a = 7°	a = 11°	a = 11°
WCGT		
WCGX		

Insert designation	d	l	s	r	m	m_1	d_1
W... 02 01 02	3.97	2.72	1.59	0.2	0.993	-	2.20
W... 02 01 04	3.97	2.72	1.59	0.4	0.882	-	2.20
W... 06 04 04	9.525	6.50	4.76	0.4	2.537	-	3.81
W... 06 04 08	9.525	6.50	4.76	0.8	2.426	-	3.81
W... 06 04 12	9.525	6.50	4.76	1.2	2.205	-	3.81
W... 08 04 04	12.70	8.70	4.76	0.4	3.308	-	5.16
W... 08 04 08	12.70	8.70	4.76	0.8	3.084	-	5.16
W... 08 04 12	12.70	8.70	4.76	1.2	2.867	-	5.16
W... 08 04 16	12.70	8.70	4.76	1.6	2.646	-	5.16
W... 10 06 12	15.875	10.86	6.35	1.2	3.749	-	6.35
W... 10 06 16	15.875	10.86	6.35	1.6	3.529	-	6.35

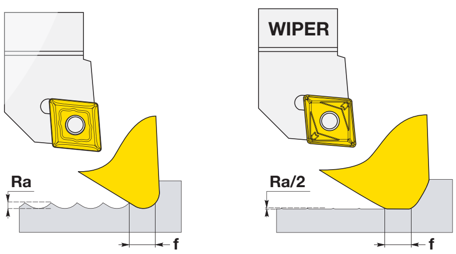
WIPER GUIDELINES

6W

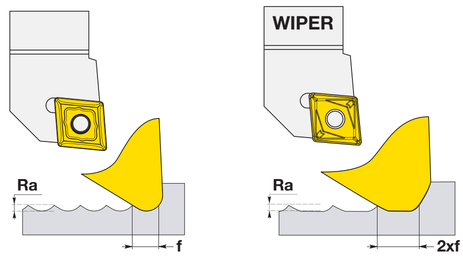
Used for semi-finish and finishing operations. Allows increased productivity while producing surfaces as good as those produced by conventional inserts.

How wiper inserts work

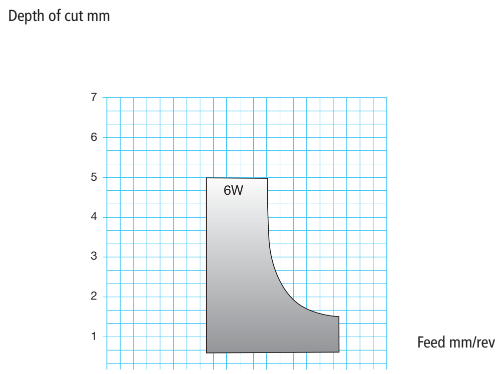
Conventional inserts produce a certain finish (Ra) at a given feed rate. Using wiper inserts can improve finish or increase feed rate.



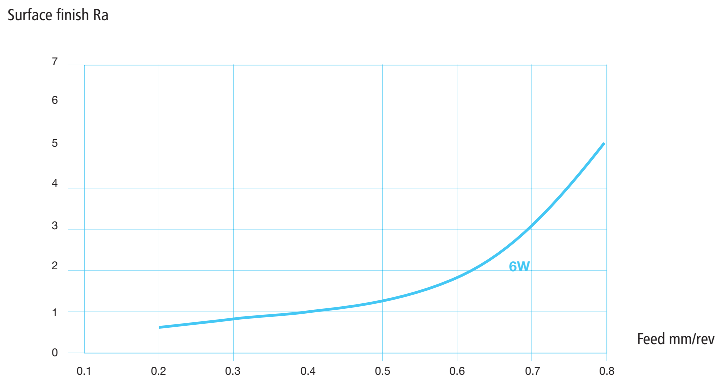
Wiper inserts operating at the same feed rate as conventional inserts can improve surface finish by up to 50%.



Wiper inserts can also produce surfaces equal to those of conventional inserts while doubling the feed rate.

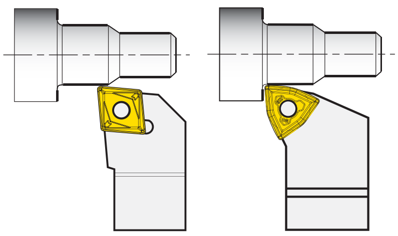


Get improved chip control and improved tool life at existing feed rates while improving surface finishes by 50%.

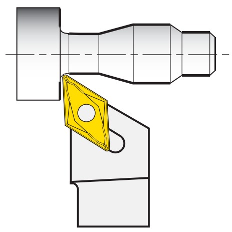


Innovative wiper corner radius design improves surface finish compared to conventional inserts with the same corner radius.

Wiper usage guidelines

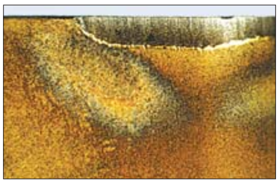
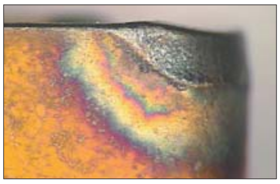
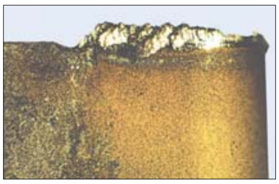
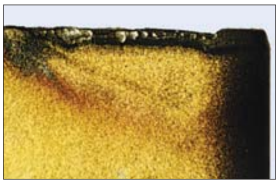


CNMG and WNMG wiper inserts produce a “true corner radius” equal to the radius produced by non-wiper inserts.

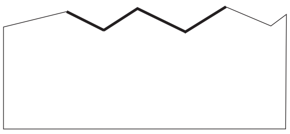
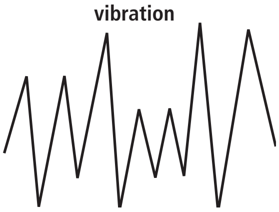
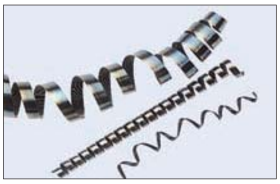


DNMG wiper inserts produce corner radius that is not “true” ; but is within tolerance range of most manufacturing requirements.

INSERT FAILURE MODES

Problem / Failure mode	Cause	Control action / Remedy
Rapid flank wear 	Excessive cutting speed Work material micro-structure contains carbides	Reduce cutting speed Use harder grade Select more positive rake chipbreaker Flood cutting zone with coolant
Crater 	Excessive cutting speed Excessive feed Ineffective use of coolant	Reduce cutting speed & feed Select harder grade with oxide coating Select more positive rake chipbreaker Flood cutting zone with coolant
Heat deformation 	Excessive heat Excessive cutting forces	Reduce cutting speed Reduce feed rate Flood cutting zone with coolant Select harder grade
Built-up edge, torn finish, chip welding 	Low cutting speed Poor shearing action	Increase cutting speed Select more positive rake chipbreaker Select tougher grade (use PVD coated insert) Flood cutting zone with coolant
Edge chipping 	Excessive feed rate Interrupted cut	Reduce feed rate Select tougher grade Select stronger chipbreaker Improve rigidity Decrease κ_r or increase hone
Excessive depth of cut notching 	Scale part High work hardening materials	Decrease κ_r Increase cutting speed Select tougher grade Select stronger chipbreaker Vary depth of cut if possible (Ramping)

INSERT FAILURE MODES

Problem / Failure mode	Cause	Control action / Remedy
Fracture 	Improper selection of grade/chipbeaker and/or cutting conditions	Reduce feed rate Select tougher grade Select stronger chipbreaker Make sure set-up is as rigid as possible Replace Shim Seat
Thermal cracks 	Extreme variation in cutting temperatures Interrupted cut	Reduce feed rate Increase cutting speed Select stronger chipbreaker Turn off coolant
Poor surface finish 	High feed rate Low cutting speed Nose radius too small	Reduce feed rate and increase cutting speed Select more positive rake chipbreaker Flood cutting zone with coolant Use larger nose radius Select a grade with smoother surface
Workpiece chatter vibration 	Poor set-up Improper insert selection	Select more positive rake chipbreaker Increase κ_r Use smaller nose radius
Unacceptable chip control (Low carbon steel) 	Low feed rate Large nose radius	Increase κ_r Use smaller nose radius Decrease lead angle Ensure use of correct chipbreaker run at recommended parameters

TURNING FORMULAE

Parameters to determine		Known parameters		Formula
Cutting speed (m/min)	v_c	Machined diameter (mm)	D_m	$v_c = \frac{\pi \times D_m \times n}{1000}$
		Spindle speed (rev/min)	n	
Spindle speed (rev/min)	n	Cutting speed (m/min)	v_c	$n = \frac{1000 \times v_c}{\pi \times D_m}$
		Machined diameter (mm)	D_m	
Cutting time (min)	T	Machined length (mm)	l_m	$T = \frac{l_m}{f_n \times n}$
		Feed per revolution (mm/rev)	f_n	
		Spindle speed (rev/min)	n	
Profile depth (µm)	R_t	Feed per revolution (mm/rev)	f_n	$R_t = \frac{f_n^2}{r_\varepsilon} \times 125$
		Insert nose radius (mm)	r_ε	
Metal removal rate (cm^3/min)	Q	Cutting speed (m/min)	v_c	$Q = v_c \times a_p \times f_n$
		Depth of cut (mm)	a_p	
		Feed per revolution (mm/rev)	f_n	
Power requirement (kW)	P_c	Metal removal rate (cm^3/min)	Q	$P_c = \frac{Q \times K_{c0.4}}{60000} \times \left(\frac{0.4}{f_n \times \sin \kappa_r} \right)^{0.22}$
		Specific cutting force for chip thickness = 0.4 mm (N/mm^2)	$K_{c0.4}$	
		Feed per revolution (mm/rev)	f_n	
		Entering angle (degree)	κ_r	
Torque requirement (Nm)	c	Power requirement (kW)	P_c	$c = \frac{30000 \times P_c}{\pi \times n}$
		Spindle speed (rev/min)	n	

TURNING

TURNING

HORSEPOWER CALCULATION

Reference charts

«P_c» Unit power factor
«K_c» Specific cutting force
To optimize the application:

Step 1: Check to make sure your machine is capable of the amount of material removal.
Calculate rate of stock removal (cm³/minute). $Q = v_c \times a_p \times f_n$

Example with data from page 16 (chapter «Insert selection method»):
$Q = 366 \times 0.9 \times 0.1 = 33$ cm³/min

Step 2: Find the power required at the spindle.
Use $K_{c0.4}$ factor to calculate horsepower requirements at the spindle: $P_c = \frac{Q \times K_{c0.4}}{60000} \times \left(\frac{0.4}{f_n \times \sin \kappa_r}\right)^{0.22}$

To find $K_{c0.4}$ see below for specific cutting forces.
Example: Locate the alloy steels group and find P_c for 600 N/mm².

$$P_c = \frac{33 \times 1860}{60000} \times \left(\frac{0.4}{0.1 \times \sin 75°}\right)^{0.22} = 1.398 \text{ kW}$$

Add the idling power comsumption of the machine $\left(P_0 \approx \frac{P_{max} \times n}{3 \times n_{max}}\right)$

P_{max} and n_{max} the maximum power and revolution speed of the machine ;

Example: $P_{max} = 4$ kW, $n_{max} = 4500$ r/min => $P_0 \approx \frac{4 \times 2300}{3 \times 4500} = 0.681$ kW ; $P = P_c + P_0 = 2.079$ kW

As machine has power rating higher than 2.1 kW, there should be no problem. If you calculate a number higher than machine power rating, you will need to make adjustments to one of the parameters, v_c, f_n or a_p to reduce Q.

Step 3: Run the insert and track the insert tool life. Analyze the failure mode.
Use the charts «Insert failure mode» to optimize your application.

P Carbon steel		
Tensile strength (N/mm²)	HB	$K_{c0.4}$
200-400	100	1680
400-700	150	1860
700-950	230	1980

P Alloys & tool steel		
Tensile strength (N/mm²)	HB	$K_{c0.4}$
400-700	150	1680
700-950	230	2100
950-1200	310	2280
1200-1400	370	2580
1400-1600	420	2760
1600-1800	460	3000

M Stainless Steels		
Type	HB	$K_{c0.4}$
Ferritic	200	1680
Martensitic	300	2100
Austenitic	200	2280
Austenitic with titanium		2400
Maraging		2400

K Cast iron		
Tensile strength (N/mm²)	HB	$K_{c0.4}$
100-150	130	1100
150-220	180	1200
220-450	220	1500
450-650	250	1700
650-800	380	2300

N Non-ferrous	
Type	$K_{c0.4}$
Aluminum Si<12%	660
Aluminum Si>13%	900
Brass	700
Bronze	1000
Copper	700
Copper alloy	1000
CuproNickel	1500
Magnesium	360
Gold	1200
Plastic	360

S High temperature alloys	
Type	$K_{c0.4}$
Iron base anealed	2900
Iron base aged/ hardened	3100
Nickel base anealed	3500
Nickel base aged/ hardened	4200
Cobalt base anealed	3500
Cobalt base aged/ hardened	4200
Titanium	1680

H Hardened materials	
Hardness (HRC)	$K_{c0.4}$
45	2850
50	3600
55	4400
60	5400

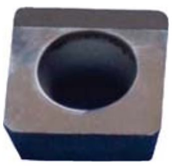
PCD - POLYCRYSTALLINE DIAMOND

D720 / PC30

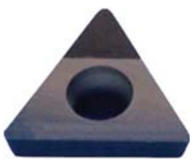
Engineered for your most demanding non-ferrous applications

Features	Benefits
Complete product offering	Covers all applications ; turning, boring and milling Pos/Neg styles for standard toolholders Tipped and full edge inserts to cover all operations ; finishing to roughing
Integrated diamond structure for higher diamond concentration and controlled sintering for increased diamond to diamond bonding	Sharper cutting edges Improved wear resistance Increased resistance to chips and pull out Excellent surface finishes For long tool life

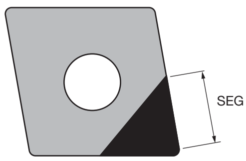
Full edge insert



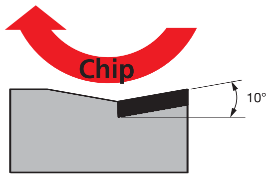
Tipped insert



Pos/Neg insert

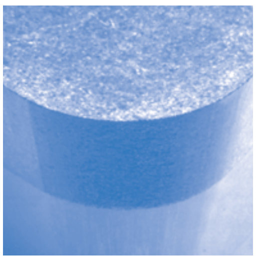


Top view

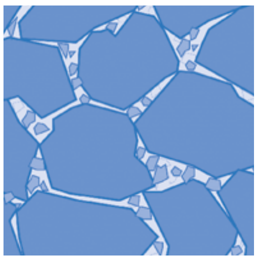


Side view

Integrated diamond structure



Insert edges
This is a proprietary process which provides a more durable PCD insert with sharper cutting edges that last longer than most other PCD inserts.



Method of construction
Controlled sintering of a blended mix of proprietary diamond particles forms a highly durable microstructure.

CBN & CERAMIC

A systematic approach to machining hardened materials

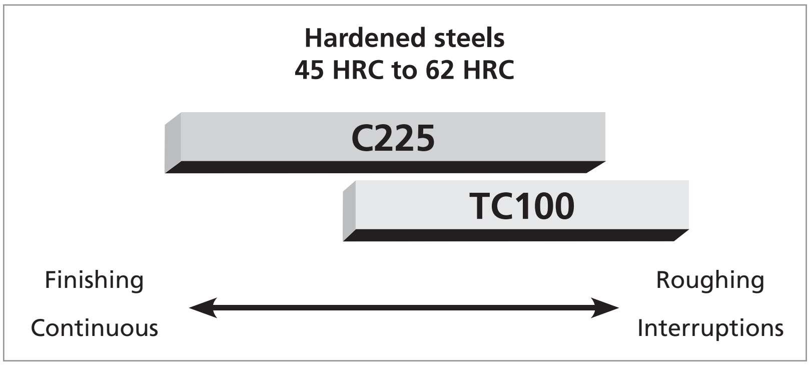
CBN (Polycrystaline Cubic Boron Nitrides) - Ceramic grades

C225
Multi cornered, coated CBN

TC100
Black ceramic

- Economic production solutions
- Critical surface finishes
- Tight tolerance specifications

Grade application guidelines



C225 - Multi-corner coated CBN

For machining materials with a hardness >45 HRC

Features	Benefits
Unique grade development	Resists cratering and impact type fracturing Ultra-hard cutting tool material Chemically resistant Thermal stability
Carbide backed segments	Dissipate heat generated during machining Stops cracks from progressing Increases brazing contact area

TC100 - Black ceramic

Features	Benefits
General purpose ceramic	Improved finishes High speed finishing of cast iron Finishing of hardened steels
CBN alternative	Excellent for ≥ 40 HRC steels

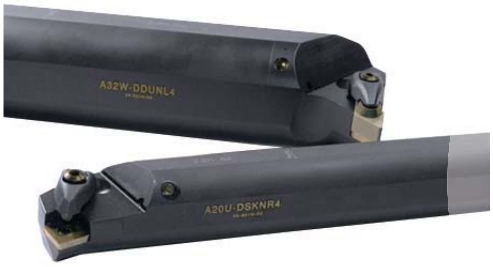
CERAMIC

Silicon nitride ceramic

SN100

Two grades with the toughness and wear resistance for use in most turning & boring cast iron machining applications

Turning application



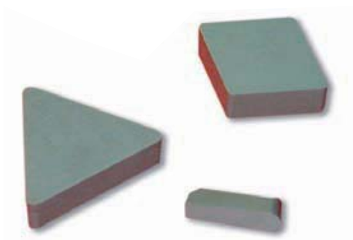
Boring application

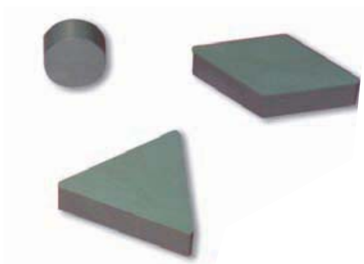
Features	Benefits
High density silicon nitride	Increased toughness for interrupted cutting
Low binder content	Increased wear resistance for higher speed range in turning
Superior notch wear resistance	Provides extra tool life when machining "as cast" components
Comprehensive product offering, including many time-proven systems	Appropriate for turning and milling applications
	Better breakage resistence

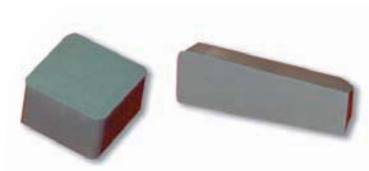
Whiskers reinforced ceramic

WS500

Features	Benefits
Whisker- reinforced composite ceramic material with silicon carbide whisker added to alumina	High speed machining of high temp alloys and hardened steels
	Excellent wear resistance
	Excellent crack resistance



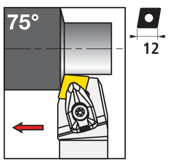




TOOLHOLDERS

D System for negative inserts

DCBN



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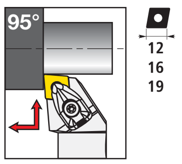
DCLN



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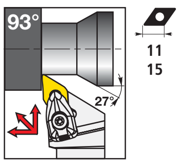
DDJN



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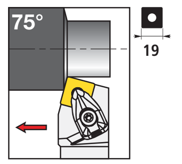
DSBN



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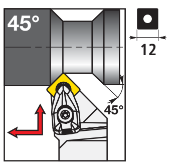
DSSN



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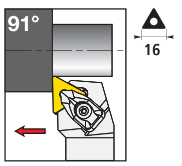
DTGN



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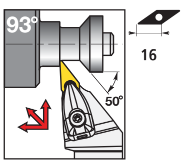
DVJN



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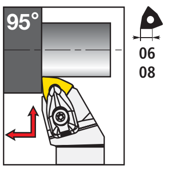
DWLN



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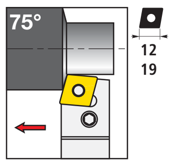
P System for negative and positive inserts

PCBN



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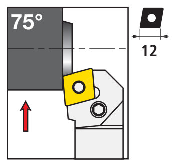
PCKN



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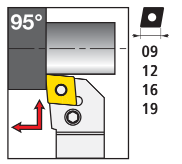
PCLN



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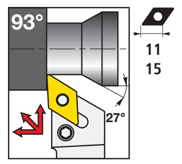
PDJN



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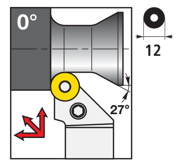
PRGN



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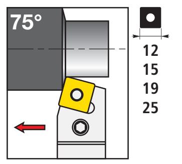
PSBN



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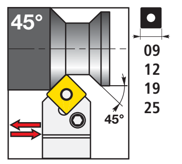
PSDNN



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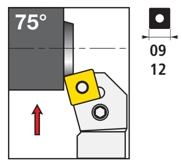
PSKN



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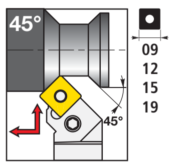
PSSN



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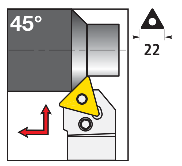
PTDN



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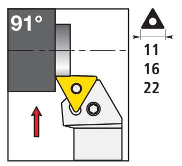
PTFN



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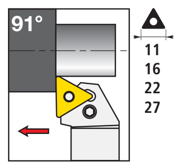
PTGN



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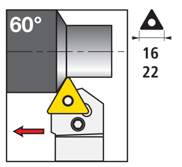
PTTN



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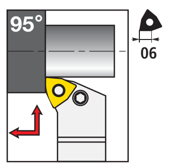
PWLN



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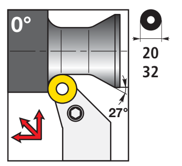
PRGC



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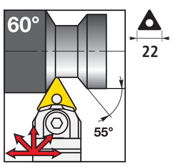
M System for negative inserts

MTENN



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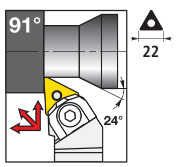
MTGN



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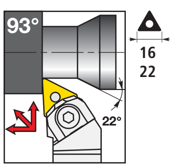
MTJN



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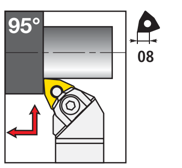
MWLN



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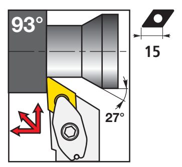
C System for negative and positive inserts

CDJN



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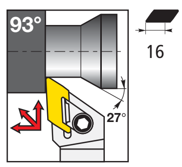
CKJN



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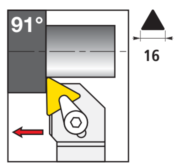
CTGP



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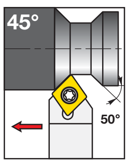
TOOLHOLDERS

S System for positive inserts

SCDC


06
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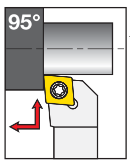
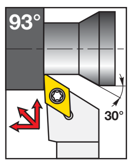
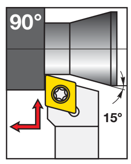
SCLC


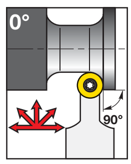
06 08 09 12
p 118

SDJC


07 11 15
p 119

SEGC


06 08
p 120

SRDCN


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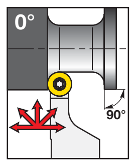
SRDC


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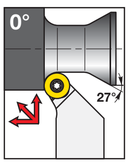
SRSC


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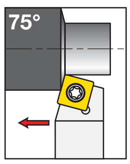
p 122

SSBC


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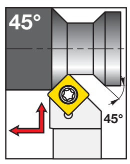
SSDC


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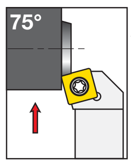
p 123

SSKC


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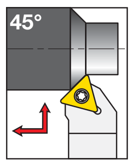
STDC


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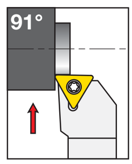
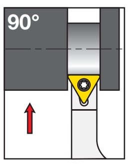
p 124

STFC


09 11 16
p 125

STFC-A


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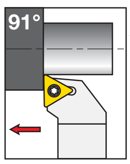
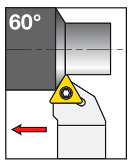
STGC


09 11 16
p 126

STTC


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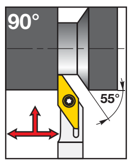
SVAC-DC


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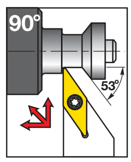
SVGC


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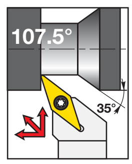
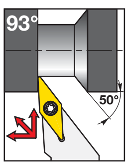
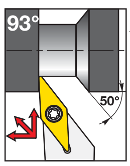
p 128

SVHB


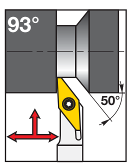
16
p 128

SVJB


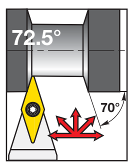
11 16
p 129

SVJC


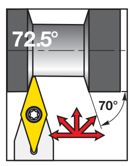
13
p 130

SVJC-DC


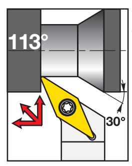
13
p 130

SVVBN


11 16
p 131

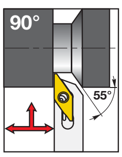
SVVCN


13
p 132

SVXC


13
p 132

DECOL-SIDE for positive inserts

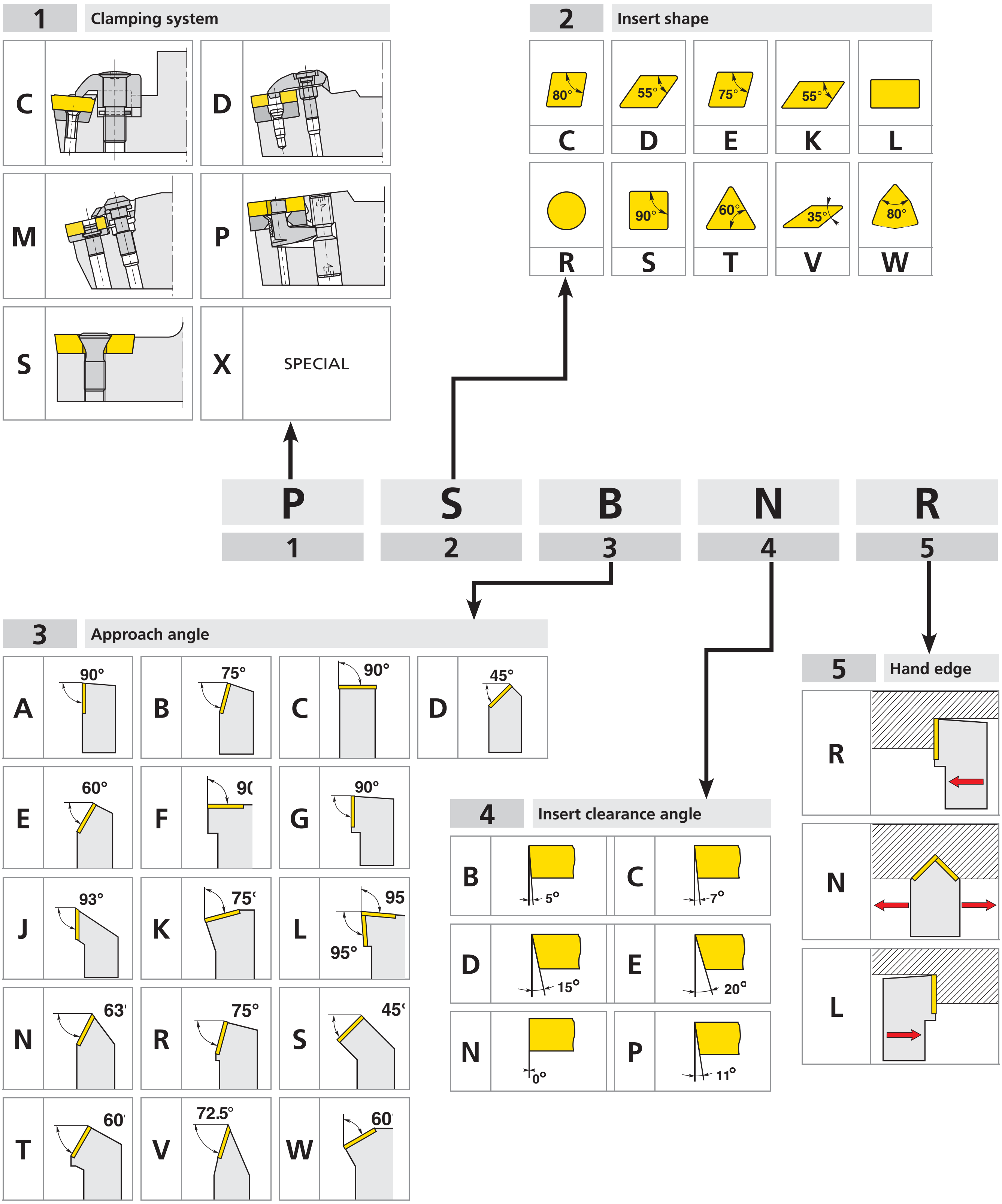
XVAP


11
p 133

TURNING

TURNING

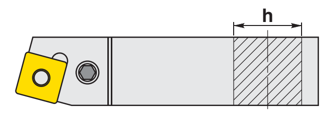
TOOLHOLDER DESIGNATION



TOOLHOLDER DESIGNATION

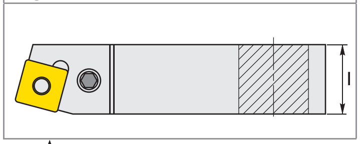
6 Height of body (mm)

If there is only a single digit prefix with a zero.
Eg: h = 8 mm is indicated as 08



7 Body width (mm)

If there is only a single digit prefix with a zero.
Eg: b = 8 mm is indicated as 08



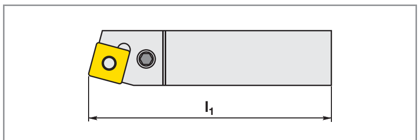
10 Manufacturer's own characteristics

If necessary an extra code can be added when the manufacturer wants to supply further details.

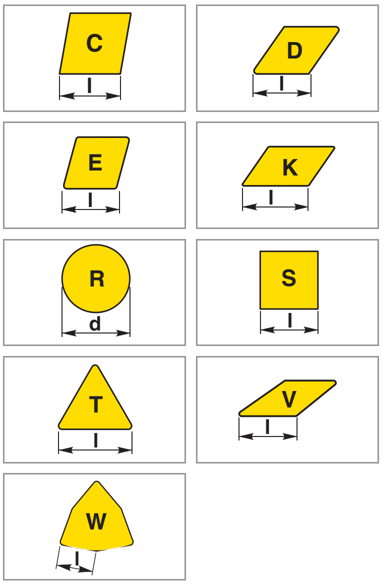
25	25	M	12	..
6	7	8	9	10

8 Length of toolholder (mm)

A	32	N	160
B	40	P	170
C	50	Q	180
D	60	R	200
E	70	S	250
F	80	T	300
G	90	U	350
H	100	V	400
J	110	W	450
K	125	Y	500
L	140	X	SPECIAL
M	150		



9 Length of cutting edge (mm)

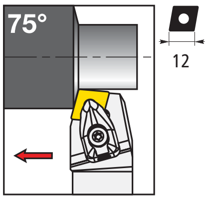


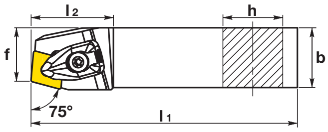
If there is only a single digit prefix with a zero

D SYSTEM FOR NEGATIVE INSERTS

TURNING

DCBNR/L



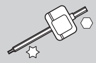


λ_s = Angle of inclination of edge
γ = Rake angle

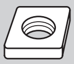
Right hand shown

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
DCBNR/L 2525M 12	CN-- 1204	25	25	22	150	34.6	-6°	-6°	✓	✓

Spare parts

Insert				
CN-- 1204	5412 028-021	5322 234-01	5513 020-02	PT-8004

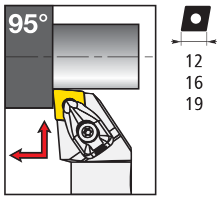
Optional spare parts

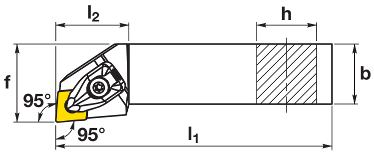
Insert		
CN-- 1207	-	5322 234-02
Ceramic insert without hole	5412 034-021	-
Ceramic insert with hole	5412 032-021	-

✓: Article which can be ordered
Ordering example: DCBNR/L 2525M 12

D SYSTEM FOR NEGATIVE INSERTS

DCLNR/L



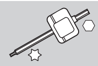


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
DCLNR/L 1616H 12	CN-- 1204	16	16	20	100	32.2	-6°	-6°	✓	✓
DCLNR/L 2020K 12	CN-- 1204	20	20	25	125	32.1	-6°	-6°	✓	✓
DCLNR/L 2525M 12	CN-- 1204	25	25	32	150	32.1	-6°	-6°	✓	✓
DCLNR/L 2525M 16	CN-- 1606	25	25	32	150	39	-6°	-6°	✓	✓
DCLNR/L 3225P 12	CN-- 1204	32	25	32	170	32.1	-6°	-6°	✓	✓
DCLNR/L 3225P 16	CN-- 1606	32	25	32	170	39	-6°	-6°	✓	✓
DCLNR/L 3232P 19	CN-- 1906	32	32	40	170	43.2	-6°	-6°	✓	✓

Spare parts

Insert				
CN-- 1204	5412 028-021	5322 234-01	5513 020-02	PT-8004
CN-- 1606	5412 028-031	5322 234-03	5513 020-07	5680 043-14
CN-- 1906	5412 028-041	5322 236-01	5513 020-07	5680 043-14

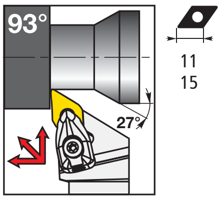
Optional spare parts

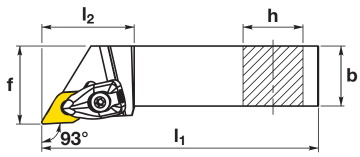
Insert		
CN-- 1207	-	5322 234-02
CN-- 1607	-	5322 234-04
Ceramic insert without hole CN-- 12-	5412 034-021	-
Ceramic insert with hole CN--12-	5412 032-021	-

✓: Article which can be ordered
Ordering example: DCLNR/L 1616H 12

D SYSTEM FOR NEGATIVE INSERTS

DDJNR/L



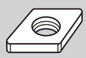
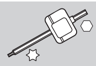


Right hand shown

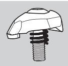
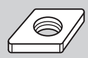
λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
DDJNR/L 2020K 11	DN-- 1104	20	20	25	125	30.2	-7°	-6°	✓	✓
DDJNR/L 2020K 15	DN-- 1506	20	20	25	125	39.3	-7°	-6°	✓	✓
DDJNR/L 2525M 11	DN-- 1104	25	25	32	150	30.2	-7°	-6°	✓	✓
DDJNR/L 2525M 15	DN-- 1506	25	25	32	150	39.3	-7°	-6°	✓	✓
DDJNR/L 3225P 15	DN-- 1506	32	25	32	170	39.3	-7°	-6°	✓	✓
DDJNR/L 3232P 15	DN-- 1506	32	32	40	170	36.2	-7°	-6°	✓	✓

Spare parts

Insert				
DN-- 1104	5412 028-011	5322 267-01	5513 020-04	PT-8002
DN-- 1506	5412 028-021	5322 266-02	5513 020-02	PT-8004

Optional spare parts

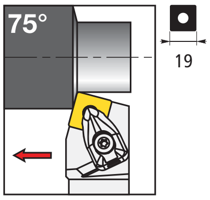
Insert		
DN-- 1504	-	5322 266-01
DN-- 1507	-	5322 266-03
Ceramic insert without hole DN-- 15-	5412 034-021	-
Ceramic insert with hole DN-- 15-	5412 032-021	-

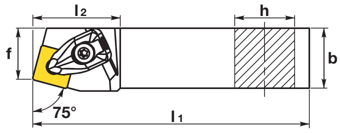
✓: Article which can be ordered
Ordering example: DDJNR/L 2020K 11

TURNING

D SYSTEM FOR NEGATIVE INSERTS

DSBNR/L



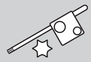


Right hand shown

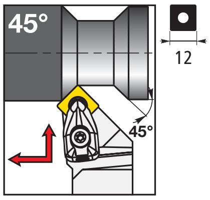
λ_s = Angle of inclination of edge
γ = Rake angle

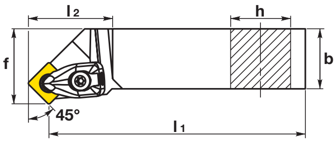
Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
DSBNR/L 3232P 19	SN-- 1906	32	32	27	170	46.4	-6°	-6°	✓	✓

Spare parts

Insert				
SN-- 1906	5412 028-041	5322 425-04	5513 020-07	5680 043-14

DSSNR/L



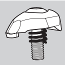
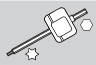


Right hand shown

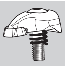
λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
DSSNR/L 2020K 12	SN-- 1204	20	20	25	125	27.5	0°	-8°	✓	✓
DSSNR/L 2525M 12	SN-- 1204	25	25	32	150	27.5	0°	-8°	✓	✓

Spare parts

Insert				
SN-- 1204	5412 028-021	5322 425-01	5513 020-02	PT-8004

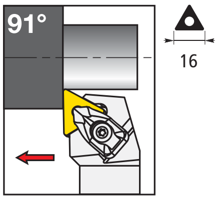
Optional spare parts

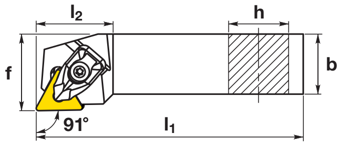
Insert		
SN-- 1207	-	5322 425-02
Ceramic insert without hole	5412 034-021	-
Ceramic insert with hole	5412 032-021	-

✓: Article which can be ordered
Ordering example: DSBNR/L 3232P 19

D SYSTEM FOR NEGATIVE INSERTS

DTGNR/L



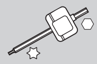


Right hand shown

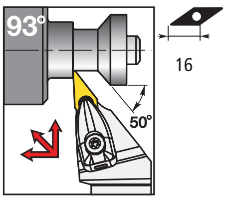
λ_s = Angle of inclination of edge
γ = Rake angle

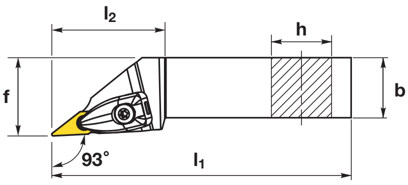
Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
DTGNR/L 2020K 16	TN-- 1604	20	20	25	125	25.4	-6°	-6°	✓	✓
DTGNR/L 2525M 16	TN-- 1604	25	25	32	150	24.6	-6°	-6°	✓	✓
DTGNR/L 3225P 16	TN-- 1604	32	25	32	170	25.3	-6°	-6°	✓	✓

Spare parts

Insert			
TN-- 1604	5412 028-011	5322 315-02	PT-8003

DVJNR/L



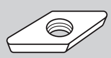
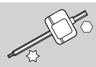


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
DVJNR/L 2020K 16	VN-- 1604	20	20	25	125	46.6	-13°	-4°	✓	✓
DVJNR/L 2525M 16	VN-- 1604	25	25	32	150	46.6	-13°	-4°	✓	✓

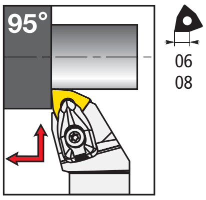
Spare parts

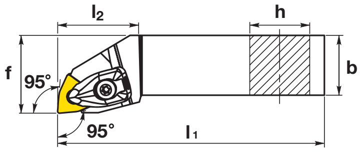
Insert				
VN-- 1604	5412 028-061	5322 269-01	5513 020-09	PT-8004

✓: Article which can be ordered
Ordering example: DTGNR/L 2020K 16

D SYSTEM FOR NEGATIVE INSERTS

DWLNR/L



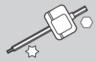


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
DWLNR/L 2020K 06	WN-- 0604	20	20	25	125	27.1	-6°	-6°	✓	✓
DWLNR/L 2020K 08	WN-- 0804	20	20	25	125	34.3	-6°	-6°	✓	✓
DWLNR/L 2525M 08	WN-- 0804	25	25	32	150	35.0	-6°	-6°	✓	✓
DWLNR/L 3225P 08	WN-- 0804	32	25	32	170	35.0	-6°	-6°	✓	✓

Spare parts

Insert				
WN-- 0604	5412 028-011	5322 328-01	5513 020-04	PT-8003
WN-- 0804	5412 028-021	5322 331-12	5513 020-02	PT-8004

Optional spare parts

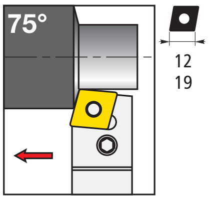
Insert	
Ceramic insert without hole	5412 034-021
Ceramic insert with hole	5412 032-021

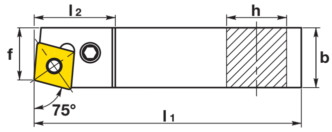
✓: Article which can be ordered
Ordering example: DWLNR/L 2020K 06

P SYSTEM FOR NEGATIVE INSERTS

TURNING

PCBNR/L



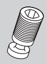
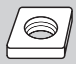
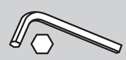


Right hand shown

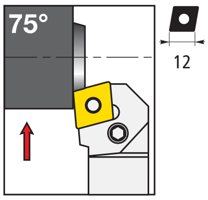
λ_s = Angle of inclination of edge
γ = Rake angle

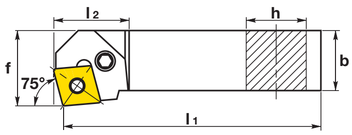
Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
PCBNR/L 2525M 12	CN-- 1204	25	25	22	150	26.9	-6°	-6°	✓	✓
PCBNR/L 3232P 19	CN-- 1906	32	32	27	170	37.5	-6°	-6°		✓
PCBNR/L 4040S 19	CN-- 1906	40	40	35	250	37.5	-6°	-6°	✓	✓

Spare parts

Insert	For insert radius						
CN-- 1204	0.4-1.6	174.3-841M	174.3-821	171.31-850M	174.3-861	5681 002-01	174.1-864
CN-- 1906	0.4-2.4	174.3-842M	174.3-822M	171.31-851M	174.3-862	5681 002-02	3021 010-040

PCKNR/L



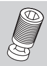
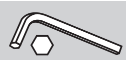


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
PCKNR/L 2020K 12	CN-- 1204	20	20	25	125	25	-6°	-6°		✓
PCKNR/L 2525M 12	CN-- 1204	25	25	32	150	25	-6°	-6°	✓	✓

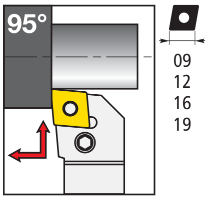
Spare parts

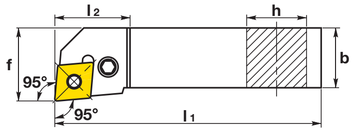
Insert	For insert radius						
CN-- 1204	0.4-1.6	174.3-841M	174.3-821	171.31-850M	174.3-861	5681 002-01	174.1-864

✓: Article which can be ordered
Ordering example: PCBNR/L 2525M 12

P SYSTEM FOR NEGATIVE INSERTS

PCLNR/L



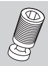
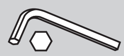


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
PCLNR/L 1616H 09	CN-- 0903	16	16	20	100	24.2	-6°	-6°		✓
PCLNR/L 1616H 12-M	CN-- 1204	16	16	20	100	27.2	-6°	-6°	✓	✓
PCLNR/L 2020K 09	CN-- 0903	20	20	25	125	24.2	-6°	-6°	✓	✓
PCLNR/L 2020K 12	CN-- 1204	20	20	25	125	27.2	-6°	-6°	✓	✓
PCLNR/L 2525M 09	CN-- 0903	25	25	32	150	24.2	-6°	-6°		✓
PCLNR/L 2525M 12	CN-- 1204	25	25	32	150	27.2	-6°	-6°	✓	✓
PCLNR/L 2525M 16	CN-- 1606	25	25	32	150	33.9	-6°	-6°	✓	✓
PCLNR/L 3225P 12	CN-- 1204	32	25	32	170	27.2	-6°	-6°	✓	✓
PCLNR/L 3232P 16	CN-- 1606	32	32	40	170	33.9	-6°	-6°	✓	✓
PCLNR/L 3232P 19	CN-- 1906	32	32	40	170	37.9	-6°	-6°	✓	✓
PCLNR/L 4040S 19	CN-- 1906	40	40	50	250	37.9	-6°	-6°	✓	✓

Spare parts

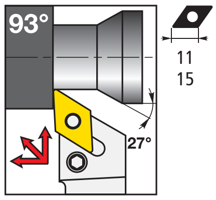
Insert	h/b	For insert radius						
CN-- 0903	-	0.4-1.2	174.3-840M	174.3-820M	5322 230-02	174.3-863	5681 002-01	174.1-863
CN-- 1204	1616	0.4-1.6	174.3-848M	174.3-858	171.31-850M	174.3-861	5681 002-01	174.1-864
CN-- 1204	2020-2525-3225	0.4-1.6	174.3-841M	174.3-821	171.31-850M	174.3-861	5681 002-01	174.1-864
CN-- 1606	-	0.4-2.4	438.3-840	438.3-831	171.31-852	174.3-864	5681 002-02	174.1-864
CN-- 1906	-	0.4-2.4	174.3-842M	174.3-822M	171.31-851M	174.3-862	5681 002-02	3021 010-040

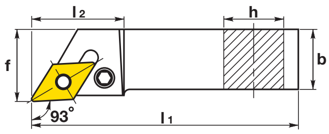
✓: Article which can be ordered
Ordering example: PCLNR/L 1616H 09

TURNING

P SYSTEM FOR NEGATIVE INSERTS

PDJNR/L



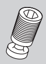
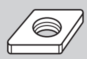
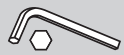


Right hand shown

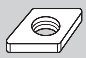
λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
PDJNR/L 1616H 11	DN-- 1104	16	16	20	100	29.7	-7°	-6°	✓	✓
PDJNR/L 2020K 11	DN-- 1104	20	20	25	125	29.7	-7°	-6°	✓	✓
PDJNR/L 2020K 15	DN-- 1506	20	20	25	125	36.2	-7°	-6°	✓	✓
PDJNR/L 2525M 11	DN-- 1104	25	25	32	150	29.7	-7°	-6°	✓	✓
PDJNR/L 2525M 15	DN-- 1506	25	25	32	150	36.2	-7°	-6°	✓	✓
PDJNR/L 3225P 15	DN-- 1506	32	25	32	170	36.2	-7°	-6°	✓	✓
PDJNR/L 3232P 15	DN-- 1506	32	32	40	170	36.2	-7°	-6°	✓	✓

Spare parts

Insert	For insert radius						
DN-- 1104	0.4-0.8	5432 001-01	174.3-820M	5322 255-01	174.3-860	5681 002-01	174.1-863
DN-- 1506	0.4-0.8	174.3-847M	174.3-830	171.35-851M	174.3-861	5681 002-01	174.1-864

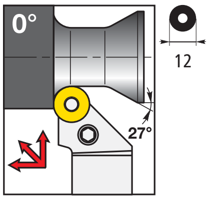
Optional spare parts

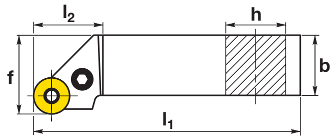
Insert	For insert radius	
DN-- 1104	1.2-1.6	5322 255-02
DN-- 1506	1.2-1.6	171.35-850M
DN-- 1504	0.4-0.8	171.35-856
DN-- 1504	1.2-1.6	171.35-855

✓: Article which can be ordered
Ordering example: PDJNR/L 1616H 11

P SYSTEM FOR NEGATIVE INSERTS

PRGNR/L



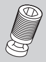
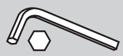


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Right hand
		h	b	f	l_1	l_2	λ_s	γ	
PRGNR/L 2525M 12	RN-- 120400	25	25	32.0	150	27.2	-6°	-6°	✓

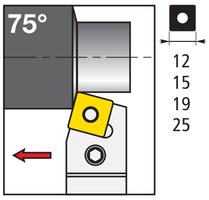
Spare parts

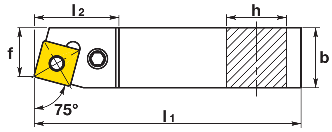
Insert						
RN-- 120400	174.3-841M	174.3-821	176.3-851M	174.3-861	5681 002-01	174.1-864

✓: Article which can be ordered
Ordering example: PRGNR/L 2525M 12

P SYSTEM FOR NEGATIVE INSERTS

PSBNR/L



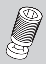
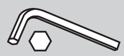


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
PSBNR/L 2020K 12	SN-- 1204	20	20	17.0	125	27.5	-6°	-6°	✓	✓
PSBNR/L 2525M 12	SN-- 1204	25	25	22.0	150	27.5	-6°	-6°	✓	✓
PSBNR/L 2525M 15	SN-- 1506	25	25	22.0	150	32.0	-6°	-6°	✓	✓
PSBNR/L 3232P 19	SN-- 1906	32	32	27.0	170	39.2	-6°	-6°	✓	✓
PSBNR/L 4040S 19	SN-- 1906	40	40	35.0	250	41.5	-6°	-6°	✓	✓
PSBNR/L 4040S 25	SN-- 2507	40	40	35.0	250	47.5	-6°	-6°	✓	✓
PSBNR/L 5050T 25	SN-- 2507	50	50	43.0	300	47.5	-6°	-6°	✓	✓

Spare parts

Insert	For insert radius						
SN-- 1204	0.4-1.2	174.3-841M	174.3-821	174.3-851M	174.3-861	5681 002-01	174.1-864
SN-- 1506	0.4-2.4	438.3-840	438.3-831	174.3-857	174.3-864	5681 002-02	174.1-864
SN-- 1906	0.8-2.4	174.3-842M	174.3-822M	174.3-852M	174.3-862	5681 002-02	3021 010-040
SN-- 2507	1.6-3.2	174.3-844M	174.3-827	174.3-853M	174.3-865	5681 002-03	3021 010-050

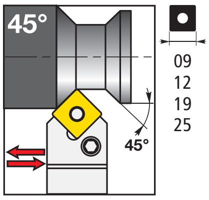
Optional spare parts

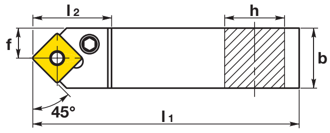
Insert	For insert radius	
SN-- 1204	1.6-2.4	174.3-856

✓: Article which can be ordered
Ordering example: PSBNR/L 2020K 12

P SYSTEM FOR NEGATIVE INSERTS

PSDNN

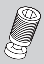
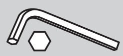




λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Neutral
		h	b	f	l_1	l_2	λ_s	γ	
PSDNN 1010E 09	SN-- 0903	10	10	5.3	70	20.0	-6°	-6°	✓
PSDNN 1212F 09	SN-- 0903	12	12	6.3	80	20.0	-6°	-6°	✓
PSDNN 1616H 09	SN-- 0903	16	16	8.3	100	21.0	-6°	-6°	✓
PSDNN 2020K 12	SN-- 1204	20	20	10.3	125	27.6	-6°	-6°	✓
PSDNN 2525M 12	SN-- 1204	25	25	12.8	150	27.6	-6°	-6°	✓
PSDNN 3225P 12	SN-- 1204	32	25	12.8	170	27.6	-6°	-6°	✓
PSDNN 3232P 19	SN-- 1906	32	32	16.3	170	40.4	-6°	-6°	✓
PSDNN 4040S 25	SN-- 2507	40	40	21.0	250	48.8	-6°	-6°	✓

Spare parts

Insert	h/b	For insert radius						
SN-- 0903	1010-1212	-	174.3-845-1	174.3-829	-	-	-	174.1-870
SN-- 0903	1616	0.4-1.2	174.3-840M	174.3-820M	174.3-850	174.3-863	5681 002-01	174.1-863
SN-- 1204	-	0.4-1.2	174.3-841M	174.3-821	174.3-851M	174.3-861	5681 002-01	174.1-864
SN-- 1906	-	0.8-2.4	174.3-842M	174.3-822M	174.3-852M	174.3-862	5681 002-02	3021 010-040
SN-- 2507	-	1.6-3.2	174.3-844M	174.3-827	174.3-853M	174.3-865	5681 002-03	3021 010-050

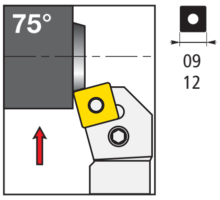
Optional spare parts

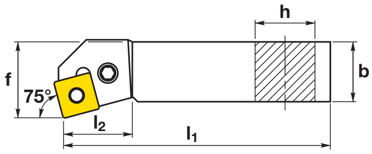
Insert	h/b	For insert radius	
SN-- 1204	-	1.6-2.4	174.3-856

✓: Article which can be ordered
Ordering example: PSDNN 1010E 09

P SYSTEM FOR NEGATIVE INSERTS

PSKNR/L



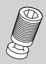
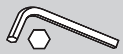


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
PSKNR 2020K 09	SN-- 0903	20	20	25.0	100	18.7	-6°	-6°		✓
PSKNR 2020K 12	SN-- 1204	20	20	25.0	125	22.7	-6°	-6°		✓
PSKNR 2525M 12	SN-- 1204	25	25	32.0	150	22.7	-6°	-6°		✓

Spare parts

Insert	For insert radius						
SN-- 0903	0.4-1.2	174.3-840M	174.3-820M	174.3-850	174.3-863	5681 002-01	174.1-863
SN-- 1204	0.4-1.2	174.3-841M	174.3-821	174.3-851M	174.3-861	5681 002-01	174.1-864

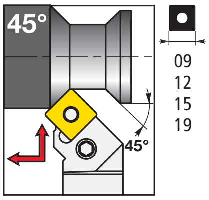
Optional spare parts

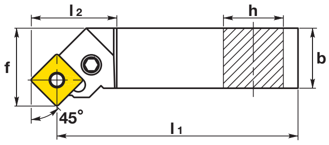
Insert	For insert radius	
SN-- 1204	1.6-2.4	174.3-856

✓: Article which can be ordered
Ordering example: PSKNR 2020K 09

P SYSTEM FOR NEGATIVE INSERTS

PSSNR/L



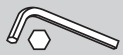


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
PSSNR/L 1616H 09	SN-- 0903	16	16	20.0	100	22.0	0°	-8°	✓	✓
PSSNR/L 2020K 09	SN-- 0903	20	20	25.0	125	21.9	0°	-8°		✓
PSSNR/L 2020K 12	SN-- 1204	20	20	25.0	125	29.3	0°	-8°	✓	✓
PSSNR/L 2525M 12	SN-- 1204	25	25	32.0	150	29.3	0°	-8°	✓	✓
PSSNR/L 3225P 12	SN-- 1204	32	25	32.0	170	29.3	0°	-8°	✓	✓
PSSNR/L 3232P 15	SN-- 1506	32	32	40.0	170	34.0	0°	-8°	✓	✓
PSSNR/L 3232P 19	SN-- 1906	32	32	40.0	170	41.3	0°	-8°	✓	✓
PSSNR/L 4040S 19	SN-- 1906	40	40	50.0	250	41.3	0°	-8°	✓	✓

Spare parts

Insert	For insert radius						
SN--0903	0.4-1.2	174.3-840M	174.3-820M	174.3-850	174.3-863	5681 002-01	174.1-863
SN--1204	0.4-1.2	174.3-841M	174.3-821	174.3-851M	174.3-861	5681 002-01	174.1-864
SN--1506	0.4-2.4	438.3-840	438.3-831	174.3-857	174.3-864	5681 002-02	174.1-864
SN--1906	0.8-2.4	174.3-842M	174.3-822M	174.3-852M	174.3-862	5681 002-02	3021 010-040

Optional spare parts

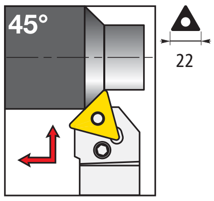
Insert	For insert radius	
SN--1204	1.6-2.4	174.3-856

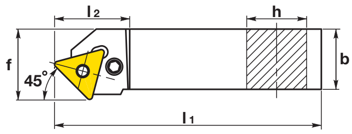
✓: Article which can be ordered
Ordering example: PSSNR/L 1616H 09

TURNING

P SYSTEM FOR NEGATIVE INSERTS

PTDNR/L



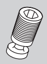
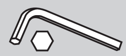


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Right hand
		h	b	f	l_1	l_2	λ_s	γ	
PTDNR/L 2525M 22	TN-- 2204	25	25	27	150	33.5	0°	-7°	✓

Spare parts

Insert	For insert radius						
TN-- 2204	1.2-1.6	174.3-841M	174.3-821	179.3-852M	174.3-861	5681 002-01	174.1-864

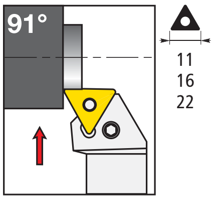
Optional spare parts

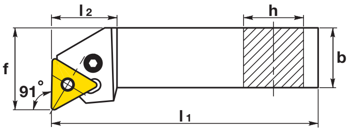
Insert	For insert radius	
TN-- 2204	0.4-0.8	179.3-853M

✓: Article which can be ordered
Ordering example: PTDNR/L 2525M 22

P SYSTEM FOR NEGATIVE INSERTS

PTFNR/L





Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
PTFNR/L 1212F 11	TN-- 1103	12	12	16	80	15	-6°	-6°		✓
PTFNR/L 1616H 16	TN-- 1604	16	16	20	100	19.7	-6°	-6°		✓
PTFNR/L 2020K 16	TN-- 1604	20	20	25	125	20.2	-6°	-6°	✓	✓
PTFNR/L 2525M 16	TN-- 1604	25	25	32	150	20.2	-6°	-6°	✓	✓
PTFNR/L 2525M 22	TN-- 2204	25	25	32	150	25.2	-6°	-6°	✓	✓
PTFNR/L 3232P 22	TN-- 2204	32	32	40	170	25.2	-6°	-6°	✓	✓

Spare parts

Insert	For insert radius						
TN-- 1103	-	174.3-846-1	174.3-829	-	-	-	174.1-870
TN-- 1604	0.4-0.8	174.3-840M	174.3-820M	179.3-850M	174.3-860	5681 002-01	174.1-863
TN-- 2204	0.4-1.6	174.3-841M	174.3-821	179.3-852M	174.3-861	5681 002-01	174.1-864

Optional spare parts

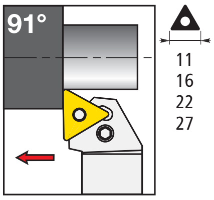
Insert	For insert radius	
TN-- 1604	1.2-1.6	174.3-858

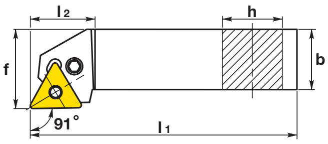
✓: Article which can be ordered
Ordering example: PTFNR/L 1212F 11

TURNING

P SYSTEM FOR NEGATIVE INSERTS

PTGNR/L



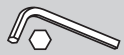


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
PTGNR/L 1212F 11	TN-- 1103	12	12	16	80	15.6	-6°	-6°		✓
PTGNR/L 1616H 16	TN-- 1604	16	16	20	100	20.2	-6°	-6°	✓	✓
PTGNR/L 2020K 16	TN-- 1604	20	20	25	125	20.2	-6°	-6°	✓	✓
PTGNR/L 2525M 16	TN-- 1604	25	25	32	150	22.2	-6°	-6°	✓	✓
PTGNR/L 2525M 22	TN-- 2204	25	25	32	150	28.7	-6°	-6°	✓	✓
PTGNR/L 3225P 16	TN-- 1604	32	25	32	170	22.2	-6°	-6°		✓
PTGNR/L 3232P 22	TN-- 2204	32	32	40	170	28.7	-6°	-6°	✓	✓
PTGNR/L 3232P 27	TN-- 2706	32	32	40	170	35.2	-6°	-6°		✓
PTGNR/L 4040S 27	TN-- 2706	40	40	50	250	34	-6°	-6°	✓	✓

Spare parts

Insert	For insert radius						
TN-- 1103	-	174.3-846-1	174.3-829	-	-	-	174.1-870
TN-- 1604	0.4-0.8	174.3-840M	174.3-820M	179.3-850M	174.3-860	5681 002-01	174.1-863
TN-- 2204	1.2-1.6	174.3-841M	174.3-821	179.3-852M	174.3-861	5681 002-01	174.1-864
TN-- 2706	0.8-1.2	174.3-843M	174.3-825	179.3-854M	174.3-864	5681 002-02	174.1-864

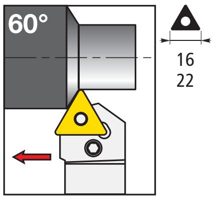
Optional spare parts

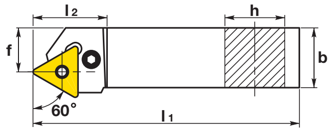
Insert	For insert radius	
TN-- 1604	1.2-1.6	174.3-858
TN-- 2204	0.4-0.8	179.3-853M
TN-- 2706	1.6-2.4	174.3-857

✓: Article which can be ordered
Ordering example: PTGNR/L 1212F 11

P SYSTEM FOR NEGATIVE INSERTS

PTTNR/L



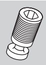
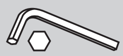


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
PTTNR/L 1616H 16	TN-- 1604	16	16	13	100	23.4	-6°	-6°	✓	✓
PTTNR/L 2020K 16	TN-- 1604	20	20	17	125	25.9	-6°	-6°		✓
PTTNR/L 2525M 22	TN-- 2204	25	25	22	150	31.9	-6°	-6°		✓

Spare parts

Insert	For insert radius						
TN-- 1604	0.4-0.8	174.3-840M	174.3-820M	179.3-850M	174.3-860	5681 002-01	174.1-863
TN-- 2204	1.2-1.6	174.3-841M	174.3-821	179.3-852M	174.3-861	5681 002-01	174.1-864

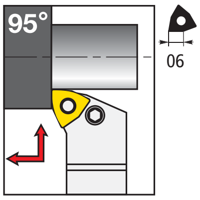
Optional spare parts

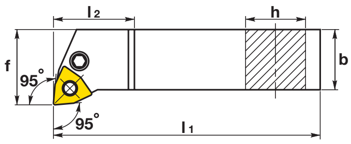
Insert	For insert radius	
TN-- 1604	1.2-1.6	179.3-858
TN-- 2204	0.4-0.8	179.3-853M

✓: Article which can be ordered
Ordering example: PTTNR/L 1616H 16

P SYSTEM FOR NEGATIVE INSERTS

PWLNR/L



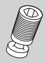
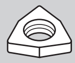
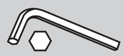


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
PWLNR/L 1616H 06	WN-- 0604	16	16	20	100	20	-6°	-6°	✓	✓
PWLNR/L 2020K 06	WN-- 0604	20	20	25	125	20	-6°	-6°	✓	✓
PWLNR/L 2525M 06	WN-- 0604	25	25	32	150	20	-6°	-6°	✓	✓

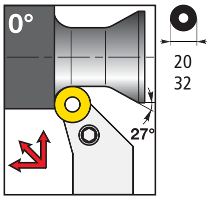
Spare parts

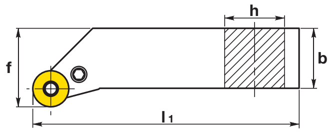
Insert	For insert radius						
WN-- 0604	0.4-1.2	174.3-840M	174.3-820M	DAN 1991	174.3-860	5681 002-01	174.1-863

✓: Article which can be ordered
Ordering example: PWLNR/L 1616H 06

P SYSTEM FOR POSITIVE INSERTS

PRGCR/L



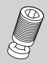
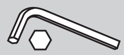


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)						Left hand	Right hand
		h	b	f	l_1	λ_s	γ		
PRGCR/L 3232P 20	RC-- 2006M0	32	32	40	170	0°	0°	✓	✓
PRGCR/L 5050T 32	RC-- 3209M0	50	50	63	300	0°	0°		✓

Spare parts

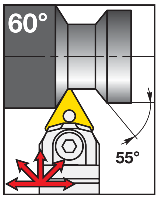
Insert						
RC-- 2006M0	176.39-843	174.3-825	176.39-853	174.3-864	5681 002-02	174.1-864
RC-- 3209M0	176.39-845	174.3-827	176.39-855	174.3-865	5681 002-03	3021 010-050

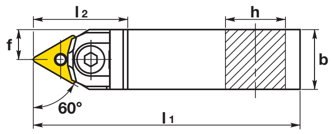
✓: Article which can be ordered
Ordering example: PRGCR/L 3232P 20

TURNING

M SYSTEM FOR NEGATIVE INSERTS

MTENN

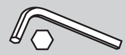




λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Neutral
		h	b	f	l_1	l_2	λ_s	γ	
MTENN 2525M 22 M1	TN-- 2204	25	25	13	150	35.7	-6°	-6°	✓
MTENN 3225P 22 M1	TN-- 2204	32	25	13	170	35.7	-6°	-6°	✓
MTENN 3232P 22 M1	TN-- 2204	32	32	16.5	170	35.7	-6°	-6°	✓

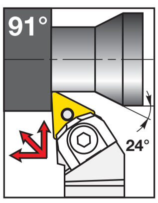
Spare parts

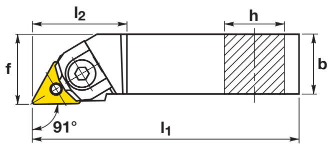
Insert	For insert radius					
TN-- 2204	1.2-1.6	170.38-821-1	170.3-855	181.38-840	3212 010-255	174.1-864

Optional spare parts

Insert	For insert radius	
TN-- 2204	0.4-0.8	170.3-856

MTGNR/L



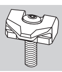
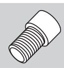


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
MTGNR/L 2525M 22M1	TN-- 2204	25	25	32	150	34.8	-6°	-6°	✓	✓
MTGNR/L 3225P 22M1	TN-- 2204	32	25	32	170	34.8	-6°	-6°	✓	✓
MTGNR/L 3232P 22M1	TN-- 2204	32	32	40	170	34.8	-6°	-6°	✓	✓

Spare parts

Insert	For insert radius					
TN-- 2204	1.2-1.6	170.38-821-1	170.3-855	181.38-840	3212 010-255	174.1-864

Optional spare parts

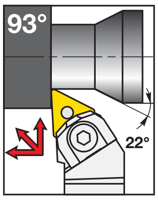
Insert	For insert radius	
TN-- 2204	0.4-0.8	170.3-856

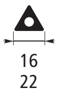
✓: Article which can be ordered
Ordering example: MTENN 2525M 22 M1

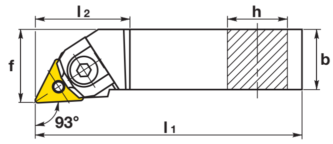
TURNING

M SYSTEM FOR NEGATIVE INSERTS

MTJNR/L





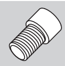
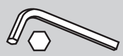


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
MTJNR/L 2020K 16 M1	TN-- 1604	20	20	25	125	30.8	-6°	-6°	✓	✓
MTJNR/L 2525M 16 M1	TN-- 1604	25	25	32	150	30.8	-6°	-6°	✓	✓
MTJNR/L 2525M 22 M1	TN-- 2204	25	25	32	150	34.8	-6°	-6°	✓	✓
MTJNR/L 3225P 16 M1	TN-- 1604	32	25	32	170	30.8	-6°	-6°	✓	✓
MTJNR/L 3225P 22 M1	TN-- 2204	32	25	32	170	34.8	-6°	-6°	✓	✓

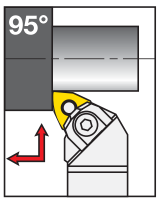
Spare parts

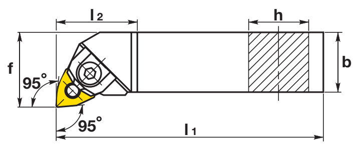
Insert	For insert radius					
TN-- 1604	0.4-1.6	170.38-820-1	170.3-852	5313 021-02	3212 010-206	174.1-863
TN-- 2204	1.2-1.6	170.38-821-1	170.3-855	181.38-840	3212 010-255	174.1-864

Optional spare parts

Insert	For insert radius	
TN-- 2204	0.4-0.8	170.3-856

MWLNR/L



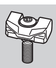
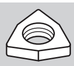
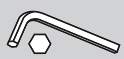


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
MWLNR/L 2020 08	WN-- 0804	20	20	25	125	31	-6°	-6°	✓	✓
MWLNR/L 2525M 08	WN-- 0804	25	25	32	150	31	-6°	-6°	✓	✓
MWLNR/L 3232P 08	WN-- 0804	32	32	40	170	31	-6°	-6°	✓	✓

Spare parts

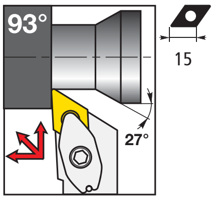
Insert				
WN-- 0804	E-28255	28173	28260	174.1-863

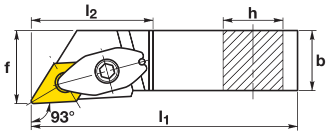
✓: Article which can be ordered
Ordering example: MTJNR/L 2020K 16 M1

TURNING

C SYSTEM FOR NEGATIVE INSERTS

CDJNR/L



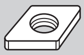
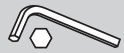


Right hand shown

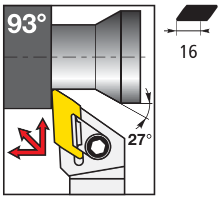
λ_s = Angle of inclination of edge
γ = Rake angle

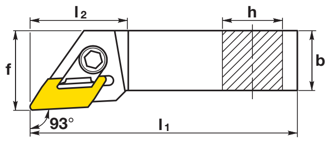
Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
CDJNR/L 2020K 15	DN-- 1506	20	20	25	125	40	-6°	-6°	✓	✓
CDJNR/L 2525M 15	DN-- 1506	25	25	32	150	40	-6°	-6°	✓	✓
CDJNR/L 3225P 15	DN-- 1506	32	25	32	170	40	-6°	-6°	✓	

Spare parts

Insert					
DN-- 1506	E-27558	27517	174.1-866	27174	3021 010-040

CKJNR/L



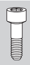
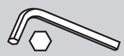


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
CKJNR/L 2020K 16	KN-- 1604	20	20	25	125	20	-2°	-5°	✓	✓
CKJNR/L 2525M 16	KN-- 1604	25	25	32	150	32	-2°	-5°	✓	✓
CKJNR/L 3225P 16	KN-- 1604	32	25	32	170	32	-2°	-5°	✓	✓

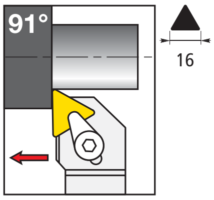
Spare parts

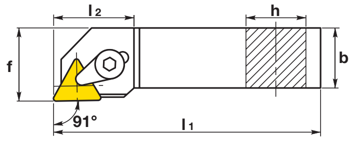
Insert	h/b	 L	 R		 L	 R		
KN-- 1604	2020	MC 6 L	MC 6 R	M8X28 RL	KN-232L	KN-232R	S2-10	3021 010-040
KN-- 1604	2525-3225	170.5-825	170.5-824	170.5-865	L170.5-851	R170.5-851	174.1-866	3021 010-040

✓: Article which can be ordered
Ordering example: CDJNR/L 2020K 15

C SYSTEM FOR POSITIVE INSERTS

CTGPR/L





Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
CTGPR/L 2020 16	TP-- 1603	20	20	25	125	25.1	0°	4.5°	✓	✓
CTGPR/L 2525 16	TP-- 1603	25	25	32	150	25.1	0°	4.5°		✓

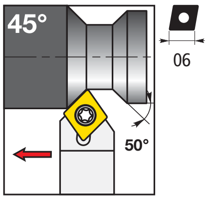
Spare parts

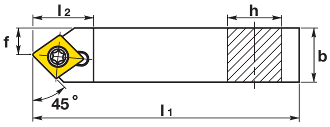
Insert					
TP-- 1603	CVB 3	STPV 16-3	VA 4012	T9 MD 703	3021 010-040

✓: Article which can be ordered
Ordering example: CTGPR/L 2020 16

S SYSTEM FOR POSITIVE INSERTS

SCDCR/L



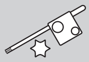


Right hand shown

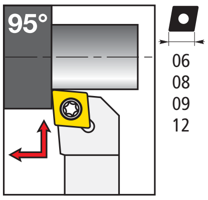
λ_s = Angle of inclination of edge
γ = Rake angle

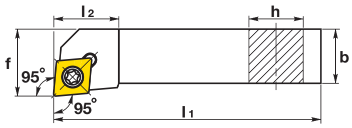
Reference	Insert	Dimensions (mm)							Right hand
		h	b	f	l_1	l_2	λ_s	γ	
SCDCR/L 1010E 06	CC-- 0602	10	10	5.11	70	11.0	0°	0°	✓

Spare parts

Insert	h/b		
CC-- 0602	1010	5513 020-03	PT-8001

SCLCR/L



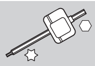


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
SCLCR/L 0808D 06	CC-- 0602	8	8	10	60	11.0	0°	0°		✓
SCLCR/L 1010E 08	CC-- 0803	10	10	12	70	13.2	0°	0°		✓
SCLCR/L 1212F 08	CC-- 0803	12	12	16	80	13.4	0°	0°	✓	✓
SCLCR/L 1616H 08	CC-- 0803	16	16	20	100	15.2	0°	0°	✓	✓
SCLCR/L 2020K 09	CC--09T3	20	20	25	125	17.8	0°	0°	✓	✓
SCLCR/L 2020K 12	CC-- 1204	20	20	25	125	21.7	0°	0°		✓
SCLCR/L 2525M 12	CC-- 1204	25	25	32	150	23.7	0°	0°	✓	✓

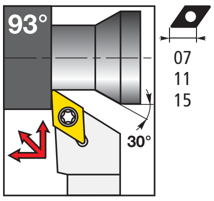
Spare parts

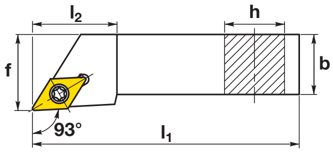
Insert	For insert radius				
CC-- 0602	-	5513 020-03	-	-	PT-8001
CC-- 0803	-	5513 020-04	-	-	PT-8003
CC-- 09T3	0.2-0.8	5513 020-01	5322 232-01	5512 090-01	PT-8004
CC-- 1204	0.4-1.2	5513 020-18	5322 232-02	5512 090-03	PT-8005

✓: Article which can be ordered
Ordering example: SCDCR/L 1010E 06

S SYSTEM FOR POSITIVE INSERTS

SDJCR/L



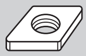
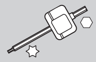
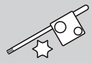


Right hand shown

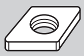
λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
SDJCR/L 1010E 07	DC-- 0702	10	10	12	70	15.7	0°	0°	✓	✓
SDJCR/L 1212F 07	DC-- 0702	12	12	16	80	15.5	0°	0°	✓	✓
SDJCR/L 1616H 07	DC-- 0702	16	16	20	100	16.0	0°	0°	✓	✓
SDJCR/L 2020K 07	DC-- 0702	20	20	25	125	17.4	0°	0°	✓	✓
SDJCR/L 2020K 11	DC-- 11T3	20	20	25	125	21.9	0°	0°	✓	✓
SDJCR/L 2525M 11	DC-- 11T3	25	25	32	150	24.4	0°	0°	✓	✓
SDJCR/L 2525-15	DC-- 1504	25	25	32	150	28	0°	0°		✓

Spare parts

Insert	h/b	For insert radius						
DC-- 0702	-	-	5513 020-03	-	-	PT-8001	-	-
DC-- 11T3	2020-2525	0.4-0.8	5513 020-01	5322 263-01	5512 090-01	PT-8004	-	-
DC-- 1504	-	0.4-0.8	28100	171.31-851M	-	-	MA2-3853	TX 220

Optional spare parts

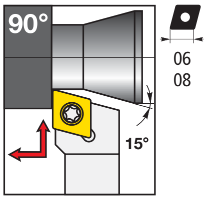
Insert	For insert radius	
DC-- 11T3	1.2	5322 263-02

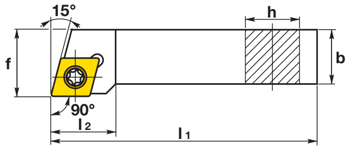
✓: Article which can be ordered
Ordering example: SDJCR/L 1010E 07

TURNING

S SYSTEM FOR POSITIVE INSERTS

SEGCR/L





Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
SEGCR/L 0808K 06	EC-- 0602	8	8	10	125	10.0	0°	0°		✓
SEGCR/L 1010M 06	EC-- 0602	10	10	12	150	10.0	0°	0°	✓	✓
SEGCR/L 1212N 08	EC-- 0803	12	12	16	160	12.0	0°	0°	✓	✓
SEGCR/L 1616H 08	EC-- 0803	16	16	20	100	12.0	0°	0°	✓	✓

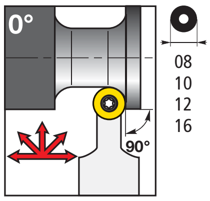
Spare parts

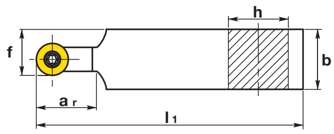
Insert		
EC-- 0602	5513 020-03	PT-8001
EC-- 0803	416.1-832	PT-8002

✓: Article which can be ordered
Ordering example: SEGCR/L 0808K 06

S SYSTEM FOR POSITIVE INSERTS

SRDCN





λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Neutral
		h	b	f	l_1	a_r	λ_s	γ	
SRDCN 1616H 08	RC-- 0803M0	16	16	12	100	16	0°	0°	✓
SRDCN 2020K 10-A	RC-- 10T3M0	20	20	15	125	25	0°	0°	✓
SRDCN 2525M 12-A	RC-- 1204M0	25	25	18.5	150	25	0°	0°	✓
SRDCN 2525M 16-A	RC-- 1605M0	25	25	20.5	150	35	0°	0°	✓

Spare parts

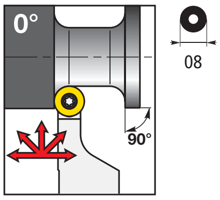
Insert						
RC-- 0803M0	5513 020-04	-	-	PT-8001	PT-8002	-
RC-- 10T3M0	5513 020-10	5322 110-01	5512 090-01	-	PT-8004	-
RC-- 1204M0	5513 020-01	5322 110-02	5512 090-01	-	PT-8004	-
RC-- 1605M0	5513 020-26	5322 110-03	5512 090-06	-	5680 043-14	3021 010-050

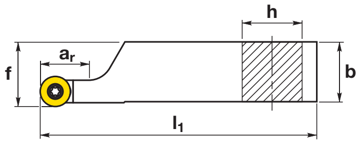
✓: Article which can be ordered
Ordering example: SRDCN 1616H 08

TURNING

S SYSTEM FOR POSITIVE INSERTS

SRDCR/L



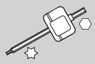


Right hand shown

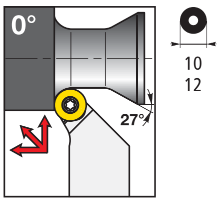
λ_s = Angle of inclination of edge
γ = Rake angle

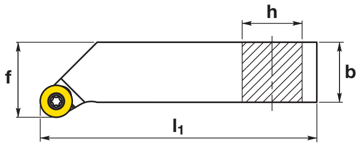
Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	a_r	λ_s	γ		
SRDCR/L 2020K 08-A	RC-- 0803	20	20	20.5	125	20	0°	0°	✓	✓
SRDCR/L 2525M 08-A	RC-- 0803	25	25	25.5	150	20	0°	0°	✓	✓
SRDCR/L 3225P 08-A	RC-- 0803	32	25	25.5	170	20	0°	0°	✓	✓

Spare parts

Insert		
RC-- 0803M0	5513 020-04	PT-8002

SRSCR/L



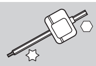
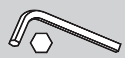


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)						Left hand	Right hand
		h	b	f	l_1	λ_s	γ		
SRSCR/L 2020K 10	RC-- 10T3M0	20	20	25	125	0°	0°	✓	✓
SRSCR/L 2525M 12	RC-- 1204M0	25	25	32	150	0°	0°	✓	✓

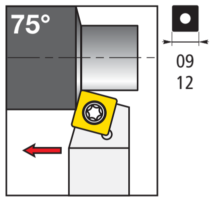
Spare parts

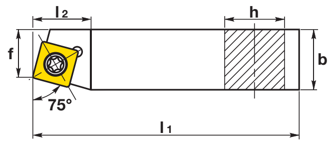
Insert					
RC-- 10T3M0	5513 020-10	5322 110-01	5512 090-01	PT-8004	-
RC-- 1204M0	5513 020-01	5322 110-02	5512 090-01	PT-8004	-

✓: Article which can be ordered
Ordering example: SRDCR/L 2020K 08-A

S SYSTEM FOR POSITIVE INSERTS

SSBCR/L



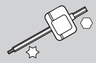


Right hand shown

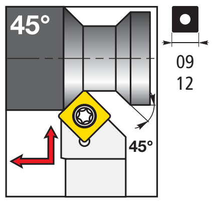
λ_s = Angle of inclination of edge
γ = Rake angle

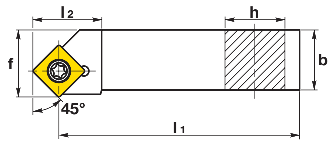
Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
SSBCR/L 1616H 09	SC-- 09T3	16	16	13	100	15.3	0°	0°	✓	✓
SSBCR/L 2020K 12	SC-- 1204	20	20	17	125	20.1	0°	0°	✓	✓

Spare parts

Insert	For insert radius				
SC-- 09T3	0.4-0.8	5513 020-01	5322 420-01	5512 090-01	PT-8004
SC-- 1204	0.4-1.2	5513 020-18	5322 420-02	5512 090-03	PT-8005

SSDCR/L



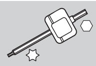


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
SSDCR/L 1616H 09	SC-- 09T3	16	16	17	93.9	15.1	0°	0°	✓	✓
SSDCR/L 2020K 09	SC-- 09T3	20	20	22	118.9	18	0°	0°		✓
SSDCR/L 2020K 12	SC-- 1204	20	20	22	116.7	21.7	0°	0°	✓	✓
SSDCR/L 2525M 12	SC-- 1204	25	25	27	141.7	21.7	0°	0°	✓	✓

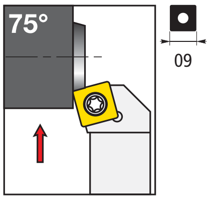
Spare parts

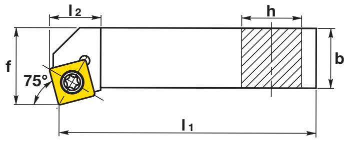
Insert	For insert radius				
SC-- 09T3	0.4-0.8	5513 020-01	5322 420-01	5512 090-01	PT-8004
SC-- 1204	0.4-1.2	5513 020-18	5322 420-02	5512 090-03	PT-8005

✓: Article which can be ordered
Ordering example: SSBCR/L 1616H 09

S SYSTEM FOR POSITIVE INSERTS

SSKCR/L



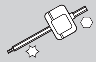


Right hand shown

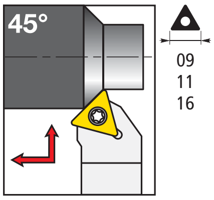
λ_s = Angle of inclination of edge
γ = Rake angle

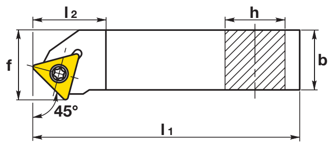
Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
SSKCR/L 1616H 09	SC-- 09T3	16	16	20	100	12.8	0°	0°	✓	✓

Spare parts

Insert	For insert radius				
SC-- 09T3	0.4-0.8	5513 020-01	5322 420-01	5512 090-01	PT-8004

STDCR/L



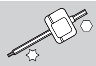


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
STDCR/L 1010E 09	TC-- 0902	10	10	11	70	11.2	0°	0°	✓	✓
STDCR/L 1212F 11	TC-- 1102	12	12	13	80	17.4	0°	0°	✓	✓
STDCR/L 1616H 11	TC-- 1102	16	16	17	100	17.4	0°	0°	✓	✓
STDCR/L 1616H 16	TC-- 16T3	16	16	17	100	21	0°	0°	✓	✓
STDCR/L 2020K 16	TC-- 16T3	20	20	22	125	21	0°	0°	✓	✓
STDCR/L 2525M 16	TC-- 16T3	25	25	27	150	22.9	0°	0°		✓

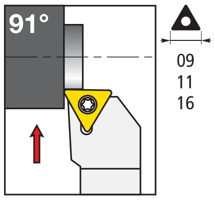
Spare parts

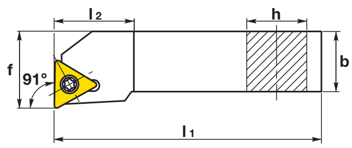
Insert	For insert radius				
TC-- 0902	-	5513 020-05	-	-	PT-8001
TC-- 1102	-	5513 020-03	-	-	PT-8001
TC-- 16T3	0.4-1.2	5513 020-01	5322 320-01	5512 090-01	PT-8004

✓: Article which can be ordered
Ordering example: SSKCR/L 1616H 09

S SYSTEM FOR POSITIVE INSERTS

STFCR/L





Right hand shown

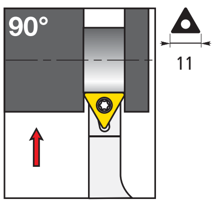
λ_s = Angle of inclination of edge
γ = Rake angle

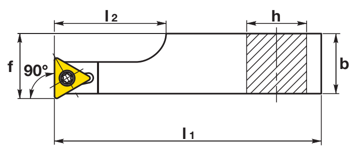
Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
STFCR/L 1010E 09	TC-- 0902	10	10	12	70	13.2	0°	0°		✓
STFCR/L 1212F 11	TC-- 1102	12	12	16	80	13.8	0°	0°	✓	✓
STFCR/L 1616H 11	TC-- 1102	16	16	20	100	14.9	0°	0°		✓
STFCR/L 1616H 16	TC-- 16T3	16	16	20	100	19.9	0°	0°	✓	✓
STFCR/L 2020K 16	TC-- 16T3	20	20	25	125	21.3	0°	0°	✓	✓
STFCR/L 2525M 16	TC-- 16T3	25	25	32	150	22.8	0°	0°	✓	✓

Spare parts

Insert	For insert radius				
TC-- 0902	-	5513 020-05	-	-	PT-8001
TC-- 1102	-	5513 020-03	-	-	PT-8001
TC-- 16T3	0.4-1.2	5513 020-01	5322 320-01	5512 090-01	PT-8004

STFCR/L-A





Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
STFCR/L 2020K 11-A	TC-- 1102	20	20	20.8	125	37	0°	0°	✓	✓

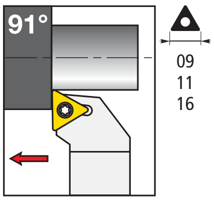
Spare parts

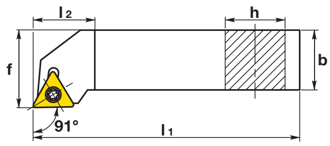
Insert		
TC-- 1102	5513 020-03	PT-8001

✓: Article which can be ordered
Ordering example: STFCR/L 1010E 09

S SYSTEM FOR POSITIVE INSERTS

STGCR/L



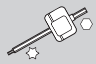


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
STGCR/L 1010E 09	TC-- 0902	10	10	12	70	13.9	0°	0°	✓	✓
STGCR/L 1212F 11	TC-- 1102	12	12	16	80	14.1	0°	0°	✓	✓
STGCR/L 1616H 11	TC-- 1102	16	16	20	100	14.1	0°	0°	✓	✓
STGCR/L 1616H 16	TC-- 16T3	16	16	20	100	20.1	0°	0°	✓	✓
STGCR/L 2020K 16	TC-- 16T3	20	20	25	125	20.4	0°	0°	✓	✓
STGCR/L 2525M 16	TC-- 16T3	25	25	32	150	20.9	0°	0°	✓	✓

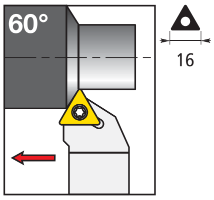
Spare parts

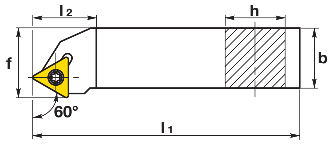
Insert	For insert radius				
TC-- 0902	-	5513 020-05	-	-	PT-8001
TC-- 1102	-	5513 020-03	-	-	PT-8001
TC-- 16T3	0.4-1.2	5513 020-01	5322 320-01	5512 090-01	PT-8004

✓: Article which can be ordered
Ordering example: STGCR/L 1010E 09

S SYSTEM FOR POSITIVE INSERTS

STTCR/L



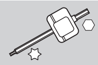


Right hand shown

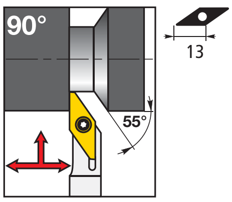
λ_s = Angle of inclination of edge
γ = Rake angle

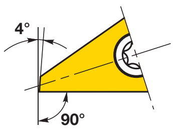
Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
STTCR/L 1616H 16	TC-- 16T3	16	16	13	100	21.2	0°	0°	✓	✓
STTCR/L 2020K 16	TC-- 16T3	20	20	17	125	21.2	0°	0°		✓
STTCR/L 2525M 16	TC-- 16T3	25	25	22	150	21.2	0°	0°	✓	✓

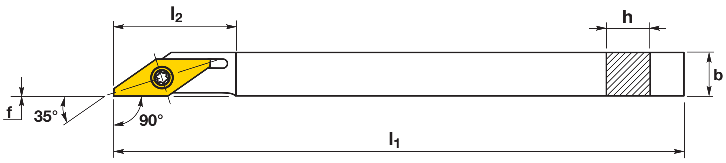
Spare parts

Insert	For insert radius				
TC-- 16T3	0.4-1.2	5513 020-01	5322 320-01	5512 090-01	PT-8004

SVACR/L-DC





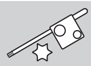


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
SVACR/L 0808K 13-DC	VCGX 1303	8	8	0	125	25	0°	0°	✓	✓
SVACR/L 1010L 13-DC	VCGX 1303	10	10	0	140	25	0°	0°	✓	✓
SVACR/L 1212L 13-DC	VCGX 1303	12	12	0	140	25	0°	0°	✓	✓
SVACR/L 1616M 13-DC	VCGX 1303	16	16	0	150	25	0°	0°	✓	✓
SVACR/L 2020M 13-DC	VCGX 1303	20	20	0	150	25	0°	0°	✓	✓
SVACR/L 2525M 13-DC	VCGX 1303	25	25	0	150	25	0°	0°	✓	✓

Spare parts

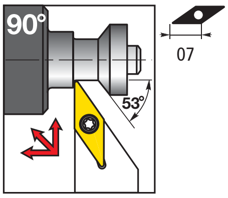
Insert		
VCGX 1303	5513 020-24	PT-8002

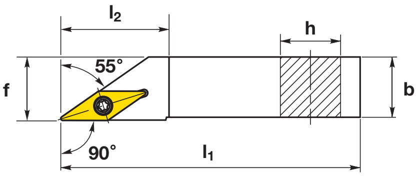
✓: Article which can be ordered
Ordering example: SVACR/L 0808K 13-DC

TURNING

S SYSTEM FOR POSITIVE INSERTS

SVGCR/L



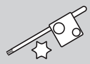


Right hand shown

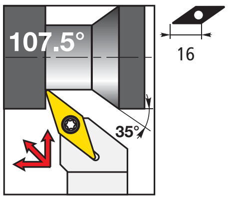
λs = Angle of inclination of edge
γ = Rake angle

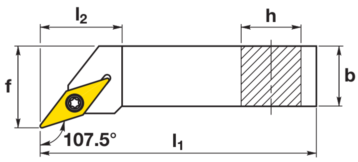
Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
SVGCR/L 0808K 07	VC--0702	8	8	8.5	125	15	0°	0°	✓	✓
SVGCR/L 1010M 07	VC--0702	10	10	10.5	150	15	0°	0°	✓	✓
SVGCR/L 1212M 07	VC--0702	12	12	12.5	150	18	0°	0°	✓	✓
SVGCR/L 1616P 07	VC--0702	16	16	16.3	170	23	0°	0°	✓	✓

Spare parts

Insert		
VC-- 0702	DVF 3584	DMD 1650

SVHBR/L



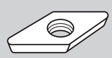
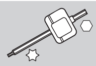


Right hand shown

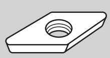
λs = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
SVHBR/L 2020K 16	VB-- 1604	20	20	25	125	27.6	0°	0°	✓	✓
SVHBR/L 2525M 16	VB-- 1604	25	25	32	150	27.6	0°	0°	✓	✓
SVHBR/L 3225P 16	VB-- 1604	32	25	32	170	27.6	0°	0°	✓	✓

Spare parts

Insert	For insert radius				
VB-- 1604	0.4-0.8	5513 020-01	5322 270-01	5512 090-01	PT-8004

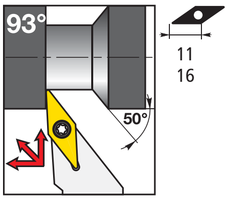
Optional spare parts

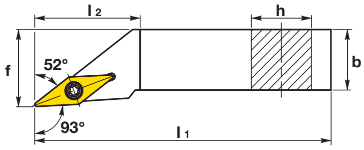
Insert	For insert radius	
VB-- 1604	1.2	5322 270-02

✓: Article which can be ordered
Ordering example: SVGCR/L 0808K 07

S SYSTEM FOR POSITIVE INSERTS

SVJBR/L



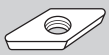
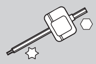


Right hand shown

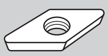
λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
SVJBR/L 1212F 11	VB-- 1102	12	12	16	80	20.6	0°	0°	✓	✓
SVJBR/L 1616H 11	VB-- 1102	16	16	20	100	21.2	0°	0°	✓	✓
SVJBR/L 2020K 11	VB-- 1102	20	20	25	125	21.2	0°	0°	✓	✓
SVJBR/L 2020K 16	VB-- 1604	20	20	25	125	31.1	0°	0°	✓	✓
SVJBR/L 2525M 16	VB-- 1604	25	25	32	150	31.5	0°	0°	✓	✓
SVJBR/L 3225P 16	VB-- 1604	32	25	32	170	31.5	0°	0°	✓	✓

Spare parts

Insert	For insert radius				
VB-- 1102	-	5513 020-03	-	-	PT-8001
VB-- 1604	0.4-0.8	5513 020-01	5322 270-01	5512 090-01	PT-8004

Optional spare parts

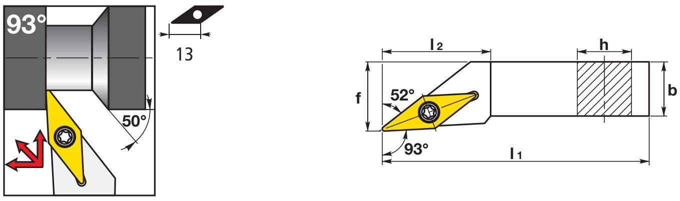
Insert	For insert radius	
VB-- 1604	1.2	5322 270-02

✓: Article which can be ordered
Ordering example: SVJBR/L 1212F 11

TURNING

S SYSTEM FOR POSITIVE INSERTS

SVJCR/L



Right hand shown

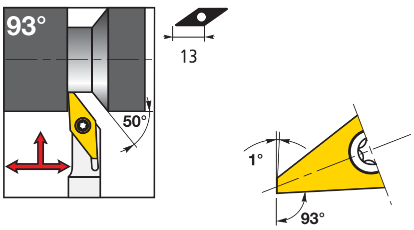
λ_s = Angle of inclination of edge
γ = Rake angle

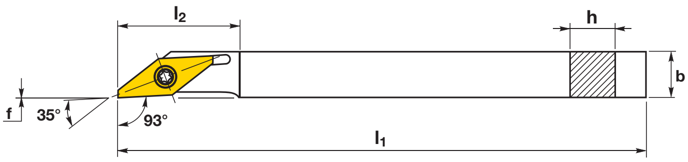
Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
SVJCR/L 1212N 13	VC-- 1303	12	12	16	160	27	0°	0°	✓	✓
SVJCR/L 1616H 13	VC-- 1303	16	16	20	100	30	0°	0°	✓	✓
SVJCR/L 2020K 13	VC-- 1303	20	20	25	125	30	0°	0°	✓	✓
SVJCR/L 2525M 13	VC-- 1303	25	25	32	150	30	0°	0°	✓	✓

Spare parts

Insert	h/b	For insert radius					
VC-- 1303	1212-1616	-	5513 020-24	-	-	PT-8002	-
VC-- 1303	2020-2525	0.2-0.8	DVF 0573	DAP 0331	DVT 0332	PT-8002	174.1-870

SVJCR/L-DC





Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
SVJCR/L 0808K 13-DC	VCGX 1303	8	8	0	125	25	0°	0°	✓	✓
SVJCR/L 1010L 13-DC	VCGX 1303	10	10	0	140	25	0°	0°	✓	✓
SVJCR/L 1212L 13-DC	VCGX 1303	12	12	0	140	25	0°	0°	✓	✓
SVJCR/L 1616M 13-DC	VCGX 1303	16	16	0	150	25	0°	0°	✓	✓
SVJCR/L 2020M 13-DC	VCGX 1303	20	20	0	150	25	0°	0°	✓	✓
SVJCR/L 2525M 13-DC	VCGX 1303	25	25	0	150	25	0°	0°	✓	✓

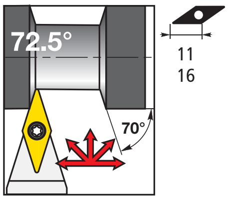
Spare parts

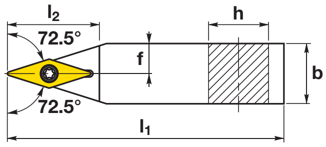
Insert		
VCGX 1303	5513 020-24	PT-8002

✓: Article which can be ordered
Ordering example: SVJCR/L 1212N 13

S SYSTEM FOR POSITIVE INSERTS

SVVBN

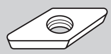
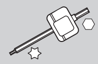




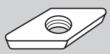
λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Neutral
		h	b	f	l_1	l_2	λ_s	γ	
SVVBN 1616H 11	VB-- 1102	16	16	8.3	100	21.1	0°	0°	✓
SVVBN 2020K 16	VB-- 1604	20	20	10.6	125	31.5	0°	0°	✓
SVVBN 2525M 16	VB-- 1604	25	25	13.1	150	31.5	0°	0°	✓
SVVBN 3225P 16	VB-- 1604	32	25	13.1	170	31.5	0°	0°	✓

Spare parts

Insert	For insert radius				
VB-- 1102	-	5513 020-03	-	-	PT-8001
VB-- 1604	0.4-0.8	5513 020-01	5322 270-01	5512 090-01	PT-8004

Optional spare parts

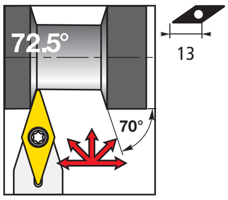
Insert	For insert radius	
VB-- 1604	1.2	5322 270-02

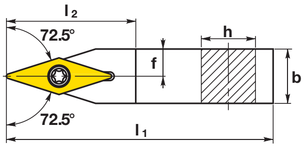
✓: Article which can be ordered
Ordering example: SVVBN 1616H 11

TURNING

S SYSTEM FOR POSITIVE INSERTS

SVVCN

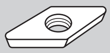
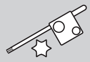
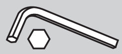




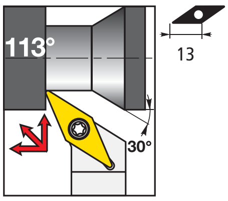
λ_s = Angle of inclination of edge
γ = Rake angle

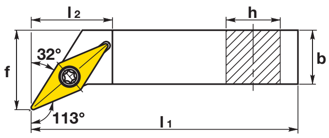
Reference	Insert	Dimensions (mm)							Neutral
		h	b	f	l_1	l_2	λ_s	γ	
SVVCN 1212N 13	VC-- 1303	12	12	6	160	27	0°	0°	✓
SVVCN 1616H 13	VC-- 1303	16	16	8	100	30	0°	0°	✓
SVVCN 2020K 13	VC-- 1303	20	20	10	125	30	0°	0°	✓
SVVCN 2525M 13	VC-- 1303	25	25	12.5	150	30	0°	0°	✓

Spare parts

Insert	h/b	For insert radius					
VC-- 1303	1212-1616	-	5513 020-24	-	-	PT-8002	-
VC-- 1303	2020-2525	0.2-0.8	DVF 0573	DAP 0331	DVT 0332	PT-8002	174.1-870

SVXCR/L



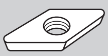
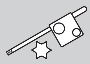
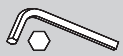


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
SVXCR/L 2020K 13	VC-- 1303	20	20	25	125	12	0°	0°	✓	✓

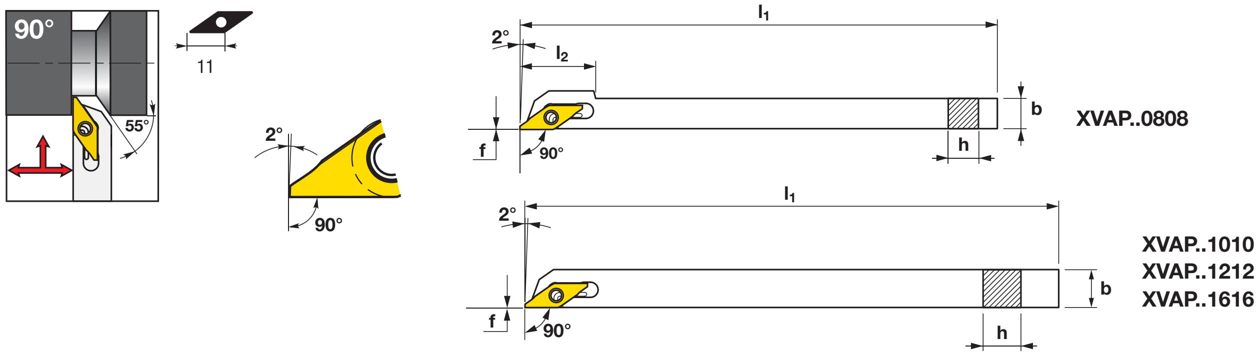
Spare parts

Insert					
VC-- 1303	DVF 0573	DAP 0331	DVT 0332	PT-8002	174.1-870

✓: Article which can be ordered
Ordering example: SVVCN 1212N 13

DECOL-SIDE FOR POSITIVE INSERTS

XVAPR/L



Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	λ_s	γ		
XVAPR/L 0808K 11-DS	VPEX 11T2	8	8	0	125	19	0°	0°	✓	✓
XVAPR/L 1010L 11-DS	VPEX 11T2	10	10	0	140	NA	0°	0°	✓	✓
XVAPR/L 1212L 11-DS	VPEX 11T2	12	12	0	140	NA	0°	0°	✓	✓
XVAPR/L 1616M 11-DS	VPEX 11T2	16	16	0	150	NA	0°	0°	✓	✓

Spare parts

Insert		
VP-- 11T2	416.1-833	TX210 PLUS

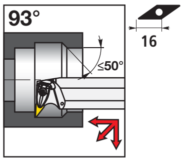
✓: Article which can be ordered
Ordering example: XVAPR/L 0808K 11-DS

TURNING

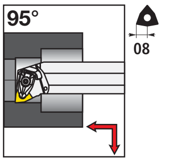
NOTES

BORING BARS

D System for negative inserts

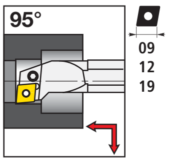
DVUN


p 138

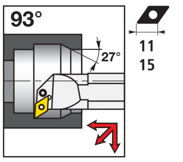
DWLN


p 138

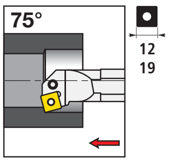
P System for negative inserts

PCLN


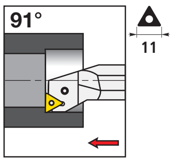
p 139

PDUN


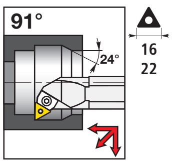
p 140

PSKN


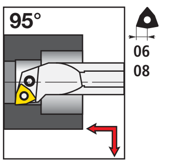
p 141

PTFN


p 141

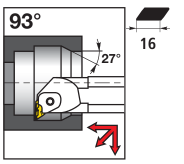
PTFN-W


p 142

PWLN


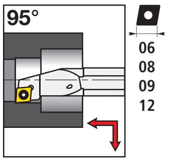
p 143

C System for negative inserts

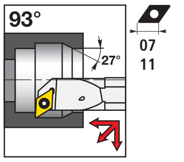
CKUN


p 144

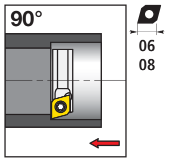
S System for positive inserts

SCLC


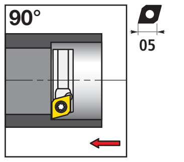
p 145

SDUC


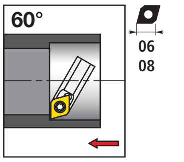
p 146

SEAC


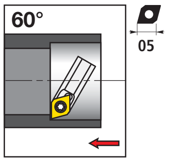
p 147

SEAP


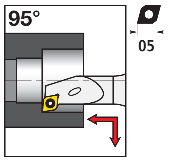
p 147

SEEC


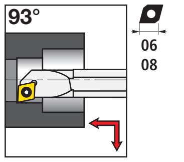
p 148

SEEP


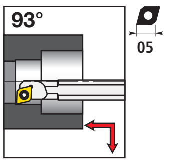
p 148

SELP


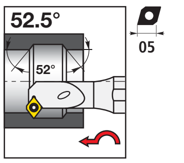
p 149

SEUC


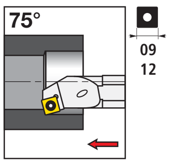
p 150

SEUP


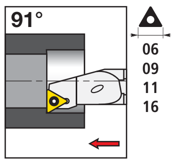
p 150

SEXP


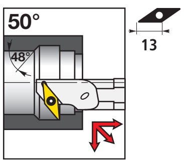
p 151

SSKC


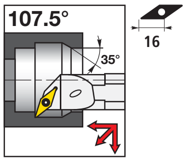
p 152

STFC


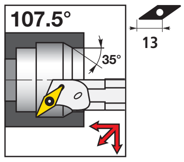
p 153-154

SVLC-X


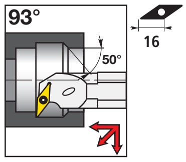
p 155

SVQB


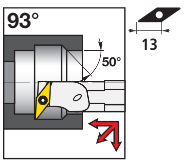
p 155

SVQC


p 156

SVUB


p 156

SVUC


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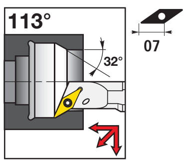
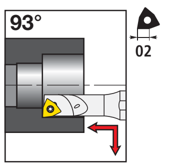
SVXC


p 157-158

SWUC


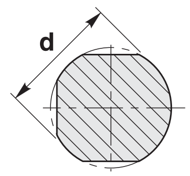
p 158-160

BORING BAR DESIGNATION

S	25	T	-	P	C
1	2	3		4	5

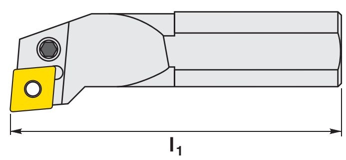
1	Type of toolholder
S	Solid steel toolholder
A	Steel monobloc with coolant hole
B	Steel monobloc with antivibration device
D	Steel monobloc with antivibration device and coolant hole
C	Carbide body with fixed steel head
E	Carbide body with fixed steel head and coolant hole
F	Carbide body with fixed steel head and antivibration device
G	Carbide body with fixed steel head, antivibration device and coolant hole
H	Heavy metal monobloc
J	Heavy metal monobloc and coolant hole

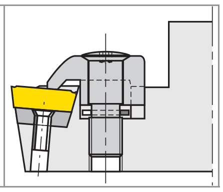
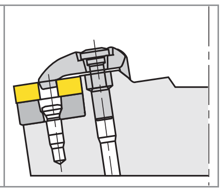
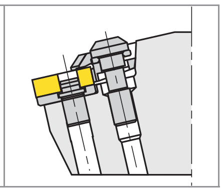
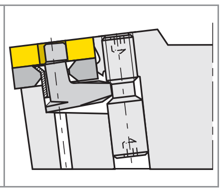
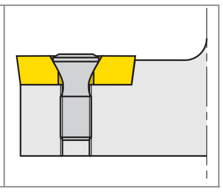
2	Shank diameter (mm)

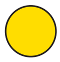
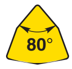


If there is only a single digit prefix with a zero

3	Length of toolholder (mm)		
F	80	Q	180
G	90	R	200
H	100	S	250
J	110	T	300
K	125	U	350
L	140	V	400
M	150	W	450
N	160	Y	500
P	170	X	SPECIAL



4	Clamping system
C	
D	
M	
P	
S	

5	Insert shape			
				
C	D	E	K	L
				
R	S	T	V	W

BORING BAR DESIGNATION

L	N	R	12	-	..
6	7	8	9		10

7 Insert clearance angle

B	5°	C	7°
D	15°	E	20°
N	0°	P	11°

8 Hand

R
L

10 Manufacturer's own characteristics

If necessary an extra code can be added when the manufacturer wants to supply further information.

Eg: R = Round shank, without flats
X = Back boring tool

6 Approach angle

F	90°	U	93°
K	75°	W	60°
L	95° / 95°	Y	85°
Q	107.5°	X	SPECIAL
S	45°		

9 Length of cutting edge (mm)

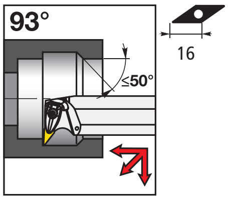
C	l	D	l
E	l	K	l
R	d	S	l
T	l	V	l
W	l		

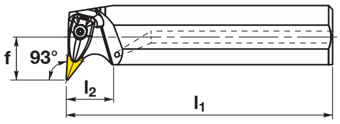
If there is only a single digit prefix with a zero

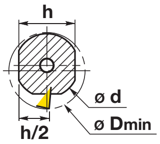
TURNING

D SYSTEM FOR NEGATIVE INSERTS

A…-DVUNR/L





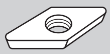
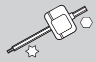


Right hand shown

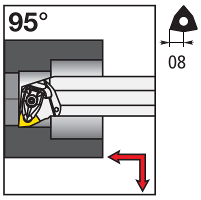
λ_s = Angle of inclination of edge
γ = Rake angle

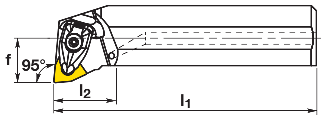
Reference	Insert	Dimensions (mm)								Left hand	Right hand
		d	D_{min}	f	λ_s	γ	l_1	l_2	h		
A40T-DVUNR/L 16	VN-- 1604	40	50	27	-9°	-6°	300	36	37	✓	✓

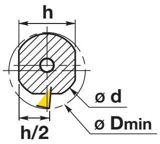
Spare parts

Insert	d				
VN-- 1604	40	5412 028-061	5322 269-01	5513 020-09	PT-8004

A…-DWLNR/L





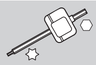


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		d	D_{min}	f	λ_s	γ	l_1	h		
A25T-DWLNR/L 08	WN-- 0804	25	33	17	-12°	-6°	300	23	✓	✓
A32T-DWLNR/L 08	WN-- 0804	32	40	22	-10°	-6°	300	30	✓	✓
A40T-DWLNR/L 08	WN-- 0804	40	50	27	-13°	-6°	300	37	✓	✓
A50U-DWLNR/L 08	WN-- 0804	50	63	35	-11°	-6°	350	47	✓	✓

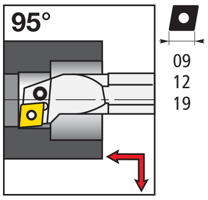
Spare parts

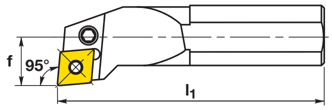
Insert	d				
WN-- 0804	25-32	5412 028-021	5322 328-02	5513 020-02	PT-8004
WN-- 0804	40-50	5412 028-021	5322 331-12	5513 020-02	PT-8004

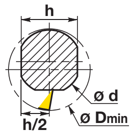
✓: Article which can be ordered
Ordering example: A40T-DVUNR/L 16

P SYSTEM FOR NEGATIVE INSERTS

S...-PCLNR/L





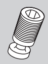
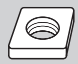
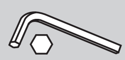


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		d	D_{min}	f	λ_s	γ	l_1	h		
S16R-PCLNR/L 09	CN-- 0903	16	20	11	-13°	-6°	200	15	✓	✓
S20S-PCLNR/L 09	CN-- 0903	20	25	13	-11°	-6°	250	18	✓	✓
S25T-PCLNR/L 09	CN-- 0903	25	32	17	-10°	-6°	300	23		✓
S25T-PCLNR/L 12	CN-- 1204	25	32	17	-13°	-6°	300	23	✓	✓
S32U-PCLNR/L 12	CN-- 1204	32	40	22	-11°	-6°	350	30	✓	✓
S40V-PCLNR/L 12	CN-- 1204	40	50	27	-10°	-6°	400	37	✓	✓
S50W-PCLNR/L 19	CN-- 1906	50	63	35	-11°	-6°	450	47	✓	✓

Spare parts

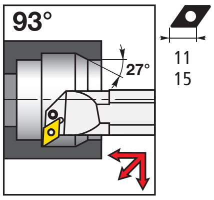
Insert	d	For radius insert						
CN-- 0903	16-20-25	-	174.3-845-1	174.3-829	-	-	-	174.3-864
CN-- 1204	25	-	438.3-841-1	438.3-832M	-	-	-	174.1-863
CN-- 1204	32	0.4-1.6	174.3-848M	174.3-858	171.31-850M	174.3-861	5681 002-01	174.1-864
CN-- 1204	40	0.4-1.6	174.3-841M	174.3-821	171.31-850M	174.3-861	5681 002-01	174.1-864
CN-- 1906	50	0.4-2.4	174.3-849M	174.3-822M	171.31-851M	174.3-868	5681 002-02	3021 010-040

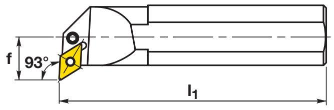
✓: Article which can be ordered
Ordering example: S16R-PCLNR/L 09

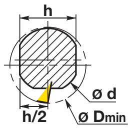
TURNING

P SYSTEM FOR NEGATIVE INSERTS

S...-PDUNR/L





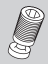
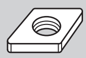
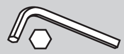


Right hand shown

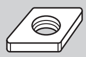
λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		d	D_{min}	f	λ_s	γ	l_1	h		
S25T-PDUNR/L 11	DN-- 1104	25	32	17	-11°	-6°	300	23	✓	✓
S32U-PDUNR/L 11	DN-- 1104	32	40	22	-10°	-6°	350	30	✓	✓
S40V-PDUNR/L 15	DN-- 1506	40	50	27	-11°	-6°	400	37	✓	✓
S50W-PDUNR/L 15	DN-- 1506	50	63	35	-10°	-6°	450	47	✓	✓

Spare parts

Insert	d	For radius insert						
DN-- 1104	25	-	5432 015-021	438.3-830	-	-	-	174.1-870
DN-- 1104	32	0.4-0.8	5432 001-01	174.3-820M	5322 255-01	174.3-860	5681 002-01	174.3-863
DN-- 1506	40-50	0.4-0.8	174.3-847M	174.3-830	171.35-851M	174.3-861	5681 002-01	174.1-864

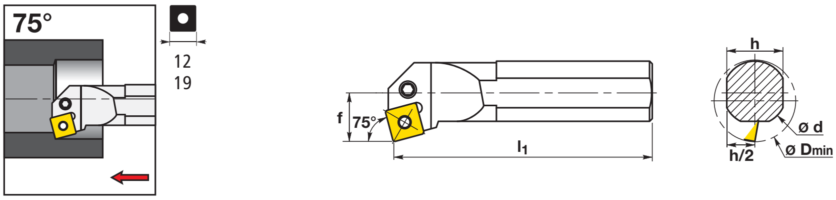
Optional spare parts

Insert	d	For radius insert	
DN-- 1104	32	1.2-1.6	5322 255-02
DN-- 1506	40-50	1.2-1.6	171.35-850M
DN-- 1504	40-50	0.4-0.8	171.35-856
DN-- 1504	40-50	1.2-1.6	171.35-855

✓: Article which can be ordered
Ordering example: S25T-PDUNR/L 11

P SYSTEM FOR NEGATIVE INSERTS

S...-PSKNR/L

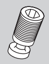
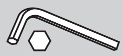


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		d	D_{min}	f	λ_s	γ	l_1	h		
S25T-PSKNR/L 12	SN-- 1204	25	32	17	-6°	-11°	300	23	✓	✓
S32U-PSKNR/L 12	SN-- 1204	32	40	22	-6°	-10°	350	30	✓	✓
S40V-PSKNR/L 12	SN-- 1204	40	50	27	-6°	-10°	400	37	✓	✓
S50W-PSKNR/L 19	SN-- 1906	50	63	35	-6°	-9°	450	47		✓

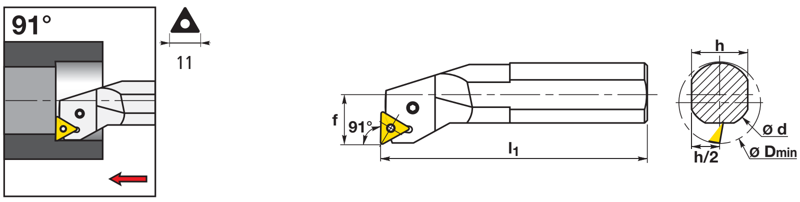
Spare parts

Insert	d	For radius insert						
SN-- 1204	25	-	438.3-841-1	438.3-832M	-	-	-	174.1-863
SN-- 1204	32	0.4-1.2	174.3-848M	174.3-858	174.3-851M	174.3-861	5681 002-01	174.1-864
SN-- 1204	40	0.4-1.2	174.3-841M	174.3-821	174.3-851M	174.3-861	5681 002-01	174.1-864
SN-- 1906	50	-	174.3-849M	174.3-822M	174.3-852M	174.3-868	5681 002-02	3021 010-040

Optional spare parts

Insert	d	For radius insert	
SN-- 1204	32-40	1.6-2.4	174.3-856

S...-PTFNR/L

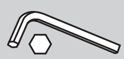


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		d	D_{min}	f	λ_s	γ	l_1	h		
S16R-PTFNR/L 11	TN-- 1103	16	20	11	-14°	-6°	200	15	✓	✓
S20S-PTFNR/L 11	TN-- 1103	20	25	13	-12°	-6°	250	18	✓	✓

Spare parts

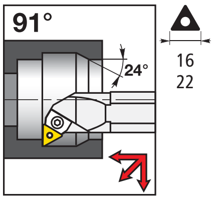
Insert	d			
TN-- 1103	16-20	174.3-846-1	174.3-829	170.3-864

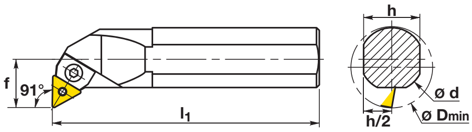
✓: Article which can be ordered
Ordering example: S25T-PSKNR/L 12

TURNING

P SYSTEM FOR NEGATIVE INSERTS

S...-PTFNR/L-W





Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		d	D_{min}	f	λ_s	γ	l_1	h		
S25T-PTFNR/L 16 W	TN-- 1604	25	32	17	-13°	-6°	300	23	✓	✓
S32U-PTFNR/L 16 W	TN-- 1604	32	40	22	-12°	-6°	350	30	✓	✓
S40V-PTFNR/L 22 W	TN-- 2204	40	50	27	-11°	-6°	400	37	✓	✓
S50W-PTFNR/L 22 W	TN-- 2204	50	63	35	-10°	-6°	450	47		✓

Spare parts

Insert	d	For radius insert						
TN-- 1604	25	-	170.38-823-2	-	5313 021-01	5512 031-01	PT-8002	174.1-864
TN-- 1604	32	0.4-1.2	170.38-823-1	170.3-852	5313 021-02	5512 031-01	PT-8002	174.1-864
TN-- 2204	40-50	1.2-1.6	170.38-824-1	170.3-855	5313 021-03	5512 031-02	PT-8005	-

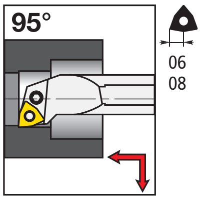
Optional spare parts

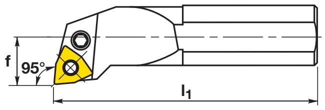
Insert	d	For radius insert			
TN-- 1604	32	0.4-1.2	170.38-820-1	-	174.1-863
TN-- 2204	40-50	0.4-0.8	170.38-821-1	170.3-856	174.1-864

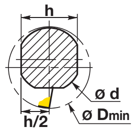
✓: Article which can be ordered
Ordering example: S25T-PTFNR/L 16 W

P SYSTEM FOR NEGATIVE INSERTS

S...-PWLNR/L





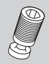
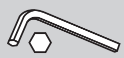


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		d	D_{min}	f	λ_s	γ	l_1	h		
S20S-PWLNR/L 06	WN-- 0604	20	25	13	-14°	-6°	250	18	✓	✓
S25T-PWLNR/L 06	WN-- 0604	25	32	17	-13°	-6°	300	23	✓	✓
S32U-PWLNR/L 08	WN-- 0804	32	40	22	-13°	-6°	350	30	✓	✓

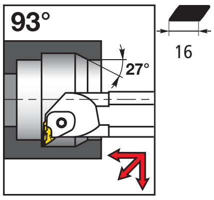
Spare parts

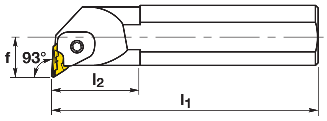
Insert	d						
WN-- 0604	20-25	5432 015-011	438.3-830	-	-	-	174.1-870
WN-- 0804	32	174.3-841M	174.3-821	5322 331-01	174.3-861	5681 002-01	174.1-864

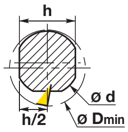
✓: Article which can be ordered
Ordering example: S20S-PWLNR/L 06

C SYSTEM FOR NEGATIVE INSERTS

S...-CKUNR/L





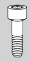
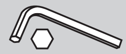


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)								Left hand	Right hand
		d	D_{min}	f	λ_s	γ	l_1	l_2	h		
S32U-CKUNR/L-16	KN-- 1604	32	44	22	-10°	-6°	350	54	30	✓	✓
S40V-CKUNR/L-16	KN-- 1604	40	48	27	-8°	-6°	400	60	37	✓	✓

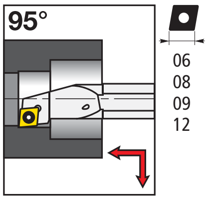
Spare parts

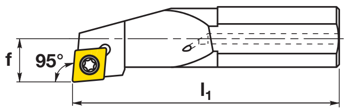
Insert	d	 L	 R		 L	 R	
KN-- 1604	32-40	170.5-824	170.5-825	170.5-865	L170.5-851	R170.5-851	3021 010-040

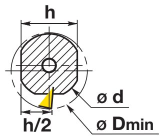
✓: Article which can be ordered
Ordering example: S32U-CKUNR/L-16

S SYSTEM FOR POSITIVE INSERTS

A...-SCLCR/L





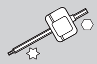


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		d	D_{min}	f	λ_s	γ	l_1	h		
A08H-SCLCR/L 06	CC-- 0602	8	10	5	-14°	0°	100	7	✓	✓
A10K-SCLCR/L 06	CC-- 0602	10	12	6	-11°	0°	125	9	✓	✓
A10K-SCLCR/L 08	CC-- 0803	10	12	6	-14°	0°	125	9	✓	✓
A12M-SCLCR/L 06	CC-- 0602	12	16	9	-7°	0°	150	11	✓	✓
A12M-SCLCR/L 08	CC-- 0803	12	16	9	-5°	0°	150	11	✓	✓
A16R-SCLCR/L 08	CC-- 0803	16	20	11	-5°	0°	200	14	✓	✓
A16R-SCLCR/L 09	CC-- 09T3	16	20	11	-8°	0°	200	14	✓	✓
A20S-SCLCR/L 09	CC-- 09T3	20	25	13	-6°	0°	250	18	✓	✓
A25T-SCLCR/L 12	CC-- 1204	25	32	17	-4.5°	0°	300	23	✓	✓

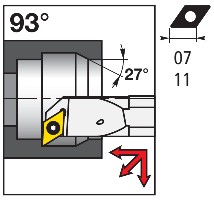
Spare parts

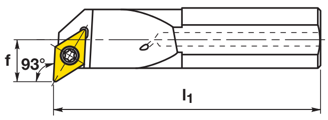
Insert	d		
CC-- 0602	8-10-12	5513 020-46	PT-8001
CC-- 0803	10-12-16	-	PT-8003
CC-- 09T3	16-20	5513 020-09	PT-8004
CC-- 09T3	25	5513 020-10	PT-8004
CC-- 1204	25	5513 020-17	PT-8005

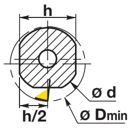
✓: Article which can be ordered
Ordering example: A08H-SCLCR/L 06

S SYSTEM FOR POSITIVE INSERTS

A...-SDUCR/L





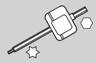


Right hand shown

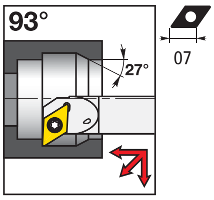
λ_s = Angle of inclination of edge
γ = Rake angle

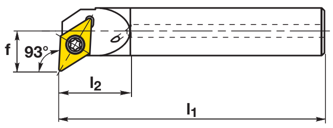
Reference	Insert	Dimensions (mm)							Left hand	Right hand
		d	D_{min}	f	λ_s	γ	l_1	h		
A10K-SDUCR/L 07	DC-- 0702	10	13	7	-9°	0°	125	9	✓	✓
A12M-SDUCR/L 07	DC-- 0702	12	16	9	-6°	0°	150	11	✓	✓
A16R-SDUCR/L 07	DC-- 0702	16	20	11	-4°	0°	200	15	✓	✓
A20S-SDUCR/L 11	DC-- 11T3	20	25	13	-6°	0°	250	18	✓	✓
A25T-SDUCR/L 11	DC-- 11T3	25	32	17	-3°	0°	300	23	✓	✓

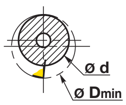
Spare parts

Insert	d		
DC-- 0702	10-12-16	5513 020-03	PT-8001
DC-- 11T3	20	5513 020-09	PT-8004
DC-- 11T3	25	5513 020-10	PT-8004

E...-SDUCR/L





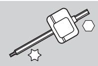


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		d	D_{min}	f	λ_s	γ	l_1	l_2		
E10M-SDUCR/L 07-ER	DC-- 0702	10	15	9.0	-5°	0°	150	21.3	✓	✓
E12Q-SDUCR/L 07-ER	DC-- 0702	12	18	11.0	-5°	0°	180	25.3	✓	✓
E16R-SDUCR/L 07-ER	DC-- 0702	16	22	13.0	-5°	0°	200	33.3	✓	✓

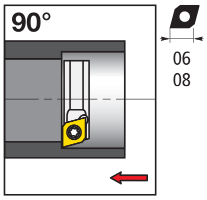
Spare parts

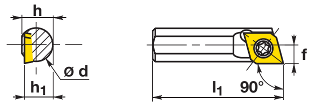
Insert	d		
DC-- 0702	10-12-16	5513 020-03	PT-8001

✓: Article which can be ordered
Ordering example: A10K-SDUCR/L 07

S SYSTEM FOR POSITIVE INSERTS

S...-SEACR/L





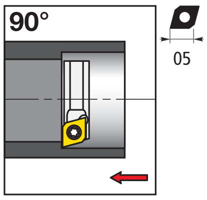
Left hand shown

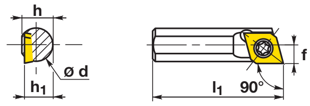
Reference	Insert	Dimensions (mm)					Left hand
		d	f	l_1	h	h_1	
S08X-SEACR/L 06	EC-- 0602	8	4.6	35	7.4	6.5	✓
S10C-SEACR/L 06	EC-- 0602	10	5.6	50	9.0	8.0	✓
S12D-SEACR/L 08	EC-- 0803	12	6.6	60	11.0	10.0	✓

Spare parts

Insert	d		
EC-- 0602	8-10	5513 020-03	PT-8001
EC-- 0803	12	416.1-832	PT-8003

S...-SEAPR/L





Left hand shown

Reference	Insert	Dimensions (mm)					Left hand
		d	f	l_1	h	h_1	
S06X-SEAPR/L 05	EP-- 0502	6	3.5	25	5.5	5	✓

Spare parts

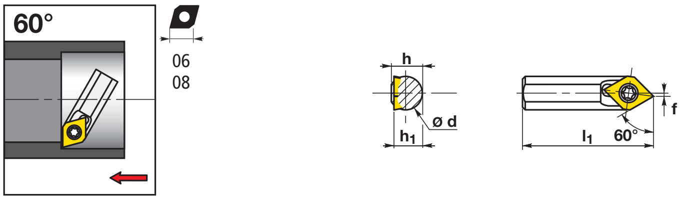
Insert	d		
EP-- 0502	6	28588	MA2-8304

✓: Article which can be ordered
Ordering example: S08X-SEACR/L 06

TURNING

S SYSTEM FOR POSITIVE INSERTS

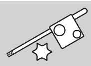
S...-SEECR/L



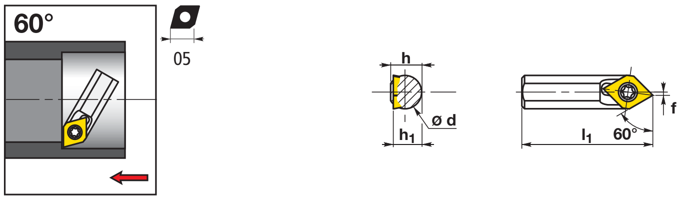
Left hand shown

Reference	Insert	Dimensions (mm)					Left hand
		d	f	l_1	h	h_1	
S08X-SEECR/L 06	EC-- 0602	8	1.0	35	7.4	6.5	✓
S10C-SEECR/L 06	EC-- 0602	10	1.5	50	9.0	8.0	✓
S12D-SEECR/L 08	EC-- 0803	12	1.5	60	11.0	10.0	✓
S16G-SEECR/L 08	EC-- 0803	16	2.5	90	15.0	13.0	✓

Spare parts

Insert	d		
EC-- 0602	8-10	5513 020-03	PT-8001
EC-- 0803	12-16	416.1-832	PT-8003

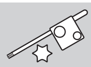
S...-SEEPR/L



Left hand shown

Reference	Insert	Dimensions (mm)					Left hand
		d	f	l_1	h	h_1	
S06X-SEEPR/L 05	EP-- 0502	6	0.5	25	5.5	5	✓

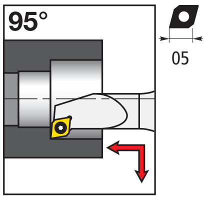
Spare parts

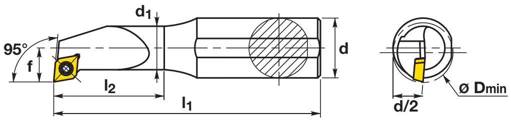
Insert	d		
EP-- 0502	6	28588	MA2-8304

✓: Article which can be ordered
Ordering example: S08X-SEECR/L 06

S SYSTEM FOR POSITIVE INSERTS

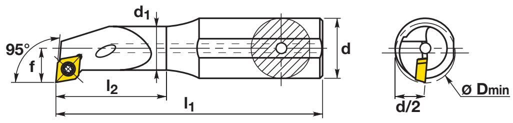
S.....-SELPR/L





Right hand shown

A...-SELPR/L

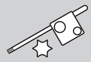


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)								Left hand	Right hand
		d	D_{min}	f	d_1	λ_s	γ	l_1	l_2		
S0608H SELPR/L-05	EP-- 0502	8	8	4.5	6	-10°	0°	10	20	✓	✓
S0810J SELPR/L-05	EP-- 0502	10	11	6	8	-5°	0°	110	26	✓	✓
S1012K SELPR/L-05	EP-- 0502	12	13	7	10	-5°	0°	125	32	✓	✓
S1216M SELPR/L-05	EP-- 0502	16	16	9	12	-2°	0°	150	40	✓	✓
A1216M SELPR/L-05	EP-- 0502	16	16	9	12	-2°	0°	150	40		✓

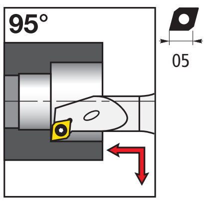
Spare parts

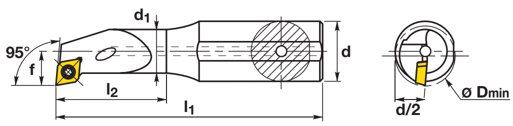
Insert	d		
EP-- 0502	8	28992	MA2-8304
EP-- 0502	10-12-16	28588	MA2-8304

COFFRET SELPR

Reference	Quantity	Type	Reference	For inserts	
COFFRET SELPR-05	1	insert holder	S 0608 H-SELPR-05	EP-- 0502	
	1	insert holder	S 0810 J-SELPR-05	EP-- 0502	
	1	insert holder	S 1012 K-SELPR-05	EP-- 0502	
	1	insert holder	S 1216 M-SELPR-05	EP-- 0502	
	1	key	MA2-8304	-	

E.....-SELPR/L



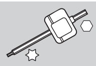


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)								Left hand	Right hand
		d	D_{min}	f	d_1	λ_s	γ	l_1	l_2		
E0608H SELPR/L-05	EP-- 0502	8	8	4.5	6	-10°	0°	100	28	✓	✓
E0810J SELPR/L-05	EP-- 0502	10	11	6	8	-5°	0°	110	36	✓	✓
E1012K SELPR/L-05	EP-- 0502	12	13	7	10	-5°	0°	125	44	✓	✓
E1216M SELPR/L-05	EP-- 0502	16	16	9	12	-2°	0°	150	55	✓	

Spare parts

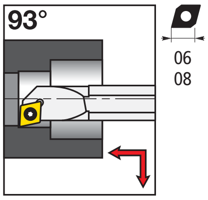
Insert	d		
EP-- 0502	8-10-12	28588	MA2-8304

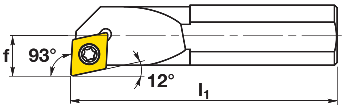
✓: Article which can be ordered
Ordering example: S0608H SELPR/L-05

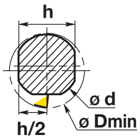
TURNING

S SYSTEM FOR POSITIVE INSERTS

S...-SEUCR/L





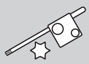


Right hand shown

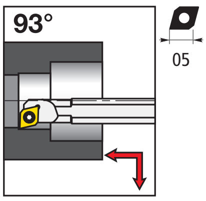
λ_s = Angle of inclination of edge
γ = Rake angle

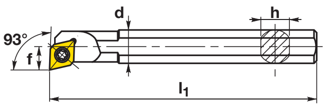
Reference	Insert	Dimensions (mm)							Left hand	Right hand
		d	D_{min}	f	λ_s	γ	l_1	h		
S08K-SEUCR/L 06	EC-- 0602	8	11	7	-5°	0°	125	7	✓	✓
S10M-SEUCR/L 06	EC-- 0602	10	13	8	-5°	0°	150	9	✓	✓
S12M-SEUCR/L 08	EC-- 0803	12	15	9	-5°	0°	150	11	✓	✓
S16R-SEUCR/L 08	EC-- 0803	16	20	11	-5°	0°	200	15	✓	✓
S20S-SEUCR/L 08	EC-- 0803	20	25	13	-5°	0°	250	18	✓	✓
S25T-SEUCR/L 08	EC-- 0803	25	32	17	-4°	0°	300	23		✓

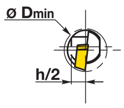
Spare parts

Insert	d		
EC-- 0602	8-10	5513 020-03	PT-8001
EC-- 0803	12-16-20-25	416.1-832	PT-8003

S...-SEUPR/L





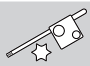


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		d	D_{min}	f	λ_s	γ	l_1	h		
S06H-SEUPR/L 05	EP-- 0502	6	8.3	5	-7°	0°	100	5.4	✓	✓

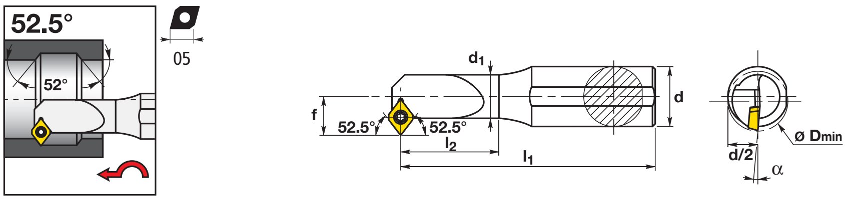
Spare parts

Insert	d		
EP-- 0502	6	28992	MA2-8304

✓: Article which can be ordered
Ordering example: S08K-SEUCR/L 06

S SYSTEM FOR POSITIVE INSERTS

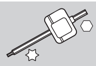
S.....-SEXPR/L



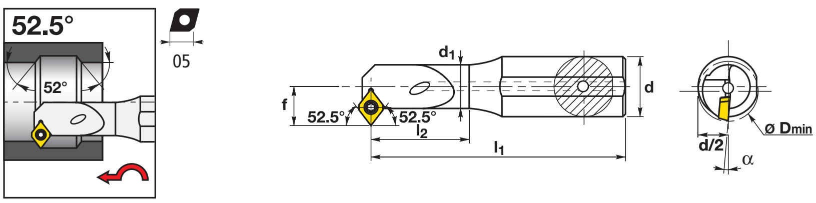
Right hand shown

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		d	D_{min}	f	d_1	α	l_1	l_2		
S0608H SEXPR/L-05	EP-- 0502	8	9.5	5.5	6	-7°	100	20	✓	✓
S0810J SEXPR/L-05	EP-- 0502	10	11	6	8	-5°	110	26	✓	✓
S1012K SEXPR/L-05	EP-- 0502	12	13	7	10	-5°	125	32	✓	✓
S1216M SEXPR/L-05	EP-- 0502	16	16	9	12	-2°	150	40	✓	✓

Spare parts

Insert	d		
EP-- 0502	8	28992	MA2-8304
EP-- 0502	10-12-16	28588	MA2-8304

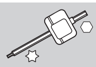
E.....-SEXPR/L



Right hand shown

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		d	D_{min}	f	d_1	α	l_1	l_2		
E0608H SEXPR/L-05	EP-- 0502	8	9.5	5.5	6	-7°	100	28	✓	✓
E0810J SEXPR/L-05	EP-- 0502	10	11	6	8	-5°	110	36		✓
E1012K SEXPR/L-05	EP-- 0502	12	13	7	10	-5°	125	44		✓
E1216M SEXPR/L-05	EP-- 0502	16	16	9	12	-2°	150	55		✓

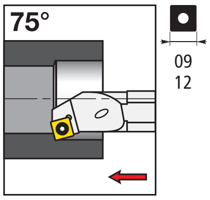
Spare parts

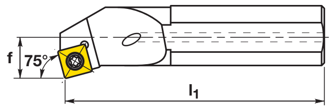
Insert	d		
EP-- 0502	8	28992	MA2-8304
EP-- 0502	10-12-16	28588	MA2-8304

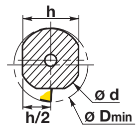
✓: Article which can be ordered
Ordering example: S0608H SEXPR/L-05

S SYSTEM FOR POSITIVE INSERTS

A...-SSKCR/L





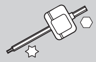


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		d	D_{min}	f	λ_s	γ	l_1	h		
A16R-SSKCR/L 09	SC-- 09T3	16	20	11	-9°	0°	200	15	✓	✓
A20S-SSKCR/L 09	SC-- 09T3	20	25	13	-6°	0°	250	18	✓	✓
A25T-SSKCR/L 12	SC-- 1204	25	32	17	-4.5°	0°	300	23	✓	✓

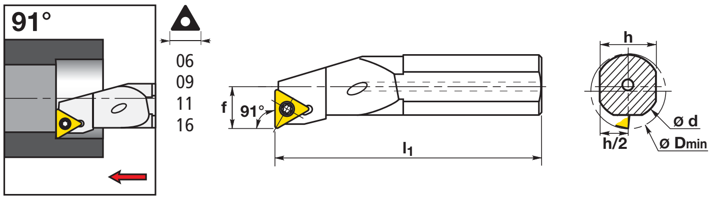
Spare parts

Insert	d		
SC-- 09T3	16-20	5513 020-09	PT-8004
SC-- 1204	25	5513 020-17	PT-8005

✓: Article which can be ordered
Ordering example: A16R-SSKCR/L 09

S SYSTEM FOR POSITIVE INSERTS

A...-STFCR/L

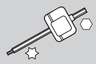


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		d	D_{min}	f	λ_s	γ	l_1	h		
A06F-STFCR/L 06	TC-- 06T1	6	8.5	4.5	-12°	0°	80	5	✓	✓
A08H-STFCR/L 06	TC-- 06T1	8	11	5.9	-10°	0°	100	7	✓	✓
A10K-STFCR/L 09	TC-- 0902	10	13	7	-9°	0°	125	9	✓	✓
A12M-STFCR/L 09	TC-- 0902	12	16	9	-6.5°	0°	150	11	✓	✓
A12M-STFCR/L 11	TC-- 1102	12	16	9	-10°	0°	150	11	✓	✓
A16R-STFCR/L 11	TC-- 1102	16	20	11	-6°	0°	200	15	✓	✓
A20S-STFCR/L 11	TC-- 1102	20	25	13	-3°	0°	250	18	✓	✓
A25T-STFCR/L 16	TC-- 16T3	25	32	17	-3°	0°	300	23	✓	✓

Spare parts

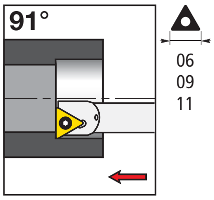
Insert	d		
TC-- 06T1	06	5513 020-28	PT-8000
TC-- 06T1	08	5513 020-27	PT-8000
TC-- 0902	10-12	5513 020-05	PT-8001
TC-- 1102	12-16-20	5513 020-03	PT-8001
TC-- 16T3	25	5513 020-10	PT-8004

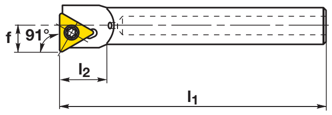
✓: Article which can be ordered
Ordering example: A06F-STFCR/L 06

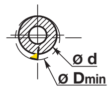
TURNING

S SYSTEM FOR POSITIVE INSERTS

E...-STFCR/L





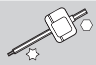


Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		d	D_{min}	f	λ_s	γ	l_1	l_2		
E06H-STFCR/L 06-R	TC-- 06T1	6	8.5	4.5	-10°	0°	100	13.3	✓	✓
E08K-STFCR/L 06-R	TC-- 06T1	8	11	5.9	-10°	0°	125	17.3	✓	✓
E10M-STFCR/L 09-R	TC-- 0902	10	13	7.0	-8°	0°	150	21.3	✓	✓
E12Q-STFCR/L 09-R	TC-- 0902	12	16	9.0	-6°	0°	180	25.3	✓	✓
E16R-STFCR/L 11-R	TC-- 1102	16	20	11.0	-5°	0°	200	33.2	✓	✓

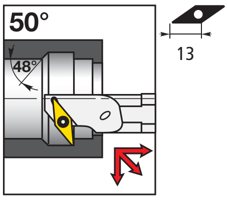
Spare parts

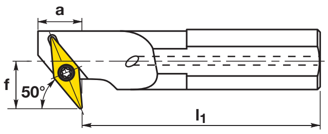
Insert	d		
TC-- 06T1	6	5513 020-28	PT-8000
TC-- 06T1	8	5513 020-27	PT-8000
TC-- 0902	10-12	5513 020-05	PT-8001
TC-- 1102	16	5513 020-03	PT-8001

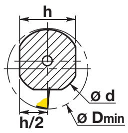
✓: Article which can be ordered
Ordering example: E06H-STFCR/L 06-R

S SYSTEM FOR POSITIVE INSERTS

A...-SVLCR/L-X







Right hand shown

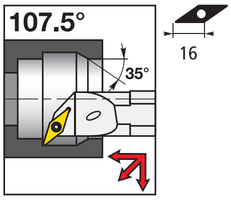
λ_s = Angle of inclination of edge
γ = Rake angle

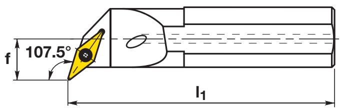
Reference	Insert	Dimensions (mm)								Left hand	Right hand
		d	D_{min}	f	λ_s	γ	l_1	h	a		
A20S-SVLCR/L 13-X	VC-- 1303	20	27	15	-4°	-2°	250	18	15	✓	✓
A25T-SVLCR/L 13-X	VC-- 1303	25	35	20	-2°	-2°	300	24	18	✓	✓
A32T-SVLCR/L 13-X	VC-- 1303	32	43	25	-1°	-2°	300	30	18	✓	✓

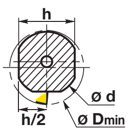
Spare parts

Insert	d		
VC-- 1303	20-25-32	5513 020-24	PT-8002

A...-SVQBR/L







Right hand shown

λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		d	D_{min}	f	λ_s	γ	l_1	h		
A25T-SVQBR/L 16-D	VB-- 1604	25	33	18	-7°	0°	300	23	✓	✓
A32T-SVQBR/L 16	VB-- 1604	32	40	22	-7°	0°	300	30	✓	✓
A40T-SVQBR/L 16	VB-- 1604	40	50	27	-5°	0°	300	37	✓	✓

Spare parts

Insert	d	For insert radius				
VB-- 1604	25	-	5513 020-10	-	-	PT-8004
VB-- 1604	32-40	0.4-0.8	5513 020-01	5322 270-01	5512 090-01	PT-8004

Optional spare parts

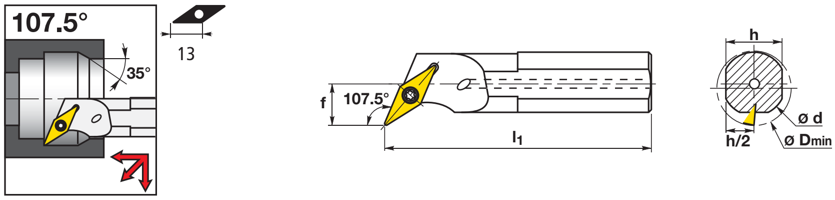
Insert	d	For insert radius	
VB-- 1604	32-40	1.2	5322 270-02

✓: Article which can be ordered
Ordering example: A20S-SVLCR/L 13-X

TURNING

S SYSTEM FOR POSITIVE INSERTS

A...-SVQCR/L



Right hand shown

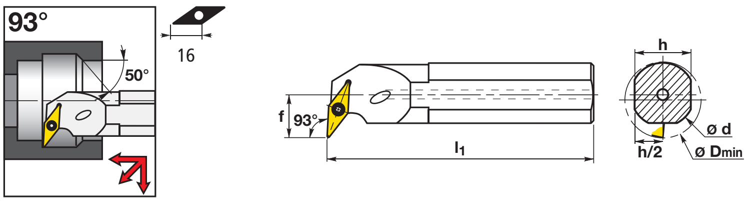
λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		d	D_{min}	f	λ_s	γ	l_1	h		
A16R-SVQCR/L 13	VC-- 1303	16	21	11	-6°	+2°	200	15	✓	✓
A20S-SVQCR/L 13	VC-- 1303	20	25	13	-4°	+2°	250	18	✓	✓

Spare parts

Insert	d	
VC-- 1303	16-20	5513 020-24

A...-SVUBR/L

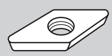
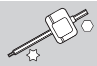


Right hand shown

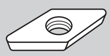
λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		d	D_{min}	f	λ_s	γ	l_1	h		
A25T-SVUBR/L 16-D	VB-- 1604	25	33	18	-6.5°	0°	300	23	✓	✓
A32T-SVUBR/L 16	VB-- 1604	32	40	22	-6°	0°	300	30	✓	✓
A40T-SVUBR/L 16	VB-- 1604	40	50	27	-4°	0°	300	37	✓	✓

Spare parts

Insert	d	For insert radius				
VB-- 1604	25	-	5513 020-10	-	-	PT-8004
VB-- 1604	32-40	0.4-0.8	5513 020-01	5322 270-01	5512 090-01	PT-8004

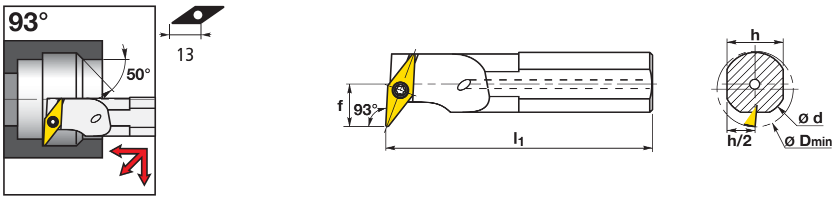
Optional spare parts

Insert	d	For insert radius	
VB-- 1604	32-40	1.2	5322 270-02

✓: Article which can be ordered
Ordering example: A25T-SVUBR/L 16-D

S SYSTEM FOR POSITIVE INSERTS

A...-SVUCR/L

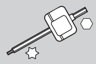


Right hand shown

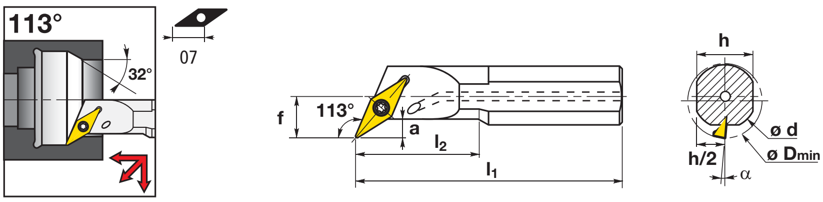
λ_s = Angle of inclination of edge
γ = Rake angle

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		d	D_{min}	f	λ_s	γ	l_1	h		
A20S-SVUCR/L 13	VC-- 1303	20	25	13	-4°	+2°	250	19	✓	✓
A25T-SVUCR/L 13	VC-- 1303	25	32	17	-2°	+2°	300	24	✓	✓
A32T-SVUCR/L 13	VC-- 1303	32	40	22	-1°	+2°	300	30	✓	✓

Spare parts

Insert	d		
VC-- 1303	20-25-32	5513 020-24	PT-8002

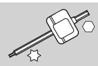
A...-SVXCR/L



Right hand shown

Reference	Insert	Dimensions (mm)								Left hand	Right hand
		d	D_{min}	f	α	l_1	l_2	h	a		
A10H-SVXCR/L 07	VC-- 0702	10	12.5	7	-10°	100	22	9	3	✓	✓
A12K-SVXCR/L 07	VC-- 0702	12	15.5	9	-8°	125	28	11	3	✓	✓
A16M-SVXCR/L 07	VC-- 0702	16	17.5	11	-6°	150	36	15	3	✓	✓

Spare parts

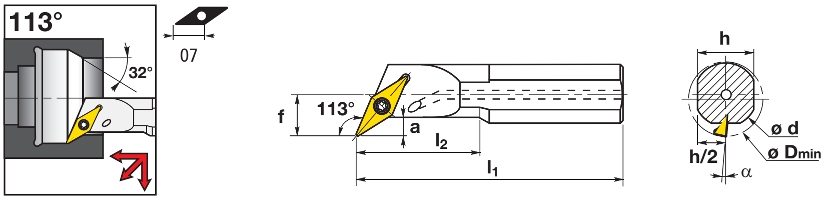
Insert	d		
VC-- 0702	10-12-16	DVF 3584	DMD 1650

✓: Article which can be ordered
Ordering example: A20S-SVUCR/L 13

S SYSTEM FOR POSITIVE INSERTS

TURNING

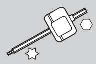
E...-SVXCR/L



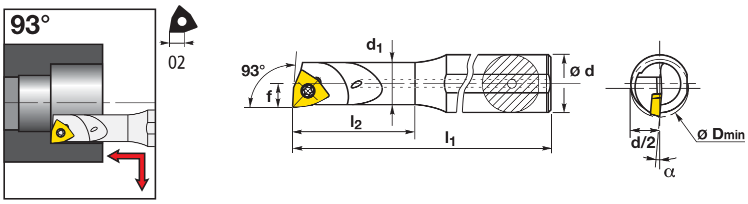
Right hand shown

Reference	Insert	Dimensions (mm)								Left hand	Right hand
		d	D_{min}	f	α	l_1	l_2	h	a		
E10H-SVXCR/L 07	VC-- 0702	10	12.5	7	-10°	100	32	9	3	✓	✓
E12K-SVXCR/L 07	VC-- 0702	12	15.5	9	-8°	125	40	11	3	✓	✓
E16M-SVXCR/L 07	VC-- 0702	16	17.5	11	-6°	150	55	15	3	✓	✓

Spare parts

Insert	d		
VC-- 0702	10-12-16	DVF 3584	DMD 1650

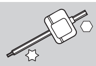
A.....-SWUCR/L



Right hand shown

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		d	D_{min}	f	d_1	α	l_1	l_2		
A0508H SWUCR/L-02	WC-- 0201	8	5.8	2.9	5	-17°	100	18	✓	✓
A0608H SWUCR/L-02	WC-- 0201	8	7.8	3.9	6	-12°	100	24	✓	✓

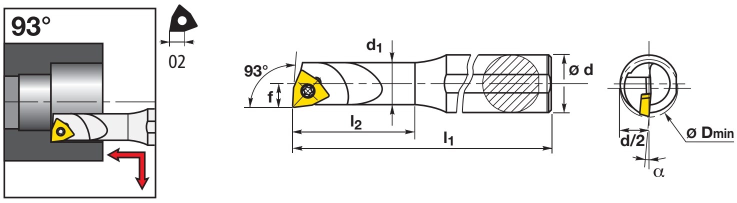
Spare parts

Insert	d		
WC-- 0201	8	T20.037	DMD 1650

✓: Article which can be ordered
Ordering example: E10H-SVXCR/L 07

S SYSTEM FOR POSITIVE INSERTS

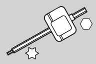
S.....-SWUCR/L



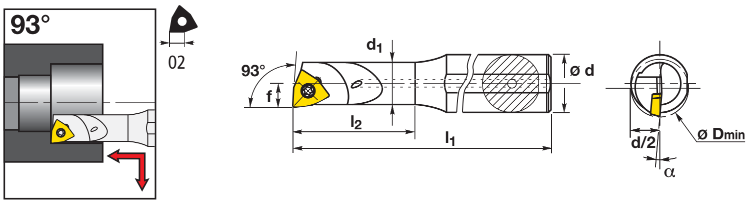
Right hand shown

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		d	D_{min}	f	d_1	α	l_1	l_2		
S0508H SWUCR/L-02	WC-- 0201	8	5.8	2.9	5	-17°	100	18	✓	✓
S0608H SWUCR/L-02	WC-- 0201	8	7.8	3.9	6	-12°	100	24	✓	✓

Spare parts

Insert	d		
WC-- 0201	8	T20.037	DMD 1650

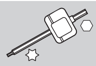
E.....-SWUCR/L



Right hand shown

Reference	Insert	Dimensions (mm)							Left hand	Right hand
		d	D_{min}	f	d_1	α	l_1	l_2		
E0508H SWUCR/L-02	WC-- 0201	8	5.8	2.9	5	-17°	100	24	✓	✓
E0608H SWUCR/L-02	WC-- 0201	8	7.8	3.9	6	-12°	100	32	✓	✓

Spare parts

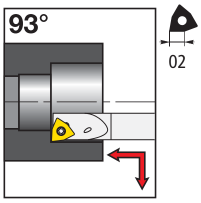
Insert	d		
WC-- 0201	8	T20.037	DMD 1650

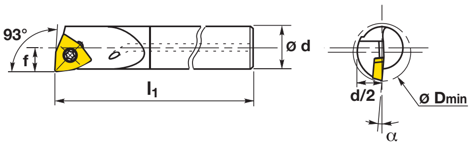
✓: Article which can be ordered
Ordering example: S0508H SWUCR/L-02

TURNING

S SYSTEM FOR POSITIVE INSERTS

E...-SWUCR/L

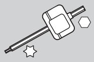




Right hand shown

Reference	Insert	Dimensions (mm)					Left hand	Right hand
		d	D_{min}	f	α	l_1		
E05F-SWUCR/L 02	WC-- 0201	5	5.8	2.9	-17°	85	✓	✓
E06G-SWUCR/L 02	WC-- 0201	6	7.8	3.9	-12°	95	✓	✓

Spare parts

Insert	d		
WC-- 0201	5-6	T20.037	DMD 1650

✓: Article which can be ordered
Ordering example: E05F-SWUCR/L 02

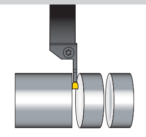
NOTES

TWIN-SAF SYSTEM

Application	Holder	Holder	Insert	Insert	Insert	Insert	Insert
PARTING	TN-P00 Shank.......p 172	TN-B02 Blade...........p 176 Blade holder.p 177	48 p 169	380 p 171			
GROOVING	TN-P00 Shank.......p 172		28 p 168	38 p 168	48 p 169	88 p 170	380 p 171
TURNING	TN-P00 Shank.......p 172		78 p 170	88 p 170	780 p 171		
PROFILING	TN-P00 Shank.......p 172		78 p 170	780 p 171			
FACE GROOVING	TN-F00 Shank.......p 179	TN-F90 Shank.......p 175	48 p 169	88 p 170	380 p 171		
INTERNAL GROOVING	TN-H90 Shank.......p 178		28 p 169	38 p 169	48 p 169	88 p 170	380 p 171

SAF-CUT SYSTEM

PARTING



151.20

Shank.......p 184

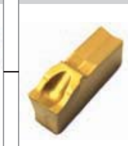
151.2

Blade..........p 189
Blade holder.p 190

N2

p 180

N3



p 180

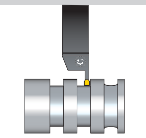
N4

p 181

N5

p 181

GROOVING



151.22

Shank.......p 185

151.23

Shank.......p 186

N2

p 180

N3

p 180

N4

p 181

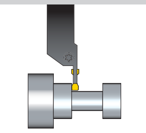
N5

p 181

G4

p 182

TURNING



151.22

Shank.......p 185

151.23

Shank.......p 186

P4

p 183

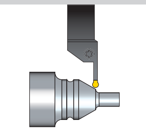
U4

p 183

G4

p 182

PROFILING



151.22

Shank.......p 185

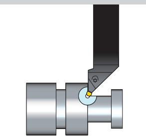
151.23

Shank.......p 186

P4

p 183

UNDERCUTTING



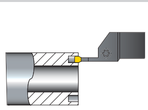
S 151.22

Shank.......p 188

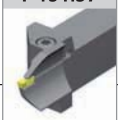
U4

p 183

FACE GROOVING



F 151.37



Shank.......p 188

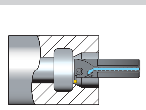
G 151.37

Shank.......p 188

G43

p 182

INTERNAL GROOVING



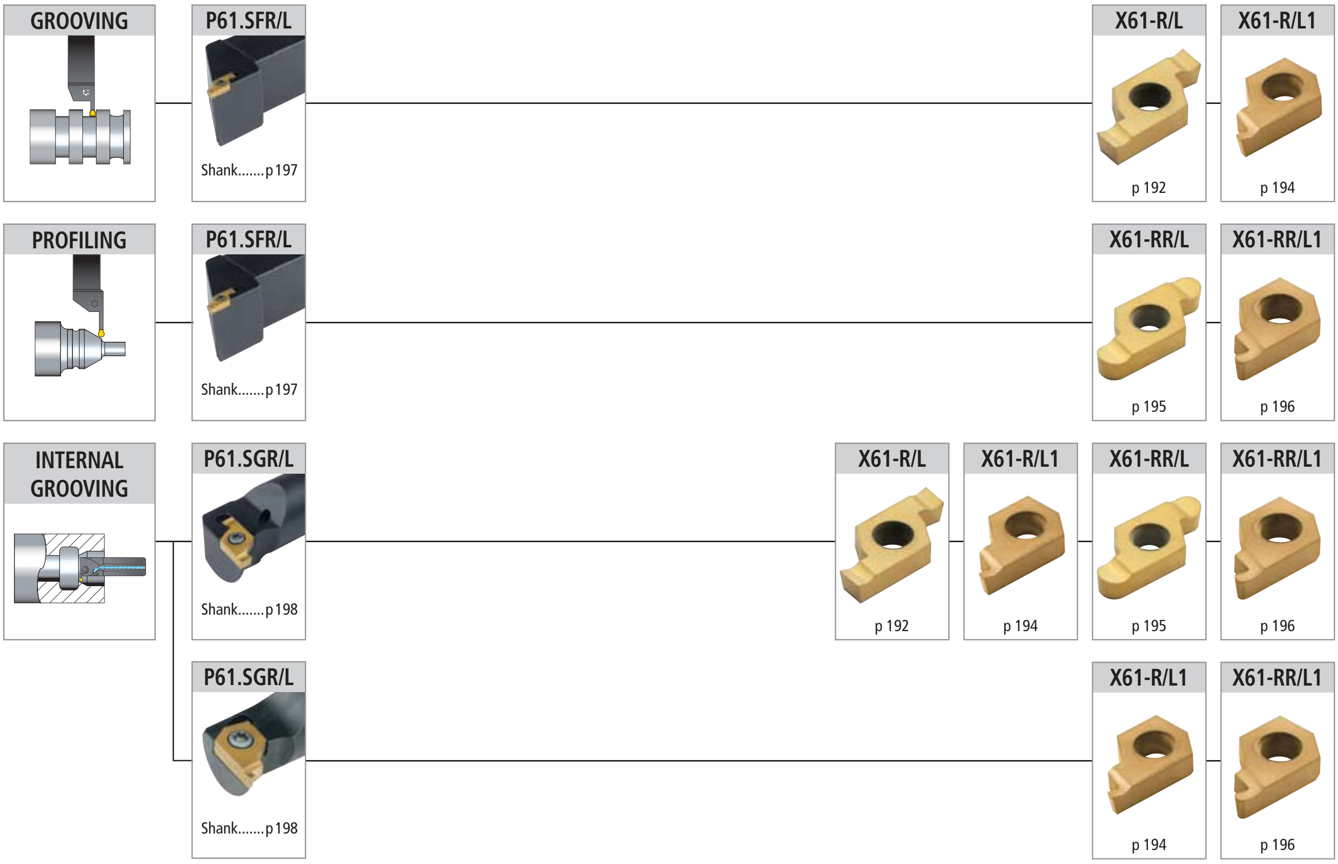
AG 151.32

Shank.......p 191

G43

p 182

X61 P61 SYSTEM



INSERTS AND TOOLS DESCRIPTION

TWIN-SAF inserts

28

Utility grooving

- Direct pressed insert
- Low cutting forces and good chip-control on many materials

38

Precision grooving

- Excellent repeatability due to tight tolerances on insert
- Low cutting forces and good chip-control on many materials

48

General grooving / parting

- Positive geometry eliminates risk of edge build-up
- Lower cutting forces resulting in reduced vibration

78

Radius grooving for profiling and turning

- Generates excellent surface finish
- Recommended for stainless and heat resistant materials

88

Turning / Grooving

- Medium feed rate capability with good chip-control
- Positive geometry minimizes edge build-up
- Recommended on steels and stainless steels

380

CBN grooving for hard materials

- General and finish grooving of irons and hard materials
- Good impact resistance
- Maintains close tolerances and excellent surface finish

380

PCD grooving for non-ferrous materials

- High performance parting and grooving in highly abrasive aluminum or other non-ferrous alloys
- High speed/long tool life
- Maintains close tolerances and excellent surface finish

780

CBN profiling for hard materials

- General and finish profiling/radius grooving of irons and hard materials
- Good impact resistance
- Maintains close tolerances and excellent surface finish

780

PCD profiling for non-ferrous materials

- High performance profiling and radius grooving in highly abrasive aluminum or other non-ferrous alloys
- High speed/long tool life
- Maintains close tolerances and excellent surface finish

TWIN-SAF tools

TN-P00

TN-P00

Grooving / Turning toolholder

- Insert clamping designed to resist axial forces when turning
- Increased speed/feed without encountering vibration problems
- Uses two-edge inserts for economy

TN-F00

TN-F90

Face grooving toolholders

- Insert clamping designed to resist raxial forces when face turning

TN-B02

Parting blades

- TN-B02 double ended, spring clamp, deep depth of cut
- Economical for many applications

TN-H90

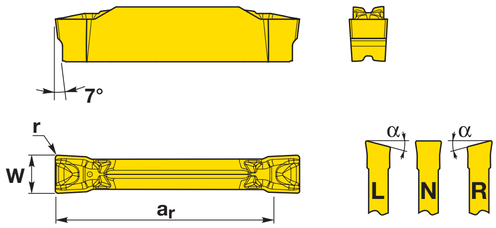
Grooving and turning boring bar

- For internal grooving and turning applications

TURNING

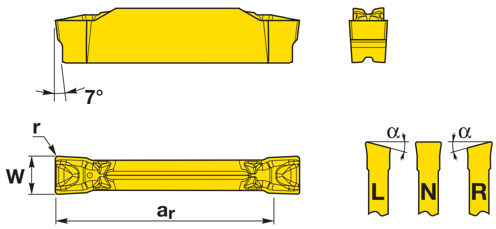
INSERTS

TN...-28 - Grooving



Reference	Seat size	Dimensions (mm)				Grades	
		W $^{+0.1}_{0}$	r	a_r	α	5735	5820
TN 300/00-G2N-28	G	3.00	0.20	19.0	0°	✓	✓
TN 400/00-H2N-28	H	4.00	0.20	19.0	0°	✓	✓

TN...-38 - Precision grooving

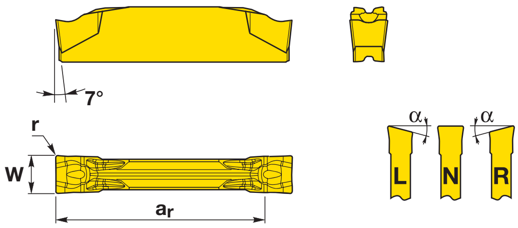


Reference	Seat size	Dimensions (mm)				Grades		
		W $^{\pm 0.02}$	r	a_r	α	5735	5820	9605
TN 139/00-D2N-38	D	1.39	0.10	13.3	0°		✓	
TN 160/00-D2N-38	D	1.60	0.10	13.3	0°	✓	✓	
TN 160/10-D2L-38	D	1.60	0.10	13.3	10°		✓	
TN 160/10-D2R-38	D	1.60	0.10	13.3	10°		✓	
TN 185/00-E2N-38	E	1.85	0.10	19.0	0°		✓	
TN 200/00-E2N-38	E	2.00	0.20	19.0	0°	✓	✓	
TN 224/00-E2N-38	E	2.24	0.20	19.0	0°		✓	
TN 274/00-F2N-38	F	2.74	0.20	19.0	0°		✓	
TN 300/00-G2N-38	G	3.00	0.20	19.0	0°	✓	✓	
TN 318/00-G2N-38	G	3.18	0.20	19.0	0°		✓	
TN 400/00-H2N-38	H	4.00	0.20	19.0	0°	✓	✓	✓
TN 500/00-J2N-38	J	5.00	0.20	24.4	0°		✓	
TN 600/00-K2N-38	K	6.00	0.40	24.4	0°		✓	
TN 800/00-L2N-38	L	8.00	0.40	24.4	0°			✓

✓: Article which can be ordered
Ordering example: TN 300/00-G2N-28 5735

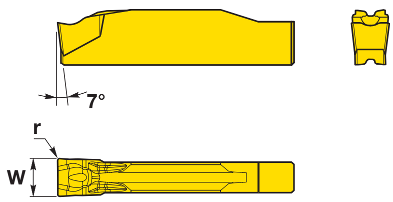
INSERTS

TN...-48 - 2 edges - General grooving / Parting



Reference	Seat size	Dimensions (mm)				Grades		
		W $^{+0.1}_{0}$	r	a_r	α	5735	5820	9605
TN 200/00-E2N-48	E	2.00	0.20	19.0	0°	✓	✓	✓
TN 200/05-E2L-48	E	2.00	0.20	19.0	5°		✓	
TN 200/05-E2R-48	E	2.00	0.20	19.0	5°		✓	
TN 250/00-F2N-48	F	2.50	0.20	18.9	0°	✓	✓	
TN 250/05-F2L-48	F	2.50	0.20	18.9	5°		✓	
TN 250/05-F2R-48	F	2.50	0.20	18.9	5°		✓	
TN 300/00-G2N-48	G	3.00	0.20	18.8	0°	✓	✓	✓
TN 300/05-G2L-48	G	3.00	0.20	18.8	5°	✓	✓	
TN 300/05-G2R-48	G	3.00	0.20	18.8	5°	✓	✓	
TN 400/00-H2N-48	H	4.00	0.20	24.1	0°	✓	✓	✓
TN 400/05-H2L-48	H	4.00	0.20	24.1	5°	✓	✓	
TN 400/05-H2R-48	H	4.00	0.20	24.1	5°	✓	✓	
TN 500/00-J2N-48	J	5.00	0.20	24.1	0°	✓	✓	
TN 600/00-K2N-48	K	6.00	0.40	23.5	0°	✓	✓	

TN...-48 - 1 edge - General grooving / Parting



Reference	Seat size	Dimensions (mm)				Grades	
		W $^{+0.1}_{0}$	r	a_r	α	5735	5820
TN 200/00-E1N-48	E	2.00	0.20	-	-	✓	✓
TN 300/00-G1N-48	G	3.00	0.20	-	-	✓	✓
TN 400/00-H1N-48	H	4.00	0.20	-	-	✓	✓
TN 500/00-J1N-48	J	5.00	0.20	-	-		✓

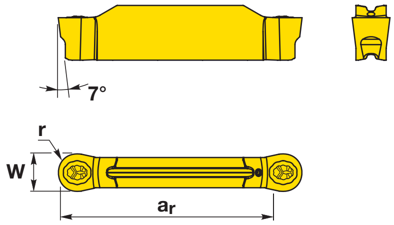
✓: Article which can be ordered
Ordering example: TN 200/00-E2N-48 5735

TURNING

TURNING

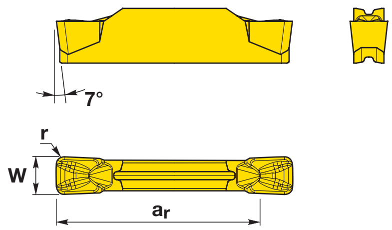
INSERTS

TN...-78 - Profiling / Radius grooving



Reference	Seat size	Dimensions (mm)				Grades	
		W ± 0.02	r	a_r	α	5735	5820
TN 200/00-E2N-78	E	2.00	1.00	19.3	-		✓
TN 300/00-F2N-78	F	3.00	1.50	19.0	-	✓	✓
TN 400/00-H2N-78	H	4.00	2.00	23.4	-	✓	✓
TN 500/00-H2N-78	H	5.00	2.50	22.9	-		✓
TN 600/00-J2N-78	J	6.00	3.00	22.2	-		✓
TN 800/00-L2N-78	L	8.00	4.00	27.0	-		✓

TN...-88 - Turn grooving

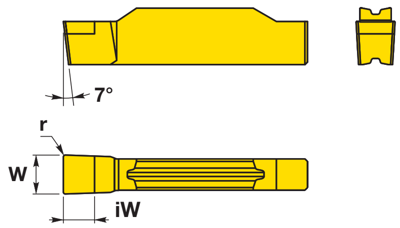


Reference	Seat size	Dimensions (mm)				Grades	
		W $^{+0.1}_{0}$	r	a_r	α	5735	5820
TN 300/04-G2N-88	G	3.00	0.40	18.4	-	✓	✓
TN 400/04-H2N-88	H	4.00	0.40	23.4	-	✓	✓
TN 400/08-H2N-88	H	4.00	0.80	23.4	-	✓	✓
TN 500/04-J2N-88	J	5.00	0.40	23.0	-	✓	✓
TN 500/08-J2N-88	J	5.00	0.80	23.0	-	✓	✓
TN 600/04-K2N-88	K	6.00	0.40	23.0	-		✓
TN 600/08-K2N-88	K	6.00	0.80	23.0	-	✓	✓
TN 800/08-L2N-88	L	8.00	0.80	27.6	-		✓
TN 800/12-L2N-88	L	8.00	1.20	27.6	-	✓	✓

✓: Article which can be ordered
Ordering example: TN 200/00-E2N-78 5820

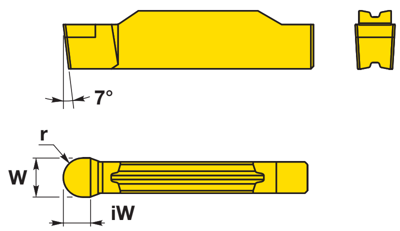
INSERTS

TN...-380 - PCD/CBN Precision grooving



Reference	Seat size	Dimensions (mm)			Grades	
		W ± 0.02	r	iW	B125	D720
TN 300/00-G1N-380	G	3.00	0.20	3.2	✓	✓
TN 400/00-H1N-380	H	4.00	0.20	3.2	✓	✓
TN 500/00-H1N-380	H	5.00	0.20	3.2	✓	✓
TN 600/00-J1N-380	J	6.00	0.20	3.2	✓	✓

TN...-780 - PCD/CBN Profiling

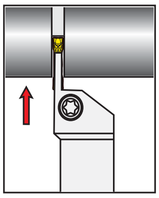


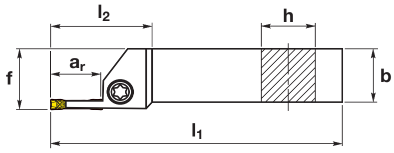
Reference	Seat size	Dimensions (mm)			Grades	
		W ± 0.02	r	iW	B125	D720
TN 300/00-G1N-780	G	3.00	1.50	2.5	✓	✓
TN 400/00-H1N-780	H	4.00	2.00	3.0	✓	✓
TN 500/00-H1N-780	H	5.00	2.50	3.5	✓	✓
TN 600/00-J1N-780	J	6.00	3.00	4.0	✓	✓
TN 800/00-L1N-780	L	8.00	4.00	5.0	✓	✓

✓: Article which can be ordered
Ordering example: TN 300/00-G1N-380 B125

TOOLHOLDERS

TN-P00 - Deep grooving / Parting

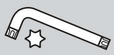




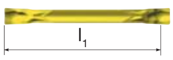
Right hand shown

Reference	Seat size	Dimensions (mm)						Left hand	Right hand
		h	b	f	l_1	l_2	a_r (1)		
TN-P00-E12R/L 1212	E	12	12	13	125	30.50	12	✓	✓
TN-P00-E15R/L 1616	E	16	16	17	125	33.50	15	✓	✓
TN-P00-E15R/L 2020	E	20	20	21	125	33.50	15	✓	✓
TN-P00-E15R/L 2525	E	25	25	26	150	33.50	15	✓	✓
TN-P00-F20R/L 1616	F	16	16	17	125	40.00	20	✓	✓
TN-P00-F20R/L 2020	F	20	20	21	125	40.00	20	✓	✓
TN-P00-F20R/L 2525	F	25	25	26	150	40.00	20	✓	✓
TN-P00-G20R/L 1616	G	16	16	17	125	41.00	20	✓	✓
TN-P00-G20R/L 2020	G	20	20	21	125	41.00	20	✓	✓
TN-P00-G20R/L 2525	G	25	25	26	150	41.00	20	✓	✓
TN-P00-H25R/L 1616	H	16	16	17	125	47.00	25	✓	✓
TN-P00-H25R/L 2020	H	20	20	21	125	47.00	25	✓	✓
TN-P00-H25R/L 2525	H	25	25	26	150	47.00	25	✓	✓
TN-P00-J32R/L 2525	J	25	25	26	150	57.00	32	✓	✓
TN-P00-K32R/L 2525	K	25	25	26	150	58.00	32	✓	✓
TN-P00-L25R/L 2525	L	25	25	26	150	52.00	25	✓	✓

Spare parts

Seat size	h/b		
E	1212	3212 012-257	5680 043-14
E	1616-2020-2525	3212 012-259	5680 043-14
F	1616-2020-2525	3212 012-259	5680 043-14
G	1616	3212 012-309	5680 043-15
G	2020-2525	3212 012-310	5680 043-15
H	1616-2020-2525	5512 044-01	5680 043-17
J	2525	5512 044-01	5680 043-17
K	2525	5512 044-01	5680 043-17
L	2525	5512 044-01	5680 043-17

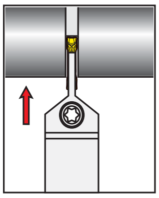
(1) Can be limited by the insert's length "l_1"

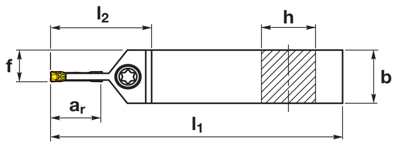


✓: Article which can be ordered
Ordering example: TN-P00-E12R 1212

TOOLHOLDERS

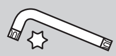
TN-P00 N - Neutral deep grooving / Parting



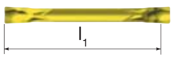


Reference	Seat size	Dimensions (mm)						Neutral
		h	b	f	l_1	l_2	a_r (1)	
TN-P00-J25N 2525	J	25	25	15	150	52.20	25	✓

Spare parts

Seat size	h/b		
J	2525	5512 044-01	5680 043-17

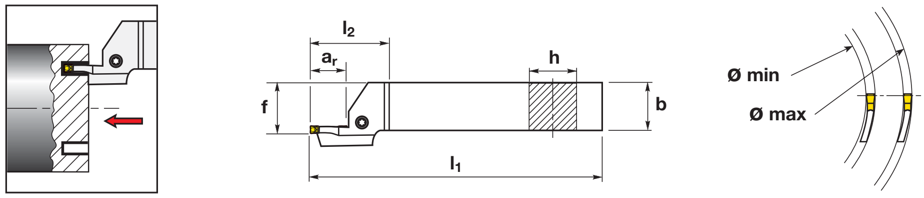
(1) Can be limited by the insert's length "l_1"



✓: Article which can be ordered
Ordering example: TN-P00-J25N 2525

TOOLHOLDERS

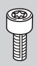
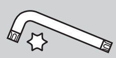
TN-F00 - Face grooving



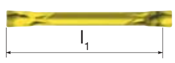
Right hand shown

Reference	Seat size	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	a_r (1)	Ø min - Ø max		
TN-F00-G12R/L 2525-034	G	25	25	26	150	32.00	12	34 - 44	✓	✓
TN-F00-G12R/L 2525-038	G	25	25	26	150	32.00	12	38 - 48	✓	✓
TN-F00-G19R/L 2525-042	G	25	25	26	150	40.00	19	42 - 60	✓	✓
TN-F00-G19R/L 2525-054	G	25	25	26	150	40.00	19	54 - 75	✓	✓
TN-F00-G22R/L 2525-067	G	25	25	26	150	43.00	22	67 - 100	✓	✓
TN-F00-G22R/L 2525-090	G	25	25	26	150	43.00	22	90 - 160	✓	✓
TN-F00-G22R/L 2525-130	G	25	25	26	150	43.00	22	130 - 300	✓	✓
TN-F00-H20R/L 2525-040	H	25	25	26	150	42.00	20	40 - 60	✓	✓
TN-F00-H20R/L 2525-052	H	25	25	26	150	42.00	20	52 - 72	✓	✓
TN-F00-H25R/L 2525-064	H	25	25	26	150	47.00	25	64 - 100	✓	✓
TN-F00-H25R/L 2525-092	H	25	25	26	150	47.00	25	92 - 140	✓	✓
TN-F00-H25R/L 2525-132	H	25	25	26	150	47.00	25	132 - 230	✓	✓
TN-F00-H25R/L 2525-220	H	25	25	26	150	47.00	25	220 - 500	✓	✓
TN-F00-H25R/L 2525-300	H	25	25	26	150	47.00	25	300 - ∞	✓	✓
TN-F00-J25R/L 2525-060	J	25	25	26	150	48.00	25	60 - 95	✓	✓
TN-F00-J25R/L 2525-085	J	25	25	26	150	48.00	25	85 - 130	✓	✓
TN-F00-J25R/L 2525-120	J	25	25	26	150	48.00	25	120 - 180	✓	✓
TN-F00-J25R/L 2525-175	J	25	25	26	150	48.00	25	175 - 500	✓	✓
TN-F00-K25R/L 2525-058	K	25	25	26	150	49.00	25	58 - 100	✓	✓
TN-F00-K25R/L 2525-088	K	25	25	26	150	49.00	25	88 - 180	✓	✓
TN-F00-K25R/L 2525-168	K	25	25	26	150	49.00	25	168 - 400	✓	✓

Spare parts

Seat size		
G	3212 012-310	5680 043-15
H	5512 044-01	5680 043-17
J	5512 044-01	5680 043-17
K	5512 044-01	5680 043-17

(1) Can be limited by the insert's length "l_1"

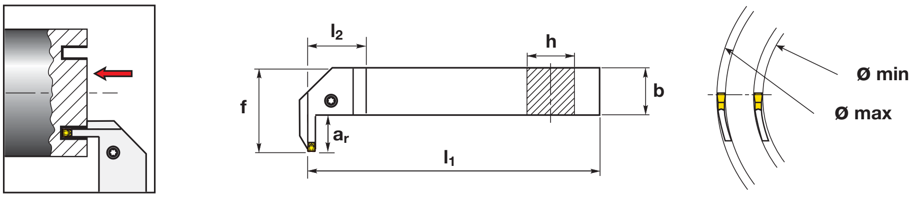


✓: Article which can be ordered
Ordering example: TN-F00-G12R 2525-034

TURNING

TOOLHOLDERS

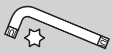
TN-F90 - 90° Face grooving



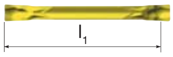
Right hand shown

Reference	Seat size	Dimensions (mm)							Left hand	Right hand
		h	b	f	l_1	l_2	a_r (1)	Ø min - Ø max		
TN-F90-H20R/L 2525-064	H	25	25	47	150	26.90	20	64 - 100	✓	✓
TN-F90-H20R/L 2525-092	H	25	25	47	150	26.90	20	92 - 140	✓	✓
TN-F90-H20R/L 2525-132	H	25	25	47	150	26.90	20	132 - 230	✓	✓

Spare parts

Seat size		
40	5512 044-01	5680 043-17

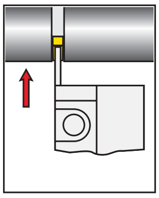
(1) Can be limited by the insert's length "l_1"

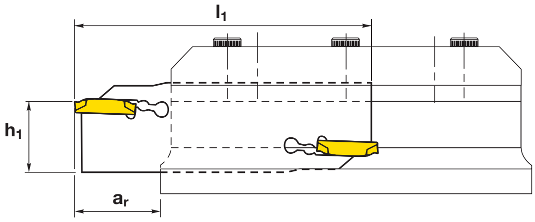


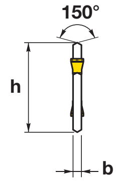
✓: Article which can be ordered
Ordering example: TN-F90-H20R 2525-064

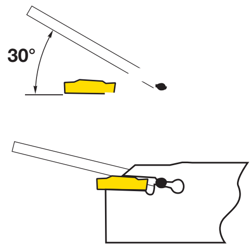
BLADES AND TOOL BLOCKS

TN-B02 - Double-ended blade







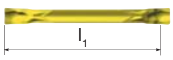


Reference	Seat size	Dimensions (mm)						Neutral
		Seat width	h	h_1	b	l_1	a_r (1)	
TN-B02-D15N 21	D	1.19	25.91	21	2.36	100	15.00	✓
TN-B02-D15N 25	D	1.19	31.90	25	2.01	150	15.00	✓
TN-B02-E15N 21	E	1.50	25.91	21	2.36	100	15.00	✓
TN-B02-E20N 25	E	1.50	31.90	25	2.01	150	20.00	✓
TN-B02-F30N 21	F	2.01	25.91	21	2.01	100	30.00	✓
TN-B02-F55N 25	F	2.01	31.90	25	2.01	150	55.00	✓
TN-B02-G30N 21	G	2.36	25.91	21	2.36	100	30.00	✓
TN-B02-G55N 25	G	2.36	31.90	25	2.36	150	55.00	✓
TN-B02-H55N 25	H	3.35	31.90	25	3.35	150	55.00	✓
TN-B02-J55N 25	J	4.34	31.90	25	4.34	150	55.00	✓
TN-B02-K55N 25	K	5.36	31.90	25	5.36	150	55.00	✓

Optional spare parts

Seat size	
D	5680 058-02
E	5680 058-02
F	5680 058-02
G	5680 058-02
H	5680 058-02
J	5680 058-02
K	5680 058-02

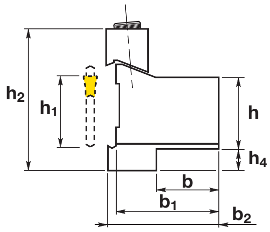
(1) Can be limited by the insert's length "l_1"

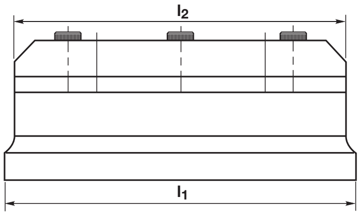


✓: Article which can be ordered
Ordering example: TN-B02-D15N 21

BLADES AND TOOL BLOCKS

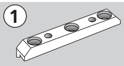
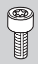
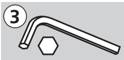
Tools blocks for blade



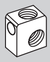
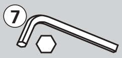


Reference	Dimensions (mm)									Neutral
	h	b	h_1	h_2	h_4	b_1	b_2	l_1	l_2	
151.2-2020-21 M	20	20	21.4	45.5	10	33.4	38	80	70	✓
151.2-2520-21	25	20	21.4	45.5	10	33.4	38	80	70	✓
151.2-2020-25	20	20	25	52.5	10	33.4	38	120	110	✓
151.2-2520-25	25	20	25	52.5	10	33.4	38	120	110	✓
151.2-3232-25	32	32	25	54.5	5	45.4	50	120	110	✓
151.2-3232-45	32	31.6	45	82.5	29.7	45	52	160	150	✓
151.2-4040-45	40	39.6	45	82.5	21.7	53	60	160	150	✓

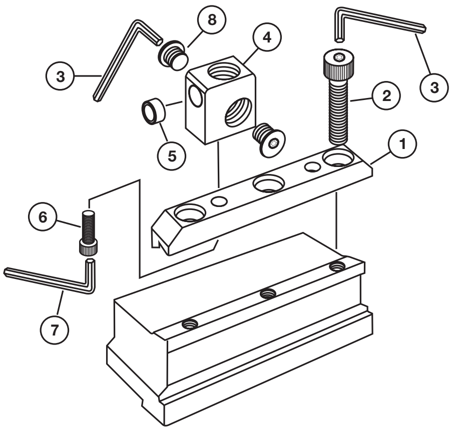
Spare parts

Reference	1 	2 	3 
151.2- ... -21	5412 120-01	3212 010-410	3021 010-060
151.2- ... -25	5412 120-02	3212 010-411	3021 010-060
151.2- ... -45	5412 120-03	3212 010-412	3021 010-060

Optional spare parts

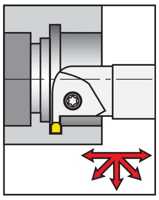
Reference	4 	5 	6 	7 	8 
151.2- ... -21	5691 050-011	5691 029-02	3212 010-358	3021 010-050	5519 055-01
151.2- ... -25	5691 050-011	5691 029-02	3212 010-358	3021 010-050	5519 055-01
151.2- ... -45	5691 050-011	5691 029-02	3212 010-358	3021 010-050	5519 055-01

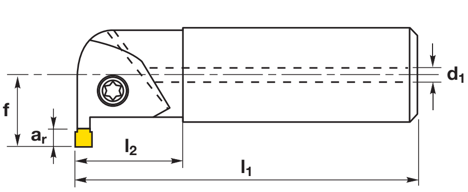
✓: Article which can be ordered
Ordering example: 151.2-2020-21 M

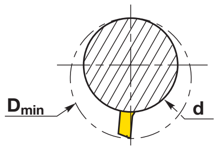


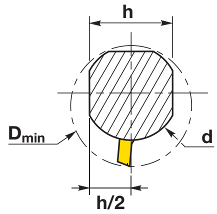
BORING BARS

TN-H90 - Grooving





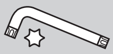




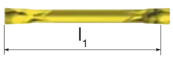
Right hand shown

Reference	Seat size	Dimensions (mm)								Left hand	Right hand
		d	D_{min}	f	l_1	l_2	h	d_1	a_r		
TN-H90-E05R/L 20	E	20	32	15.25	180	30	-	6	5.00	✓	✓
TN-H90-E07R/L 25	E	25	32	19.75	200	35	-	9	7.00	✓	✓
TN-H90-E09R/L 32	E	32	40	25.50	250	45	30	9	9.00	✓	✓
TN-H90-G06R/L 20	G	20	32	15.25	180	30	-	6	5.00	✓	✓
TN-H90-G07R/L 25	G	25	32	19.75	200	35	-	9	7.00	✓	✓
TN-H90-G09R/L 32	G	32	40	25.50	250	45	30	9	9.00	✓	✓
TN-H90-H07R/L 25	H	25	32	19.75	200	35	-	9	7.00	✓	✓
TN-H90-H10R/L 32	H	32	40	26.50	250	45	30	9	10.00	✓	✓
TN-H90-H11R/L 40	H	40	50	31.00	300	55	37	12	11.00	✓	✓

Spare parts

Seat size	d		
E	20	5512 031-03	5680 043-13
E	25-32	3212 012-259	5680 043-14
G	20	5512 031-03	5680 043-13
G	25-32	3212 012-309	5680 043-15
H	25	3212 012-309	5680 043-15
H	32-40	3212 012-359	5680 043-17

(1) Can be limited by the insert's length "l_1"



✓: Article which can be ordered
Ordering example: TN-H90-E05R 20

INSERTS AND TOOLS DESCRIPTION

SAF-CUT inserts

N2

Cutt-off

- Optimal parting and light grooving geometry
- Minimizes pips and burrs when parting bars and tubes
- Excellent for stainless, low carbon steel, high temp alloys

N3

Fine grooving / Parting

- Good chip control and moderate cutting forces
- Recommended for tubes and stainless steel

N4

General grooving / Parting

- Strong geometry ideal for interrupted cuts
- For parting-off steel and cast irons

N5

Light grooving / Parting

- Alternate light grooving and parting geometry
- Generates low cutting forces
- For stainless steels, ductile and work hardening materials

G4

Precision grooving

- Excellent repeatability due to tight tolerances
- Low cutting forces

G43

Face grooving - Precision

- Metric & circlips grooves
- Low cutting forces

P4

Radius grooving / Profiling

- Designed for radius grooving and profiling on all materials
- Generates excellent surface finish

U4

Undercutting grooves

- For turning of undercuts and reliefs
- Increased clearance angle permits undercutting

SAF-CUT tools

151.20

Reinforced spring clamp parting toolholder

- Reinforced clamping for better insert seating and lower vibration
- Small shanks for lower horsepower machines

151.22

Grooving, turning and profiling toolholder

- Short reach for minimal deflection in turning and profiling
- Screw clamp for secure insert seating and lower vibration

151.23

Deep grooving and parting toolholder

- Excellent for deep grooving operation
- Screw clamp for secure insert seating and lower vibration

S 151.22

Grooving and undercut turning toolholder

- Designed for undercutting and turning at 45°

151.2

Double-ended parting blades

- Ideal for parting-off bars and tubes
- Economical system for many applications

151.37

Face grooving toolholders

- Available 0° & 90°
- Screw clamp for secure insert seating and lower vibration

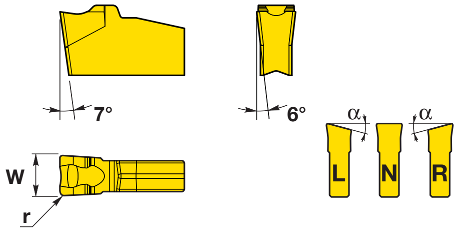
AG 151.32

Boring bars for grooving, turning & profiling

- All internal operations
- Screw clamp for secure insert seating and lower vibration

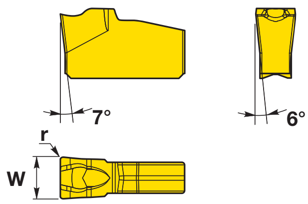
INSERTS

LCMX-R/N/L2 - Parting / Light grooving



Reference	Seat size	Dimensions (mm)			Grades	
		W	r	α	5735	5820
LCMX 204200-N2	20	2.10	0.20	0°	✓	✓
LCMX 204212-L2	20	2.10	0.10	12°	✓	
LCMX 204212-R2	20	2.10	0.10	12°	✓	
LCMX 255600-N2	25	2.60	0.20	0°		✓
LCMX 255605-L2	25	2.60	0.10	5°		✓
LCMX 255605-R2	25	2.60	0.10	5°		✓
LCMX 255612-L2	25	2.60	0.10	12°		✓
LCMX 255612-R2	25	2.60	0.10	12°		✓
LCMX 305600-N2	30	3.13	0.20	0°	✓	✓
LCMX 305605-L2	30	3.13	0.10	5°		✓
LCMX 305605-R2	30	3.13	0.10	5°		✓
LCMX 305612-L2	30	3.13	0.10	12°		✓
LCMX 305612-R2	30	3.13	0.10	12°		✓
LCMX 405600-N2	40	4.10	0.20	0°	✓	✓

LCMX-N3 - General grooving / Parting

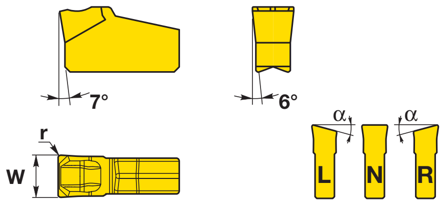


Reference	Seat size	Dimensions (mm)		Grades	
		W	r	5735	5820
LCMX 204200-N3	20	2.13	0.20	✓	✓
LCMX 305600-N3	30	3.13	0.20	✓	✓
LCMX 407100-N3	40	4.13	0.20	✓	✓
LCMX 507300-N3	50	5.13	0.20		✓

✓: Article which can be ordered
Ordering example: LCMX 20 42 00-N2 5735

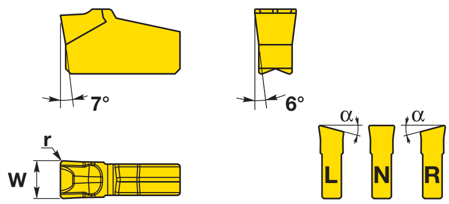
INSERTS

LCMX-R/N/L4 - Heavy grooving / Parting



Reference	Seat size	Dimensions (mm)			Grades		
		W	r	α	5735	5820	N
LCMX 255600-N4	25	2.63	0.30	0°	✓	✓	✓
LCMX 305600-N4	30	3.13	0.30	0°	✓	✓	✓
LCMX 305605-L4	30	3.13	0.30	5°	✓	✓	
LCMX 305605-R4	30	3.13	0.30	5°	✓	✓	
LCMX 407100-N4	40	4.13	0.30	0°	✓	✓	✓
LCMX 407105-L4	40	4.13	0.30	5°	✓	✓	
LCMX 407105-R4	40	4.13	0.30	5°	✓	✓	
LCMX 507300-N4	50	5.13	0.30	0°	✓	✓	✓
LCMX 608800-N4	60	6.13	0.30	0°	✓	✓	
LCMX 808800-N4	80	8.13	0.60	0°	✓	✓	

LCMX-R/N/L5 - Light grooving / Parting

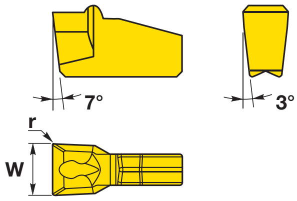


Reference	Seat size	Dimensions (mm)			Grades	
		W	r	α	5735	5820
LCMX 305600-N5	30	3.13	0.20x45°	0°	✓	✓
LCMX 305608-L5	30	3.13	0.30	8°	✓	✓
LCMX 305608-R5	30	3.13	0.20x45°	8°	✓	✓
LCMX 305615-L5	30	3.13	0.20x45°	15°	✓	✓
LCMX 305615-R5	30	3.13	0.20x45°	15°	✓	✓
LCMX 407100-N5	40	4.13	0.20x45°	0°	✓	✓
LCMX 407115-L5	40	4.13	0.30	15°	✓	✓
LCMX 407115-R5	40	4.13	0.20x45°	15°	✓	✓

✓: Article which can be ordered
Ordering example: LCMX 25 56 00-N4 5735

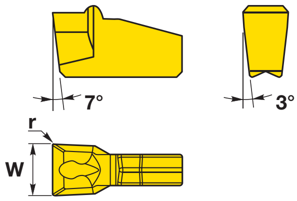
INSERTS

LCGX-G4 - Precision grooving



Reference	Seat size	Dimensions (mm)			Grades		
		W	r	for circlips	5735	5820	N
LCGX 184200-G4	18	1.85	0.10	1.85	✓		
LCGX 204200-G4	20	2.00	0.20		✓	✓	
LCGX 214200-G4	21	2.15	0.15	2.15	✓		
LCGX 265600-G4	26	2.65	0.15	2.65	✓		
LCGX 305600-G4	30	3.00	0.20		✓	✓	
LCGX 405600-G4	40	4.00	0.20		✓	✓	
LCGX 507100-G4	50	5.00	0.40		✓	✓	
LCGX 607300-G4	60	6.00	0.20		✓	✓	✓
LCGX 808800-G4	80	8.00	0.20		✓		

LCGX-G43 - Precision face grooving



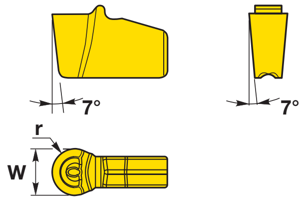
These inserts are only suitable with tools F 151.37, G 151.37 and AG 151.32

Reference	Seat size	Dimensions (mm)			Grades		
		W	r	for circlips	5735	5820	N
LCGX 183300-G43	20	1.85	0.10	1.85	✓		
LCGX 203300-G43	20	2.00	0.20		✓		
LCGX 213300-G43	20	2.15	0.15	2.15	✓		
LCGX 264000-G43	25	2.65	0.15	2.65	✓		
LCGX 304000-G43	30	3.00	0.20		✓		
LCGX 314000-G43	30	3.15	0.15	3.15	✓		
LCGX 405000-G43	40	4.00	0.20		✓		

✓: Article which can be ordered
Ordering example: LCGX 184200-G4 5735

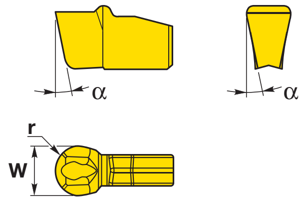
INSERTS

LCGX-P4 - Radius grooving / Profiling



Reference	Seat size	Dimensions (mm)		Grades		
		W	r	5735	5820	N
LCGX 305600-P4	30	3.00	1.50	✓	✓	
LCGX 407100-P4	40	4.00	2.00	✓	✓	
LCGX 507100-P4	50	5.00	2.50	✓		
LCGX 607300-P4	60	6.00	3.00	✓		✓
LCGX 808800-P4	80	8.00	4.00	✓		✓

L.GX-U4 - Undercut grooving



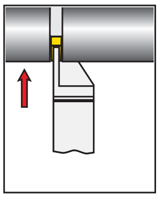
Reference	Seat size	Dimensions (mm)		Grades	
		W	r	5735	5820
LBGX 204200-U4	20	2.00	1.00	✓	✓
LCGX 305600-U4	30	3.00	1.50	✓	✓

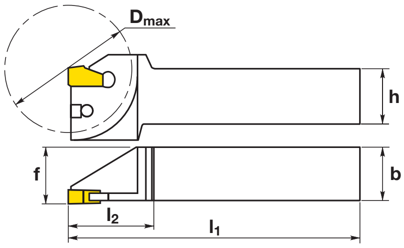
✓: Article which can be ordered
Ordering example: LCGX 305600-P4 5735

TURNING

TOOLHOLDERS

151.20 - Grooving

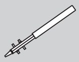




Right hand shown

Reference	Seat size	Dimensions (mm)						Left hand	Right hand
		h	b	f	l_1	l_2	D_{max}		
R/L 151.20-1212-20	20	12	12	12.25	150	20.50	30.00	✓	✓
R/L 151.20-1616-20	20	16	16	16.25	150	20.50	30.00	✓	✓
R/L 151.20-1212-25	25	12	12	12.25	150	20.50	30.00	✓	✓
R/L 151.20-1616-25	25	16	16	16.25	150	20.50	30.00	✓	✓
R/L 151.20-2020-25	25	20	20	20.25	125	26.00	35.00	✓	✓
R/L 151.20-1616-30	30	16	16	16.30	100	26.00	35.00	✓	✓
R/L 151.20-2020-30	30	20	20	20.25	125	26.00	35.00	✓	✓
R/L 151.20-2020-30A	30	20	20	20.25	125	31.80	45.00	✓	✓
R/L151.20-2525-30A	30	25	25	25.30	150	31.80	45.00	✓	✓
R/L 151.20-2020-40	40	20	20	20.25	125	31.80	45.00	✓	✓

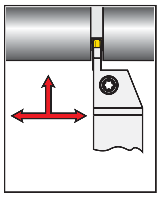
Optional spare parts

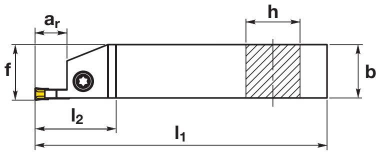
Seat size	
20	5680 057-021
25	5680 057-021
30	5680 057-021
40	5680 057-011

✓: Article which can be ordered
Ordering example: R 151.20-1212-20

TOOLHOLDERS

151.22 - Grooving / Profiling

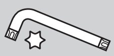




Right hand shown

Reference	Seat size	Dimensions (mm)						Left hand	Right hand
		h	b	f	l_1	l_2	a_r		
R/L F 151.22-1616-20	20	16	16	16.10	100	23	8	✓	✓
R/L F 151.22-2020-20	20	20	20	20.10	125	23	8	✓	✓
R/L F 151.22-2525-20	20	25	25	25.10	150	23	8	✓	✓
R/L F 151.22-2020-25	25	20	20	20.40	125	27	10	✓	✓
R/L F 151.22-2525-25	25	25	25	25.40	150	27	10	✓	✓
R/L F 151.22-1616-30	30	16	16	16.70	100	27	10	✓	✓
R/L F 151.22-2020-30	30	20	20	20.70	125	27	10	✓	✓
R/L F 151.22-2525-30	30	25	25	25.70	150	27	10	✓	✓
R/L F 151.22-2020-40	40	20	20	20.70	125	31	13	✓	✓
R/L F 151.22-2525-40	40	25	25	25.70	150	31	13	✓	✓
R/L F 151.22-2525-50	50	25	25	25.70	150	31	13	✓	✓
R/L F 151.22-2525-60	60	25	25	26.20	150	37	16	✓	✓

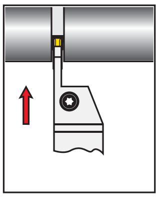
Spare parts

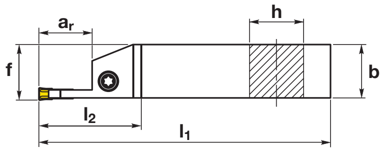
Seat size		
20	3212 012-259	5680 043-14
25	3212 012-259	5680 043-14
30	3212 012-259	5680 043-14
40	3212 012-360	5680 043-17
50	3212 012-360	5680 043-17
60	3212 012-360	5680 043-17

✓: Article which can be ordered
Ordering example: R F 151.22-1616-20

TOOLHOLDERS

151.23 - Deep grooving / Parting

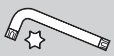




Right hand shown

Reference	Seat size	Dimensions (mm)						Left hand	Right hand
		h	b	f	l_1	l_2	a_r		
R/L F 151.23-1616-20 M1	20	16	16	17	100	39	15	✓	✓
R/L F 151.23-2020-20 M1	20	20	20	21	125	39	15	✓	✓
R/L F 151.23-2525-20 M1	20	25	25	26	150	39	15	✓	✓
R/L F 151.23-1616-25 M1	25	16	16	17	100	40	20	✓	✓
R/L F 151.23-2020-25 M1	25	20	20	21	125	40	20	✓	✓
R/L F 151.23-2525-25 M1	25	25	25	26	150	40	20	✓	✓
R/L F 151.23-1616-30 M1	30	16	16	17	100	41	20	✓	✓
R/L F 151.23-2020-30 M1	30	20	20	21	125	41	20	✓	✓
R/L F 151.23-2525-30 M1	30	25	25	26	150	41	20	✓	✓
R/L F 151.23-3225-30 M1	30	32	25	26	170	41	20	✓	✓
R/L F 151.23-2020-40 M1	40	20	20	21	125	47	25	✓	✓
R/L F 151.23-2525-40 M1	40	25	25	26	150	47	25	✓	✓
R/L F 151.23-3225-40 M1	40	32	25	26	170	47	20	✓	✓
R/L F 151.23-2525-50 M1	50	25	25	26	150	57	32	✓	✓
R/L F 151.23-3225-50 M1	50	32	25	26	170	57	32	✓	✓
R/L F 151.23-2525-60 M1	60	25	25	26	150	57	32	✓	✓
R/L F 151.23-3225-60 M1	60	32	25	26	170	57	32	✓	✓

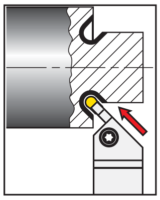
Spare parts

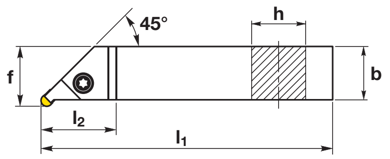
Seat size		
20	3212 012-259	5680 043-14
25	3212 012-259	5680 043-14
30	3212 012-310	5680 043-15
40	3212 012-360	5680 043-17
50	3212 012-360	5680 043-17
60	3212 012-360	5680 043-17

✓: Article which can be ordered
Ordering example: R F 151.23-1616-20 M1

TOOLHOLDERS

S 151.22 - Undercut turning





Right hand shown

Reference	Seat size	Dimensions (mm)					Left hand	Right hand
		h	b	f	l_1	l_2		
R/L S 151.22-2525-20	20	25	25	25.30	150	24	✓	✓
R/L S 151.22-2525-30	30	25	25	25.80	150	28	✓	✓
R/L S 151.22-3225-60	60	32	25	26.40	170	37		✓

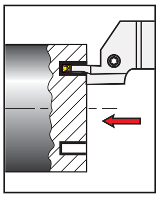
Spare parts

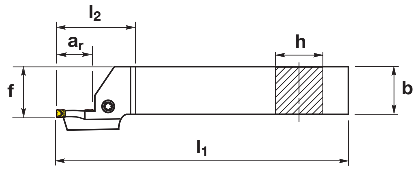
Seat size		
20	3212 012-259	5680 043-14
30	3212 012-259	5680 043-14
60	3212 012-360	5680 043-17

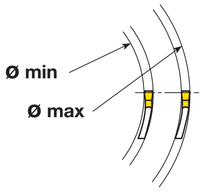
✓: Article which can be ordered
Ordering example: R S 151.22-2525-20

TOOLHOLDERS

F 151.37 - Face grooving - 0°





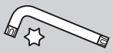


Right hand shown

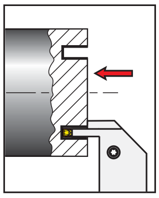
Reference	Seat size	Dimensions (mm)						Left hand	Right hand
		h	b	f	l_1	l_2	a_r		
R/L F 151.37-2525-024B25	25	25	25	26	150	37.7	8.7	✓	✓
R/L F 151.37-2525-027B30	30	25	25	26	150	44.7	8.7	✓	✓

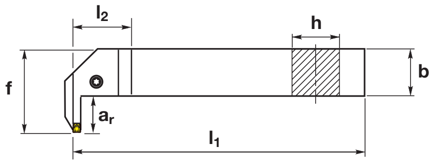
These tools only allows inserts LCGX-G43

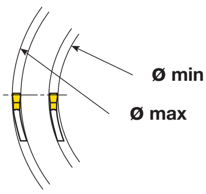
Spare parts

Seat size		
25 - 30	3212 012-360	5680 043-17

G 151.37 - Face grooving - 90°





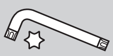


Right hand shown

Reference	Seat size	Dimensions (mm)						Left hand	Right hand
		h	b	f	l_1	l_2	a_r		
R/L G 151.37-2525-027B30	30	25	25	47	150	26	8.7	✓	✓

These tools only allows inserts LCGX-G43

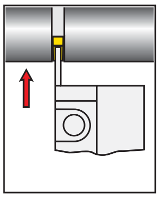
Spare parts

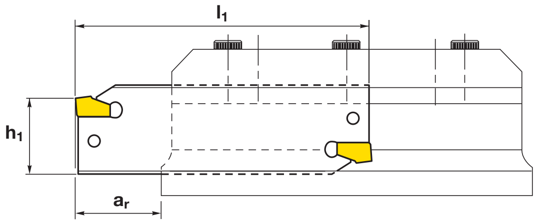
Seat size		
30	3212 012-360	5680 043-17

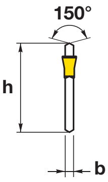
✓: Article which can be ordered
Ordering example: R F 151.37-2525-024B25

BLADES AND TOOL BLOCKS

151.2 - Double-ended blade

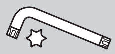




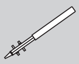


Reference	Seat size	Dimensions (mm)						Neutral
		Seat width	h	h_1	b	l_1	a_r	
151.2-21-20	20	1.50	26	21	1.50	110	35	✓
151.2-21-25	25	2.00	26	21	2.01	110	35	✓
151.2-25-25	25	2.00	32	25	2.01	150	60	✓
151.2-21-30	30	2.36	26	21	2.36	110	35	✓
151.2-25-30	30	2.36	32	25	2.36	150	60	✓
151.2-21-40	40	3.35	26	21	3.35	110	35	✓
151.2-25-40	40	3.35	32	25	3.35	150	60	✓
151.2-25-50	50	4.34	32	25	4.34	150	60	✓
151.2-25-60	60	5.36	32	25	5.36	150	60	✓
151.2-45-80	80	7.15	52.5	45	7.15	250	100	✓

Spare parts

Seat size		
80	3212 012-259	5680 043-14

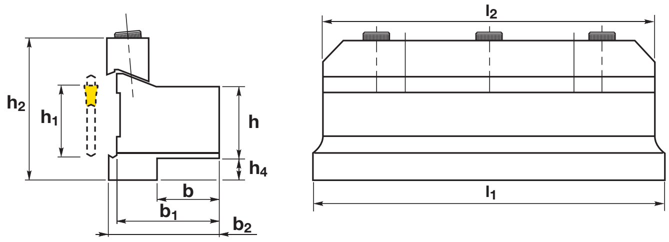
Optional spare parts

Seat size	
20	5680 057-021
25	5680 057-021
30	5680 057-021
40	5680 057-011
50	5680 057-011
60	5680 057-011

✓: Article which can be ordered
Ordering example: 151.2-21-20

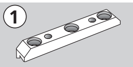
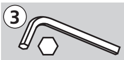
BLADES AND TOOL BLOCKS

151.2 - Tools blocks for blade

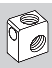
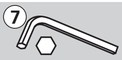


Reference	Dimensions (mm)									Neutral
	h	b	h_1	h_2	h_4	b_1	b_2	l_1	l_2	
151.2-2020-21 M	20	20	21.4	45.5	10	33.4	38	80	70	✓
151.2-2520-21	25	20	21.4	45.5	10	33.4	38	80	70	✓
151.2-2020-25	20	20	25	52.5	10	33.4	38	120	110	✓
151.2-2520-25	25	20	25	52.5	10	33.4	38	120	110	✓
151.2-3232-25	32	32	25	54.5	5	45.4	50	120	110	✓
151.2-3232-45	32	31.6	45	82.5	29.7	45	52	160	150	✓
151.2-4040-45	40	39.6	45	82.5	21.7	53	60	160	150	✓

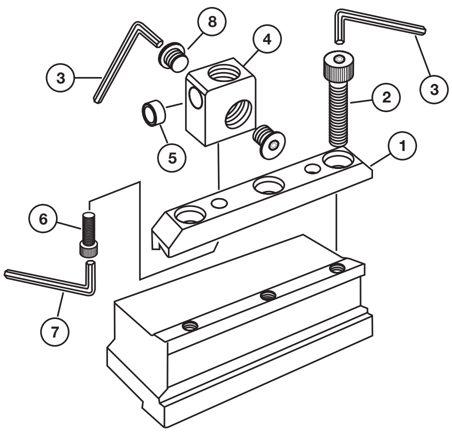
Spare parts

Reference	1 	2 	3 
151.2- ... -21	5412 120-01	3212 010-410	3021 010-060
151.2- ... -25	5412 120-02	3212 010-411	3021 010-060
151.2- ... -45	5412 120-03	3212 010-412	3021 010-060

Optional spare parts

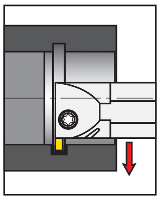
Reference	4 	5 	6 	7 	8 
151.2- ... -21	5691 050-011	5691 029-02	3212 010-358	3021 010-050	5519 055-01
151.2- ... -25	5691 050-011	5691 029-02	3212 010-358	3021 010-050	5519 055-01
151.2- ... -45	5691 050-011	5691 029-02	3212 010-358	3021 010-050	5519 055-01

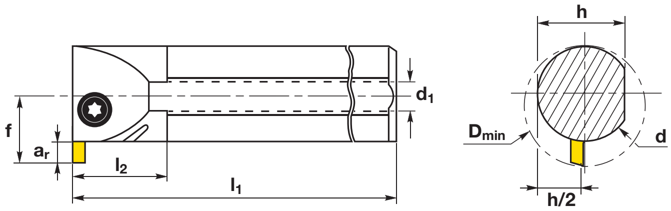
✓: Article which can be ordered
Ordering example: 151.2-2020-21 M



BORING BARS

AG 151.32 - Grooving / Turning / Profiling



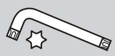


Right hand shown

Reference	Seat size	Dimensions (mm)								Left hand	Right hand
		d	D_{min}	f	l_1	l_2	h	d_1	a_r		
R/L AG 151.32-16M-20	20	16	20	11.5	150	24	-	6	3.5	✓	✓
R/L AG 151.32-20Q-25	25	20	25	14.6	180	30	-	6	4.6	✓	✓
R/L AG 151.32-25R-30	30	25	32	18.5	200	32.2	-	8.5	6.0	✓	✓
R/L AG 151.32-32S-40	40	32	40	23.1	250	36.3	30	8.5	7.1	✓	✓

These tools only allows inserts LCGX-G43

Spare parts

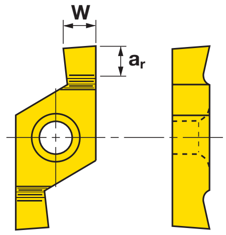
Seat size		
20-30	5512 031-03	5680 043-13
40	3212 012-360	5680 043-17

✓: Article which can be ordered
Ordering example: R AG 151.32-16M-20

TURNING

X61 INSERTS

X61 L - Light grooving



Reference	Seat size	Dimensions (mm)			5735	5820	SY3
		For circlips groove	W	a_r			
X61 0602-080 L	6	0.80	0.85	0.80	✓	✓	
X61 0602-090 L	6	0.90	0.95	0.80	✓	✓	
X61 0602-100 L	6	1.00	1.05	0.80	✓	✓	
X61 0602-110 L	6	1.10	1.15	1.20	✓	✓	✓
X61 0602-130 L	6	1.30	1.35	1.40	✓	✓	✓
X61 0602-150 L	6	1.50	1.55	1.60	✓		
X61 0602-160 L	6	1.60	1.65	1.70	✓	✓	✓
X61 0602-185 L	6	1.85	1.90	2.00	✓	✓	✓
X61 0602-200 L	6	2.00	2.05	2.20		✓	
X61 0602-215 L	6	2.15	2.20	2.40	✓	✓	✓
X61 0602-250 L	6	2.50	2.55	2.60		✓	
X61 0602-265 L	6	2.65	2.70	2.70	✓	✓	✓
X61 0602-300 L	6	3.00	3.05	3.00	✓	✓	✓
X61 0602-315 L	6	3.15	3.20	3.00	✓	✓	✓
X61 09T3-415 L	9	4.15	4.20	3.00			✓
X61 09T3-550 L	9	5.50	5.55	5.50			✓

SET X61-L

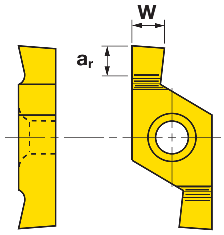
Reference		Quantity of inserts	SY3
SET X61-06-L		8	✓
contents:	X61 0602-110 L	1	
	X61 0602-130 L	1	
	X61 0602-160 L	1	
	X61 0602-185 L	1	
	X61 0602-215 L	1	
	X61 0602-265 l	1	
	X61 0602-300 L	1	
	X61 0602-315 L	1	

✓: Article which can be ordered
Ordering example: X61 0602-080 L 5735

TURNING

X61 INSERTS

X61 R - Light grooving



Reference	Seat size	Dimensions (mm)			5735	5820	SY3
		For circlips groove	W	a_r			
X61 0602-080 R	6	0.80	0.85	0.80	✓	✓	
X61 0602-090 R	6	0.90	0.95	0.80	✓	✓	
X61 0602-100 R	6	1.00	1.05	0.80	✓	✓	
X61 0602-110 R	6	1.10	1.15	1.20	✓	✓	✓
X61 0602-130 R	6	1.30	1.35	1.40	✓	✓	✓
X61 0602-150 R	6	1.50	1.55	1.60	✓		
X61 0602-160 R	6	1.60	1.65	1.70	✓	✓	✓
X61 0602-185 R	6	1.85	1.90	2.00	✓	✓	✓
X61 0602-200 R	6	2.00	2.05	2.20		✓	
X61 0602-215 R	6	2.15	2.20	2.40	✓	✓	✓
X61 0602-250 R	6	2.50	2.55	2.60		✓	
X61 0602-265 R	6	2.65	2.70	2.70	✓	✓	✓
X61 0602-300 R	6	3.00	3.05	3.00	✓	✓	✓
X61 0602-315 R	6	3.15	3.20	3.00	✓	✓	✓
X61 09T3-415 R	9	4.15	4.20	3.00			✓
X61 09T3-515 R	9	5.15	5.20	5.50			✓
X61 09T3-550 R	9	5.50	5.55				✓

SET X61-R

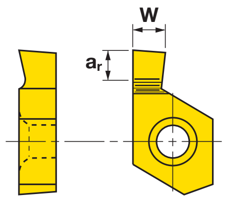
Reference		Quantity of inserts	SY3
SET X61-06-R		8	✓
contents:	X61 0602-110 R	1	
	X61 0602-130 R	1	
	X61 0602-160 R	1	
	X61 0602-185 R	1	
	X61 0602-215 R	1	
	X61 0602-265 R	1	
	X61 0602-300 R	1	
	X61 0602-315 R	1	

✓: Article which can be ordered
Ordering example: X61 0602-080 R 5735

TURNING

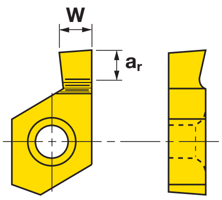
X61 INSERTS

X61-R1 - Light grooving - One edge



Reference	Seat size	Dimensions (mm)			5735
		For circlips groove	W	a_r	
X61 0602-080 R1	6	0.80	0.85	0.65	✓
X61 0602-090 R1	6	0.90	0.95	0.80	✓
X61 0602-110 R1	6	1.10	1.15	1.20	✓
X61 0602-130 R1	6	1.30	1.35	1.40	✓
X61 0602-160 R1	6	1.60	1.65	1.70	✓
X61 0602-185 R1	6	1.85	1.90	2.00	✓
X61 0602-215 R1	6	2.15	2.20	2.20	✓

X61-L1 - Light grooving - One edge

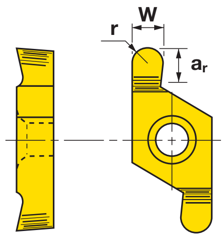


Reference	Seat size	Dimensions (mm)			5735
		For circlips groove	W	a_r	
X61 0602-080 L1	6	0.80	0.85	0.65	✓
X61 0602-090 L1	6	0.90	0.95	0.80	✓
X61 0602-110 L1	6	1.10	1.15	1.20	✓
X61 0602-130 L1	6	1.30	1.35	1.40	✓
X61 0602-160 L1	6	1.60	1.65	1.70	✓
X61 0602-185 L1	6	1.85	1.90	2.00	✓
X61 0602-215 L1	6	2.15	2.20	2.20	✓

✓: Article which can be ordered
Ordering example: X61 0602-080 R1 5735

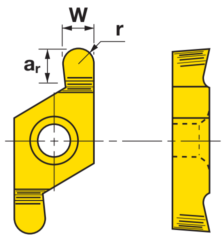
X61 INSERTS

X61-R...R - Radius grooving



Reference	Seat size	Dimensions (mm)				5735	5820	SY3
		For circlips groove	W	r	a_r			
X61 0602-R100 R	6	1.00	2.09	1.00	3.00	✓	✓	✓
X61 0602-R150 R	6	1.50	3.09	1.50	3.00	✓	✓	✓

X61-R...L - Radius grooving

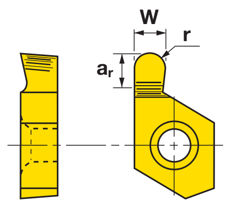


Reference	Seat size	Dimensions (mm)				5735	5820	SY3
		For circlips groove	W	r	a_r			
X61 0602-R100 L	6	1.00	2.09	1.00	3.00	✓	✓	✓
X61 0602-R150 L	6	1.50	3.09	1.50	3.00	✓	✓	

✓: Article which can be ordered
Ordering example: X61 0602-R100 R 5735

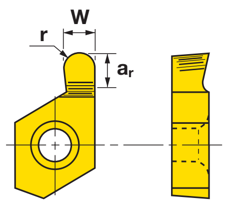
X61 INSERTS

X61-R...R1 - Radius grooving - One edge



Reference	Seat size	Dimensions (mm)				5735
		For circlips groove	W	r	a_r	
X61 0602-R050 R1	6	0.50	1.09	0.50	1.30	✓
X61 0602-R100 R1	6	1.00	2.09	1.00	2.80	✓

X61-R...L1 - Radius Grooving - One edge



Reference	Seat size	Dimensions (mm)				5735
		For circlips groove	W	r	a_r	
X61 0602-R050 L1	6	0.50	1.09	0.50	1.30	✓
X61 0602-R100 L1	6	1.00	2.09	1.00	2.80	✓

SET-X61-MINI R/L

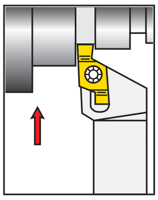
Reference		Quantity of inserts	5735
SET-X61-MINI R		10	✓
contents:	X61 0602-090 R1	2	
	X61 0602-110 R1	2	
	X61 0602-130 R1	1	
	X61 0602-160 R1	1	
	X61 0602-185 R1	1	
	X61 0602-215 R1	1	
	X61 0602-R050 R1	1	
	X61 0602-R100 R1	1	

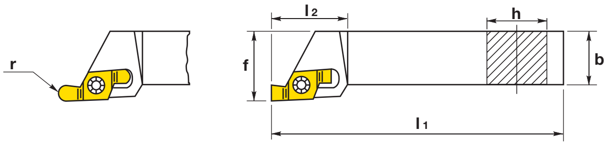
Reference		Quantity of inserts	5735
SET-X61-MINI L		10	✓
contents:	X61 0602-090 L1	2	
	X61 0602-110 L1	2	
	X61 0602-130 L1	1	
	X61 0602-160 L1	1	
	X61 0602-185 L1	1	
	X61 0602-215 L1	1	
	X61 0602-R050 L1	1	
	X61 0602-R100 L1	1	

✓: Article which can be ordered
Ordering example: X61 0602-R050 R1 5735

P61 TOOLHOLDERS

P61.SFR/L - Grooving / Profiling

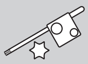
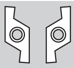
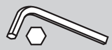




Right hand shown

Reference	Seat size	Dimensions (mm)						Left hand	Right hand
		h	b	f	l_1	l_2	$r_{min-max}$		
P61.SFR/L-1616H-06	6	16	16	20	100	21	1-1.5	✓	✓
P61.SFR/L-2020K-06	6	20	20	25	125	25	1-1.5	✓	✓
P61.SFR/L-2525M-06	6	25	25	32	150	32	1-1.5	✓	✓
P61.SFR/L-2020K-09	9	20	20	25	125	25	2-2.5	✓	
P61.SFR/L-2020M-09	9	25	25	32	150	32	2-2.5	✓	✓

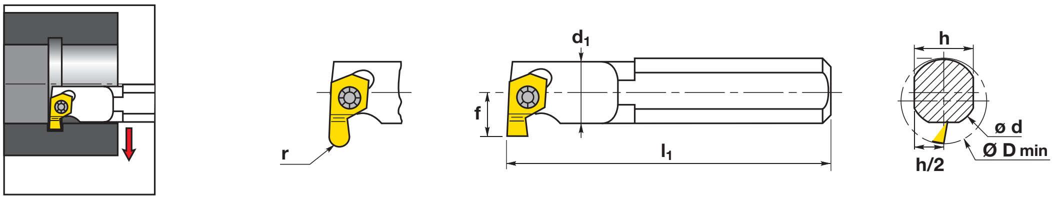
Spare parts

Seat size			R  L		
06	5513 020-03	PT-8001	-	-	-
09	DVF 0573	T9 MD 703	PZ61-09R/L	DVT 0332	MA2-884

✓: Article which can be ordered
Ordering example: P61.SFR-1616H-06

P61 BORING BARS

P61.SGR/L - Grooving - Single edge insert



Right hand shown

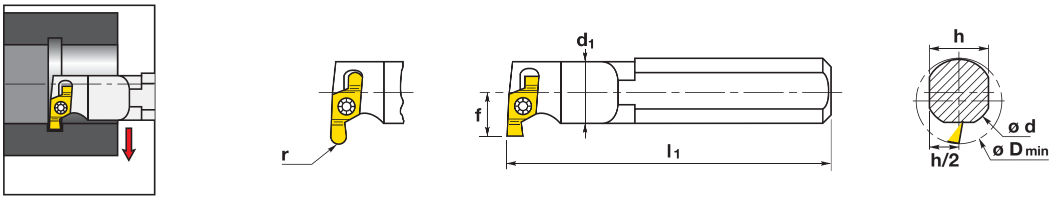
Reference	Seat size	Dimensions (mm)							Left hand	Right hand
		d	D_{min}	f	l_1	h	d_1	$r_{min\text{-}max}$		
P61.SGR/L-0010M-06/1D	6	10	12.50	7.50	150	9	10	0.5 - 1	✓	✓
P61.SGR/L-0012M-06/1	6	12	12.50	7.50	150	11	10	0.5 - 1	✓	✓

Important: Insert holder R with insert L / Insert holder R with insert L

Spare parts

Seat size		
06	5513 020-03	PT-8001

P61.SGR/L - Grooving



Right hand shown

Reference	Seat size	Dimensions (mm)							Left hand	Right hand
		d	D_{min}	f	l_1	h	d_1	$r_{min\text{-}max}$		
P61.SGR/L-0012M-06	6	12	16	9	150	11	11.50	1 - 1.5	✓	✓
P61.SGR/L-A-0016M-06	6	16	20	11	150	15	15.00	1 - 1.5	✓	✓
P61.SGR/L-A-0020P-06	6	20	25	13	170	18	19.00	1 - 1.5	✓	✓
P61.SGR/L-A-0025R-06	6	25	32	17	200	23	24.00	1 - 1.5	✓	✓
P61.SGR/L-A-0032T-06	6	32	40	22	300	30	31.00	1 - 1.5	✓	✓
P61.SGR/L-A-0020P-09	9	20	25	13	170	18	19.00	2-2.5	✓	✓
P61.SGR/L-A-0025R-09	9	25	32	17	200	23	24.00	2-2.5	✓	✓
P61.SGR/L-A-0032T-09	9	32	40	22	300	30	31.00	2-2.5	✓	✓

Important: Insert holder R with insert L / Insert holder R with insert L

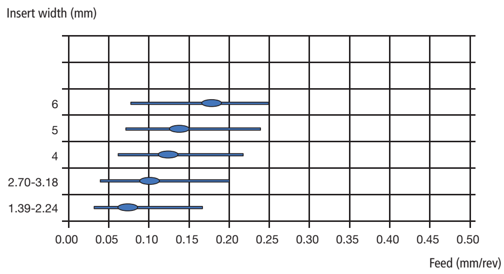
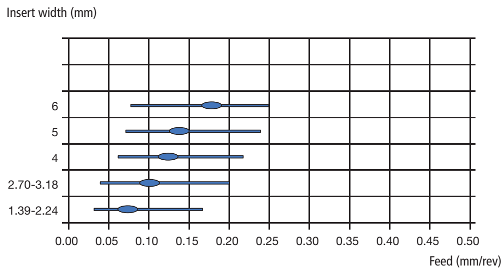
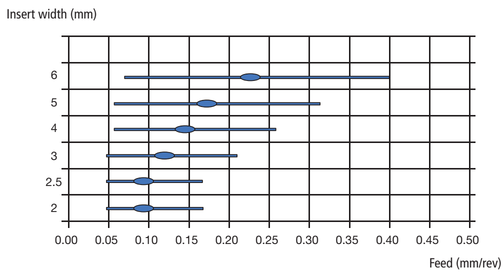
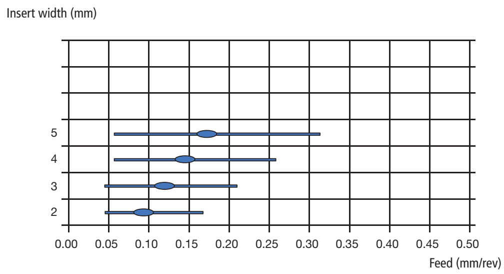
Spare parts

Seat size			R L		
06	5513 020-03	PT-8001	-	-	-
09	DVF 0573	T9 MD 703	PZ61-09R/L	DVT 0332	MA2-884

✓: Article which can be ordered
Ordering example: P61.SGR-0010M-06/1D

INSERT GEOMETRY APPLICATION DATA

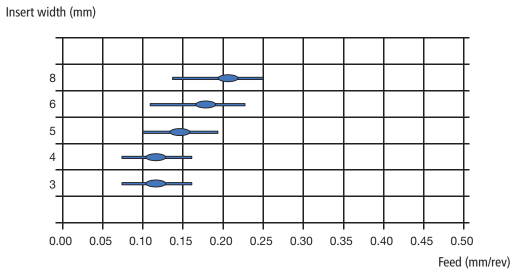
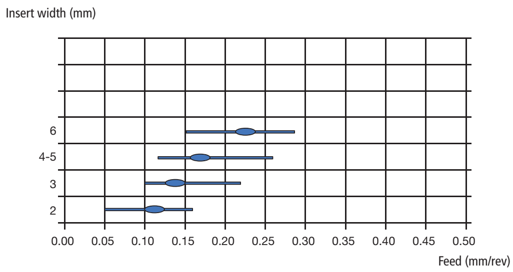
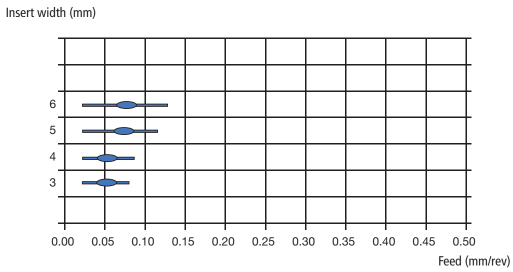
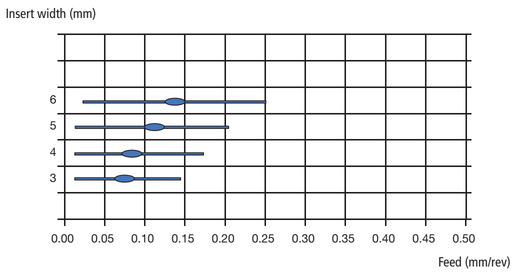
TWIN-SAF system

Insert style	Description	Radial feed rate = Optimum feed rate for most applications	Materials	Application
28 	**Parting/Grooving** Precision ground cutting edge Excellent choice for general grooving and plunge-turning Medium feed rate capability with excellent chip control		P M K S H	**Main application area** Precision grooving at light to medium feed Turning capability up to half of the insert width, with the same feed rate as radial operations
38 	**Parting/Grooving** Precision ground cutting edge Excellent choice for general grooving and plunge-turning Medium feed rate capability with excellent chip control		P M K S H	**Main application area** Precision grooving at light to medium feed Turning capability up to half of the insert width, with the same feed rate as radial operations
48 - 2 edges 	**Parting/Grooving** First choice for parting and grooving Positive geometry eliminates the risk of edge build-up Low cutting forces reduce vibration Recommended for thin walled tubes and small diameter components		P K S H	**Main application area** General machining to finishing operations Light to medium feed rates
48 - 1 edge 	**Parting/Grooving** For deep parting One edge only Same geometry as 48		P K S H	**Main application area** General machining to finishing operations Light to medium feed rates

TURNING

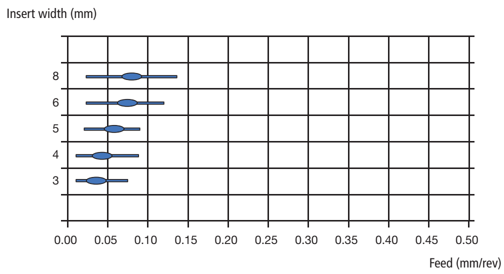
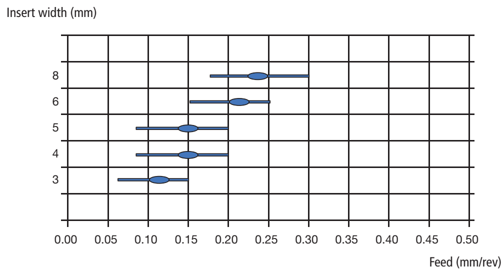
INSERT GEOMETRY APPLICATION DATA

TWIN-SAF system (continued)

Insert style	Description	Radial feed rate (blue ellipse) = Optimum feed rate for most applications	Materials	Application
88 	**Turn-grooving** Excellent choice for general plunge-turning Medium feed rate capability with good chip control		P M K S H	**Main application area** General machining operations Medium feed rates
78 	**Profiling/Radius grooving** First choice for profiling/ turning and radius grooving operations Precision ground cutting edge for low forces and excellent surface finish Strong geometry resists chipping in work hardening materials and interrupted cuts		P M K N S H	**Main application area** General machining to finishing operations Light to medium feed rates
380-CBN 	**Grooving** General and finish grooving of irons and hard materials Good impact resistance Maintains close tolerances and excellent surface finish		K H	**Main application area** General high speed machining in irons Finishing operations in hard materials
380-PCD 	**Grooving** High performance parting and grooving in non-ferrous materials High speed/long tool life for aluminum and non-ferrous materials Excellent in highly abrasive aluminum or other non-ferrous alloys Maintains close tolerances and excellent surface finish		N	**Main application area** General machining to finishing at high speeds

INSERT GEOMETRY APPLICATION DATA

TWIN-SAF system (continued)

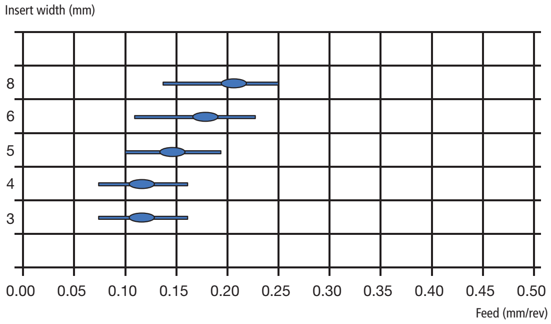
Insert style	Description	Radial feed rate = Optimum feed rate for most applications	Materials	Application
780-CBN 	**Profiling/Radius Grooving** General and finish profiling/ radius grooving of irons and hard materials Good impact resistance Maintains close tolerances and excellent surface finish		K H	**Main application area** General high speed machining in irons. Finishing operations in hard materials
780-PCD 	**Profiling/Radius Grooving** High performance profiling and radius grooving in non-ferrous materials High speed/long tool life for aluminum and non-ferrous materials Excellent in highly abrasive aluminum or other non-ferrous alloys Maintains close tolerances and excellent surface finish		N	**Main application area** General machining to finishing at high speeds

INSERT GEOMETRY APPLICATION DATA

TWIN-SAF system (continued)

- 88

Radial feed rate



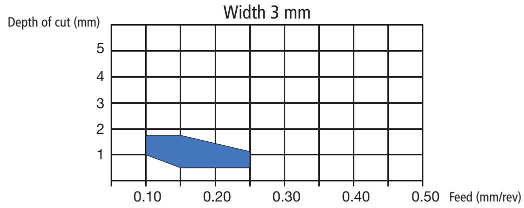
Description
Designed for turn-grooving on all materials
Generates excellent surface finish
Recommended for stainless and heat resistant materials

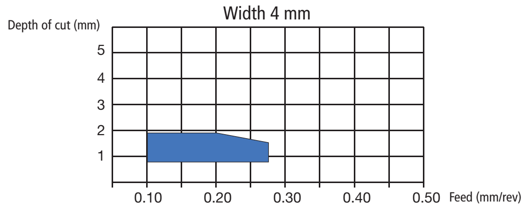
Application
Main application area
General machining operations
Medium feed rates
General rule: a_p maxi = width/2

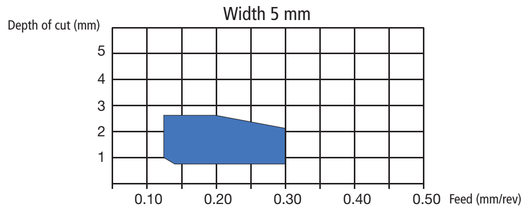
Materials	
P	Steel
M	Stainless steel
K	Cast iron
S	High temperature alloys
H	Hardened materials

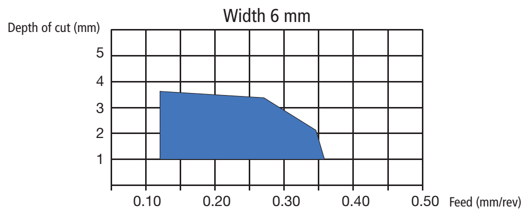
Turn-grooving

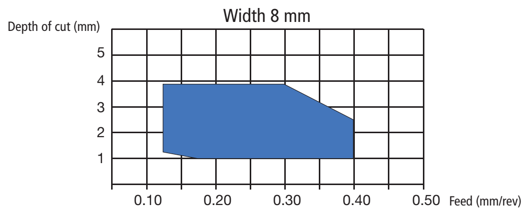
Axial feed rate/Depth of cut









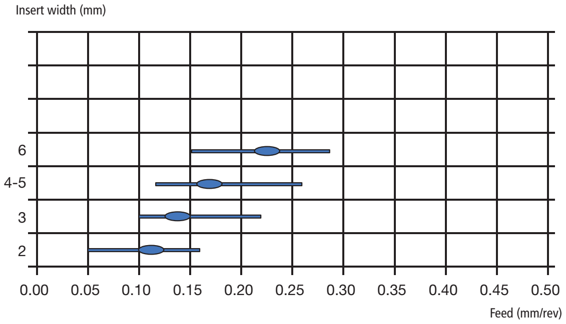


INSERT GEOMETRY APPLICATION DATA

TWIN-SAF system (continued)

- 78

Radial feed rate



Description

First choice for profiling and turning operations
Precision ground edge for low forces and excellent surface finish
Strong geometry resists chipping in work hardening materials

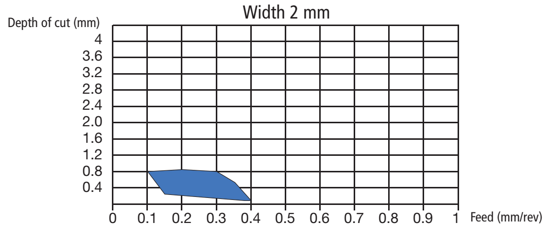
Application

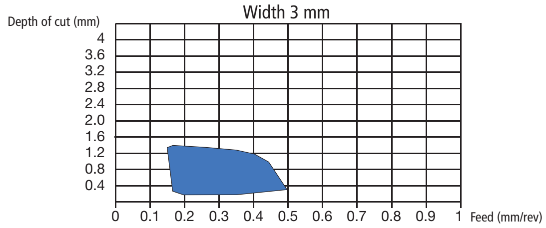
Main application area
General machining to finishing operations
Light to medium feed rates

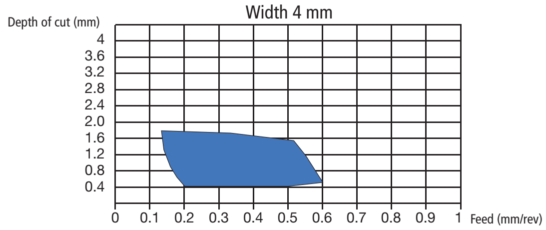
Materials	
P	Steel
M	Stainless steel
K	Cast iron
N	Aluminum/non-ferrous
S	High temperature alloys
H	Hardened materials

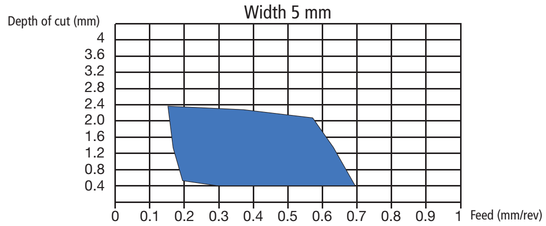
Profiling/Radius grooving

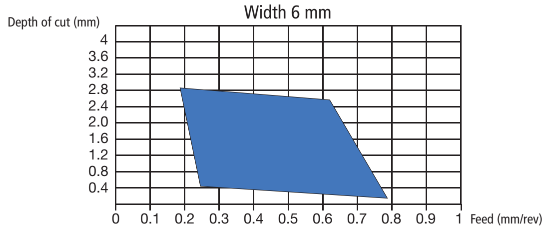
Axial feed rate/Depth of cut











TURNING

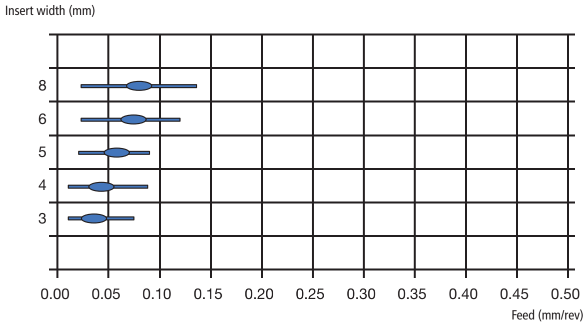
TURNING

INSERT GEOMETRY APPLICATION DATA

TWIN-SAF system (continued)

- 780 CBN

Radial feed rate



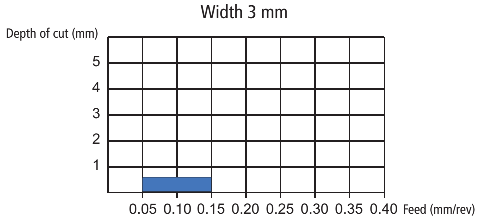
Description
General and finish profiling/radius grooving of irons and hard materials
Good impact resistance
Maintains close tolerances and excellent surface finish

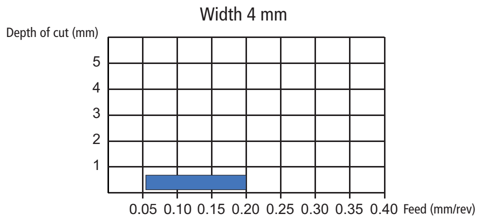
Application
Main application area
General high speed machining in irons
Finishing operations in hard materials

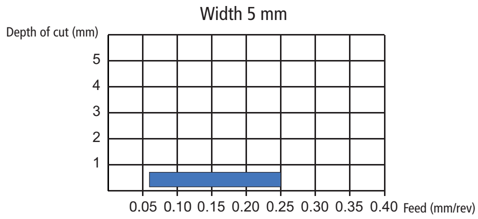
Materials	
K	Cast iron
S	Hardened materials

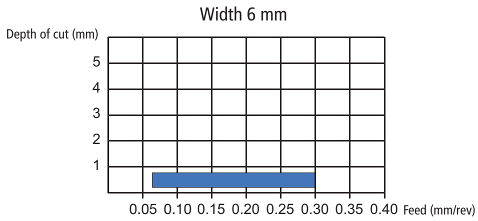
Profiling/Radius grooving

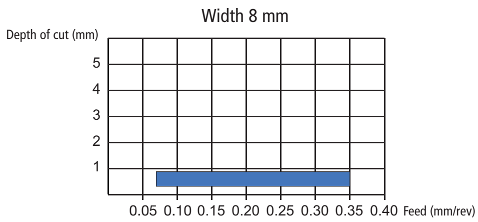
Axial feed rate/Depth of cut









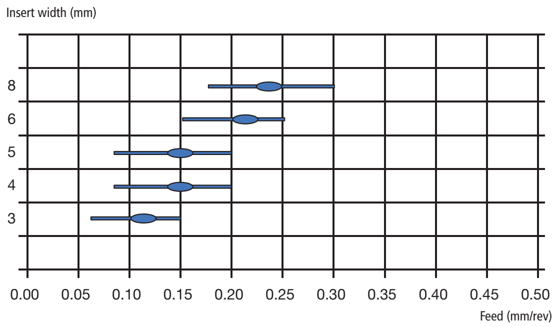


INSERT GEOMETRY APPLICATION DATA

TWIN-SAF system (continued)

- 780 PCD

Radial feed rate



Description
High performance profiling and radius grooving in non-ferrous materials
High speed/long tool life for aluminum and non-ferrous materials
Excellent in highly abrasive aluminum or other non-ferrous alloys
Maintains close tolerances and excellent surface finish

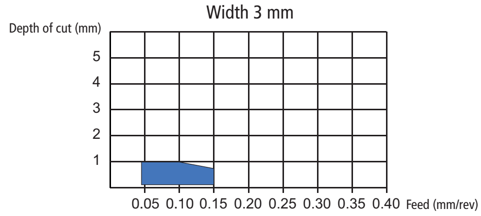
Application
Main application area
General machining to finishing at high speeds

Materials	
N	Aluminum/non-ferrous

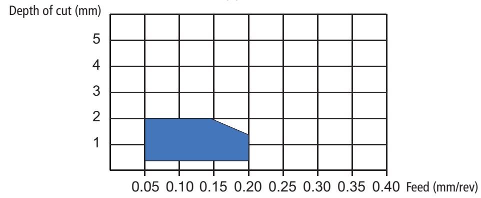
Profiling/Radius grooving

Axial feed rate/Depth of cut

Width 3 mm



Width 4 mm



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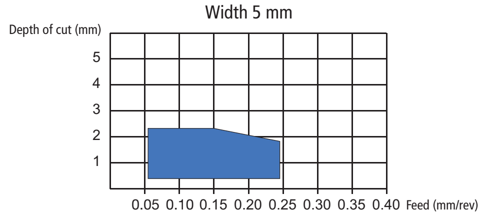

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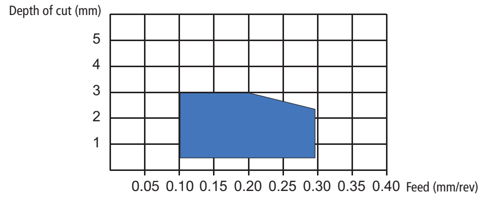

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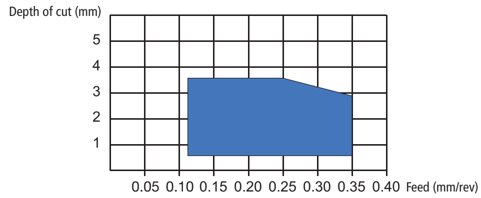
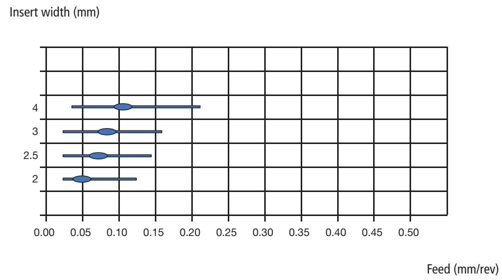
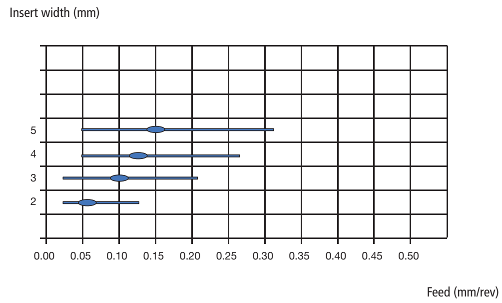
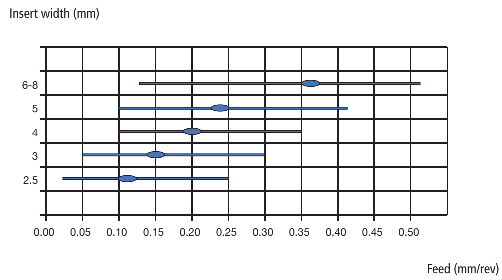
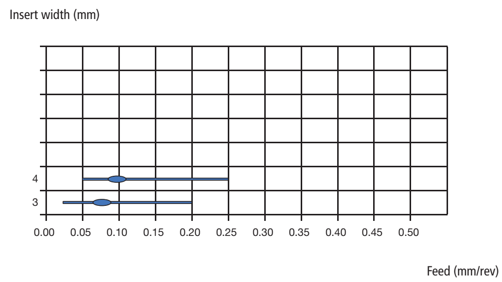


TURNING

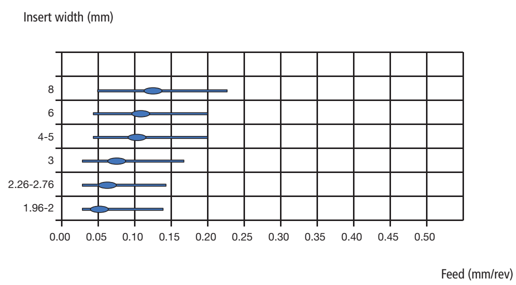
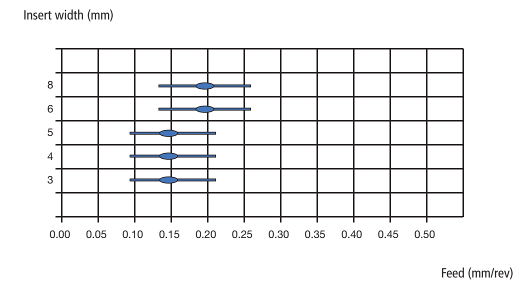
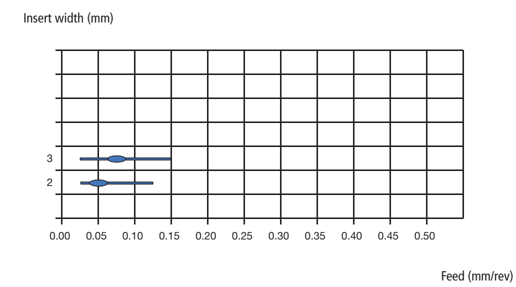
INSERT GEOMETRY APPLICATION DATA

SAF-CUT system

Insert style	Description	Radial feed rate = Optimum feed rate for most applications	Materials	Application
N2 	**Parting/Grooving** Optimal parting and light grooving geometry Minimizes pips and burrs when parting bars and tubes Excellent for stainless, low carbon steel, high temp alloys		P M K N S	**Main application area** General machining to finishing operations Light to medium feed rates
N3 	**Parting/Grooving** First choice for general parting and grooving operations Good chip control and moderate cutting forces Recommended for tubes and stainless steel		P M K	**Main application area** General machining to finishing operations Light to medium feed rates
N4 	**Parting/Grooving** Ideal for heavy parting and grooving operations Strong geometry for interrupted cuts		P M K	**Main application area** General machining to heavy roughing Medium to high feed rates
N5 	**Grooving / Parting** Alternate light grooving and parting geometry Generates low cutting forces For stainless steels, ductile and work hardening materials		P M K N S	**Main application area** General machining to finishing operations Light to medium feed rates

INSERT GEOMETRY APPLICATION DATA

SAF-CUT system (continued)

Insert style	Description	Radial feed rate (blue oval) = Optimum feed rate for most applications	Materials	Application
G4 	**Precision grooving** Excellent repeatability due to tight tolearances Low cutting forces and good chip control on many materials		P M K N S	**Main application area** Precision grooves at light to medium feed rates General machining to finishing operations
P4 	**Radius grooving/Profiling** Designed for radius grooving and profiling on all materials. Generates excellent surface finish.		P M K N S	**Main application area** General machining to finishing operations Medium feed rates
U4 	**Undercut grooving** First choice for turning of undercuts and reliefs Increased clearance angle permits undercutting Good chip control in a wide variety of materials		P M K N S	**Main application area** General machining to finishing operations Light feed rates

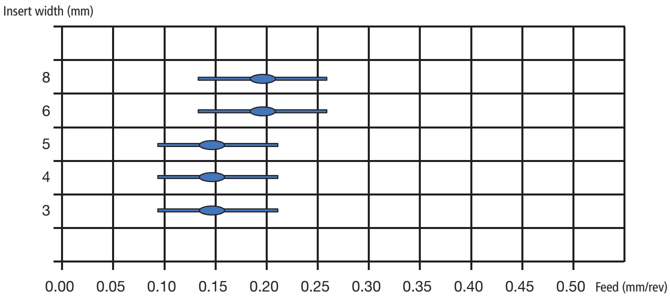
TURNING

INSERT GEOMETRY APPLICATION DATA

SAF-CUT system (continued)

- P4

Radial feed rate



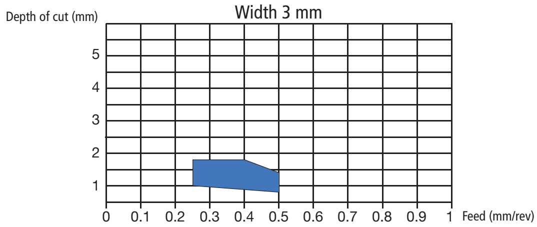
Description
Designed for radius grooving and profiling on all materials
Generates excellent surface finish
Good chip control in a wide variety of materials

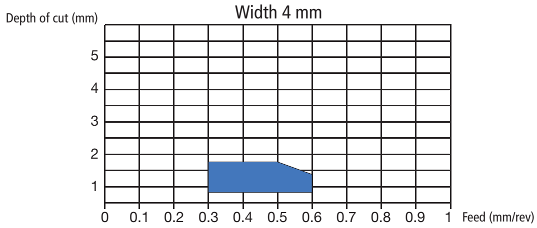
Application
Main application area
General machining to finishing operations
Medium feed rates.

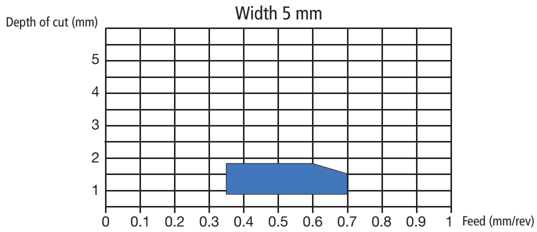
Materials	
P	Steel
M	Stainless steel
K	Cast iron
N	Aluminum/non-ferrous
S	High temperature alloys

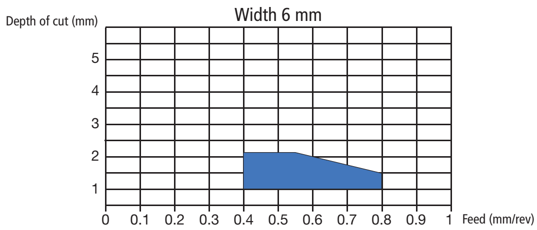
Radius grooving/Profiling

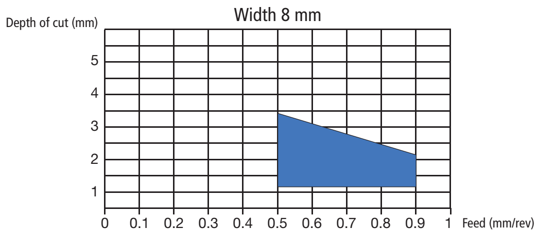
Axial feed rate/Depth of cut







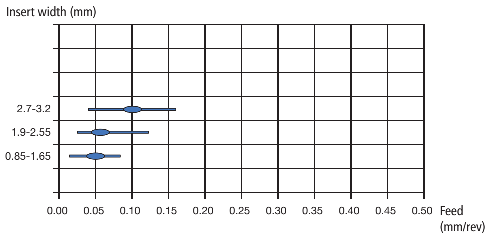
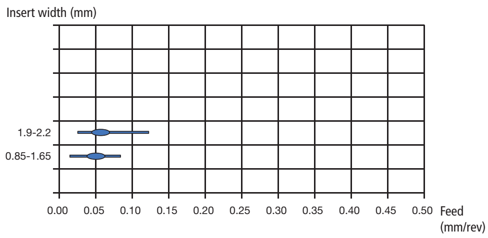
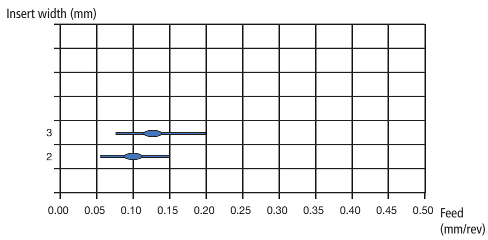
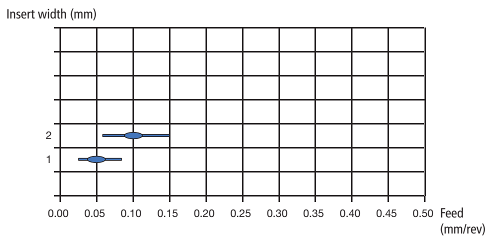




INSERT GEOMETRY APPLICATION DATA

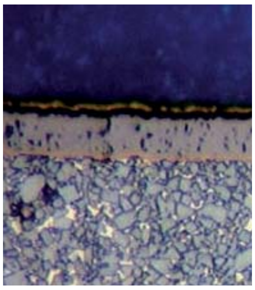
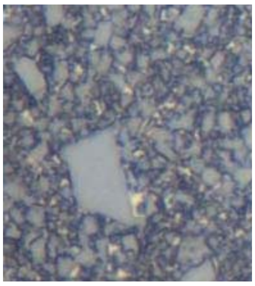
SAF-CUT system (continued)

X61 - Grooving system

Insert style	Description	Radial feed rate ⬭ = Optimum feed rate for most applications	Materials	Application
X61-R/L 	**Grooving** General grooving applications O-ring grooves, circlip grooves		P M N S	**Main application area** Finishing operation on small workpieces Light feed rates
X61-R/L1 	**Grooving** O-ring grooves and circlip grooves Designed to be mounted on P61.SGR/L boring bars		P M N S	**Main application area** Finishing operations in small internal diameter Light feed rates
X61-RxxxR/L 	**Radius grooving/Profiling**		P M N S	**Main application area** Finishing operation on small workpieces Light feed rates
X61-RxxxR/L1 	**Radius grooving** Designed to be mounted on P61.SGR/L boring bars		P M N S	**Main application area** Finishing operations in small internal diameter Light feed rates

TURNING

GRADE DESCRIPTION

Grade	Description	Performance	ISO Class	Application
5820 	**PVD coated Carbide** ■ TiAlN/ TiN multi-layer coating ■ Micro grain substrate ■ High cobalt substrate	**General machining grade** ■ Enhanced crater resistance ■ Excellent wear resistance ■ Excellent toughness and chipping resistance ■ Low cutting edge build-up	P20 M20 K20 N20 S20	■ Steels, stainless steels, cast irons, high temperature alloys, titanium alloys, aluminum & non-ferrous alloys ■ General purpose machining Medium to high speeds Continuous and interrupted cuts, and medium to high feed rates
5735 	**MTCVD Coated Carbide** ■ $TiCN/Al_2O_3/TiN$ coating ■ High cobalt substrate	**Roughing grade** ■ Excellent wear resistance ■ Very high toughness and chipping resistance	P35 M35 K35 S35	■ Steels, stainless steels, cast iron, high temperature alloys ■ Roughing to general purpose machining, medium speeds, continuous and interrupted cuts, and high feed rates
N 	**Uncoated carbide** ■ Fine grain substrate ■ Medium hardness	**General purpose grade** ■ Excellent toughness ■ Good wear resistance and chipping resistance	M25 K25 N25 S25	■ Aluminum, stainless steels- ferritic and austenitic, gray iron, ductile iron, malleable iron, bi-metal components ■ Low to medium speed under a wide range of cutting conditions ■ General machining with good surface finish, continuous and interrupted cuts

GRADE DESCRIPTION

Grade	Description	Performance	ISO Class	Application
B125 	**CBN Tipped carbide**	**High speed grade for iron. General purpose grade for hardened steels** ■ High impact resistance ■ Excellent wear resistance	K01 K05 H10 H15	■ Gray irons, most ductile irons, hardened steels 45-60 HRC ■ High speeds in iron, medium speeds in hard steels continuous and light interrupted cuts
D720 	**Diamond tipped carbide**	**High speed grade for aluminum and non-ferrous materials** ■ Excellent toughness ■ Excellent wear resistance	N10 N40	■ Aluminum & non-ferrous alloys. Medium speed to high speed under a wide range of cutting conditions ■ Roughing to finishing with good surface finish

TURNING

GRADE SELECTION/APPLICATION GUIDE

TURNING

Steels

<table>
<tr><th colspan="7">P
Steels</th></tr>
<tr><th>ISO</th><th>P01</th><th>P10</th><th>P20</th><th>P30</th><th>P40</th><th>P50</th></tr>
<tr><td>Typical failure modes</td><td colspan="3">- Wear
- Deformation
- Chipping</td><td colspan="3">- Chipping
- Deformation
- Wear</td></tr>
<tr><td>Application</td><td colspan="3">Light machining</td><td colspan="3">General machining</td></tr>
<tr><td>PVD coated</td><td></td><td colspan="4">5820</td><td></td></tr>
<tr><td>MTCVD coated</td><td></td><td></td><td colspan="3">5735</td><td></td></tr>
</table>

- Parting and grooving

Material	Operation	Feed (mm/r)	Cutting speed (m/min) Coated	
			5820	5735
Free machining and low carbon steels	L	0.05-0.15	305-244	244-213
	G	0.18-0.46	244-183	213-152
Medium carbon and high carbon steels	L	0.05-0.13	244-198	213-183
	G	0.15-0.38	198-152	183-122
Alloy steels and easy to machine tool steels	L	0.05-0.13	213-152	183-137
	G	0.15-0.30	152-122	137-107
Tool steels and die steels	L	0.05-0.10	152-122	122-91
	G	0.13-0.20	122-107	91-76

L = Light machining
G = General machining

GRADE SELECTION/APPLICATION GUIDE

Steels (continued)

- Turning and profiling

Material	Operation	Feed (mm/r)	Cutting speed (m/min)	
			Coated	
			5820	5735
Free machining and low carbon steels 120-170 HB	L	0.05-0.15	305-244	244-213
	G	0.18-0.46	244-183	213-152
Medium carbon and high carbon steels 180-220 HB	L	0.05-0.13	244-198	213-183
	G	0.15-0.38	198-152	183-122
Alloy steels and easy to machine tool steels 200-240 HB	L	0.05-0.13	213-152	183-137
	G	0.15-0.30	152-122	137-107
Tool steels and die steels 220-260 HB	L	0.05-0.10	152-122	122-91
	G	0.13-0.20	122-107	91-76

Note: For turning and profiling applications, please see section for feed and depth of cut recommendations

- Internal grooving, undercutting and face grooving

Material	Operation	Feed (mm/r)	Cutting speed (m/min)	
			Coated	
			5820	5735
Free machining and low carbon steels 120-170 HB	L	0.05-0.15	229-183	183-137
	G	0.18-0.46	183-137	152-122
Medium carbon and high carbon steels 180-220 HB	L	0.05-0.13	183-152	145-107
	G	0.15-0.38	152-107	114-84
Alloy steels and easy to machine tool steels 200-240 HB	L	0.05-0.13	168-137	107-76
	G	0.15-0.30	122-91	99-69
Tool steels and die steels 220-260 HB	L	0.05-0.10	107-76	84-61
	G	0.13-0.20	84-61	76-55

L = Light machining
G = General machining

GRADE SELECTION/APPLICATION GUIDE

Stainless steels

M Stainless steel				
ISO	**M10**	**M20**	**M30**	**M40**
Typical failure modes	- Wear - Build-up edge - Chipping		- Build-up edge - Wear - Chipping	
Application	Light machining		General machining	
PVD coated			5820	
MTCVD coated			5735	
Uncoated		N		

- Parting and grooving

Material	Operation	Feed (mm/r)	Cutting speed (m/min)		
			Coated		Uncoated
			5820	5735	N
Ferritic and martensitic stainless steels 180 - 240 HB	L	0.05-0.15	198-152	183-137	98-67
	G	0.18-0.30	152-122	137-107	91-61
Austenitic stainless steels 140 - 180 HB	L	0.05-0.10	183-137	152-122	98-67
	G	0.13-0.25	137-107	122-107	91-61
PH and duplex stainless steels 220 - 260 HB	L	0.05-0.10	137-107	122-91	64-46
	G	0.13-0.25	107-76	91-61	55-40

L = Light machining
G = General machining

GRADE SELECTION/APPLICATION GUIDE

Stainless steels (continued)

- Turning and profiling

Material	Operation	Feed (mm/r)	Cutting speed (m/min)		
			Coated		Uncoated
			5820	5735	N
Ferritic and martensitic stainless steels 180 - 240 HB	L	0.05-0.15	198-152	183-137	98-67
	G	0.18-0.30	152-122	137-107	91-61
Austenitic stainless steels 140 - 180 HB	L	0.05-0.10	183-137	152-122	98-67
	G	0.13-0.25	137-107	122-107	91-61
PH and duplex stainless steels 220 - 260 HB	L	0.05-0.10	137-107	122-91	64-46
	G	0.13-0.25	107-76	91-61	55-40

Note: For turning and profiling applications, please see section for feed and depth of cut recommendations

- Internal grooving, undercutting and face grooving

Material	Operation	Feed (mm/r)	Cutting speed (m/min)		
			Coated		Uncoated
			5820	5735	N
Ferritic and martensitic stainless steels 180 - 240 HB	L	0.05-0.15	152-122	137-107	91-61
	G	0.18-0.30	137-107	107-91	76-52
Austenitic stainless steels 140 - 180 HB	L	0.05-0.10	137-107	122-91	91-61
	G	0.13-0.25	107-84	91-76	84-52
PH and duplex stainless steels 220 - 260 HB	L	0.05-0.10	122-91	107-76	61-43
	G	0.13-0.25	107-69	76-53	52-34

L = Light machining
G = General machining

GRADE SELECTION/APPLICATION GUIDE

Cast iron

K Cast iron				
ISO	**K10**	**K20**	**K30**	**K40**
Typical failure modes	- Wear - Build-up edge		- Wear - Build-up edge - Chipping	
Application	Light machining		General machining	
PVD coated			5820	
MTCVD coated				5735
Uncoated			N	

- Parting and grooving

Material	Operation	Feed (mm/r)	Cutting speed (m/min)		
			Coated		Uncoated
			5820	5735	N
Gray cast irons 180 - 220 HB	L	0.05-0.15	183-99	198-91	82-67
	G	0.18-0.41	168-91	168-76	76-61
Gray cast irons 220 - 260 HB	L	0.05-0.15	152-91	130-76	76-61
	G	0.18-0.41	137-76	122-61	69-53
Ductile & malleable cast irons 140 - 180 HB	L	0.05-0.13	213-107	152-91	99-76
	G	0.15-0.30	183-91	137-84	84-69
Ductile & malleable cast irons 220 - 260 HB	L	0.05-0.13	152-84	107-67	67-52
	G	0.15-0.25	130-69	91-61	53-46

L = Light machining
G = General machining

GRADE SELECTION/APPLICATION GUIDE

Cast iron (continued)

- Turning and profiling

Material	Operation	Feed (mm/r)	Cutting speed (m/min)		
			Coated		Uncoated
			5820	5735	N
Gray cast irons 180 - 220 HB	L	0.05-0.15	183-99	198-91	82-67
	G	0.18-0.41	168-91	168-76	76-61
Gray cast irons 220 - 260 HB	L	0.05-0.15	152-91	130-76	76-61
	G	0.18-0.41	137-76	122-61	69-53
Ductile & malleable cast irons 140 - 180 HB	L	0.05-0.13	213-107	152-91	99-76
	G	0.15-0.30	183-91	137-84	84-69
Ductile & malleable cast irons 220 - 260 HB	L	0.05-0.13	152-84	107-67	67-52
	G	0.15-0.30	130-69	91-61	53-46

Note: For turning and profiling applications, please see section for feed and depth of cut recommendations

- Internal grooving, undercutting and face grooving

Material	Operation	Feed (mm/r)	Cutting speed (m/min)		
			Coated		Uncoated
			5820	5735	N
Gray cast irons 180 - 220 HB	L	0.05-0.15	146-76	137-64	73-55
	G	0.18-0.41	122-64	114-53	61-46
Gray cast irons 220 - 260 HB	L	0.05-0.15	114-64	91-53	61-46
	G	0.18-0.41	104-58	85-43	46-38
Ductile & malleable cast irons 140 - 180 BHN	L	0.05-0.13	160-82	107-64	61-46
	G	0.15-0.30	137-69	96-58	46-38
Ductile & malleable cast irons 220 - 260 HB	L	0.05-0.13	114-64	76-46	53-38
	G	0.15-0.25	99-52	64-43	38-30

L = Light machining
G = General machining

GRADE SELECTION/APPLICATION GUIDE

Aluminum & non-ferrous

<table>
<tr><th colspan="5">N
Aluminum & non-ferrous</th></tr>
<tr><th>ISO</th><th>N01</th><th>N10</th><th>N20</th><th>N30</th></tr>
<tr><td>Typical failure modes</td><td colspan="2">- Wear
- Build-up edge</td><td colspan="2">- Build-up edge
- Wear
- Chipping</td></tr>
<tr><td>Application</td><td colspan="2">Light machining</td><td colspan="2">General machining</td></tr>
<tr><td>PVD coated</td><td></td><td colspan="2">5820</td><td></td></tr>
<tr><td>Uncoated</td><td></td><td></td><td colspan="2">N</td></tr>
<tr><td>PCD</td><td colspan="2">D720</td><td></td><td></td></tr>
</table>

- Parting and grooving, turning and profiling

Material	Operation	Feed (mm/r)	Cutting speed (m/min)		
			Coated	Uncoated	PCD
			5820	N	D720
Aluminum alloys <7% silicon	L	0.05-0.20	914-762	762-533	1800-610
	G	0.23-0.51	762-533	533-381	1800-610
Aluminum alloys 7% - 12% silicon	L	0.05-0.20	762-533	533-381	1800-610
	G	0.23-0.51	533-381	381-305	1800-610
Aluminum alloys 12% - 18% silicon	L	0.05-0.20	457-381	305-244	900-450
	G	0.23-0.36	381-244	244-183	610-300
Copper alloys	L	0.05-0.20	366-244	244-183	550-360
	G	0.23-0.36	244-152	183-122	360-180

Note: For turning and profiling applications, please see section for feed and depth of cut recommendations

L = Light machining
G = General machining

GRADE SELECTION/APPLICATION GUIDE

Aluminum & non-ferrous (continued)

- Internal grooving, undercutting and face grooving

Material	Operation	Feed (mm/r)	Cutting speed (m/min)		
			Coated	Uncoated	PCD
			5820	N	D720
Aluminum alloys <7% silicon	L	0.05-0.20	732-610	610-427	1800-610
	G	0.23-0.51	610-427	427-305	1800-610
Aluminum alloys 7% - 12% silicon	L	0.05-0.20	610-427	427-305	1800-610
	G	0.23-0.51	427-305	305-244	1800-610
Aluminum alloys 12% - 18% silicon	L	0.05-0.20	366-305	244-198	900-450
	G	0.23-0.36	305-195	198-152	600-300
Copper alloys	L	0.05-0.20	305-195	198-152	550-360
	G	0.23-0.36	195-122	146-98	350-180

L = Light machining
G = General machining

GRADE SELECTION/APPLICATION GUIDE

High temperature alloys

S High temperature alloys				
ISO	S10	S20	S30	S40
Typical failure modes	- Wear - Build-up edge - Deformation		- Build-up edge - Deformation - Chipping	
Application	Light machining		General machining	
PVD coated			5820	
MTCVD coated			5735	
Uncoated		N		

- Parting and grooving

Material	Operation	Feed (mm/r)	Cutting speed (m/min)		
			Coated		Uncoated
			5820	5735	N
Iron & nickel based alloys, monel, hastelloy, inconel, waspaloy	L	0.05-0.15	70-30	52-24	52-24
	G	0.13-0.20	46-15	30-11	38-15
Cobalt base alloys haynes stellite	L	0.05-0.10	52-30	44-23	37-18
	G	0.13-0.20	34-15	37-14	34-12
Titanium alloys 6Al-4V	L	0.05-0.10	69-40	-	79-61
	G	0.13-0.20	67-34	-	64-52

L = Light machining
G = General machining

GRADE SELECTION/APPLICATION GUIDE

High temperature alloys (continued)

- Turning and profiling

Material	Operation	Feed (mm/r)	Cutting speed (m/min)		
			Coated		Uncoated
			5820	5735	N
Iron & nickel based alloys, monel, hastelloy, inconel, waspaloy	L	0.05-0.10	70-30	52-24	52-24
	G	0.13-0.20	46-15	30-11	38-15
Cobalt base alloys haynes stellite	L	0.05-0.10	52-30	44-23	37-18
	G	0.13-0.20	34-15	37-14	34-12
Titanium alloys 6Al-4V	L	0.05-0.10	69-40	-	79-61
	G	0.13-0.20	67-34	-	64-52

Note: For turning and profiling applications, please see section for feed and depth of cut recommendations

- Internal grooving, undercutting and face grooving

Material	Operation	Feed (mm/r)	Cutting speed (m/min)		
			Coated		Uncoated
			5820	5735	N
Iron & nickel based alloys, monel, hastelloy, inconel, waspaloy	L	0.05-0.10	64-27	49-23	46-21
	G	0.13-0.20	41-15	30-11	37-15
Cobalt base alloys haynes stellite	L	0.05-0.10	49-27	43-21	34-18
	G	0.13-0.20	30-15	34-14	30-17
Titanium alloys 6Al-4V	L	0.05-0.10	66-37	-	73-55
	G	0.13-0.20	58-30	-	61-49

L = Light machining
G = General machining

GRADE SELECTION/APPLICATION GUIDE

Hardened materials

H Hardened materials			
ISO	H10	H20	H30
Typical failure modes	- Wear - Deformation - Chipping		- Wear - Chipping
Application	Light machining		General machining
PVD coated	5820		
CBN			B125

- Parting and grooving, turning and profiling

Material	Operation	Feed (mm/r)	Cutting speed (m/min)	
			Coated	CBN
			5820	B125
Steels 45-50 HRC	L	0.03-0.08	107-61	107-61
	G	0.08-0.13	91-46	91-46
Steels 50-60 HRC	L	0.03-0.08	84-46	84-46
	G	0.08-0.13	55-37	55-37
Chilled irons 40-50 HRC	L	0.03-0.08	91-61	91-61
	G	0.08-0.13	76-53	76-53

Note: For turning and profiling applications, please see section for feed and depth of cut recommendations

L = Light machining
G = General machining

GRADE SELECTION/APPLICATION GUIDE

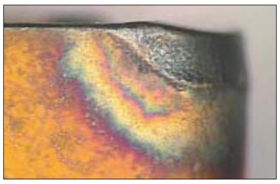
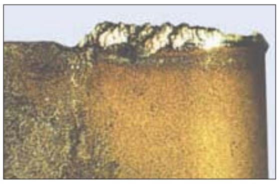
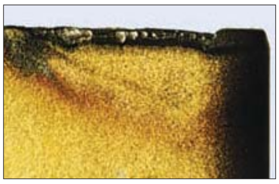
Hardened materials (continued)

- Internal grooving, undercutting and face grooving

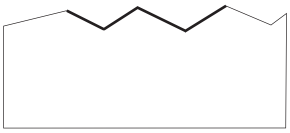
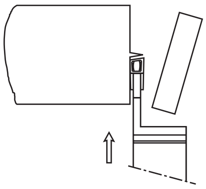
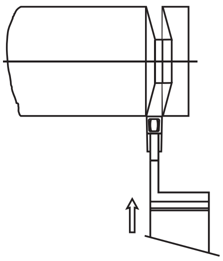
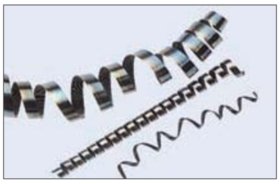
Material	Operation	Feed (mm/r)	Cutting speed (m/min)	
			Coated	CBN
			5820	B125
Steels 45-50 HRC	L	0.05-0.10	85-49	85-49
	G	0.05-0.10	73-37	73-37
Steels 50-60 HRC	L	0.05-0.10	67-37	67-37
	G	0.05-0.10	46-30	46-30
Chilled irons 40-50 HRC	L	0.05-0.10	73-49	73-49
	G	0.05-0.10	61-43	61-43

L = Light machining
G = General machining

INSERT FAILURE MODES

Problem / Failure mode	Cause	Control action / Remedy
Heat deformation 	■ Excessive heat ■ Excessive cutting forces	■ Reduce cutting speed ■ Reduce feed rate ■ Flood cutting zone with coolant ■ Select harder grade
Rapid flank wear 	■ Excessive cutting speed ■ Work material micro-structure contains carbides	■ Reduce cutting speed ■ Use more wear resistant grade ■ Select more positive rake chipbreaker ■ Flood cutting zone with coolant
Built-up edge, torn finish, chip welding 	■ Low cutting speed ■ High feed rate ■ Poor shearing action	■ Increase cutting speed and/or decrease feed ■ Select more positive rake chipbreaker ■ Select tougher grade (use PVD coated insert) ■ Flood cutting zone with coolant
Edge chipping 	■ Excessive feed rate ■ Interrupted cut	■ Increase speed ■ Reduce feed rate ■ Select tougher grade ■ Check for edge build-up ■ Select stronger chipbreaker ■ Improve rigidity, minimize overhang
Fracture 	■ Improper selection of grade/chipbeaker and/or cutting conditions	■ Reduce feed rate ■ Select tougher grade ■ Select stronger chipbreaker ■ Ensure set-up rigidity, minimize tool overhang
Thermal cracks 	■ Extreme variation in cutting temperatures ■ Interrupted cut	■ Reduce feed rate ■ Increase cutting speed ■ Select stronger chipbreaker

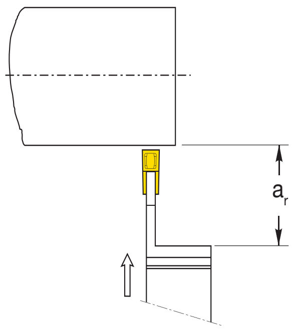
INSERT FAILURE MODES

Problem / Failure mode	Cause	Control action / Remedy
Poor surface finish 	■ High feed rate ■ Low cutting speed	■ Reduce feed rate and increase cutting speed ■ Check set-up, minimize overhang of tool ■ Select more positive rake chipbreaker/PVD coated insert ■ Flood cutting zone with coolant ■ Select a precision ground insert style ■ Dwell at bottom of groove (3 rev. max)
Residual burrs/Nibs 	■ Improper feed ■ Improper set-up	■ Use sharp inserts ■ Adjust feed rate ■ Adjust tool center height ■ Use a lead angle insert for parting
Convex or concave surfaces 	■ High feed rate ■ Excessive tool overhang ■ Small insert width	■ Check set-up, minimize overhang of tool ■ Check tool alignment for square ■ Use a correct hand insert ■ Use a sharper tool ■ Use a wider insert
Workpiece chatter vibration 	■ Poor set-up ■ Improper insert selection	■ Check set-up, minimize tool overhang ■ Check tool center height ■ Increase feed rate ■ Increase speed ■ Use sharp inserts ■ Select more positive rake chipbreaker
Unacceptable chip control (Low carbon steel) 	■ Low feed rate	■ Increase feed rate ■ Use more aggressive chipbreaker style ■ Decrease speed ■ Adjust coolant flow and concentration

GENERAL

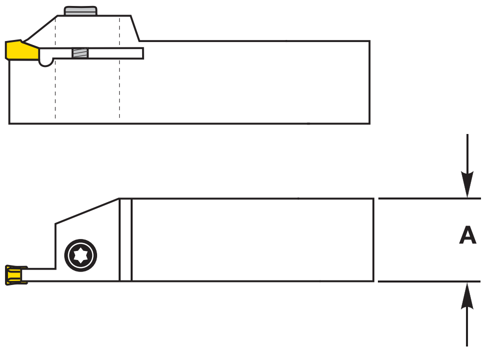
Toolholder overhang

To minimize deflection and vibration, choose the toolholder size with the least possible overhang a_r, part configuration will allow.



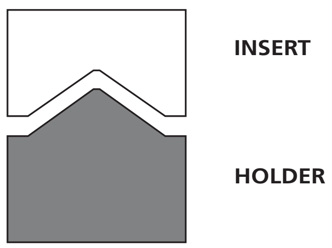
Choose a shank size with adequate strength

The larger the shank size, the more rigid the toolholder.
If the shank is too small in relation to feed rate and width of cut, deflection and vibration can occur.



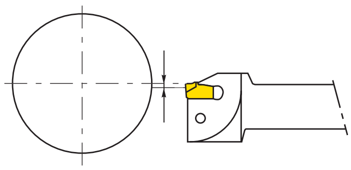
Choose an insert size with adequate strength

The wider the insert, the more secure the seating in the pocket. The insert should be as large as possible, relative to the dimensions of the workpiece. Make sure the insert is wide enough for the cutting conditions. For small parts and thin walls choose a smaller width to minimize cutting forces. For profiling when the depth of cut is small, the width of the insert should be proportionately smaller to guarantee the required deflection (see Turning guidelines).



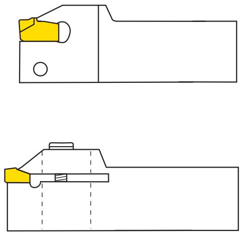
Check the center height of the edge of the insert

To optimize tool performance, the center height of the insert should be maintained within ±0.1 mm.
This is critical when machining parts with a small diameter.



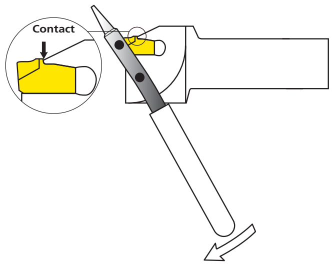
GENERAL

Correct insert clamping



Choose the correct toolholder style for the operation. Screw clamp toolholders provide the most secure clamping for both radial (plunging) and axial (turning) machining. Wedge clamp toolholders are recommended only for radial machining.

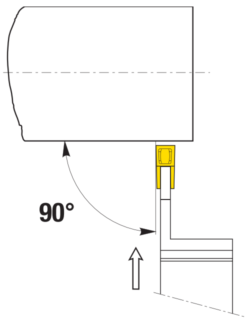
Installing and extracting the insert



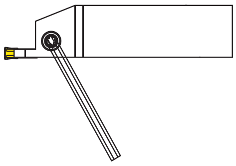
Wedge style

Clean holder seat and insert seat. Lubricate (light oil) the seat surfaces. Slide the insert into pocket ; make sure angle surfaces match. Locate with wrench to a positive stop.

Positioning the tool in the tool block



It is essential that the tool be correctly positioned in the tool block. The toolholder must be perpendicular to the workpiece. Deviation will cause part distortion. The front edge of the insert should be parallel to the workpiece to minimize vibration.

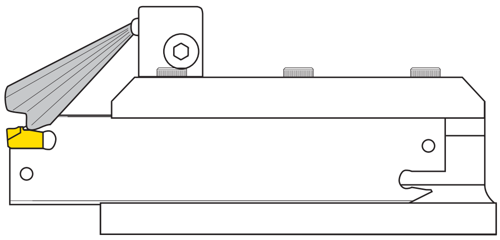


Screw style

Clean holder seat and insert. Slide insert into contact position. Tighten torque screw. Do not overtighten.

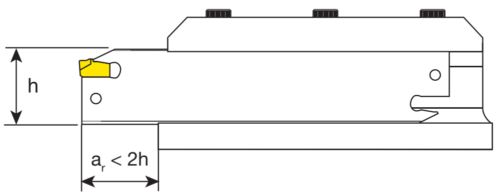
Cutting fluid

Cutting fluid must be continuously applied throughout the operation with adequate volume and pressure. It is critical that the cutting fluid be directed at the cutting edge.



Choosing blade size

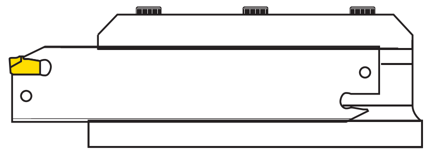
For maximum stability, the insertion depth, a_r, should not exceed twice the blade height h.



PARTING

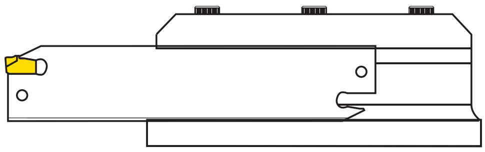
Minimize overhang

For maximum stability, position the blade for the least possible overhang.



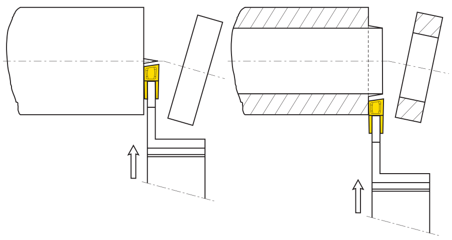
Parting large diameters

Use double ended blades for large depths.



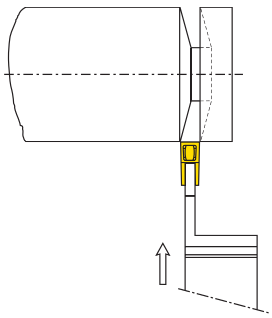
Clean parting

To minimize pips when parting solid parts, or burrs when parting tubing, use R or L inserts (point toward finished surface).



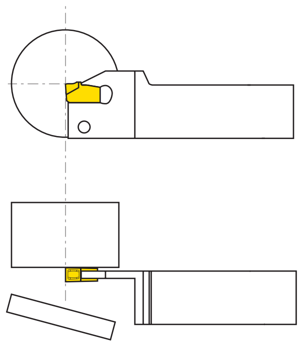
Convex or concave surfaces

If convex or concave surfaces are produced, reduce the feed rate or use a wider insert.



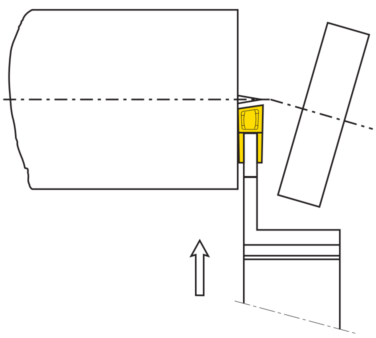
Parting to center

Exceeding the center line of the workpiece after parting will damage the insert.



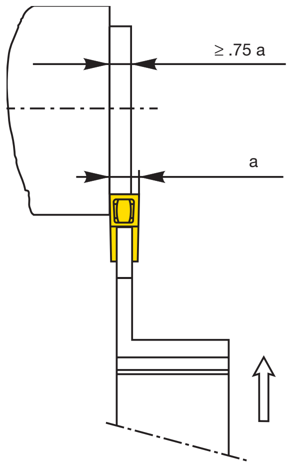
Reduce feed rate

The tool life of the insert will be improved by reducing the feed rate in the final revolutions just before separating the workpiece.



Facing cuts

To ensure good chip control when facing a part, the insert must be engaged over 75% of its width.



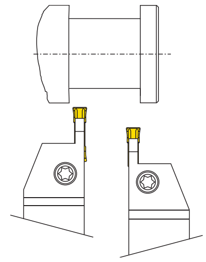
TURNING AND PROFILING

Toolholder selection

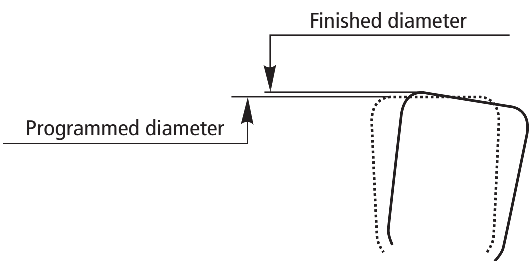
A screw clamp toolholder provides maximum insert stability for turning and profiling operations. Wedge style holders are not recommended.

Turning and profiling machining practice

TWIN-SAF style holders provide maximum insert security for turning and profiling operations. SAF-CUT system screw clamp style toolholders can also be used for turning and profiling operations at reduced feed rates and depths of cut.



Compensation for deflection when axial turning

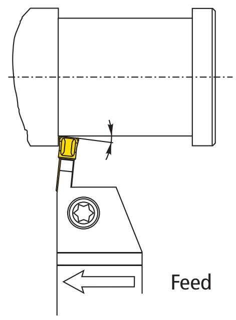


The cutting force from axial turning causes a slight deflection of the tool, resulting in a difference between the finished diameter and programmed diameter.

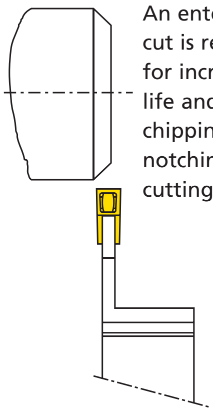
Determine the compensation during set up by measuring the difference between the programmed diameter and the finished diameter. Values will vary depending on workpiece material as well as feed and depth of cut.

Turning depth of cut and feed rate

Sufficient axial force is required to guarantee adequate frontal clearance angle (α). It is normally recommended to use larger depths of cut and higher feed rates with inserts than with conventional turning inserts. When the depth of cut and feed rate are too small, the low axial force is not sufficient to cause the required deflection and vibration can result.



Entering chamfer



An entering chamfer cut is recommended for increased tool life and to reduce chipping and notching of the cutting edge.

Roughing a wide groove

In order to avoid insert damage it is necessary to release the axial cutting forces on the insert when turning before beginning a grooving cut. The following machining sequence is suggested:

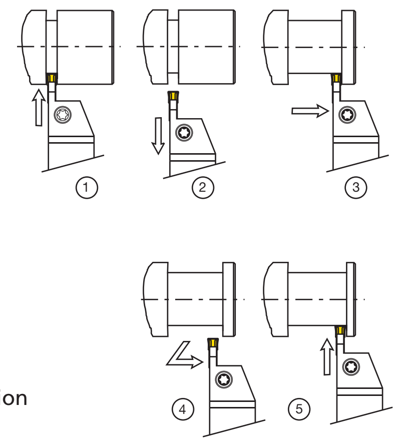
① Radial feed to depth of cut

② Retract to compensate

③ Turn along axis

④ Retract on an angle and feed to finish position

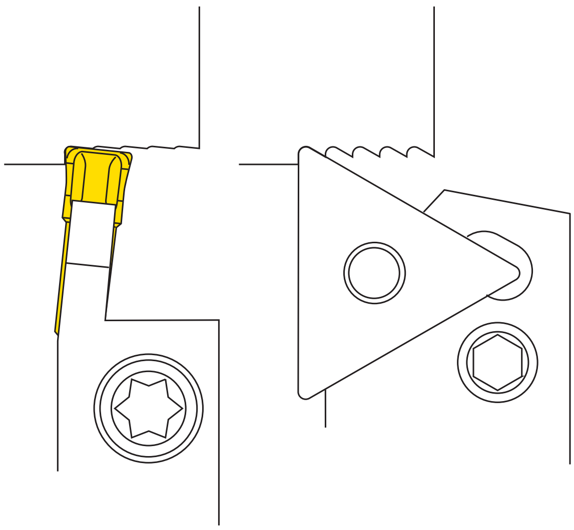
⑤ Radial feed to depth of cut



TURNING AND PROFILING

Surface finish

The wiper effect from deflecting the insert produces surface finishes much superior to those produced by conventional inserts. This wiper effect makes it possible to increase the feed rate resulting in productivity gain.



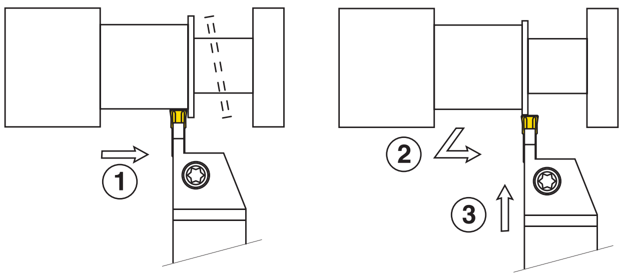
Trapped ring

An unwanted trapped ring of material can result when turning toward the end of a bar or a recess between two walls.
To prevent a trapped ring:

① Turn toward the recess

② Pull back and reposition

③ Radially feed to finish the side wall



Finishing a wide groove

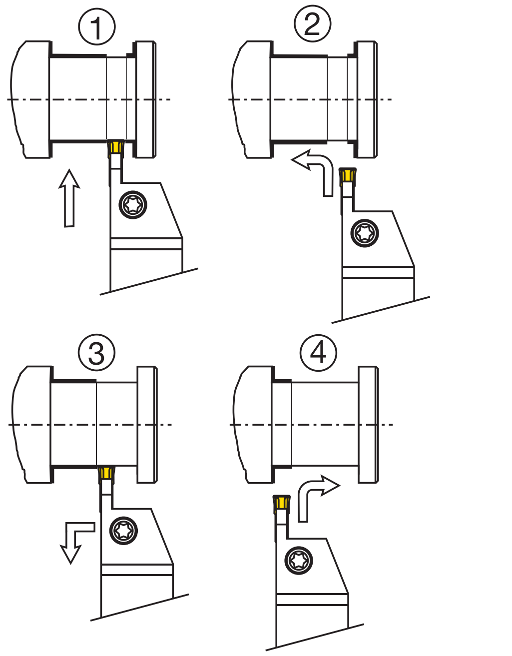
Generating a radius at the bottom of a wide groove produces a very thin chip. The result is vibration and tool wear which can be addressed by the following actions:

① Plunge parallel to finished surface

② Retract and finish wall and radius

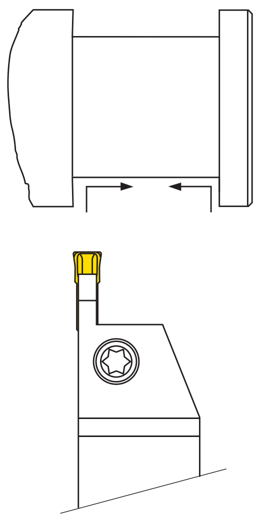
③ Turn diameter and retract tool

④ Radially feed and generate radius to finish diameter



In copying

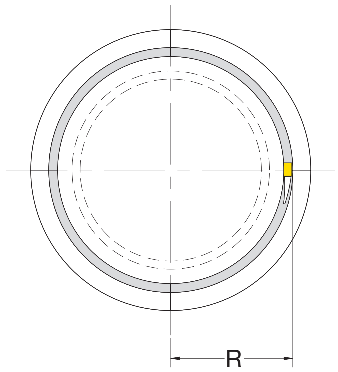
For increased tool life and better chip control, in copying is recommended. Doing so uses both corners of the insert, minimizing tool wear.



FACE GROOVING

General recommendations

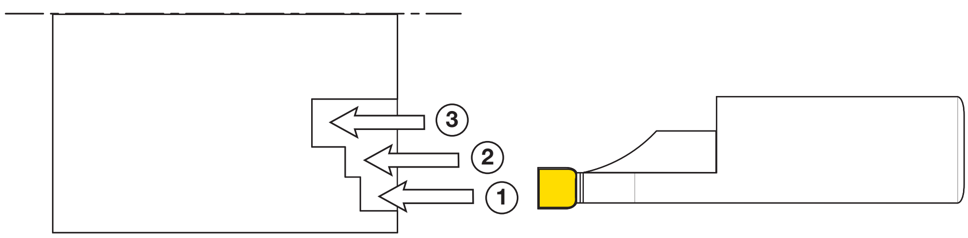
- Always start with the largest possible diameter and work inward.
- Use the tool with the largest possible diameter range.
- To avoid chatter minimize overhang.



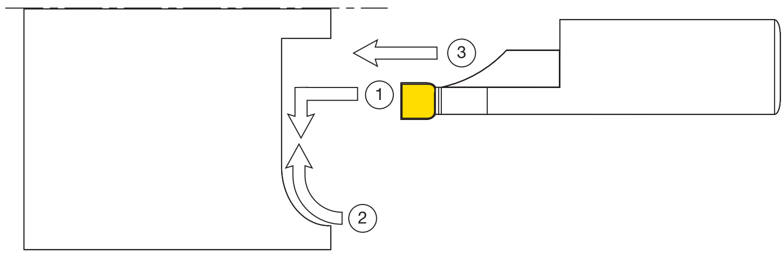
Roughing

① Starting cut chip control but no breaking.

② & ③ Width of cut should be 50% to 80% of insert width - insert will break chips.



Finishing



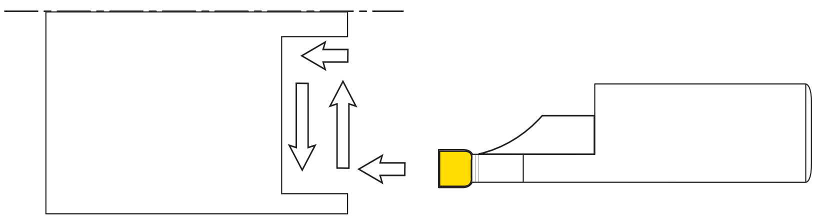
① Position within diameter range and feed toward the radius.

② Finish the outside diameter and radius and face turn inward.

③ Finish the inside diameter to the correct dimension.

Plunge turning

Axial depth of cut should not be deeper than 75% width of insert.



NOTES

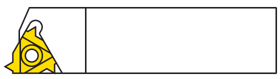
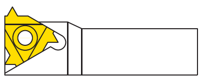
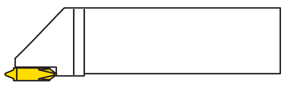
PROGRAM OVERVIEW

Inserts

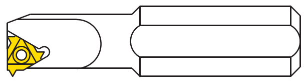
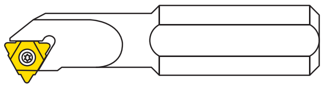
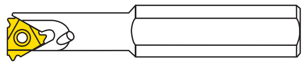
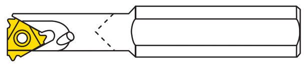
60		Partial profile 60°	p 238
55		Partial profile 55°	p 240
ISO		ISO	p 242
UN		UN	p 246
UNJ		UNJ	p 250
MJ		MJ (ISO 5855)	p 252
NPT		NPT	p 253
NPTF		NPTF	p 255
ACME		ACME	p 256

STACME		Stub ACME	p 257
TR		Trapez (DIN 103)	p 258
W		Whitworth	p 259
BSPT		BSPT	p 263
RD		Round (DIN 405)	p 264
RD 20400		Round (DIN 20400)	p 265
ABUT		American Buttress	p 266
SAGE		SAGE (DIN 513 - UNI 127B)	p 267
PG		PG (DIN 40430)	p 268

Toolholders

SER/L		p 269
SER/L-U		p 270
SER/L-G		p 271
SER/L-V		p 271

Boring bars

SIR/L		p 272
SIR/L-U		p 273
SIR/L-B		p 274
SIR/L-BC		p 275

TURNING

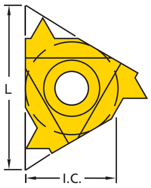
INSERT DESIGNATION

16	E	R	B	12	ISO		9410
1	2	3	4	5	6	7	8

1 Size

L	I.C. (mm)
11	6.35
16	9.52
16V(1)	9.52
22	12.70
22U(2)	12.70
22V(1)	12.70
27	15.88
27U(2)	15.88

(1) Vertical insert and toolholder pocket
(2) U style insert and toolholder pocket



2 Operation

E	External
I	Internal

3 Hand

R	Right hand
L	Left hand

4 Chipbreaker

B	Pressed geometry

5 Pitch (mm)

Full profile

0.35-12

Partial profile

A	0.5-1.5
G	1.75-3
AG	0.5-3
N	3.5-5
Q	5.5-6
U	5.5-8 / 6.5-9

6 Profile

Full profile

ISO	ACME	PG
UN	ST.ACME	AM.BUTT
WHIT	TRAPEZ	SAGE
NPT	ROUND	API
NPTF	UNJ	
BSPT	MJ	

Partial profile

60°	55°	

7 Multi-tooth style

Number of teeth

8 Carbide grade

9410
9420

TOOL DESIGNATION

S	E	R	2020	K	16	B
1	2	3	4	5	6	7

1	Clamping system
S	Screw

2	Operation
E	External
I	Internal

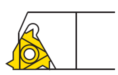
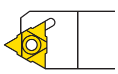
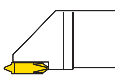
3	Hand
R	Right hand
L	Left hand

4	Toolholder size
Toolholders	
Square shank: 2020 = 20 mm x 20 mm	
Boring bars	
Round shank: 0020 = Diameter of 20 mm	

5	Toolholder length (mm)
D	60
F	80
H	100
K	125
L	140
M	150
P	170
R	200
S	250
T	300
U	350
V	400

6	Insert pocket size
L	I.C. (mm)
11	6.35
16	9.52
16V(1)	9.52
22	12.70
22U(2)	12.70
22V(1)	12.70
27	15.88
27U(2)	15.88

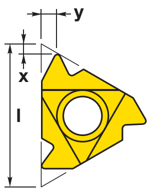
(1) Vertical insert and toolholder pocket
(2) U style insert and toolholder pocket

Standard style insert and toolholder pocket	
U-style insert and toolholder pocket	
Vertical insert and toolholder pocket	

7	Special features
B	Coolant hole
C	Carbide shank
V	Vertical (on edge)
G	Gang toolholders

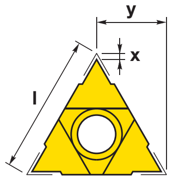
PARTIAL PROFILE 60°

External

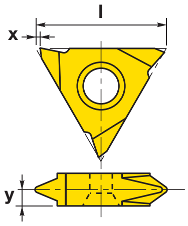


Right hand shown

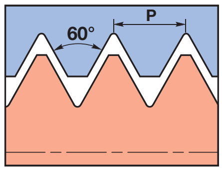
U Type



Vertical



Right hand shown



Reference		Pitch (mm)	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
11 ER A60		0.5-1.5	11	0.8	0.9	✓	
16 ER A60		0.5-1.5	16	0.8	0.9	✓	
16 ER AG60		0.5-3	16	1.2	1.7	✓	
16 ER G60		1.75-3	16	1.2	1.7	✓	
22 ER N60		3.5-5	22	1.7	2.5	✓	
27 ER Q60		5.5-6	27	2.1	3.1	✓	
	11 EL A60	0.5-1.5	11	0.8	0.9	✓	
	16 EL A60	0.5-1.5	16	0.8	0.9	✓	
	16 EL AG60	0.5-3	16	1.2	1.7	✓	
	16 EL G60	1.75-3	16	1.2	1.7	✓	
	22 EL N60	3.5-5	22	1.7	2.5	✓	
	27 EL Q60	5.5-6	27	2.1	3.1	✓	
22U EI/RL U60		5.5-8	22U	0.6	11	✓	
27U EI/RL U60		6.5-9	27U	1	13.7	✓	

External - Chipbreaker

Reference		Pitch (mm)	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
16 ERB A 60		0.5-1.5	16	0.8	0.9		✓
16 ERB AG 60		0.5-3	16	1.2	1.7		✓
16 ERB G 60		1.75-3	16	1.2	1.7		✓

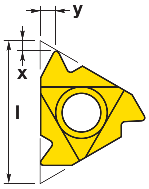
External - Vertical

Reference		Pitch (mm)	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
16V ER A 60		0.5-1.5	16	1	0.9	✓	
16V ER AG60		0.5-3	16	1	1.8	✓	
16V ER G60		1.75-3	16	1	1.8	✓	
22V ER G60		1.75-3	22	1.2	1.7	✓	
22V ER N60		3.5-5	22	1.2	2.5	✓	

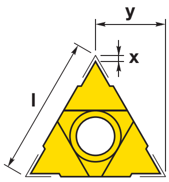
✓: Article which can be ordered
Ordering example: 11 ER A60 9410

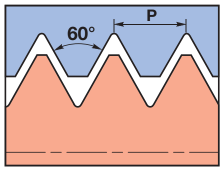
PARTIAL PROFILE 60°

Internal



U Type





Right hand shown

Reference		Pitch (mm)	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
11 IR A60		0.5-1.5	11	0.8	0.9	✓	
16 IR A60		0.5-1.5	16	0.8	0.9	✓	
16 IR AG60		0.5-3	16	1.2	1.7	✓	
16 IR G60		1.75-3	16	1.2	1.7	✓	
22 IR N60		3.5-5	22	1.7	2.5	✓	
27 IR Q60		5.5-6	27	2.1	3.1	✓	
	11 IL A60	0.5-1.5	11	0.8	0.9	✓	
	16 IL A60	0.5-1.5	16	0.8	0.9	✓	
	16 IL AG60	0.5-3	16	1.2	1.7	✓	
	16 IL G60	1.75-3	16	1.2	1.7	✓	
	22 IL N60	3.5-5	22	1.7	2.5	✓	
	27 IL Q60	5.5-6	27	2.1	3.1	✓	
22U EI/RL U60		5.5-8	22U	0.6	11	✓	
27U EI/RL U60		6.5-9	27U	1	13.7	✓	

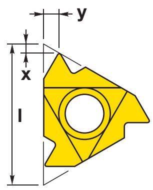
Internal - Chipbreaker

Reference		Pitch (mm)	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
16 IRB A60		0.5-1.5	16	0.8	0.9		✓
16 IRB AG 60		0.5-3	16	1.2	1.7		✓
16 IRB G 60		0.5-3	16	1.2	1.7		✓

✓: Article which can be ordered
Ordering example: 11 IR A60 9410

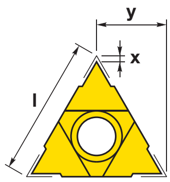
PARTIAL PROFILE 55°

External

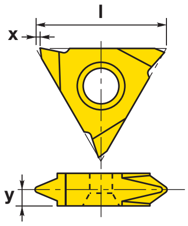


Right hand shown

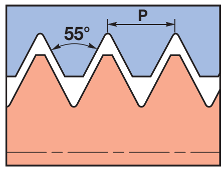
U Type



Vertical



Right hand shown



Reference		Pitch (mm)	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
11 ER A55		0.5-1.5	11	0.8	0.9	✓	
16 ER A55		0.5-1.5	16	0.8	0.9	✓	
16 ER AG55		0.5-3	16	1.2	1.7	✓	
16 ER G55		1.75-3	16	1.2	1.7	✓	
22 ER N55		3.5-5	22	1.7	2.5	✓	
27 ER Q55		5.5-6	27	2	2.9	✓	
	11 EL A55	0.5-1.5	11	0.8	0.9	✓	
	16 EL A55	0.5-1.5	16	0.8	0.9	✓	
	16 EL AG55	0.5-3	16	1.2	1.7	✓	
	16 EL G55	1.75-3	16	1.2	1.7	✓	
	22 EL N55	3.5-5	22	1.7	2.5	✓	
	27 EL Q55	5.5-6	27	2	2.9	✓	
22U EI/RL U55		5.5-8	22U	0.9	11	✓	
27U EI/RL U55		-	27U	1.2	13.7	✓	

External - Chipbreaker

Reference		Pitch (mm)	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
16 ERB AG55		0.5-3	16	1.2	1.7		✓
16 ERB G55		1.75-3	16	1.2	1.7		✓

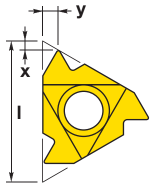
External - Vertical

Reference		Pitch (mm)	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
16V ER A55		0.5-1.5	16	1	0.9	✓	
16V ER AG55		0.5-3	16	1	1.8	✓	
16V ER G55		1.75-3	16	1	1.7	✓	
22V ER N55		3.5-5	22	1.2	2.5	✓	

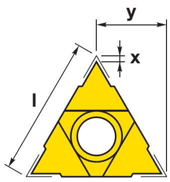
✓: Article which can be ordered
Ordering example: 11 ER A55 9410

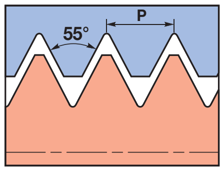
PARTIAL PROFILE 55°

Internal



U Type





Right hand shown

Reference		Pitch (mm)	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
11 IR A55		0.5-1.5	11	0.8	0.9	✓	
16 IR A55		0.5-1.5	16	0.8	0.9	✓	
16 IR AG55		0.5-3	16	1.2	1.7	✓	
16 IR G55		1.75-3	16	1.2	1.7	✓	
22 IR N55		3.5-5	22	1.7	2.5	✓	
27 IR Q55		5.5-6	27	2	2.9	✓	
	11 IL A55	0.5-1.5	11	0.8	0.9	✓	
	16 IL A55	0.5-1.5	16	0.8	0.9	✓	
	16 IL AG55	0.5-3	16	1.2	1.7	✓	
	16 IL G55	1.75-3	16	1.2	1.7	✓	
	22 IL N55	3.5-5	22	1.7	2.5	✓	
	27 IL Q55	5.5-6	27	2	2.9	✓	
22U EI/RL U55		5.5-8	22U	0.9	11	✓	
27U EI/RL U55			27U	1.2	13.7	✓	

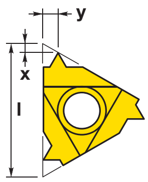
Internal - Chipbreaker

Reference		Pitch (mm)	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
16 IRB AG55		0.5-3	16	1.2	1.7		✓
16 IRB G55		1.75-3	16	1.2	1.7		✓

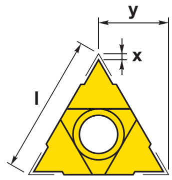
✓: Article which can be ordered
Ordering example: 11 IR A55 9410

ISO

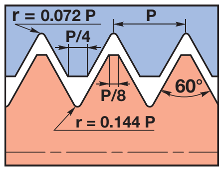
External



U Type



Right hand shown

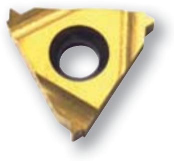


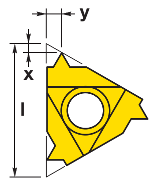
Reference		Pitch (mm)	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
11 ER 0.35 ISO		0.35	11	0.8	0.3	✓	
11 ER 0.4 ISO		0.4	11	0.8	0.4	✓	
11 ER 0.45 ISO		0.45	11	0.8	0.4	✓	
11 ER 0.5 ISO		0.5	11	0.6	0.6	✓	
11 ER 0.6 ISO		0.6	11	0.6	0.6	✓	
11 ER 0.7 ISO		0.7	11	0.6	0.6	✓	
11 ER 0.75 ISO		0.75	11	0.6	0.6	✓	
11 ER 0.8 ISO		0.8	11	0.6	0.6	✓	
11 ER 1.0 ISO		1	11	0.7	0.7	✓	
11 ER 1.25 ISO		1.25	11	0.8	0.9	✓	
11 ER 1.5 ISO		1.5	11	0.8	1	✓	
11 ER 1.75 ISO		1.75	11	0.8	1.1	✓	
16 ER 0.35 ISO		0.35	16	0.8	0.4	✓	
16 ER 0.4 ISO		0.4	16	0.7	0.4	✓	
16 ER 0.45 ISO		0.45	16	0.7	0.4	✓	
16 ER 0.5 ISO		0.5	16	0.6	0.6	✓	
16 ER 0.6 ISO		0.6	16	0.6	0.6	✓	
16 ER 0.7 ISO		0.7	16	0.6	0.6	✓	
16 ER 0.75 ISO		0.75	16	0.6	0.6	✓	
16 ER 0.8 ISO		0.8	16	0.6	0.6	✓	
16 ER 1.0 ISO		1	16	0.7	0.7	✓	
16 ER 1.25 ISO		1.25	16	0.8	0.9	✓	
16 ER 1.5 ISO		1.5	16	0.8	1	✓	
16 ER 1.75 ISO		1.75	16	0.9	1.2	✓	
16 ER 2.0 ISO		2	16	1	1.3	✓	
16 ER 2.5 ISO		2.5	16	1.1	1.5	✓	
16 ER 3.0 ISO		3	16	1.2	1.6	✓	
16 ER 3.5 ISO		3.5	16	1.2	1.7	✓	
22 ER 3.5 ISO		3.5	22	1.6	2.3	✓	
22 ER 4.0 ISO		4	22	1.6	2.3	✓	
22 ER 4.5 ISO		4.5	22	1.7	2.4	✓	
22 ER 5.0 ISO		5	22	1.7	2.5	✓	
27 ER 5.5 ISO		5.5	27	1.9	2.7	✓	
27 ER 6.0 ISO		6	27	2	2.9	✓	
	11 EL 0.5 ISO	0.5	11	0.6	0.6	✓	
	11 EL 0.6 ISO	0.6	11	0.6	0.6	✓	
	11 EL 0.7 ISO	0.7	11	0.6	0.6	✓	
	11 EL 0.75 ISO	0.75	11	0.6	0.6	✓	
	11 EL 1.0 ISO	1	11	0.6	0.7	✓	
	11 EL 1.25 ISO	1.25	11	0.8	0.8	✓	
	11 EL 1.5 ISO	1.5	11	0.8	1	✓	
	11 EL 1.75 ISO	1.75	11	0.8	1.1	✓	
	16 EL 0.35 ISO	0.35	16	0.8	0.4	✓	
	16 EL 0.4 ISO	0.4	16	0.7	0.4	✓	
	16 EL 0.45 ISO	0.45	16	0.7	0.4	✓	
	16 EL 0.5 ISO	0.5	16	0.6	0.6	✓	

✓: Article which can be ordered
Ordering example: 11 ER 0.35 ISO 9410

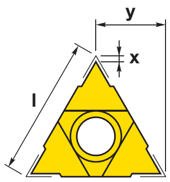
ISO

External



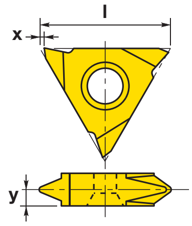


U Type

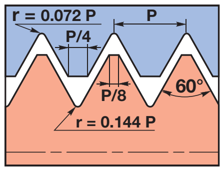


Right hand shown

Vertical



Right hand shown



Reference		Pitch (mm)	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
	16 EL 0.6 ISO	0.6	16	0.6	0.6	✓	
	16 EL 0.7 ISO	0.7	16	0.6	0.6	✓	
	16 EL 0.75 ISO	0.75	16	0.6	0.6	✓	
	16 EL 0.8 ISO	0.8	16	0.6	0.6	✓	
	16 EL 1.0 ISO	1	16	0.7	0.7	✓	
	16 EL 1.25 ISO	1.25	16	0.8	0.9	✓	
	16 EL 1.5 ISO	1.5	16	0.8	1	✓	
	16 EL 1.75 ISO	1.75	16	0.9	1.2	✓	
	16 EL 2.0 ISO	2	16	1	1.3	✓	
	16 EL 2.5 ISO	2.5	16	1.1	1.5	✓	
	16 EL 3.0 ISO	3	16	1.2	1.6	✓	
	16 EL 3.5 ISO	3.5	16	1.2	1.7	✓	
	22 EL 3.5 ISO	3.5	22	1.6	2.3	✓	
	22 EL 4.0 ISO	4	22	1.6	2.3	✓	
	22 EL 4.5 ISO	4.5	22	1.7	2.4	✓	
	22 EL 5.0 ISO	5	22	1.7	2.5	✓	
	27 EL 5.5 ISO	5.5	27	1.9	2.7	✓	
	27 EL 6.0 ISO	6	27	2	2.9	✓	
22U ER/L 5.5 ISO		5.5	22U	2.3	11	✓	
22U ER/L 6.0 ISO		6	22U	2.6	11	✓	
27U ER/L 8.0 ISO		8	27U	2.4	13.7	✓	

External - Chipbreaker

Reference		Pitch (mm)	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
16 ERB 0.8 ISO		0.8	16	0.6	0.6		✓
16 ERB 1.0 ISO		1	16	0.7	0.7		✓
16 ERB 1.25 ISO		1.25	16	0.8	0.9		✓
16 ERB 1.5 ISO		1.5	16	0.8	1		✓
16 ERB 1.75 ISO		1.75	16	0.9	1.2		✓
16 ERB 2.0 ISO		2	16	1	1.3		✓
16 ERB 2.5 ISO		2.5	16	1.1	1.5		✓
16 ERB 3.0 ISO		3	16	1.2	1.6		✓

External - Vertical

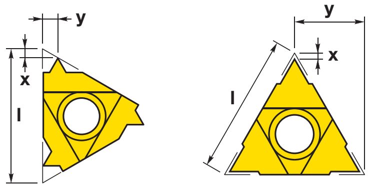
Reference		Pitch (mm)	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
16V ER 1.0 ISO		1	16	1	0.7	✓	
16V ER 1.25 ISO		1.25	16	1	0.9	✓	
16V ER 1.5 ISO		1.5	16	1	0.9	✓	
16V ER 1.75 ISO		1.75	16	1	1.2	✓	
16V ER 2.0 ISO		2	16	1	1.3	✓	
16V ER 2.5 ISO		2.5	16	1	1.5	✓	

✓: Article which can be ordered
Ordering example: 16 EL 0.6 ISO 9410

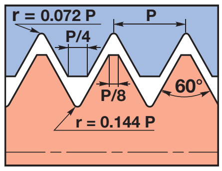
TURNING

ISO

Internal



Right hand shown

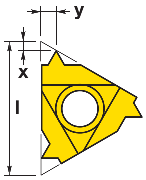


Reference		Pitch (mm)	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
11 IR 0.35 ISO		0.35	11	0.8	0.3	✓	
11 IR 0.4 ISO		0.4	11	0.8	0.4	✓	
11 IR 0.45 ISO		0.45	11	0.8	0.4	✓	
11 IR 0.5 ISO		0.5	11	0.6	0.6	✓	
11 IR 0.6 ISO		0.6	11	0.6	0.6	✓	
11 IR 0.7 ISO		0.7	11	0.6	0.6	✓	
11 IR 0.75 ISO		0.75	11	0.6	0.6	✓	
11 IR 0.8 ISO		0.8	11	0.6	0.6	✓	
11 IR 1.0 ISO		1	11	0.6	0.7	✓	
11 IR 1.25 ISO		1.25	11	0.8	0.8	✓	
11 IR 1.5 ISO		1.5	11	0.8	1	✓	
11 IR 1.75 ISO		1.75	11	0.8	1.1	✓	
11 IR 2.0 ISO		2	11	0.8	0.9	✓	
11 IR 2.5 ISO		2.5	11	0.8	1.2	✓	
16 IR 0.35 ISO		0.35	16	0.8	0.3	✓	
16 IR 0.4 ISO		0.4	16	0.8	0.4	✓	
16 IR 0.45 ISO		0.45	16	0.8	0.4	✓	
16 IR 0.5 ISO		0.5	16	0.6	0.6	✓	
16 IR 0.6 ISO		0.6	16	0.6	0.6	✓	
16 IR 0.7 ISO		0.7	16	0.6	0.6	✓	
16 IR 0.75 ISO		0.75	16	0.6	0.6	✓	
16 IR 0.8 ISO		0.8	16	0.6	0.6	✓	
16 IR 1.0 ISO		1	16	0.6	0.7	✓	
16 IR 1.25 ISO		1.25	16	0.8	0.9	✓	
16 IR 1.5 ISO		1.5	16	0.8	1	✓	
16 IR 1.75 ISO		1.75	16	0.9	1.2	✓	
16 IR 2.0 ISO		2	16	1	1.3	✓	
16 IR 2.5 ISO		2.5	16	1.1	1.5	✓	
16 IR 3.0 ISO		3	16	1.1	1.5	✓	
16 IR 3.5 ISO		3.5	16	1.2	1.7	✓	
22 IR 3.5 ISO		3.5	22	1.6	2.3	✓	
22 IR 4.0 ISO		4.0	22	1.6	2.3	✓	
22 IR 4.5 ISO		4.5	22	1.6	2.4	✓	
22 IR 5.0 ISO		5.0	22	1.6	2.3	✓	
27 IR 5.5 ISO		5.5	27	1.6	2.3	✓	
27 IR 6.0 ISO		6.0	27	1.8	2.5	✓	
	11 IL 0.35 ISO	0.35	11	0.8	0.3	✓	
	11 IL 0.5 ISO	0.5	11	0.6	0.6	✓	
	11 IL 0.75 ISO	0.75	11	0.6	0.6	✓	
	11 IL 1.0 ISO	1	11	0.6	0.7	✓	
	11 IL 1.25 ISO	1.25	11	0.8	0.8	✓	
	11 IL 1.5 ISO	1.5	11	0.8	1	✓	
	11 IL 1.75 ISO	1.75	11	0.8	1.1	✓	
	11 IL 2.0 ISO	2	11	0.8	0.9	✓	
	16 IL 0.35 ISO	0.35	16	0.8	0.3	✓	
	16 IL 0.5 ISO	0.5	16	0.6	0.6	✓	

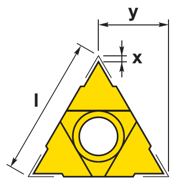
✓: Article which can be ordered
Ordering example: 11 IR 0.35 ISO 9410

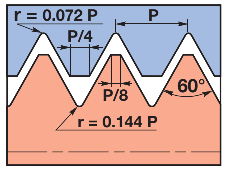
ISO

Internal



U Type





Right hand shown

Reference		Pitch (mm)	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
	16 IL 0.6 ISO	0.6	16	0.6	0.6	✓	
	16 IL 0.75 ISO	0.75	16	0.6	0.6	✓	
	16 IL 0.8 ISO	0.8	16	0.6	0.6	✓	
	16 IL 1.0 ISO	1	16	0.6	0.7	✓	
	16 IL 1.25 ISO	1.25	16	0.8	0.9	✓	
	16 IL 1.5 ISO	1.5	16	0.8	1	✓	
	16 IL 1.75 ISO	1.75	16	0.9	1.2	✓	
	16 IL 2.0 ISO	2	16	1	1.3	✓	
	16 IL 2.5 ISO	2.5	16	1.1	1.5	✓	
	16 IL 3.0 ISO	3	16	1.1	1.5	✓	
	16 IL 3.5 ISO	3.5	16	1.2	1.7	✓	
	22 IL 3.5 ISO	3.5	22	1.6	2.3	✓	
	22 IL 4.0 ISO	4.0	22	1.6	2.3	✓	
	22 IL 4.5 ISO	4.5	22	1.6	2.4	✓	
	22 IL 5.0 ISO	5.0	22	1.6	2.3	✓	
	27 IL 5.5 ISO	5.5	27	1.6	2.3	✓	
	27 IL 6.0 ISO	6.0	27	1.8	2.5	✓	
22U IR/L 5.5 ISO		5.5	22U	2.4	11	✓	
22U IR/L 6.0 ISO		6	22U	2.1	11	✓	
27U IR/L 8.0 ISO		8	27U	2.4	13.7	✓	

Internal - Chipbreaker

Reference		Pitch (mm)	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
16 IRB 1.0 ISO		1	16	0.6	0.7		✓
16 IRB 1.25 ISO		1.25	16	0.8	0.9		✓
16 IRB 1.5 ISO		1.5	16	0.8	1		✓
16 IRB 1.75 ISO		1.75	16	0.9	1.2		✓
16 IRB 2.0 ISO		2.0	16	1	1.3		✓
16 IRB 2.5 ISO		2.5	16	1.1	1.5		✓
16 IRB 3.0 ISO		3.0	16	1.1	1.5		✓

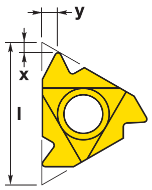
✓: Article which can be ordered
Ordering example: 16 IL 0.6 ISO 9410

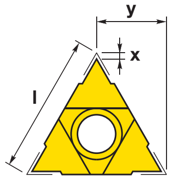
TURNING

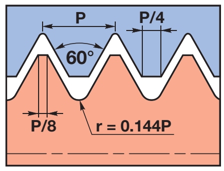
UN

External

U Type







Right hand shown

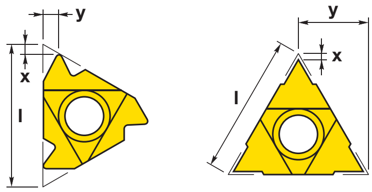
Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
11 ER 14 UN		14	11	0.9	1.1	✓	
11 ER 16 UN		16	11	0.9	1.1	✓	
11 ER 18 UN		18	11	0.8	1	✓	
11 ER 20 UN		20	11	0.8	0.9	✓	
11 ER 24 UN		24	11	0.7	0.8	✓	
11 ER 27 UN		27	11	0.7	0.8	✓	
11 ER 28 UN		28	11	0.6	0.7	✓	
11 ER 32 UN		32	11	0.6	0.6	✓	
11 ER 36 UN		36	11	0.6	0.6	✓	
11 ER 40 UN		40	11	0.6	0.6	✓	
11 ER 44 UN		44	11	0.6	0.6	✓	
11 ER 48 UN		48	11	0.6	0.6	✓	
11 ER 56 UN		56	11	0.7	0.4	✓	
11 ER 64 UN		64	11	0.8	0.4	✓	
11 ER 72 UN		72	11	0.8	0.4	✓	
16 ER 8 UN		8	16	1.2	1.6	✓	
16 ER 9 UN		9	16	1.2	1.7	✓	
16 ER 10 UN		10	16	1.1	1.5	✓	
16 ER 11 UN		11	16	1.1	1.5	✓	
16 ER 11.5 UN		11.5	16	1.1	1.5	✓	
16 ER 12 UN		12	16	1.1	1.4	✓	
16 ER 13 UN		13	16	1	1.3	✓	
16 ER 14 UN		14	16	1	1.2	✓	
16 ER 16 UN		16	16	0.9	1.1	✓	
16 ER 18 UN		18	16	0.8	1	✓	
16 ER 20 UN		20	16	0.8	0.9	✓	
16 ER 24 UN		24	16	0.7	0.8	✓	
16 ER 27 UN		27	16	0.7	0.8	✓	
16 ER 28 UN		28	16	0.6	0.7	✓	
16 ER 32 UN		32	16	0.6	0.6	✓	
16 ER 36 UN		36	16	0.6	0.6	✓	
16 ER 40 UN		40	16	0.6	0.6	✓	
16 ER 44 UN		44	16	0.6	0.6	✓	
16 ER 48 UN		48	16	0.6	0.6	✓	
16 ER 56 UN		56	16	0.7	0.4	✓	
16 ER 64 UN		64	16	0.8	0.4	✓	
16 ER 72 UN		72	16	0.8	0.4	✓	
22 ER 5 UN		5	22	1.7	2.5	✓	
22 ER 6 UN		6	22	1.6	2.3	✓	
22 ER 7 UN		7	22	1.6	2.3	✓	
27 ER 4 UN		4	22	2.1	3	✓	
27 ER 4.5 UN		4.5	22	1.9	2.7	✓	
	11 EL 14 UN	14	11	0.9	1.1	✓	
	11 EL 18 UN	18	11	0.8	1	✓	
	11 EL 20 UN	20	11	0.8	0.9	✓	
	11 EL 24 UN	24	11	0.7	0.8	✓	
	11 EL 28 UN	28	11	0.6	0.7	✓	

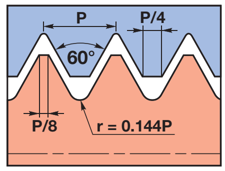
✓: Article which can be ordered
Ordering example: 11 ER 14 UN 9410

UN

External

U Type





Right hand shown

Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
	11 EL 32 UN	32	11	0.6	0.6	✓	
	11 EL 40 UN	40	11	0.6	0.6	✓	
	16 EL 8 UN	8	16	1.2	1.6	✓	
	16 EL 9 UN	9	16	1.2	1.7	✓	
	16 EL 10 UN	10	16	1.1	1.5	✓	
	16 EL 11 UN	11	16	1.1	1.5	✓	
	16 EL 11.5 UN	11.5	16	1.1	1.5	✓	
	16 EL 12 UN	12	16	1.1	1.4	✓	
	16 EL 13 UN	13	16	1	1.3	✓	
	16 EL 14 UN	14	16	1	1.2	✓	
	16 EL 16 UN	16	16	0.9	1.1	✓	
	16 EL 18 UN	18	16	0.8	1	✓	
	16 EL 20 UN	20	16	0.8	0.9	✓	
	16 EL 24 UN	24	16	0.7	0.8	✓	
	16 EL 27 UN	27	16	0.7	0.8	✓	
	16 EL 28 UN	28	16	0.6	0.7	✓	
	16 EL 32 UN	32	16	0.6	0.6	✓	
	16 EL 36 UN	36	16	0.6	0.6	✓	
	16 EL 40 UN	40	16	0.6	0.6	✓	
	16 EL 48 UN	48	16	0.6	0.6	✓	
	16 EL 56 UN	56	16	0.7	0.4	✓	
	16 EL 64 UN	64	16	0.8	0.4	✓	
	16 EL 72 UN	72	16	0.8	0.4	✓	
	22 EL 5 UN	5	22	1.7	2.5	✓	
	22 EL 6 UN	6	22	1.6	2.3	✓	
	22 EL 7 UN	7	22	1.6	2.3	✓	
	27 EL 4 UN	4	22	2.1	3	✓	
	27 EL 4.5 UN	4.5	22	1.9	2.7	✓	
22U ER L 4 UN		4	22U	2	11	✓	
22U ER L 4.5 UN		4.5	22U	2	11	✓	
27U ER L 3 UN		3	27U	2.5	13.7	✓	

External - Chipbreaker

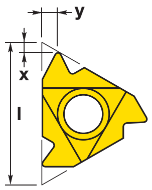
Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
16 ERB 8 UN		8	16	1.2	1.6		✓
16 ERB 9 UN		9	16	1.2	1.7		✓
16 ERB 10 UN		10	16	1.1	1.5		✓
16 ERB 11 UN		11	16	1.1	1.5		✓
16 ERB 12 UN		12	16	1.1	1.4		✓
16 ERB 13 UN		13	16	1	1.3		✓
16 ERB 14 UN		14	16	1	1.2		✓
16 ERB 16 UN		16	16	0.9	1.1		✓
16 ERB 18 UN		18	16	0.8	1		✓
16 ERB 20 UN		20	16	0.8	0.9		✓
16 ERB 24 UN		24	16	0.7	0.8		✓

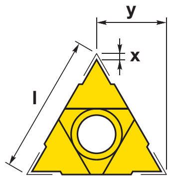
✓: Article which can be ordered
Ordering example: 11 EL 32 UN 9410

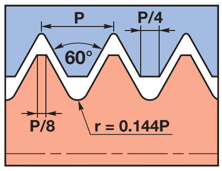
UN

Internal

U Type







Right hand shown

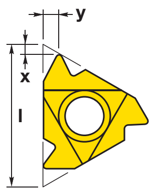
Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
11 IR 11 UN		11	11	0.8	1.1	✓	
11 IR 12 UN		12	11	0.9	1.1	✓	
11 IR 13 UN		13	11	0.8	1	✓	
11 IR 14 UN		14	11	0.9	1.1	✓	
11 IR 16 UN		16	11	0.9	1.1	✓	
11 IR 18 UN		18	11	0.8	1	✓	
11 IR 20 UN		20	11	0.8	0.9	✓	
11 IR 24 UN		24	11	0.7	0.8	✓	
11 IR 27 UN		27	11	0.7	0.8	✓	
11 IR 28 UN		28	11	0.6	0.7	✓	
11 IR 32 UN		32	11	0.6	0.6	✓	
11 IR 36 UN		36	11	0.6	0.6	✓	
11 IR 40 UN		40	11	0.6	0.6	✓	
11 IR 44 UN		44	11	0.6	0.6	✓	
11 IR 48 UN		48	11	0.6	0.6	✓	
11 IR 56 UN		56	11	0.7	0.4	✓	
11 IR 64 UN		64	11	0.8	0.4	✓	
11 IR 72 UN		72	11	0.8	0.3	✓	
16 IR 8 UN		8	16	1.1	1.5	✓	
16 IR 9 UN		9	16	1.2	1.7	✓	
16 IR 10 UN		10	16	1.1	1.5	✓	
16 IR 11 UN		11	16	1.1	1.5	✓	
16 IR 11.5 UN		11.5	16	1.1	1.5	✓	
16 IR 12 UN		12	16	1.1	1.4	✓	
16 IR 13 UN		13	16	1	1.3	✓	
16 IR 14 UN		14	16	0.9	1.2	✓	
16 IR 16 UN		16	16	0.9	1.1	✓	
16 IR 18 UN		18	16	0.8	1	✓	
16 IR 20 UN		20	16	0.8	0.9	✓	
16 IR 24 UN		24	16	0.7	0.8	✓	
16 IR 27 UN		27	16	0.7	0.8	✓	
16 IR 28 UN		28	16	0.6	0.7	✓	
16 IR 32 UN		32	16	0.6	0.6	✓	
16 IR 36 UN		36	16	0.6	0.6	✓	
16 IR 40 UN		40	16	0.6	0.6	✓	
16 IR 44 UN		44	16	0.6	0.6	✓	
16 IR 48 UN		48	16	0.6	0.6	✓	
16 IR 56 UN		56	16	0.7	0.4	✓	
16 IR 64 UN		64	16	0.8	0.4	✓	
16 IR 72 UN		75	16	0.8	0.3	✓	
22 IR 5 UN		5	22	1.6	2.3	✓	
22 IR 6 UN		6	22	1.6	2.3	✓	
22 IR 7 UN		7	22	1.6	2.3	✓	
27 IR 4 UN		4	27	1.8	2.7	✓	
27 IR 4.5 UN		4.5	27	1.7	2.4	✓	

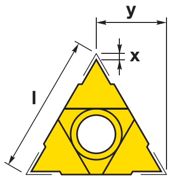
✓: Article which can be ordered
Ordering example: 11 IR 11 UN 9410

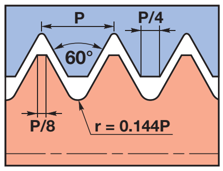
UN

Internal

U Type







Right hand shown

Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
	11 IL 11 UN	11	11	0.8	1.1	✓	
	11 IL 14 UN	14	11	0.9	1.1	✓	
	11 IL 16 UN	16	11	0.9	1.1	✓	
	11 IL 18 UN	18	11	0.8	1	✓	
	11 IL 20 UN	20	11	0.8	0.9	✓	
	11 IL 24 UN	24	11	0.7	0.8	✓	
	11 IL 28 UN	28	11	0.6	0.7	✓	
	11 IL 32 UN	32	11	0.6	0.6	✓	
	11 IL 40 UN	40	11	0.6	0.6	✓	
	11 IL 48 UN	48	11	0.6	0.6	✓	
	16 IL 8 UN	8	16	1.1	1.5	✓	
	16 IL 9 UN	9	16	1.2	1.7	✓	
	16 IL 10 UN	10	16	1.1	1.5	✓	
	16 IL 11 UN	11	16	1.1	1.5	✓	
	16 IL 11.5 UN	11.5	16	1.1	1.5	✓	
	16 IL 12 UN	12	16	1.1	1.4	✓	
	16 IL 13 UN	13	16	1	1.3	✓	
	16 IL 14 UN	14	16	0.9	1.2	✓	
	16 IL 16 UN	16	16	0.9	1.1	✓	
	16 IL 18 UN	18	16	0.8	1	✓	
	16 IL 20 UN	20	16	0.8	0.9	✓	
	16 IL 24 UN	24	16	0.7	0.8	✓	
	16 IL 28 UN	28	16	0.6	0.7	✓	
	16 IL 32 UN	32	16	0.6	0.6	✓	
	16 IL 40 UN	40	16	0.6	0.6	✓	
	22 IL 5 UN	5	22	1.6	2.3	✓	
	22 IL 6 UN	6	22	1.6	2.3	✓	
	22 IL 7 UN	7	22	1.6	2.3	✓	
	27 IL 4.5 UN	4.5	27	1.7	2.4	✓	
	22U IR L 4.5 UN	4.5	22U	2.4	11	✓	
	22U IR/L 4 UN	4	22U	2.4	11	✓	
	27U IR L 3 UN	3	27U	2.7	13.7	✓	

Internal - Chipbreaker

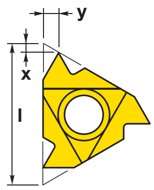
Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
16 IRB 8 UN		8	16	1.1	1.5		✓
16 IRB 10 UN		10	16	1.1	1.5		✓
16 IRB 12 UN		12	16	1.1	1.4		✓
16 IRB 14 UN		14	16	0.9	1.2		✓
16 IRB 16 UN		16	16	0.9	1.1		✓
16 IRB 18 UN		18	16	0.8	1		✓
16 IRB 20 UN		20	16	0.8	0.9		✓
16 IRB 24 UN		24	16	0.7	0.8		✓

✓: Article which can be ordered
Ordering example: 11 IL 11 UN 9410

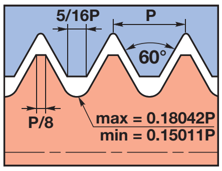
TURNING

UNJ

External



Right hand shown



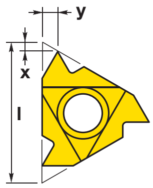
Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
11 ER 14 UNJ		14	11	0.9	1	✓	
11 ER 16 UNJ		16	11	0.8	1	✓	
11 ER 18 UNJ		18	11	0.8	1	✓	
11 ER 20 UNJ		20	11	0.8	0.9	✓	
11 ER 24 UNJ		24	11	0.7	0.8	✓	
11 ER 28 UNJ		28	11	0.6	0.6	✓	
11 ER 32 UNJ		32	11	0.6	0.6	✓	
11 ER 36 UNJ		36	11	0.6	0.6	✓	
11 ER 40 UNJ		40	11	0.6	0.6	✓	
11 ER 44 UNJ		44	11	0.6	0.6	✓	
11 ER 48 UNJ		48	11	0.6	0.6	✓	
16 ER 8 UNJ		8	16	1.2	1.6	✓	
16 ER 9 UNJ		9	16	1.2	1.6	✓	
16 ER 10 UNJ		10	16	1.1	1.5	✓	
16 ER 11 UNJ		11	16	1.1	1.5	✓	
16 ER 12 UNJ		12	16	1.1	1.4	✓	
16 ER 13 UNJ		13	16	1	1.3	✓	
16 ER 14 UNJ		14	16	1	1.2	✓	
16 ER 16 UNJ		16	16	0.8	1	✓	
16 ER 18 UNJ		18	16	0.8	1	✓	
16 ER 20 UNJ		20	16	0.8	0.9	✓	
16 ER 24 UNJ		24	16	0.7	0.8	✓	
16 ER 28 UNJ		28	16	0.6	0.6	✓	
16 ER 32 UNJ		32	16	0.6	0.6	✓	
16 ER 36 UNJ		36	16	0.6	0.6	✓	
16 ER 40 UNJ		40	16	0.6	0.6	✓	
16 ER 44 UNJ		44	16	0.6	0.6	✓	
16 ER 48 UNJ		48	16	0.6	0.6	✓	
	11 EL 18 UNJ	18	11	0.8	1	✓	
	11 EL 20 UNJ	20	11	0.8	0.9	✓	
	11 EL 24 UNJ	24	11	0.7	0.8	✓	
	16 EL 8 UNJ	8	16	1.2	1.6	✓	
	16 EL 10 UNJ	10	16	1.1	1.5	✓	
	16 EL 11 UNJ	11	16	1.1	1.5	✓	
	16 EL 12 UNJ	12	16	1.1	1.4	✓	
	16 EL 14 UNJ	14	16	1	1.2	✓	
	16 EL 16 UNJ	16	16	0.8	1	✓	
	16 EL 18 UNJ	18	16	0.8	1	✓	
	16 EL 20 UNJ	20	16	0.8	0.9	✓	
	16 EL 24 UNJ	24	16	0.7	0.8	✓	
	16 EL 28 UNJ	28	16	0.6	0.6	✓	
	16 EL 32 UNJ	32	16	0.6	0.6	✓	
	16 EL 48 UNJ	48	16	0.6	0.6	✓	

✓: Article which can be ordered
Ordering example: 11 ER 14 UNJ 9410

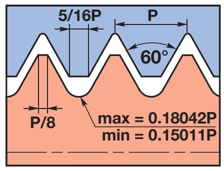
TURNING

UNJ

Internal



Right hand shown

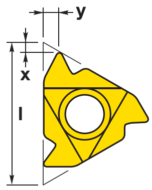


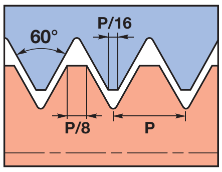
Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
11 IR 14 UNJ		14	11	0.9	1	✓	
11 IR 16 UNJ		16	11	0.8	1	✓	
11 IR 18 UNJ		18	11	0.8	1	✓	
11 IR 20 UNJ		20	11	0.8	0.9	✓	
11 IR 24 UNJ		24	11	0.7	0.8	✓	
11 IR 28 UNJ		28	11	0.6	0.6	✓	
11 IR 32 UNJ		32	11	0.6	0.6	✓	
11 IR 36 UNJ		36	11	0.6	0.6	✓	
11 IR 40 UNJ		40	11	0.6	0.6	✓	
11 IR 44 UNJ		44	11	0.6	0.6	✓	
11 IR 48 UNJ		48	11	0.6	0.6	✓	
16 IR 8 UNJ		8	16	1.2	1.6	✓	
16 IR 9 UNJ		9	16	1.2	1.6	✓	
16 IR 10 UNJ		10	16	1.2	1.6	✓	
16 IR 11 UNJ		11	16	1.1	1.5	✓	
16 IR 12 UNJ		12	16	1.1	1.4	✓	
16 IR 13 UNJ		13	16	1	1.3	✓	
16 IR 14 UNJ		14	16	1	1.2	✓	
16 IR 16 UNJ		16	16	0.8	1	✓	
16 IR 18 UNJ		18	16	0.8	1	✓	
16 IR 20 UNJ		20	16	0.8	0.9	✓	
16 IR 24 UNJ		24	16	0.7	0.8	✓	
16 IR 28 UNJ		28	16	0.6	0.6	✓	
16 IR 32 UNJ		32	16	0.6	0.6	✓	
16 IR 36 UNJ		36	16	0.6	0.6	✓	
16 IR 40 UNJ		40	16	0.6	0.6	✓	
16 IR 44 UNJ		44	16	0.6	0.6	✓	
16 IR 48 UNJ		48	16	0.6	0.6	✓	
	11 IL 14 UNJ	14	11	0.9	1	✓	
	11 IL 16 UNJ	16	11	0.8	1	✓	
	11 IL 18 UNJ	18	11	0.8	1	✓	
	11 IL 20 UNJ	20	11	0.8	0.9	✓	
	16 IL 8 UNJ	8	16	1.2	1.6	✓	
	16 IL 10 UNJ	10	16	1.1	1.5	✓	
	16 IL 11 UNJ	11	16	1.1	1.5	✓	
	16 IL 12 UNJ	12	16	1.1	1.4	✓	
	16 IL 16 UNJ	16	16	0.8	1	✓	
	16 IL 18 UNJ	18	16	0.8	1	✓	

✓: Article which can be ordered
Ordering example: 11 IR 14 UNJ 9410

MJ (ISO 5855)

External





Right hand shown

Reference		Pitch (mm)	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
16 ER 1.0 MJ		1	16	0.7	0.8	✓	
16 ER 1.25 MJ		1.25	16	0.8	0.9	✓	
16 ER 1.5 MJ		1.5	16	0.8	1	✓	
16 ER 2.0 MJ		2	16	1	1.3	✓	

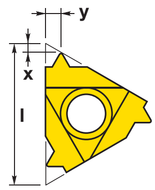
Internal

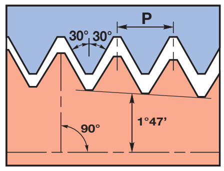
Reference		Pitch (mm)	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
11 IR 1.0 MJ		1	11	0.7	0.8	✓	
11 IR 1.25 MJ		1.25	11	0.8	0.9	✓	
11 IR 1.5 MJ		1.5	11	0.8	1	✓	
11 IR 2.0 MJ		2	11	0.9	1	✓	
16 IR 1.0 MJ		1	16	0.7	0.8	✓	
16 IR 1.25 MJ		1.25	16	0.8	0.9	✓	
16 IR 1.5 MJ		1.5	16	0.8	1	✓	
16 IR 2.0 MJ		2	16	1	1.3	✓	

✓: Article which can be ordered
Ordering example: 16 ER 1.0 MJ 9410

NPT

External





Right hand shown

Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
11 ER 14 NPT		14	11	0.8	1	✓	
11 ER 18 NPT		18	11	0.8	1	✓	
11 ER 27 NPT		27	11	0.7	0.8	✓	
16 ER 8 NPT		8	16	1.3	1.8	✓	
16 ER 11.5 NPT		11.5	16	1.1	1.5	✓	
16 ER 14 NPT		14	16	0.9	1.2	✓	
16 ER 18 NPT		18	16	0.8	1	✓	
16 ER 27 NPT		27	16	0.7	0.8	✓	
	16 EL 8 NPT	8	16	1.3	1.8	✓	
	16 EL 11.5 NPT	11.5	16	1.1	1.5	✓	
	16 EL 14 NPT	14	16	0.9	1.2	✓	
	16 EL 18 NPT	18	16	0.8	1	✓	
	16 EL 27 NPT	27	16	0.7	0.8	✓	

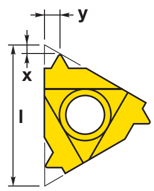
External - Chipbreaker

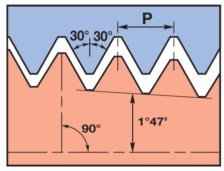
Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
16 ERB 8 NPT		8	16	1.3	1.8		✓
16 ERB 11.5 NPT		11.5	16	1.1	1.5		✓
16 ERB 14 NPT		14	16	0.9	1.2		✓
16 ERB 18 NPT		18	16	0.8	1		✓

✓: Article which can be ordered
Ordering example: 11 ER 14 NPT 9410

NPT

Internal





Right hand shown

Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
11 IR 14 NPT		14	11	0.8	1	✓	
11 IR 18 NPT		18	11	0.8	1	✓	
11 IR 27 NPT		27	11	0.7	0.8	✓	
16 IR 8 NPT		8	16	1.3	1.8	✓	
16 IR 11.5 NPT		11.5	16	1.1	1.5	✓	
16 IR 14 NPT		14	16	0.9	1.2	✓	
16 IR 18 NPT		18	16	0.8	1	✓	
16 IR 27 NPT		27	16	0.7	0.8	✓	
	11 IL 14 NPT	14	11	0.8	1	✓	
	11 IL 18 NPT	18	11	0.8	1	✓	
	11 IL 27 NPT	27	11	0.7	0.8	✓	
	16 IL 8 NPT	8	16	1.3	1.8	✓	
	16 IL 11.5 NPT	11.5	16	1.1	1.5	✓	
	16 IL 14 NPT	14	16	0.9	1.2	✓	
	16 IL 27 NPT	27	16	0.7	0.8	✓	

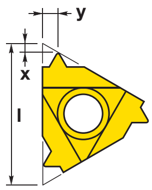
Internal - Chipbreaker

Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
16 IRB 8 NPT		8	16	1.3	1.8		✓
16 IRB 11.5 NPT		11.5	16	1.1	1.5		✓
16 IRB 14 NPT		14	16	0.9	1.2		✓
16 IRB 18 NPT		18	16	0.8	1		✓

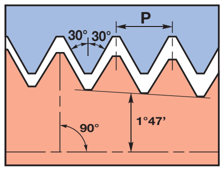
✓: Article which can be ordered
Ordering example: 11 IR 14 NPT 9410

NPTF

External



Right hand shown



Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
11 ER 14 NPTF		14	11	0.8	1	✓	
11 ER 18 NPTF		18	11	0.8	1	✓	
11 ER 27 NPTF		27	11	0.7	0.7	✓	
16 ER 8 NPTF		8	16	1.3	1.8	✓	
16 ER 11.5 NPTF		11.5	16	1.1	1.5	✓	
16 ER 14 NPTF		14	16	0.9	1.2	✓	
16 ER 18 NPTF		18	16	0.8	1	✓	
16 ER 27 NPTF		27	16	0.7	0.7	✓	
	11 EL 18 NPTF	18	11	0.8	1	✓	
	16 EL 11.5 NPTF	11.5	16	1.1	1.5	✓	
	16 EL 14 NPTF	14	16	0.9	1.2	✓	
	16 EL 18 NPTF	18	16	0.8	1	✓	
	16 EL 27 NPTF	27	16	0.7	0.7	✓	

Internal

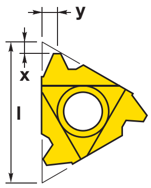
Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
11 IR 14 NPTF		14	11	0.8	1	✓	
11 IR 18 NPTF		18	11	0.8	1	✓	
11 IR 27 NPTF		27	11	0.7	0.7	✓	
16 IR 8 NPTF		8	16	1.3	1.8	✓	
16 IR 11.5 NPTF		11.5	16	1.1	1.5	✓	
16 IR 14 NPTF		14	16	0.9	1.2	✓	
16 IR 18 NPTF		18	16	0.8	1	✓	
16 IR 27 NPTF		27	16	0.7	0.7	✓	

✓: Article which can be ordered
Ordering example: 11 ER 14 NPTF 9410

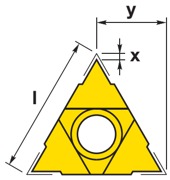
TURNING

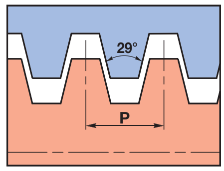
ACME

External



U Type





Right hand shown

Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
11 ER 16 ACME		16	11	0.9	1	✓	
16 ER 6 ACME		6	16	1.7	1.8	✓	
16 ER 8 ACME		8	16	1.5	1.5	✓	
16 ER 10 ACME		10	16	1.3	1.3	✓	
16 ER 12 ACME		12	16	1.1	1.2	✓	
16 ER 14 ACME		14	16	1	1.2	✓	
16 ER 16 ACME		16	16	0.9	1	✓	
22 ER 5 ACME		5	22	2	2.3	✓	
22 ER 6 ACME		6	22	1.8	2.1	✓	
27 ER 4 ACME		4	27	2.3	2.7	✓	
	16 EL 6 ACME	6	16	1.7	1.8	✓	
	16 EL 8 ACME	8	16	1.5	1.5	✓	
	16 EL 10 ACME	10	16	1.3	1.3	✓	
	16 EL 12 ACME	12	16	1.1	1.2	✓	
	16 EL 14 ACME	14	16	1	1.2	✓	
	16 EL 16 ACME	16	16	0.9	1	✓	
	22 EL 5 ACME	5	22	2	2.3	✓	
	22 EL 6 ACME	6	22	1.8	2.1	✓	
	27 EL 4 ACME	4	27	2.3	2.7	✓	
22U ER/L 4 ACME		4	22U	2.3	11	✓	
27U ER/L 3 ACME		3	27U	2.8	13.7	✓	

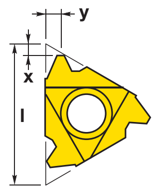
Internal

Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
11 IR 16 ACME		16	11	0.9	1	✓	
16 IR 6 ACME		6	16	1.7	1.8	✓	
16 IR 8 ACME		8	16	1.5	1.5	✓	
16 IR 10 ACME		10	16	1.3	1.3	✓	
16 IR 12 ACME		12	16	1.1	1.2	✓	
16 IR 14 ACME		14	16	1	1.2	✓	
16 IR 16 ACME		16	16	0.9	1	✓	
22 IR 5 ACME		5	22	2	2.3	✓	
22 IR 6 ACME		6	22	1.8	2.1	✓	
27 IR 4 ACME		4	27	2.3	2.7	✓	
	16 IL 6 ACME	6	16	1.7	1.8	✓	
	16 IL 8 ACME	8	16	1.5	1.5	✓	
	16 IL 10 ACME	10	16	1.3	1.3	✓	
	16 IL 12 ACME	12	16	1.1	1.2	✓	
	16 IL 14 ACME	14	16	1	1.2	✓	
	16 IL 16 ACME	16	16	0.9	1	✓	
	22 IL 5 ACME	5	22	2	2.3	✓	
	22 IL 6 ACME	6	22	1.8	2.1	✓	
	27 IL 4 ACME	4	27	2.3	2.7	✓	
22U IR/L 4 ACME		4	22U	2.3	11	✓	
27U IR/L 3 ACME		3	27U	2.8	13.7	✓	

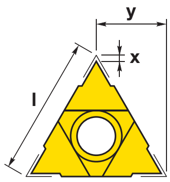
✓: Article which can be ordered
Ordering example: 11 ER 16 ACME 9410

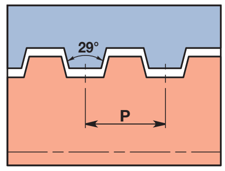
STUB ACME

External



U Type





Right hand shown

Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
11 ER 16 ST ACME		16	11	1	1	✓	
16 ER 6 ST ACME		6	16	1.8	1.8	✓	
16 ER 8 ST ACME		8	16	1.5	1.5	✓	
16 ER 10 ST ACME		10	16	1.3	1.3	✓	
16 ER 12 ST ACME		12	16	1.2	1.2	✓	
16 ER 14 ST ACME		14	16	1.1	1.1	✓	
16 ER 16 ST ACME		16	16	1	1	✓	
22 ER 5 ST ACME		5	22	2	2.3	✓	
27 ER 3 ST ACME		3	27	2.8	2.9	✓	
27 ER 4 ST ACME		4	27	2.3	2.4	✓	
	16 EL 6 STACME	6	16	1.8	1.8	✓	
	16 EL 8 ST ACME	8	16	1.5	1.5	✓	
	16 EL 10 ST ACME	10	16	1.3	1.3	✓	
	16 EL 12 ST ACME	12	16	1.2	1.2	✓	
	16 EL 14 ST ACME	14	16	1.1	1.1	✓	
	16 EL 16 ST ACME	16	16	1	1	✓	
	22 EL 5 ST ACME	5	22	2	2.3	✓	
	27 EL 3 ST ACME	3	27	2.8	2.9	✓	
	27 EL 4 ST ACME	4	27	2.3	2.4	✓	
22U ER/L 3 STACME		3	22U	3.3	11	✓	
22U ER/L 4 STACME		4	22U	2.5	11	✓	

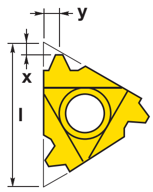
Internal

Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
16 IR 6 ST ACME		6	16	1.8	1.8	✓	
16 IR 8 ST ACME		8	16	1.5	1.5	✓	
16 IR 10 ST ACME		10	16	1.3	1.3	✓	
16 IR 12 ST ACME		12	16	1.2	1.2	✓	
16 IR 14 STACME		14	16	1.1	1.1	✓	
16 IR 16 ST ACME		16	16	1	1	✓	
22 IR 5 ST ACME		5	22	2	2.3	✓	
27 IR 3 ST ACME		3	27	2.8	2.9	✓	
27 IR 4 ST ACME		4	27	2.3	2.4	✓	
	16 IL 6 ST ACME	6	16	1.8	1.8	✓	
	16 IL 8 ST ACME	8	16	1.5	1.5	✓	
	16 IL 10 ST ACME	10	16	1.3	1.3	✓	
	16 IL 12 ST ACME	12	16	1.2	1.2	✓	
	16 IL 14 ST ACME	14	16	1.1	1.1	✓	
	16 IL 16 ST ACME	16	16	1	1	✓	
	22 IL 5 ST ACME	5	22	2	2.3	✓	
	27 IL 3 STACME	3	27	2.8	2.9	✓	
	27 IL 4 ST ACME	4	27	2.3	2.4	✓	
22U IR/L 3 STACME		3	22U	3.3	11	✓	
22U IR/L 4 STACME		4	22U	2.5	11	✓	

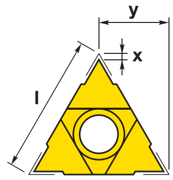
✓: Article which can be ordered
Ordering example: 11 ER 16 ST ACME 9410

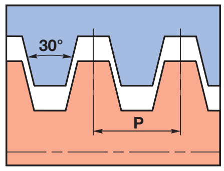
TRAPEZ (DIN 103)

External



U Type





Right hand shown

Reference		Pitch (mm)	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
16 ER 1.5 TR		1.5	16	1	1.1	✓	
16 ER 2 TR		2	16	1	1.3	✓	
16 ER 3 TR		3	16	1.3	1.5	✓	
22 ER 4 TR		4	22	1.8	1.9	✓	
22 ER 5 TR		5	22	2	2.4	✓	
27 ER 6 TR		6	27	2.3	2.7	✓	
27 ER 7 TR		7	27	2.2	2.6	✓	
	16 EL 1.5 TR	1.5	16	1	1.1	✓	
	16 EL 2 TR	2	16	1	1.3	✓	
	16 EL 3 TR	3	16	1.3	1.5	✓	
	22 EL 4 TR	4	22	1.8	1.9	✓	
	22 EL 5 TR	5	22	2	2.4	✓	
	27 EL 6 TR	6	27	2.3	2.7	✓	
	27 EL 7 TR	7	27	2.2	2.6	✓	
22U ER/L 6 TR		6	22U	2	11	✓	
22U ER/L 7 TR		7	22U	2.3	11	✓	
27U ER/L 10 TR		10	27U	3.2	13.7	✓	
27U ER/L 8 TR		8	27U	2.5	13.7	✓	
27U ER/L 9 TR		9	27U	3	13.7	✓	

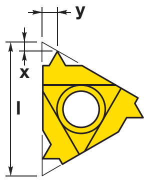
Internal

Reference		Pitch (mm)	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
16 IR 2 TR		2	16	1	1.3	✓	
16 IR 3 TR		3	16	1.3	1.5	✓	
22 IR 4 TR		4	22	1.8	1.9	✓	
22 IR 5 TR		5	22	2	2.4	✓	
27 IR 6 TR		6	27	2.3	2.7	✓	
27 IR 7 TR		7	27	2.2	2.6	✓	
	16 IL 2 TR	2	16	1	1.3	✓	
	16 IL 3 TR	3	16	1.3	1.5	✓	
	22 IL 4 TR	4	22	1.8	1.9	✓	
	22 IL 5 TR	5	22	2	2.4	✓	
	27 IL 6 TR	6	27	2.3	2.7	✓	
	27 IL 7 TR	7	27	2.2	2.6	✓	
22U IR/L 6 TR		6	22U	2	11	✓	
22U IR/L 7 TR		7	22U	2.3	11	✓	
27U IR/L 10 TR		10	27U	3.2	13.7	✓	
27U IR/L 8 TR		8	27U	2.5	13.7	✓	
27U IR/L 9 TR		9	27U	3	13.7	✓	

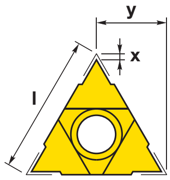
✓: Article which can be ordered
Ordering example: 16 ER 1.5 TR 9410

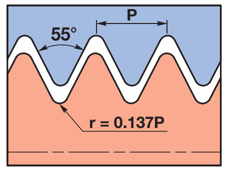
WHITWORTH

External



U Type





Right hand shown

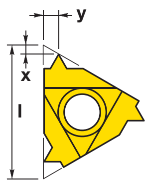
Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
11 ER 14 W		14	11	0.9	1.1	✓	
11 ER 16 W		16	11	0.9	1.1	✓	
11 ER 19 W		19	11	0.8	1	✓	
11 ER 24 W		24	11	0.7	0.8	✓	
11 ER 26 W		26	11	0.7	0.7	✓	
11 ER 28 W		28	11	0.6	0.7	✓	
11 ER 32 W		32	11	0.6	0.6	✓	
11 ER 36 W		36	11	0.6	0.6	✓	
11 ER 40 W		40	11	0.6	0.6	✓	
11 ER 48 W		48	11	0.6	0.6	✓	
11 ER 56 W		56	11	0.7	0.4	✓	
11 ER 60 W		60	11	0.7	0.4	✓	
11 ER 72 W		72	11	0.7	0.4	✓	
16 ER 8 W		8	16	1.2	1.5	✓	
16 ER 9 W		9	16	1.2	1.7	✓	
16 ER 10 W		10	16	1.1	1.5	✓	
16 ER 11 W		11	16	1.1	1.5	✓	
16 ER 12 W		12	16	1.1	1.4	✓	
16 ER 14 W		14	16	1	1.2	✓	
16 ER 16 W		16	16	0.9	1.1	✓	
16 ER 18 W		18	16	0.8	1	✓	
16 ER 19 W		19	16	0.8	1	✓	
16 ER 20 W		20	16	0.8	0.9	✓	
16 ER 22 W		22	16	0.8	0.9	✓	
16 ER 24 W		24	16	0.7	0.8	✓	
16 ER 26 W		26	16	0.7	0.7	✓	
16 ER 28 W		28	16	0.6	0.7	✓	
16 ER 32 W		32	16	0.6	0.6	✓	
16 ER 36 W		36	16	0.6	0.6	✓	
16 ER 40 W		40	16	0.6	0.6	✓	
16 ER 48 W		48	16	0.6	0.6	✓	
16 ER 56 W		56	16	0.7	0.4	✓	
16 ER 60 W		60	16	0.7	0.4	✓	
16 ER 72 W		72	16	0.7	0.4	✓	
22 ER 5 W		5	22	1.7	2.4	✓	
22 ER 6 W		6	22	1.6	2.3	✓	
22 ER 7 W		7	22	1.6	2.3	✓	
27 ER 4 W		4	27	2	2.9	✓	
27 ER 4.5 W		4.5	27	1.8	2.6	✓	
	11 EL 18 W	18	11	0.8	1	✓	
	11 EL 60 W	60	11	0.7	0.4	✓	
	16 EL 8 W	8	16	1.2	1.5	✓	
	16 EL 9 W	9	16	1.2	1.7	✓	
	16 EL 10 W	10	16	1.1	1.5	✓	
	16 EL 11 W	11	16	1.1	1.5	✓	
	16 EL 12 W	12	16	1.1	1.4	✓	

✓: Article which can be ordered
Ordering example: 11 ER 14 W 9410

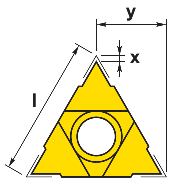
TURNING

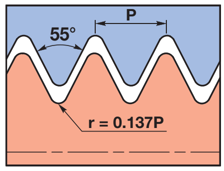
WHITWORTH

External



U Type





Right hand shown

Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
	16 EL 14 W	14	16	1	1.2	✓	
	16 EL 16 W	16	16	0.9	1.1	✓	
	16 EL 18 W	18	16	0.8	1	✓	
	16 EL 19 W	19	16	0.8	1	✓	
	16 EL 20 W	20	16	0.8	0.9	✓	
	16 EL 22 W	22	16	0.8	0.9	✓	
	16 EL 24 W	24	16	0.7	0.8	✓	
	16 EL 26 W	26	16	0.7	0.7	✓	
	16 EL 28 W	28	16	0.6	0.7	✓	
	16 EL 32 W	32	16	0.6	0.6	✓	
	16 EL 36 W	36	16	0.6	0.6	✓	
	16 EL 40 W	40	16	0.6	0.6	✓	
	16 EL 60 W	60	16	0.7	0.4	✓	
22U EI/RL 4 W		4	22U	1.8	11	✓	
22U EI/RL 4.5 W		4.5	22U	2.3	11	✓	
27U EI/RL 2.75 W		2.75	27U	2.4	13.7	✓	
27U EI/RL 3 W		3	27U	2.3	13.7	✓	
27U EI/RL 3.25 W		3.25	27U	2	13.7	✓	
27U EI/RL 3.5 W		3.5	27U	2.1	13.7	✓	

External - Chipbreaker

Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
16 ERB 10 W		10	16	1.1	1.5		✓
16 ERB 11 W		11	16	1.1	1.5		✓
16 ERB 14 W		14	16	1	1.2		✓
16 ERB 16 W		16	16	0.9	1.1		✓
16 ERB 19 W		19	16	0.8	1		✓

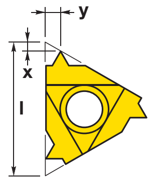
External - Vertical

Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
16V ER 11 W		11	16	1	1.5	✓	
16V ER 14 W		14	16	1	1.2	✓	
16V ER 19 W		19	16	1	0.9	✓	

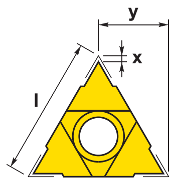
✓: Article which can be ordered
Ordering example: 16 EL 14 W 9410

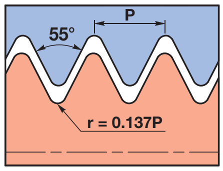
WHITWORTH

Internal



U Type





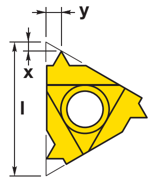
Right hand shown

Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
11 IR 11 W		11	11	0.9	1.2	✓	
11 IR 12 W		12	11	1	1.1	✓	
11 IR 14 W		14	11	0.9	1.1	✓	
11 IR 16 W		16	11	0.9	1.1	✓	
11 IR 18 W		18	11	0.8	1	✓	
11 IR 19 W		19	11	0.8	1	✓	
11 IR 20 W		20	11	0.8	0.9	✓	
11 IR 24 W		24	11	0.7	0.8	✓	
11 IR 26 W		26	11	0.7	0.7	✓	
11 IR 28 W		28	11	0.6	0.7	✓	
11 IR 32 W		32	11	0.6	0.6	✓	
11 IR 36 W		36	11	0.6	0.6	✓	
11 IR 40 W		40	11	0.6	0.6	✓	
11 IR 48 W		48	11	0.6	0.6	✓	
11 IR 56 W		56	11	0.7	0.4	✓	
11 IR 60 W		60	11	0.7	0.4	✓	
11 IR 72 W		72	11	0.7	0.4	✓	
16 IR 8 W		8	16	1.2	1.5	✓	
16 IR 9 W		9	16	1.2	1.7	✓	
16 IR 10 W		10	16	1.1	1.5	✓	
16 IR 11 W		11	16	1.1	1.5	✓	
16 IR 12 W		12	16	1.1	1.4	✓	
16 IR 14 W		14	16	1	1.2	✓	
16 IR 16 W		16	16	0.9	1.1	✓	
16 IR 18 W		18	16	0.8	1	✓	
16 IR 19 W		19	16	0.8	1	✓	
16 IR 20 W		20	16	0.8	0.9	✓	
16 IR 22 W		22	16	0.8	0.9	✓	
16 IR 24 W		24	16	0.7	0.8	✓	
16 IR 26 W		26	16	0.7	0.7	✓	
16 IR 28 W		28	16	0.6	0.7	✓	
16 IR 32 W		32	16	0.6	0.6	✓	
16 IR 36 W		36	16	0.6	0.6	✓	
16 IR 40 W		40	16	0.6	0.6	✓	
16 IR 48 W		48	16	0.6	0.6	✓	
16 IR 72 W		72	16	0.7	0.4	✓	
22 IR 5 W		5	22	1.7	2.4	✓	
22 IR 6 W		6	22	1.6	2.3	✓	
22 IR 7 W		7	22	1.6	2.3	✓	
27 IR 4 W		4	27	2	2.9	✓	
27 IR 4.5 W		4.5	27	1.8	2.6	✓	
	11 IL 11 W	11	11	0.9	1.2	✓	
	11 IL 12 W	12	11	1	1.1	✓	
	11 IL 14 W	14	11	0.9	1.1	✓	
	11 IL 16 W	16	11	0.9	1.1	✓	
	11 IL 19 W	19	11	0.8	1	✓	

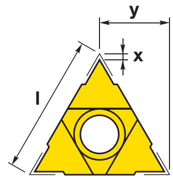
✓: Article which can be ordered
Ordering example: 11 IR 11 W 9410

WHITWORTH

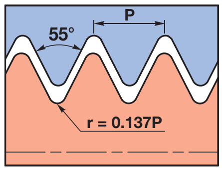
Internal



U Type



Right hand shown



Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
	11 IL 24 W	24	11	0.7	0.8	✓	
	11 IL 26 W	26	11	0.7	0.7	✓	
	11 IL 32 W	32	11	0.6	0.6	✓	
	11 IL 48 W	48	11	0.6	0.6	✓	
	16 IL 8 W	8	16	1.2	1.5	✓	
	16 IL 9 W	9	16	1.2	1.7	✓	
	16 IL 10 W	10	16	1.1	1.5	✓	
	16 IL 11 W	11	16	1.1	1.5	✓	
	16 IL 12 W	12	16	1.1	1.4	✓	
	16 IL 14 W	14	16	1	1.2	✓	
	16 IL 16 W	16	16	0.9	1.1	✓	
	16 IL 18 W	18	16	0.8	1	✓	
	16 IL 19 W	19	16	0.8	1	✓	
	16 IL 20 W	20	16	0.8	0.9	✓	
	16 IL 22 W	22	16	0.8	0.9	✓	
	16 IL 26 W	26	16	0.7	0.7	✓	
	16 IL 28 W	28	16	0.6	0.7	✓	
22U EI/RL 4 W		4	22U	1.8	11	✓	
22U EI/RL 4.5 W		4.5	22U	2.3	11	✓	
27U EI/RL 2.75 W		2.75	27U	2.4	13.7	✓	
27U EI/RL 3 W		3	27U	2.3	13.7	✓	
27U EI/RL 3.25 W		3.25	27U	2	13.7	✓	
27U EI/RL 3.5 W		3.5	27U	2.1	13.7	✓	

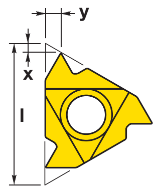
Internal - Chipbreaker

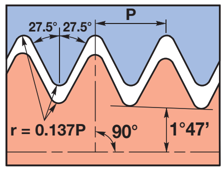
Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
16 IRB 10 W		10	16	1.1	1.5		✓
16 IRB 11 W		11	16	1.1	1.5		✓
16 IRB 14 W		14	16	1	1.2		✓
16 IRB 16 W		16	16	0.9	1.1		✓
16 IRB 19 W		19	16	0.8	1		✓

✓: Article which can be ordered
Ordering example: 11 IL 24 W 9410

BSPT

External





Right hand shown

Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
16 ER 11 BSPT		11	16	1.1	1.5	✓	
16 ER 14 BSPT		14	16	1	1.2	✓	
16 ER 19 BSPT		19	16	0.8	0.9	✓	
16 ER 28 BSPT		28	16	0.6	0.6	✓	
	16 EL 11 BSPT	11	16	1.1	1.5	✓	
	16 EL 14 BSPT	14	16	1	1.2	✓	
	16 EL 19 BSPT	19	16	0.8	0.9	✓	
	16 EL 28 BSPT	28	16	0.6	0.6	✓	

External - Chipbreaker

Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
16 ERB 11 BSPT		11	16	1.5	1.1		✓
16 ERB 14 BSPT		14	16	1.2	1		✓
16 ERB 19 BSPT		19	16	1	1.1		✓

Internal

Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
11 IR 14 BSPT		14	11	0.9	1	✓	
11 IR 19 BSPT		19	11	0.8	0.9	✓	
11 IR 28 BSPT		28	11	0.6	0.6	✓	
16 IR 11 BSPT		11	16	1.1	1.5	✓	
16 IR 14 BSPT		14	16	1	1.2	✓	
16 IR 19 BSPT		19	16	0.8	0.9	✓	
16 IR 28 BSPT		28	16	0.6	0.6	✓	
	16 IL 11 BSPT	11	16	1.1	1.5	✓	
	16 IL 19 BSPT	19	16	0.8	0.9	✓	
	16 IL 28 BSPT	28	16	0.6	0.6	✓	

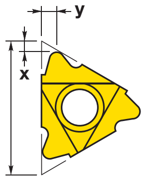
Internal - Chipbreaker

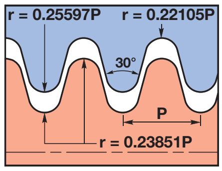
Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
16 IRB 11 BSPT		11	16	1.5	1.1		✓
16 IRB 14 BSPT		14	16	1.2	1		✓

✓: Article which can be ordered
Ordering example: 16 ER 11 BSPT 9410

ROUND (DIN 405)

External





Right hand shown

Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
16 ER 10 RD		10	16	1.1	1.2	✓	
16 ER 6 RD		6	16	1.5	1.7	✓	
16 ER 8 RD		8	16	1.4	1.3	✓	
22 ER 4 RD		4	22	2.2	2.3	✓	
22 ER 6 RD		6	22	1.5	1.7	✓	
27 ER 4 RD		4	27	2.2	2.3	✓	
	16 EL 10 RD	10	16	1.1	1.2	✓	
	16 EL 6 RD	6	16	1.5	1.7	✓	
	16 EL 8 RD	8	16	1.4	1.3	✓	
	22 EL 4 RD	4	22	2.2	2.3	✓	
	22 EL 6 RD	6	22	1.5	1.7	✓	
	27 EL 4 RD	4	27	2.2	2.3	✓	

Internal

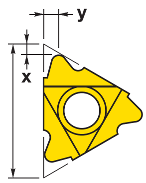
Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
16 IR 10 RD		10	16	1.1	1.2	✓	
16 IR 6 RD		6	16	1.4	1.5	✓	
16 IR 8 RD		8	16	1.4	1.4	✓	
22 IR 4 RD		4	22	2.2	2.3	✓	
22 IR 6 RD		6	22	1.5	1.7	✓	
27 IR 4 RD		4	27	2.2	2.3	✓	
27 IR 6 RD		6	27	2.2	2.3	✓	
	16 IL 10 RD	10	16	1.1	1.2	✓	
	16 IL 6 RD	6	16	1.4	1.5	✓	
	16 IL 8 RD	8	16	1.4	1.4	✓	
	22 IL 4 RD	4	22	2.2	2.3	✓	
	22 IL 6 RD	6	22	1.5	1.7	✓	

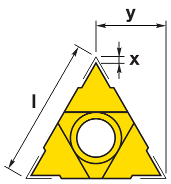
✓: Article which can be ordered
Ordering example: 16 ER 10 RD 9410

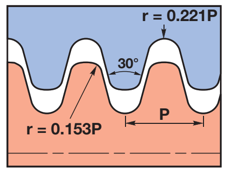
ROUND (DIN 20400)

External

U Type







Right hand shown

Reference		Pitch (mm)	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
22 ER 4.0 RD 20400		4	22	1.4	1.4	✓	
22 ER 5 RD 20400		5	22	1.7	1.8	✓	
22 ER 6.0 RD 20400		6	22	1.7	2	✓	
27U - 8.0 RD 20400		8	27U	3	13.7	✓	

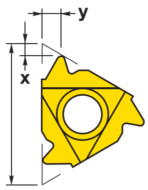
Internal

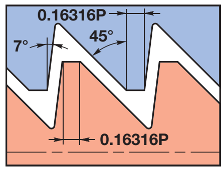
Reference		Pitch (mm)	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
22 IR 4.0 RD 20400		4	22	1.4	1.4	✓	
22 IR 5 RD 20400		5	22	1.7	1.8	✓	
22 IR 6.0 RD 20400		6	22	1.7	2	✓	
27U - 8.0 RD 20400		8	27U	3	13.7	✓	

✓: Article which can be ordered
Ordering example: 22 ER 4.0 RD 20400 9410

AMERICAN BUTTRESS

External





Right hand shown

Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
11 ER 20 ABUT		20	11	1	1.3	✓	
16 ER 10 ABUT		10	16	1.5	2.3	✓	
16 ER 12 ABUT		12	16	1.4	2	✓	
16 ER 16 ABUT		16	16	1	1.5	✓	
16 ER 20 ABUT		20	16	1	1.3	✓	
22 ER 6 ABUT		6	22	2.1	3.4	✓	
22 ER 8 ABUT		8	22	2.1	3.3	✓	
22U ER 4 ABUT		4	22U	2.3	9.5	✓	
27U ER 3 ABUT		3	22U	3.1	11.7	✓	
	16 EL 10 ABUT	10	16	1.5	2.3	✓	
	16 EL 12 ABUT	12	16	1.4	2	✓	
	16 EL 16 ABUT	16	16	1	1.5	✓	
	16 EL 20 ABUT	20	16	1	1.3	✓	
	22 EL 6 ABUT	6	22	2.1	3.4	✓	
	22 EL 8 ABUT	8	22	2.1	3.3	✓	
	22U EL 4 ABUT	4	22U	2.3	9.5	✓	
	27U EL 3 ABUT	3	22U	3.1	11.7	✓	

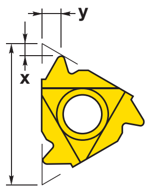
Internal

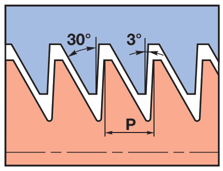
Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
11 IR 16 ABUT		16	11	1	1.5	✓	
11 IR 20 ABUT		20	11	1	1.3	✓	
16 IR 10 ABUT		10	16	1.5	2.3	✓	
16 IR 12 ABUT		12	16	1.4	2	✓	
16 IR 16 ABUT		16	16	1	1.5	✓	
16 IR 20 ABUT		20	16	1	1.3	✓	
22 IR 6 ABUT		6	22	2.1	3.4	✓	
22 IR 8 ABUT		8	22	2.1	3.3	✓	
22U IR 4 ABUT		4	22U	2.3	9.5	✓	
27U IR 3 ABUT		3	22U	3.1	11.7	✓	
	11 IL 20 ABUT	20	11	1	1.3	✓	
	16 IL 10 ABUT	10	16	1.5	2.3	✓	
	16 IL 12 ABUT	12	16	1.4	2	✓	
	16 IL 16 ABUT	16	16	1	1.5	✓	
	16 IL 20 ABUT	20	16	1	1.3	✓	
	22 IL 6 ABUT	6	22	2.1	3.4	✓	
	22 IL 8 ABUT	8	22	2.1	3.3	✓	
	22U IL 4 ABUT	4	22U	2.3	9.5	✓	

✓: Article which can be ordered
Ordering example: 11 ER 20 ABUT 9410

SAGE (DIN 513 - UNI 127B)

External





Right hand shown

Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
16 ER 2 SAGE		2	16	1.1	1.6	✓	
22 ER 3 SAGE		3	22	1.5	2.4	✓	
22 ER 4 SAGE		4	22	1.9	3.1	✓	
22U ER 5 SAGE		5	22U	1.2	11.6	✓	
22U ER 6 SAGE		6	22U	1.2	11.7	✓	
	16 EL 2 SAGE	2	16	1.1	1.6	✓	
	22 EL 3 SAGE	3	22	1.5	2.4	✓	
	22 EL 4 SAGE	4	22	1.9	3.1	✓	
	22U EL 6 SAGE	6	22U	1.2	11.7	✓	

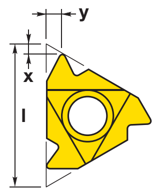
Internal

Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
16 IR 2 SAGE		2	16	1.2	1.7	✓	
22 IR 3 SAGE		3	22	1.9	2.9	✓	
22 IR 4 SAGE		4	22	2.3	3.5	✓	
22U IR 5 SAGE		5	22U	1.9	11.7	✓	
22U IR 6 SAGE		6	22U	2.1	11.9	✓	
	16 IL 2 SAGE	2	16	1.2	1.7	✓	
	22 IL 3 SAGE	3	22	1.9	2.9	✓	
	22 IL 4 SAGE	4	22	2.3	3.5	✓	
	22U IL 6 SAGE	6	22U	2.1	11.9	✓	

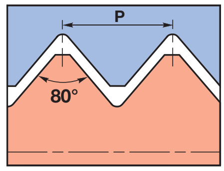
✓: Article which can be ordered
Ordering example: 16 ER 2 SAGE 9410

PG (DIN 40430)

External



Right hand shown



Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
16 ER 16 PG		16	16	0.8	1	✓	
16 ER 18 PG		18	16	0.8	0.9	✓	
16 ER 20 PG		20	16	0.7	0.8	✓	

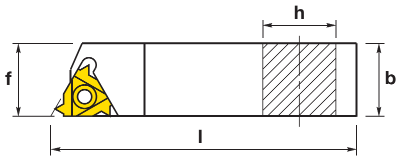
Internal

Reference		TPI	Dimensions (mm)			9410	9420
Right hand	Left hand		l	x	y		
11 IR 18 PG		18	11	0.8	0.9	✓	
16 IR 16 PG		16	16	0.8	1	✓	
16 IR 18 PG		18	16	0.8	0.9	✓	

✓: Article which can be ordered
Ordering example: 16 ER 16 PG 9410

STANDARD TYPE TOOLHOLDERS

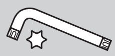
SER/L



Right hand shown

Reference	Insert size	Dimensions (mm)			Left hand	Right hand
		b=h	l	f		
SER/L 0808 H11	11	8	100	11	✓	✓
SER/L 1010 H11	11	10	100	11	✓	✓
SER/L 1212 K11	11	12	125	12	✓	✓
SER/L 1212 F16	16	12	80	16	✓	✓
SER/L 1616 H16	16	16	100	16	✓	✓
SER/L 2020 K16	16	20	125	20	✓	✓
SER/L 2525 M16	16	25	150	25	✓	✓
SER/L 3232 P16	16	32	170	32	✓	✓
SER/L 2525 M22	22	25	150	22	✓	✓
SER/L 3232 P22	22	32	170	32	✓	✓
SER/L 4040 R22	22	40	200	40	✓	✓
SER/L 2525 M27	27	25	150	32	✓	✓
SER/L 3232 P27	27	32	170	32	✓	✓
SER/L 4040 R27	27	40	200	40	✓	✓

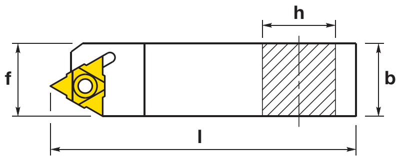
Spare parts

Insert size					
11	RS11	-	-	-	RK11
16	RS16	CAI16	CAE16	RA16	RK16
22	RS22	CAI22	CAE22	RA22	RK22
27	RS27	CAI27	CAE27	RA27	RK27

✓: Article which can be ordered
Ordering example: SER 0808 H11

U TYPE TOOLHOLDERS

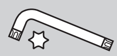
SER/L-U



Right hand shown

Reference	Insert size	Dimensions (mm)			Left hand	Right hand
		b=h	l	f		
SER/L 2525 M22U	22	25	150	28	✓	✓
SER/L 3232 P22U	22	32	170	32	✓	✓
SER/L 4040 R22U	22	40	200	40	✓	✓
SER/L 2525 M27U	27	25	150	32	✓	✓
SER/L 3232 P27U	27	32	170	32	✓	✓
SER/L 4040 R27U	27	40	200	40	✓	✓
SER/L 2525 M33U	33	25	150	32	✓	✓
SER/L 3232 P33U	33	32	170	32	✓	✓

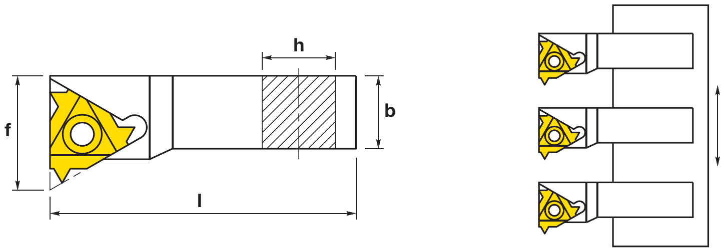
Spare parts

Insert size					
22	RS22	CAI22U	CAE22U	RA22	RK22
27	RS27	CAI27U	CAE27U	RA27	RK27
33	RS33	-	-	-	RK33

✓: Article which can be ordered
Ordering example: SER 2525 M22U

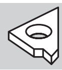
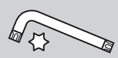
GANG TOOLHOLDERS / VERTICAL TOOLHOLDERS

SER/L-G

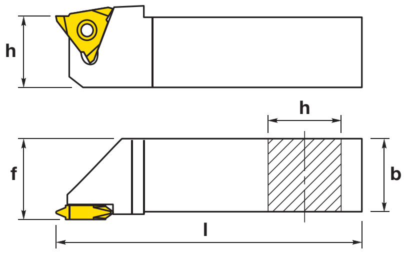


Reference	Insert size	Dimensions (mm)			Left hand	Right hand
		b=h	l	f		
SER/L 0808 H11G	11	8	100	12	✓	✓
SER/L 1010 H11G	11	10	100	14	✓	✓

Spare parts

Insert size					
11	RS11	-	-	-	RK11

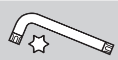
SER/L-V



Right hand shown

Reference	Insert size	Dimensions (mm)			Left hand	Right hand
		b=h	l	f		
SER/L 2020 K16V	16	20	125	22	✓	✓
SER/L 2525 M16V	16	25	150	27	✓	✓
SER/L 2525 M22V	22	25	150	27.5	✓	✓

Spare parts

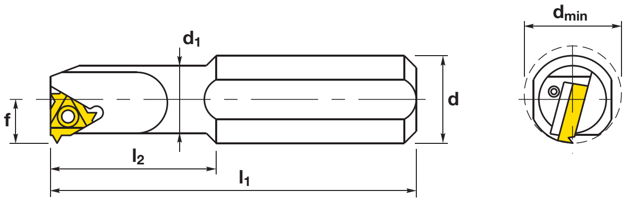
Insert size					
16	RS16S	-	-	-	RK16
22	RS22S	-	-	-	RK22

✓: Article which can be ordered
Ordering example: SER 0808 H11G

STANDARD TYPE BORING BARS

TURNING

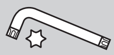
SIR/L



Right hand shown

Reference	Insert size	Dimensions (mm)						Left hand	Right hand
		d	d1	d_{min}	l1	l2	f		
SIR/L 0010 H11	11	10	10	12	100	-	7.4	✓	✓
SIR/L 0010 K11	11	16	10	12	125	25	7.4	✓	✓
SIR/L 0013 L11	11	16	13	15	140	32	8.9	✓	✓
SIR/L 0013 M16	16	16	13	16	150	32	10.2	✓	✓
SIR/L 0016 P16	16	20	16	19	170	40	11.7	✓	✓
SIR/L 0020 P16	16	20	20	24	170	-	13.7	✓	✓
SIR/L 0025 R16	16	25	25	29	200	-	16.2	✓	✓
SIR/L 0032 S16	16	32	32	396	250	-	19.7	✓	✓
SIR/L 0040 T16	16	40	40	44	300	-	23.7	✓	✓
SIR/L 0050 U16	16	50	50	54	350	-	28.7	✓	✓
SIR/L 0020 P22	22	20	20	24	170	-	15.6	✓	✓
SIR/L 0025 R22	22	25	25	29	200	-	18.1	✓	✓
SIR/L 0032 S22	22	32	32	38	250	-	21.6	✓	✓
SIR/L 0040 T22	22	40	40	46	300	-	25.6	✓	✓
SIR/L 0050 U22	22	50	50	56	350	-	30.6	✓	✓
SIR/L 0032 S27	27	32	32	40	250	-	22.6	✓	✓
SIR/L 0040 T27	27	40	40	48	300	-	26.6	✓	✓
SIR/L 0050 U27	27	50	50	58	350	-	31.6	✓	✓
SIR/L 0060 V27	27	60	60	68	400	-	36.6	✓	✓

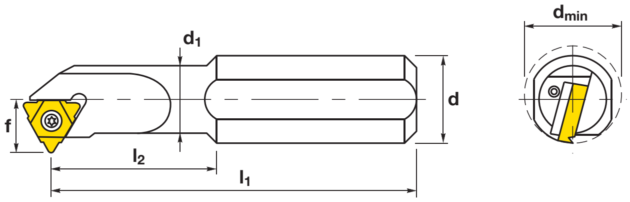
Spare parts

Insert size	d					
11	-	RS11	-	-	-	RK11
16	0013 - 0016	RS16S	-	-	-	RK16
16	0020 - 0050	RS16	CAE16	CAI16	RA16	RK16
22	0020	RS22S	-	-	-	RK22
22	0025 - 0050	RS22	CAE22	CAI22	RA22	RK22
27	-	RS27	CAE27	CAI27	RA27	RK27

✓: Article which can be ordered
Ordering example: SIR 0010 H11

U TYPE BORING BARS

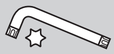
SIR/L-U



Right hand shown

Reference	Insert size	Dimensions (mm)						Left hand	Right hand
		d	d1	d_{min}	l1	l2	f		
SIR/L 0032 S22U	22	32	32	38	250	-	24.4	✓	✓
SIR/L 0040 T22U	22	40	40	46	300	-	28.1	✓	✓
SIR/L 0050 U22U	22	50	50	57	350	-	30.8	✓	✓
SIR/L 0032 S27U	27	32	32	40	250	-	25.8	✓	✓
SIR/L 0040 T27U	27	40	40	48	300	-	29.4	✓	✓
SIR/L 0050 U27U	27	50	50	58	350	-	34.3	✓	✓
SIR/L 0060 V27U	27	60	60	68	400	-	39.7	✓	✓
SIR/L 0050 U33U	33	550	50	62	350	-	37.5	✓	✓

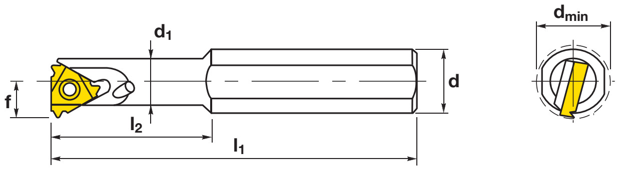
Spare parts

Insert size					
22	RS22	CAE22U	CAI22U	RA22	RK22
27	RS27	CAE27U	CAI27U	RA27	RK27
33	RS33	-	-	-	RK33

✓: Article which can be ordered
Ordering example: SIR 0032 S22U

BORING BARS WITH COOLANT HOLE

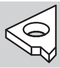
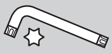
SIR/L-B



Right hand shown

Reference	Insert size	Dimensions (mm)						Left hand	Right hand
		d	d1	d_{min}	l1	l2	f		
SIR/L 0010 K11B	11	16	10	12	125	25	7.4	✓	✓
SIR/L 0013 M16B	16	16	13	16	150	32	10.2	✓	✓
SIR/L 0016 P16B	16	20	16	19	170	40	11.7	✓	✓
SIR/L 0020 P16B	16	20	20	24	170	-	13.7	✓	✓
SIR/L 0025 R16B	16	25	25	29	200	-	16.2	✓	✓
SIR/L 0032 S16B	16	32	32	36	250	-	19.7	✓	✓
SIR/L 0025 R22B	22	25	25	29	200	-	18.1	✓	✓

Spare parts

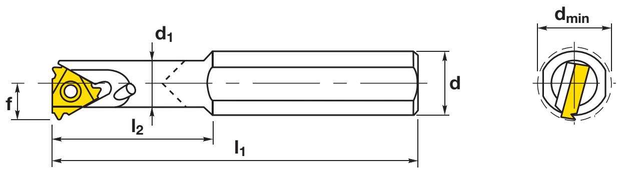
Insert size	d					
11	-	RS11	-	-	-	RK11
16	0013 - 0016	RS16S	-	-	-	RK16
16	0020 - 0032	RS16	CAE16	CAI16	RA16	RK16
22	-	RS22	CAE22	CAI22	RA22	RK22

✓: Article which can be ordered
Ordering example: SIR 0010 K11B

TURNING

CARBIDE BORING BARS WITH COOLANT HOLE

SIR/L-CB



Right hand shown

Reference	Insert size	Dimensions (mm)						Left hand	Right hand
		d	d1	d_{min}	l1	l2	f		
SIR/L 0010 M11CB	11	10	10	12	150	-	7.4	✓	✓
SIR/L 0012 P11CB	11	12	12	15	170	-	8.4		✓
SIR/L 0016 R16CB	16	16	16	19	200	-	11.7	✓	✓
SIR/L 0020 S16CB	16	20	20	23	250	-	13.7	✓	✓
SIR/L 0025 S16CB	16	25	25	28	250	-	16.2	✓	✓

Spare parts

Insert size	d					
11	-	RS11	-	-	-	RK11
16	0016	RS16S	-	-	-	RK16
16	0020 - 0025	RS16	CAE16	CAI16	RA16	RK16

✓: Article which can be ordered
Ordering example: SIR 0010 M11CB

GRADE DESCRIPTION / CUTTING DATA

9410 (P10-P25) - (M10-M25) - (K10-K20):

Micrograin coated grade TiN (PVD) for the machining of steels, stainless steels and cast irons.

Very versatile grade

9420 (P20-P40) - (M20-M40) - (K20-K30):

Submicrograin coated grade TiAlN (PVD) for the machining of stainless steels and heat resistant alloys with medium to high cutting speed.

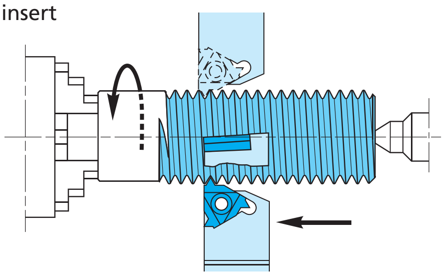
Coated grades	Low carbon steels	Medium carbon and high carbon steels	Alloy steels	Tools steels and die steels	Stainless steels austenitic, ferritic	Grey cast iron	Aluminum and copper alloys	High temp alloys and titanium	Hardened materials
9410	100-180	80-160	80-120	120-160	90-120	80-150	300-600	40-80	20-40
9420	90-160	80-150	80-120	100-140	70-130	80-130	300-800	40-100	20-50

MACHINING GUIDELINES

Threading methods - External

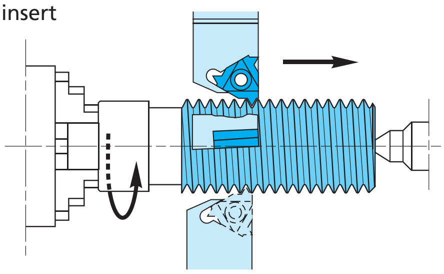
Right hand thread

- Counter-clockwise rotation
- Movement towards the spindle
- Right hand toolholder
- Right hand insert



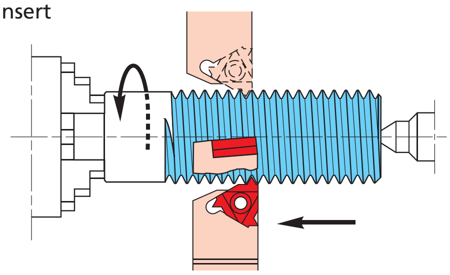
Right hand thread

- Clockwise rotation
- Movement towards the tailstock
- Right hand toolholder
- Right hand insert



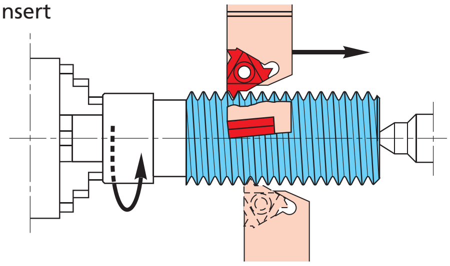
Right hand thread

- Counter-clockwise rotation
- Movement towards the spindle
- Left hand toolholder
- Left hand insert



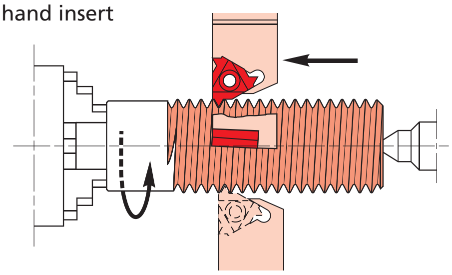
Right hand thread

- Clockwise rotation
- Movement towards the tailstock
- Left hand toolholder
- Left hand insert



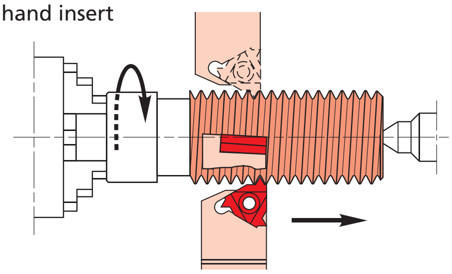
Left hand thread

- Clockwise rotation
- Movement towards the spindle
- Left hand toolholder
- Left hand insert



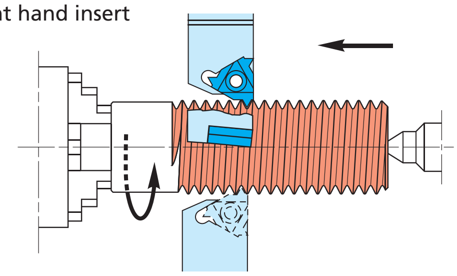
Left hand thread

- Counter-clockwise rotation
- Movement towards the taistock
- Left hand toolholder
- Left hand insert



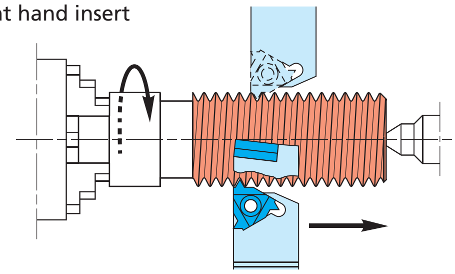
Left hand thread

- Clockwise rotation
- Movement towards the spindle
- Right hand toolholder
- Right hand insert



Left hand thread

- Counter-clockwise rotation
- Movement towards the tailstock
- Right hand toolholder
- Right hand insert

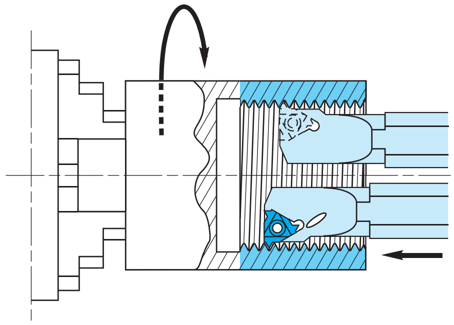


MACHINING GUIDELINES

Threading methods - Internal

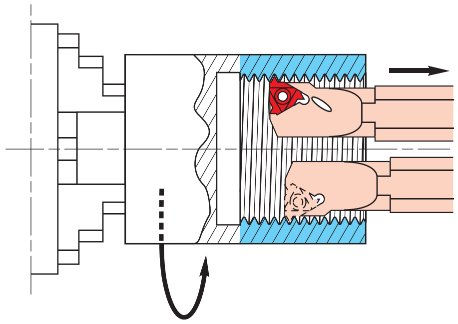
Right hand thread

. Counter-clockwise rotation
. Movement towards the spindle
. Right hand bar
. Right hand insert



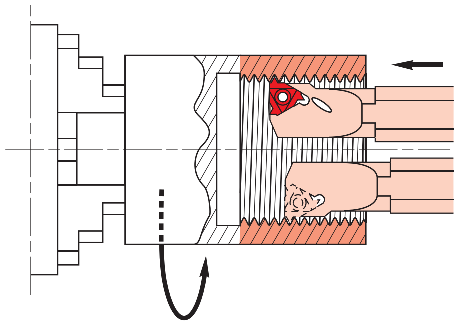
Right hand thread

- Clockwise rotation
- Movement towards the tailstock
- Left hand bar
- Left hand insert



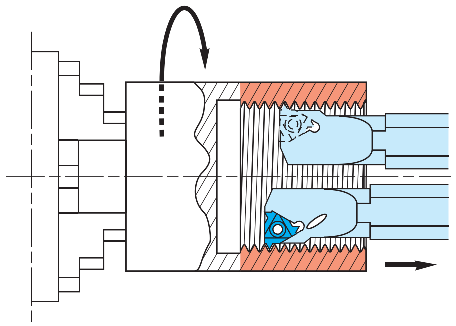
Left hand thread

- Counter-clockwise rotation
- Movement towards the spindle
- Left hand bar
- Left hand insert



Left hand thread

- Clockwise rotation
- Movement towards the tailstock
- Right hand bar
- Right hand insert

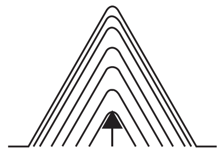
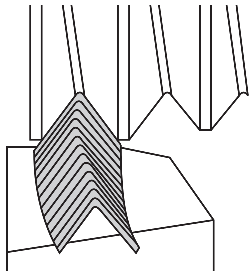
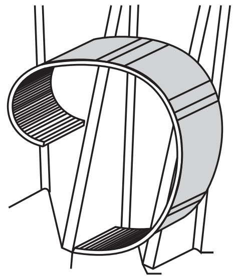
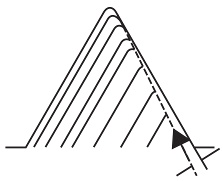
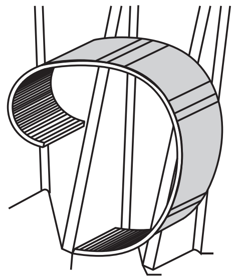
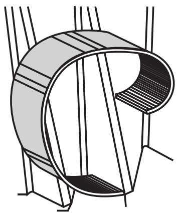
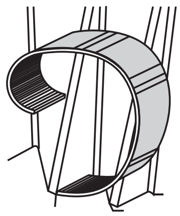


Number of cutting passes selection

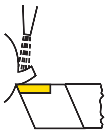
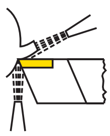
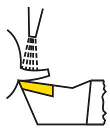
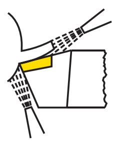
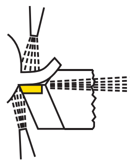
Pitch millimeters	0.5	1.0	1.5	2.0	2.5	3.0	4.0	6.0
Threads per Inch	48	24	16	12	10	8	6	4
Number of passes	3-6	4-9	5-11	6-13	7-15	8-17	10-20	11-22

Thread pass notes:
For most standard applications, choose the middle of the range as a good starting point.
In most cases, the tougher the material, the higher the number of cutting passes required.
As a general rule of thumb, less passes are better than increasing speed.

MACHINING GUIDELINES

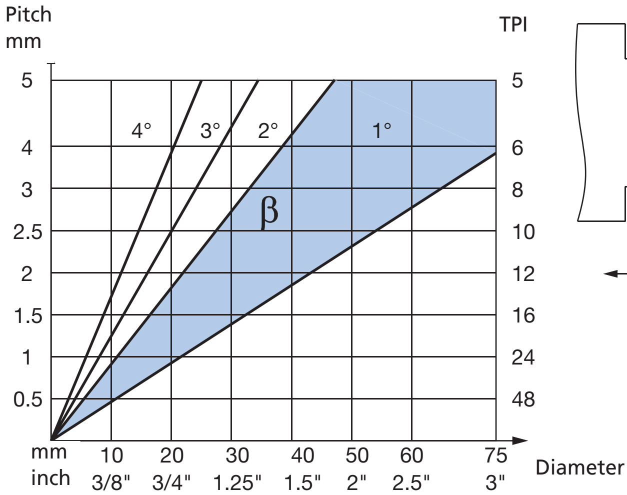
Infeed angle selection and chip formation		Typical chip formation	
Infeed angle 0° Benefit: Cutting edge is protected from chippping by both sides in cut. Problem: Both sides of insert are heated by the workpiece. Produces «Vee» chips which can be very difficult to handle.			
Infeed angle 30° Benefit: Chip is curied away from thread form. Problem: Trailing edge may drag rather than cut, which may cause chipping.			
Infeed angle 29° Benefit: Cutting edge is protected from chipping by both sides in cut. Chip is curled away from thread form. Part of the heat generated is dissipated to the trailing edge. Final pass infeed angle shoud be 0°.			
Alternating flank infeed for very large thread forms Benefit: Increased tool life because both edges are used effectively. Final pass should be 0°.			

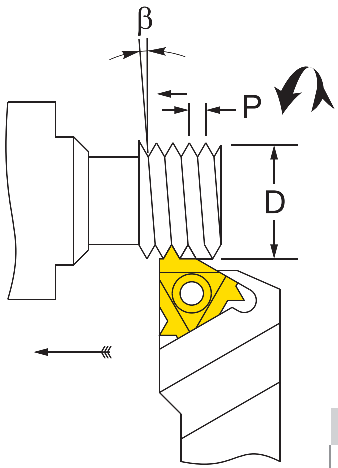
The coolant should provide

Fast heat removal	Good surface coverage	Non-corrosiveness	Homogeneity and stability	Good lubricant qualities
				

MACHINING GUIDELINES

Thread helix angle





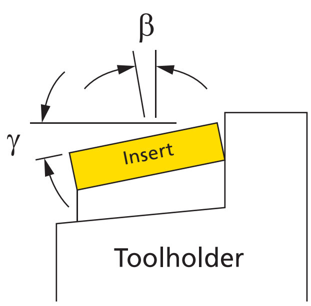
$$\tan \beta = \frac{P}{\pi \cdot D}$$

Simplified formula	
Metric:	β = 20P/D
Inch:	β = 20/PD

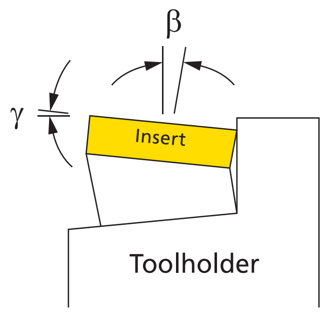
Example
D = 30 mm (1.18")
P = 1.5 mm (16 TPI)
Metric: β = 20 x 1.5/30 = 1
Inch: β = 20/16 x 1.18 = 1

Standard and slanted shims

Safety toolholder and boring bar pockets have a built-in 1.5 helix compensation angle. This angle may be adjusted to match the helix angle of the thread being produced by replacing the shim.



Positive helix angles
Applicable when turning RH thread with RH holder or LH thread with LH holder.



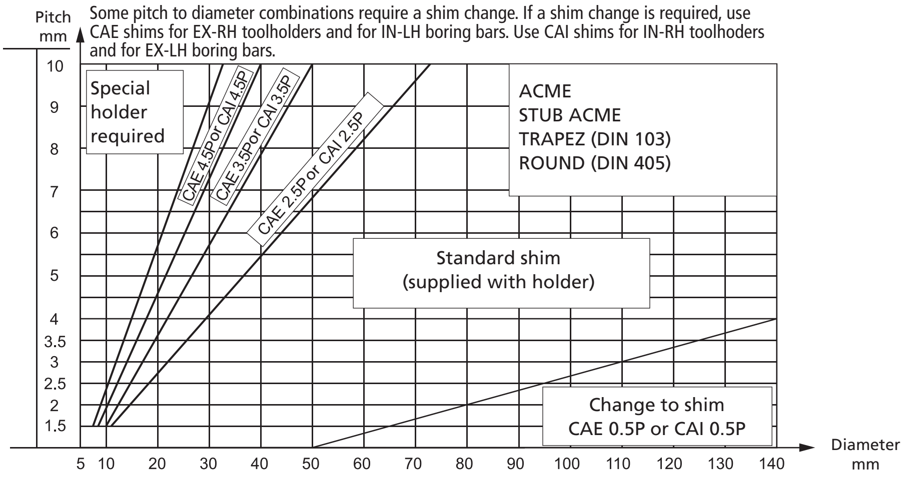
Negative helix angles
Applicable when turning RH thread with LH holder or LH thread with RH holder.

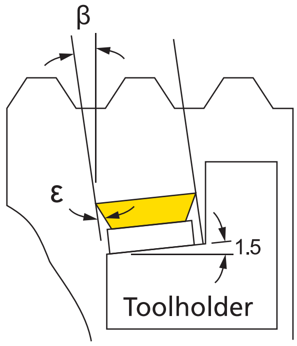
Insert Size	Toolholders	+ 4.5°	+ 3.5°	+ 2.5°	+ 1.5° Standard	+0.5°	- 0.5°	- 1.5°
16	EX-RH or IN-LH	CAE 16 4.5P	CAE 16 3.5P	CAE 16 2.5P	CAE 16	CAE 16 0.5P	CAE 16 0.5N	CAE 16 1.5N
16	EX-LH or IN-RH	CAI 16 4.5P	CAI 16 3.5P	CAI 16 2.5P	CAI 16	CAI 16 0.5P	CAI 16 0.5N	CAI 16 1.5N
22	EX-RH or IN-LH	CAE 22 4.5P	CAE 22 3.5P	CAE 22 2.5P	CAE 22	CAE 22 0.5P	CAE 22 0.5N	CAE 22 1.5N
22	EX-LH or IN-RH	CAI 22 4.5P	CAI 22 3.5P	CAI 22 2.5P	CAI 22	CAI 22 0.5P	CAI 22 0.5N	CAI 22 1.5N
22U	EX-RH or IN-LH	CAE 22U 4.5P	CAE 22U 3.5P	CAE 22U 2.5P	CAE 22U	CAE 22U 0.5P	CAE 22U 0.5N	CAE 22U 1.5N
22U	EX-LH or IN-RH	CAI 22U 4.5P	CAI 22U 3.5P	CAI 22U 2.5P	CAI 22U	CAI 22U 0.5P	CAI 22U 0.5N	CAI 22U 1.5N
27	EX-RH or IN-LH	CAE 27 4.5P	CAE 27 3.5P	CAE 27 2.5P	CAE 27	CAE 27 0.5P	CAE 27 0.5N	CAE 27 1.5N
27	EX-LH or IN-RH	CAI 27 4.5P	CAI 27 3.5P	CAI 27 2.5P	CAI 27	CAI 27 0.5P	CAI 27 0.5N	CAI 27 1.5N
27U	EX-RH or IN-LH	CAE 27U 4.5P	CAE 27U 3.5P	CAE 27U 2.5P	CAE 27U	CAE 27U 0.5P	CAE 27U 0.5N	CAE 27U 1.5N
27U	EX-LH or IN-RH	CAI 27U 4.5P	CAI 27U 3.5P	CAI 27U 2.5P	CAI 27U	CAI 27U 0.5P	CAI 27U 0.5N	CAI 27U 1.5N

MACHINING GUIDELINES

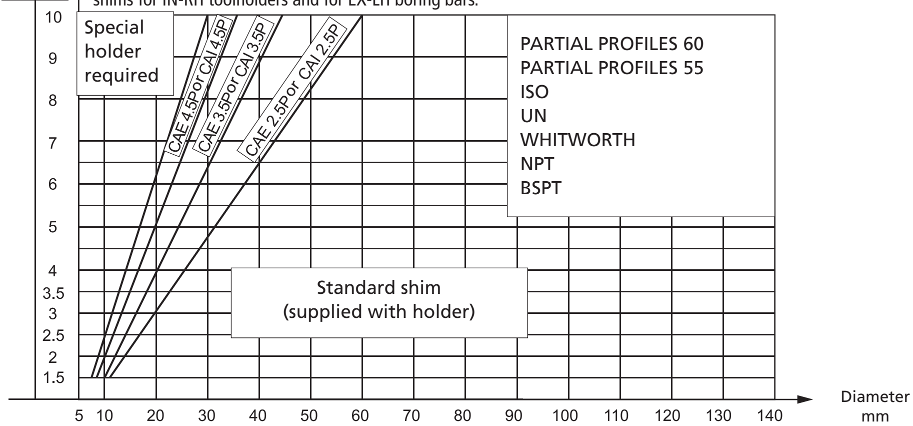
Recommended shim replacements

Some pitch to diameter combinations require a shim change. If a shim change is required, use CAE shims for EX-RH toolholders and for IN-LH boring bars. Use CAI shims for IN-RH toolholders and for EX-LH boring bars.

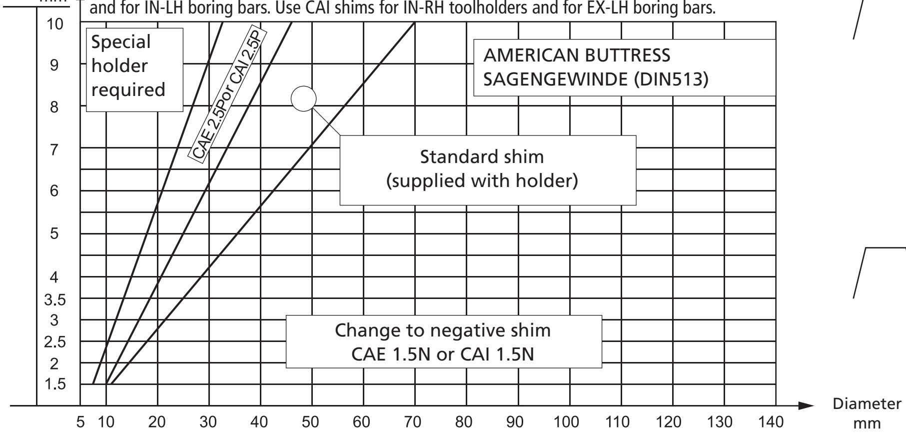


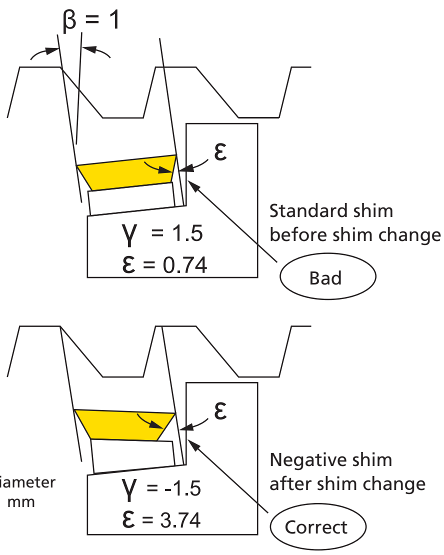


Most applications use the standard shim supplied with the toolholder or boring bar. If a shim change is required, use CAE shims for EX-RH toolholders and for IN-LH boring bars. Use CAI shims for IN-RH toolholders and for EX-LH boring bars.

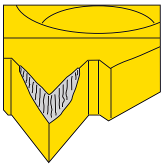


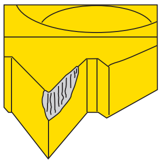
Most American Buttress and Sagengewinde applications require a shim change. Note that in many case a negative shim is required. If a shim change is required, use CAE shims for EX-RH toolholders and for IN-LH boring bars. Use CAI shims for IN-RH toolholders and for EX-LH boring bars.

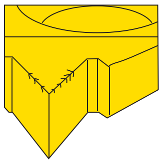


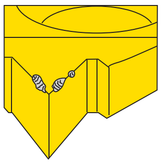


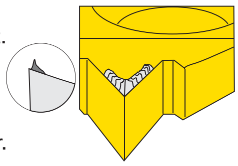
INSERT FAILURE MODES

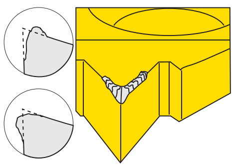
Regular flank wear		Causes	Solutions
Flank wear causes a deterioration in the surface finish and a failure to respect manufacturing tolerances.		1 - Cutting speed too high 2 - Cutting fluid flow insufficient 3 - Chip section too small, penetration per cut too small	1 - Reduce the cutting speed 2 - Increase the cutting fluid flow 3 - Increase chip section by reducing the number of cuts

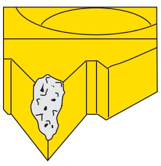
Irregular flank wear		Causes	Solutions
Flank wear causes a deterioration in the surface finish and a failure to respect manufacturing tolerances.		1 - Angle of inclination (λ) of the insert incorrect 2 - Wrong choice of penetration method 3 - Too many passes	1 - Match the angle of inclination (λ) to the helix angle (β) 2 - Choose a modified oblique penetration 3 - Increase the depth of cut

Cracks		Causes	Solutions
Small cracks forming perpendicular to the cutting edge cause the insert to crumble and the surface finish deteriorates.		1 - Sudden variation in temperature 2 - Irregular or inadequate cutting fluid supply causing thermal shocks	1 - Reduce depth of cut on first pass 2 - Cut off the supply, or apply it generously and regularly

Frittering		Causes	Solutions
Small particles of carbide have been detached from the insert. This results in a poor surface finish and excessive flank wear.		1 - Built-up edge coming away 2 - Workpiece or machine not sufficiently rigid	1 - Increase the cutting speed 2 - Make sure the workpiece is not vibrating, increase the tool section and reduce its overhang

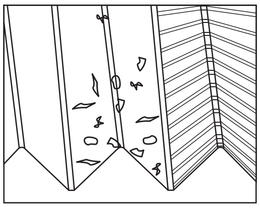
Built-up edge		Causes	Solutions
Workpiece material has welded itself to the insert. The surface finish is bad and if this material comes away it can cause the cutting edge to fritter.		1 - Cutting speed too slow 2 - Characteristic of excessively «sticky» material: e.g.: stainless steel, aluminum, etc.	1 - Increase the cutting speed 2 - Greatly increase the cuttting speed. If overheating occurs, use copiant amount of coolant

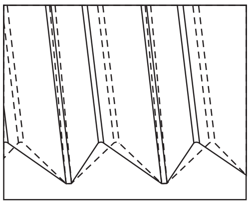
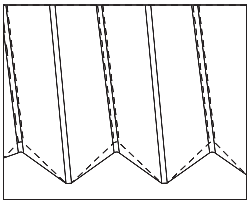
Plastic deformation		Causes	Solutions
Depression or recess of the cutting edge resulting in poor surface finish and weak chip control. The flank wear becomes high causing the insert to break.		1 - Insufficient cutting fluid flow volume 2 - Cutting speed too high causing overheating 3 - Cutting force too high due to excessive penetration per cut.	1 - Increase the flow volume 2 - Reduce the cutting speed 3 - Reduce the penetration and increase the number of cuts

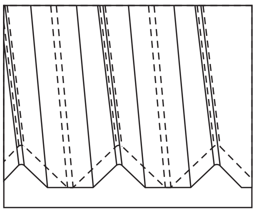
Breakage		Causes	Solutions
Breakage of the insert resulting in breakage of the insert seat or the tool holder at the shim.		1 - Penetration or cut too large	1 - Reduce the penetration and increase the number of cuts

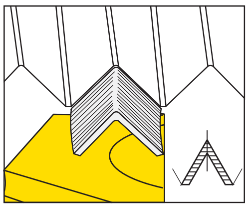
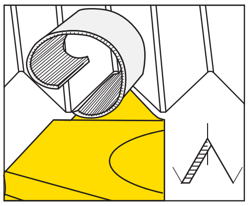
Note:
Breakage is sometimes caused by a problem of wear such as excess flank wear, built-up edge, crack wear, or frittering.

THREAD QUALITY

Poor thread surface finish	Causes	Solutions
	1 - Cutting speed too low 2 - Chip section too small 3 - Inclination of the insert not, or badly matched to the helix angle 4 - Oblique penetration 5 - Rise in temperature	1 - Increase the cutting speed 2 - Decrease the penetration value and reduce the number of cuts 3 - Correct the inclination angle of the insert by fitting the correct shim 4 - Choose modified oblique penetration 5 - Increase the coolant volume

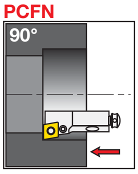
Incorrect profile	Causes	Solutions
 	1 - Incorrect choice of insert 2 - Incorrect adjustment of the centre height or perpendicularity of the tool	1 - Choose the correct profile 2 - Set the tool : centre height and perpendicularity of the tool in relation to the workpiece

Insufficient thread depth	Causes	Solutions
	1 - Excessive cutting edge wear 2 - Incorrect centre height setting 3 - Incorrect choice of insert	1 - Change the cutting edge 2 - Set the tool to the correct centre height 3 - Check that the insert corresponds with the profile to be cut

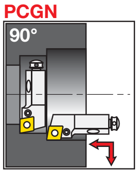
Chip control	Causes	Solutions
 	1 - Radial penetration 2 - Unsuitable penetration figure	1 - Choose an oblique penetration 2 - Choose a different penetration per cut

PROGRAM OVERVIEW

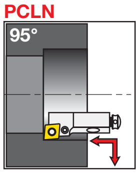
P System for negative inserts

PCFN


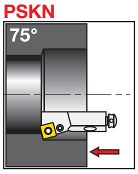
12
p 288

PCGN


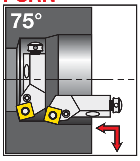
12
p 288

PCLN


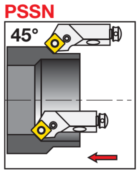
12
19
p 288

PSKN


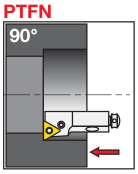
12
15
19
p 290

PSRN


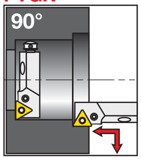
12
15
p 290

PSSN


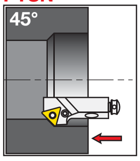
12
15
p 290

PTFN


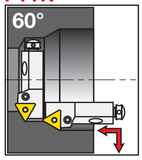
16
22
p 292

PTGN


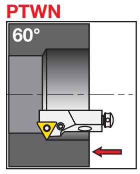
16
22
p 292

PTSN


16
p 292

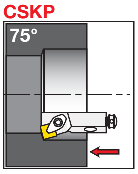
PTTN


16
p 293

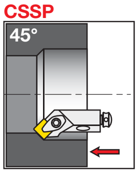
PTWN


16
p 293

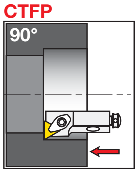
C System for positive inserts

CSKP


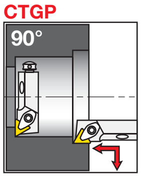
09
12
p 296

CSSP


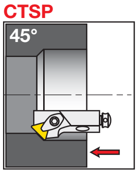
12
p 296

CTFP


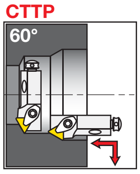
11
16
p 297

CTGP


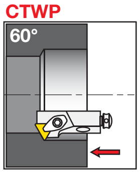
11
16
p 297

CTSP


11
16
p 297

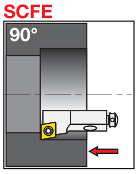
CTTP


11
16
p 298

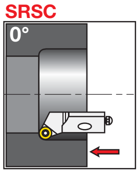
CTWP


11
16
p 298

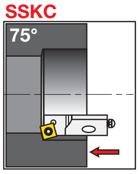
S System for positive inserts

SCFE


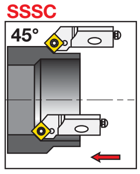
09
p 305

SRSC


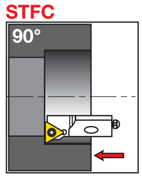
08
10
p 300

SSKC


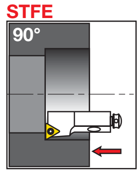
09
p 300

SSSC


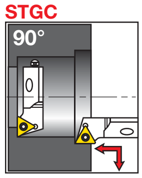
09
p 301

STFC


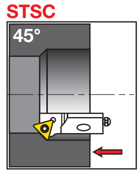
06
09
p 301

STFE


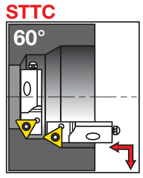
13
p 305

STGC


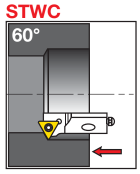
06
09
p 302

STSC


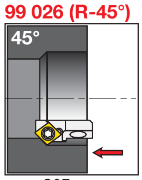
06
09
p 302

STTC


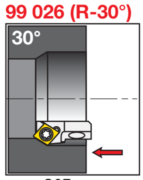
06
09
p 303

STWC


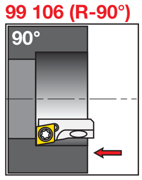
06
09
p 303

99 026 (R-45°)


06
p 307

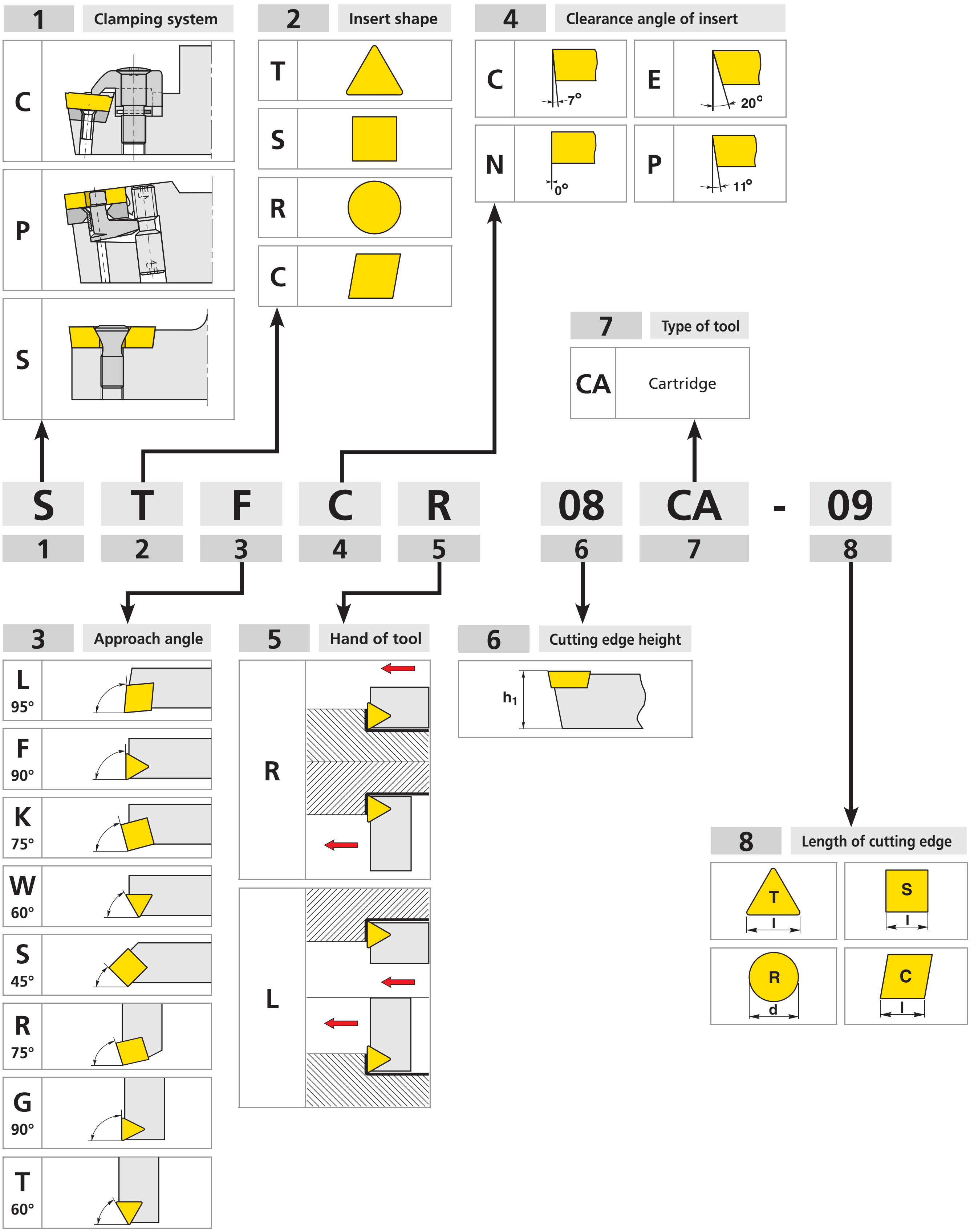
99 026 (R-30°)


06
p 307

99 106 (R-90°)


06
p 307

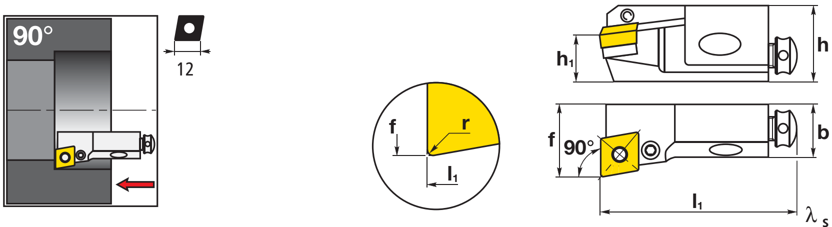
CARTRIDGES DESIGNATION



P SYSTEM FOR NEGATIVE INSERTS

PCFNR/L

Right hand shown

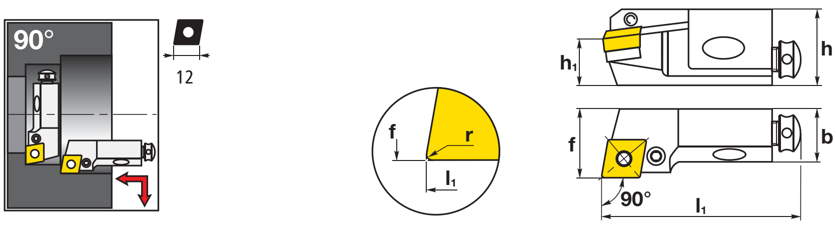


λ_s = Angle of inclination of edge
γ_n = Rake angle

Reference	Insert	Dimensions (mm)													Hand of tool	
		D_{min}	h	h_1	b	l_1	f (r = 0)	f (r = 0.4)	f (r = 0.8)	f (r = 1.2)	f (r = 1.6)	f (r = 2.4)	λ_s	γ_n	R	L
PCFNR/L 16CA-12	CN-- 1204	55	25	16	20	63	25.14	25.07	25.00	24.93	24.86	-	-8°	-6°	✓	✓

PCGNR/L

Right hand shown

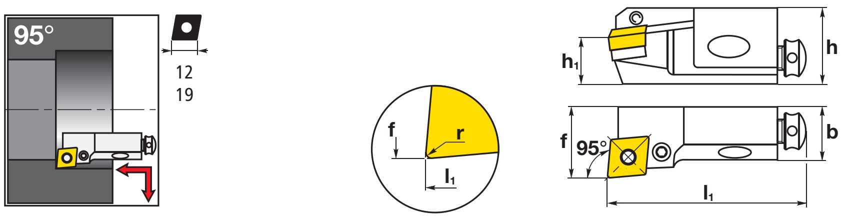


λ_s = Angle of inclination of edge
γ_n = Rake angle

Reference	Insert	Dimensions (mm)													Hand of tool	
		D_{min}	h	h_1	b	l_1	f (r = 0)	f (r = 0.4)	f (r = 0.8)	f (r = 1.2)	f (r = 1.6)	f (r = 2.4)	λ_s	γ_n	R	L
PCGNR/L 16CA-12	CN-- 1204	60	25	16	20	63	25.00	25.00	25.00	25.00	25.00	-	-6°	-10°	✓	✓

PCLNR/L

Right hand shown



λ_s = Angle of inclination of edge
γ_n = Rake angle

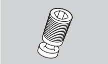
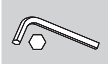
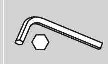
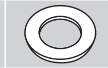
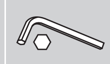
Reference	Insert	Dimensions (mm)													Hand of tool	
		D_{min}	h	h_1	b	l_1	f (r = 0)	f (r = 0.4)	f (r = 0.8)	f (r = 1.2)	f (r = 1.6)	f (r = 2.4)	λ_s	γ_n	R	L
PCLNR/L 16CA-12	CN-- 1204	55	25	16	20	63	25.07	25.03	25.00	24.96	24.93	-	-8°	-8°	✓	✓
PCLNR/L 25CA-19	CN-- 1906	100	38	25	25	100	32.11	32.07	32.04	32.00	31.96	31.89	-8°	-8°	✓	✓

✓: Article which can be ordered
Ordering example: PCFNR 16CA-12

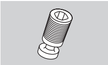
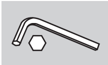
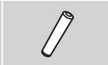
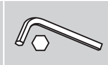
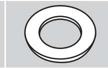
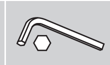
P SYSTEM FOR NEGATIVE INSERTS

Spare parts

Insert: CN-- 1204   Cartridge: 16 CA-12

											
174.3-848M	174.3-858	MA2-668	171.31-850M	174.3-861	174.3-871	438.3-828	438.3-821	174.1-863	434.9-830	3411 011-084	174-815

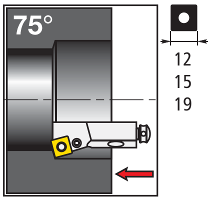
Insert: CN-- 1906   Cartridge: 25 CA-19

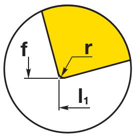
											
174.3-849M	174.3-835	174.1-815	171.31-851M	174.3-868	174.3-872	438.3-825	438.3-822	174.1-864	434.9-822	3411 010-105	186-844

TURNING

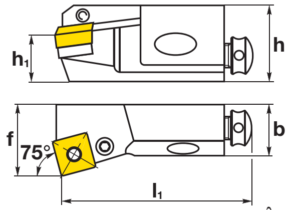
P SYSTEM FOR NEGATIVE INSERTS

PSKNR/L





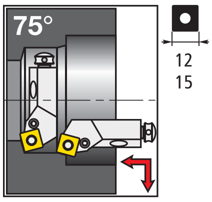
Right hand shown

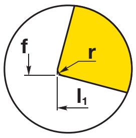


λ_s = Angle of inclination of edge
γ_n = Rake angle

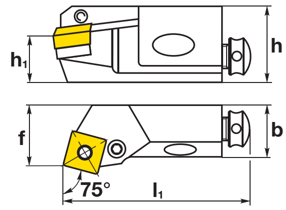
Reference	Insert	Dimensions (mm)													Hand of tool	
		D_{min}	h	h_1	b	l_1	f (r = 0)	f (r = 0.4)	f (r = 0.8)	f (r = 1.2)	f (r = 1.6)	f (r = 2.4)	λ_s	γ_n	R	L
PSKNR/L 12CA-12	SN-- 1204	50	20	12	15	55	20.18	20.09	20.00	19.91	19.82	19.64	-8°	-6°	✓	✓
PSKNR/L 16CA-12	SN-- 1204	55	25	16	20	63	25.17	25.09	25.00	24.91	24.83	24.66	-7°	-6°	✓	✓
PSKNR 20CA-15	SN-- 1506	70	30	20	20	70	25.00	25.17	25.08	25.00	24.92	24.75	-6°	-8°	✓	
PSKNR 25CA-19	SN-- 1906	100	38	25	25	100	32.26	-	32.09	32.00	31.91	31.74	-7°	-6°	✓	

PSRNR/L





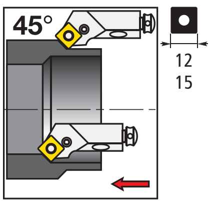
Right hand shown

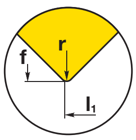


λ_s = Angle of inclination of edge
γ_n = Rake angle

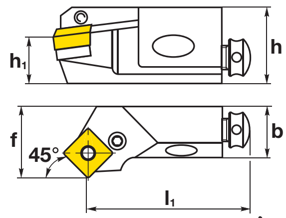
Reference	Insert	Dimensions (mm)													Hand of tool	
		D_{min}	h	h_1	b	l_1	f (r = 0)	f (r = 0.4)	f (r = 0.8)	f (r = 1.2)	f (r = 1.6)	f (r = 2.4)	λ_s	γ_n	R	L
PSRNR/L 16CA-12	SN-- 1204	60	25	16	20	63	24.96	24.98	25.00	25.02	25.04	-	-10°	-6°	✓	✓
PSRNR/L 20CA-15	SN-- 1506	70	30	20	20	70	24.93	24.95	24.98	25.00	25.02	-	-10°	-6°	✓	✓

PSSNR/L





Right hand shown



λ_s = Angle of inclination of edge
γ_n = Rake angle

Reference	Insert	Dimensions (mm)													Hand of tool	
		D_{min}	h	h_1	b	l_1	f (r = 0)	f (r = 0.4)	f (r = 0.8)	f (r = 1.2)	f (r = 1.6)	f (r = 2.4)	λ_s	γ_n	R	L
PSSNR/L 12CA-12	SN-- 1204	50	20	12	15	47	20.32	20.16	20.00	19.84	19.68	19.35	-10°	-3°	✓	✓
PSSNR/L 16CA-12	SN-- 1204	55	25	16	20	53	25.33	25.16	25.00	25.84	24.67	24.35	-11°	0°	✓	✓
PSSNR/L 20CA-15	SN-- 1506	70	30	20	20	60	25.49	25.32	25.16	25.00	28.84	24.51	-10°	-3°	✓	✓

✓: Article which can be ordered
Ordering example: PSKNR 12CA-12

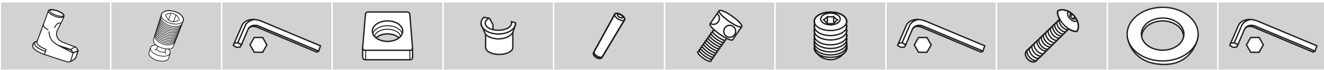
P SYSTEM FOR NEGATIVE INSERTS

Spare parts

Insert: SN-- 1204 Cartridge: 12 CA-12

438.3-841-1	438.3-832M	MA2-669	-	-	-	438.3-824	438.3-820	174.1-870	434.9-824	3411 011-064	174-815

Insert: SN-- 1204 Cartridge: 16 CA-12



174.3-848M	174.3-858	MA2-668	174.3-851M	174.3-861	174.3-871	438.3-828	438.3-821	174.1-863	434.9-830	3411 011-084	186-843

Insert: SN-- 1506 Cartridge: 20 CA-15

438.3-840	438.3-831	174.1-864	174.3-857	174.3-864	174.3-873	438.3-839	438.3-821	174.1-863	434.9-830	3411 011-084	186-843

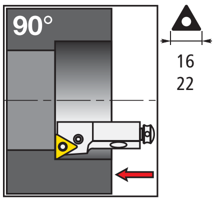
Insert: SN-- 1906 Cartridge: 25 CA-19

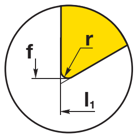
174.3-849M	174.3-835	174.1-815	174.3-852M	174.3-868	174.3-872	438.3-825	438.3-822	174.1-864	434.9-822	3411 010-105	186-844

TURNING

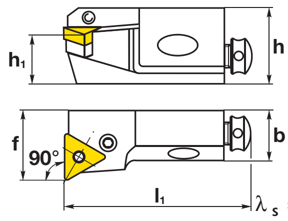
P SYSTEM FOR NEGATIVE INSERTS

PTFNR/L





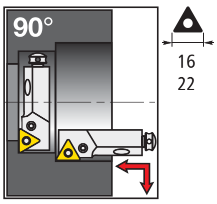
Right hand shown

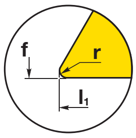


λ_s = Angle of inclination of edge
γ_n = Rake angle

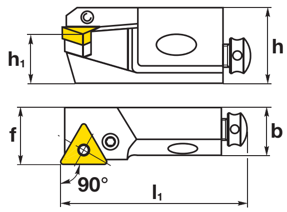
Reference	Insert	Dimensions (mm)													Hand of tool	
		D_{min}	h	h_1	b	l_1	f (r = 0)	f (r = 0.4)	f (r = 0.8)	f (r = 1.2)	f (r = 1.6)	f (r = 2.4)	λ_s	γ_n	R	L
PTFNR/L 12CA-16	TN-- 1604	50	20	12	15	55	20.56	20.28	20.00	19.72	19.44	-	-6°	-9°	✓	✓
PTFNR/L 16CA-16	TN-- 1604	55	25	16	20	63	25.56	25.28	25.00	24.72	24.44	-	-6°	-8°	✓	✓
PTFNR/L 20CA-22	TN-- 2204	70	30	20	20	70	25.56	25.28	25.00	24.72	24.44	-	-6°	-8°	✓	✓

PTGNR/L





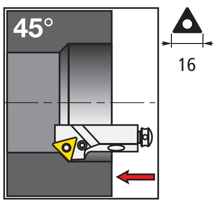
Right hand shown

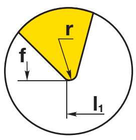


λ_s = Angle of inclination of edge
γ_n = Rake angle

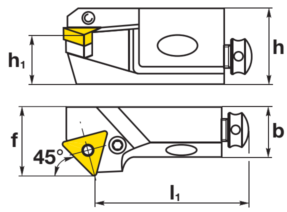
Reference	Insert	Dimensions (mm)													Hand of tool	
		D_{min}	h	h_1	b	l_1	f (r = 0)	f (r = 0.4)	f (r = 0.8)	f (r = 1.2)	f (r = 1.6)	f (r = 2.4)	λ_s	γ_n	R	L
PTGNR/L 12CA-16	TN-- 1604	50	20	12	15	55	20.01	20.00	20.00	20.00	19.99	-	-10°	-6°	✓	✓
PTGNR/L 16CA-16	TN-- 1604	60	25	16	20	63	25.01	25.00	25.00	25.00	24.99	-	-10°	-6°	✓	✓
PTGNR/L 20CA-22	TN-- 2204	70	30	20	20	70	25.01	25.00	25.00	25.00	24.99	-	-8°	-6°	✓	✓

PTSNR/L





Right hand shown



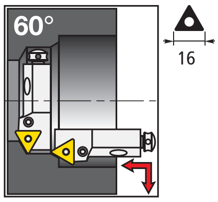
λ_s = Angle of inclination of edge
γ_n = Rake angle

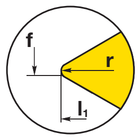
Reference	Insert	Dimensions (mm)													Hand of tool	
		D_{min}	h	h_1	b	l_1	f (r = 0)	f (r = 0.4)	f (r = 0.8)	f (r = 1.2)	f (r = 1.6)	f (r = 2.4)	λ_s	γ_n	R	L
PTSNR/L 12CA-16	TN-- 1604	50	20	12	15	47	20.76	20.38	20.00	19.62	19.24	-	-10°	-3°	✓	✓
PTSNR/L 16CA-16	TN-- 1604	55	25	16	20	53	25.74	25.37	25.00	24.63	24.26	-	-11°	0°	✓	✓

✓: Article which can be ordered
Ordering example: PTFNR 12CA-16

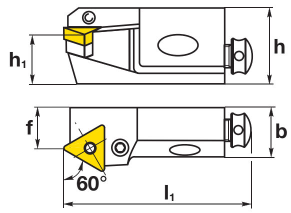
P SYSTEM FOR NEGATIVE INSERTS

PTTNR/L





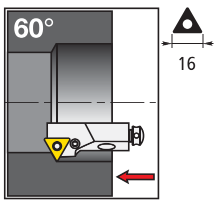
Right hand shown

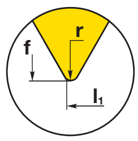


λ_s = Angle of inclination of edge
γ_n = Rake angle

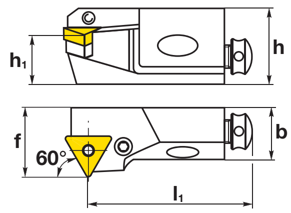
Reference	Insert	Dimensions (mm)													Hand of tool	
		D_{min}	h	h_1	b	l_1	f (r = 0)	f (r = 0.4)	f (r = 0.8)	f (r = 1.2)	f (r = 1.6)	f (r = 2.4)	λ_s	γ_n	R	L
PTTNR/L 12CA-16	TN-- 1604	50	20	12	15	55	12.54	12.77	13.00	13.23	13.46	-	-9°	-2°	✓	✓
PTTNR 16CA-16	TN-- 1604	60	25	16	20	63	14.54	14.77	15.00	15.23	15.46	-	-10°	-2°	✓	

PTWNR/L





Right hand shown



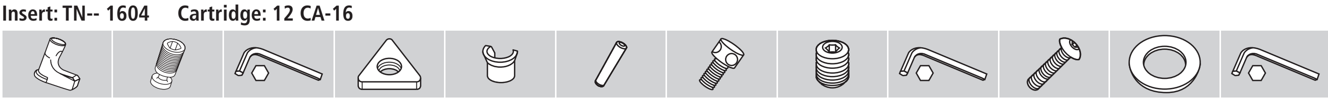
λ_s = Angle of inclination of edge
γ_n = Rake angle

Reference	Insert	Dimensions (mm)													Hand of tool	
		D_{min}	h	h_1	b	l_1	f (r = 0)	f (r = 0.4)	f (r = 0.8)	f (r = 1.2)	f (r = 1.6)	f (r = 2.4)	λ_s	γ_n	R	L
PTWNR/L 12CA-16	TN-- 1604	50	20	12	15	47	20.78	20.39	20.00	19.61	19.22	-	-7°	-6°	✓	✓
PTWNR 16CA-16	TN-- 1604	55	25	16	20	53	25.79	25.39	25.00	24.61	24.21	-	-6°	-6°	✓	

✓: Article which can be ordered
Ordering example: PTTNR 12CA-16

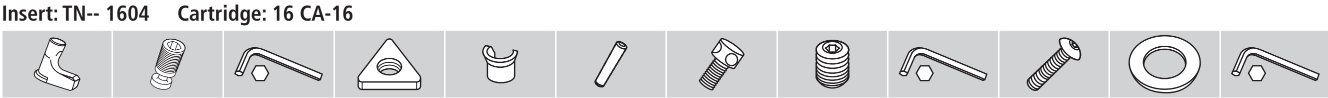
Spare parts

Insert: TN-- 1604 Cartridge: 12 CA-16



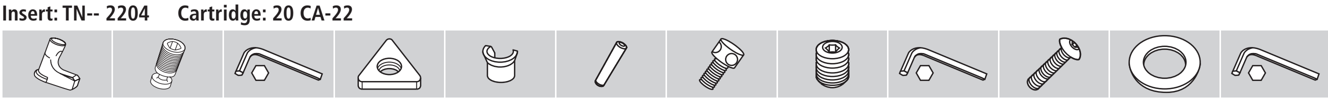
5432.015-011	438.3-830	MA2-884	-	-	-	438.3-824	438.3-820	174.1-870	434.9-824	3411 011-064	174-815

Insert: TN-- 1604 Cartridge: 16 CA-16



174.3-840M	174.3-820M	MA2-669	179.3-850M	174.3-860	174.3-870	438.3-828	438.3-821	174.1-863	434.9-830	3411 011-084	186-843

Insert: TN-- 2204 Cartridge: 20 CA-22

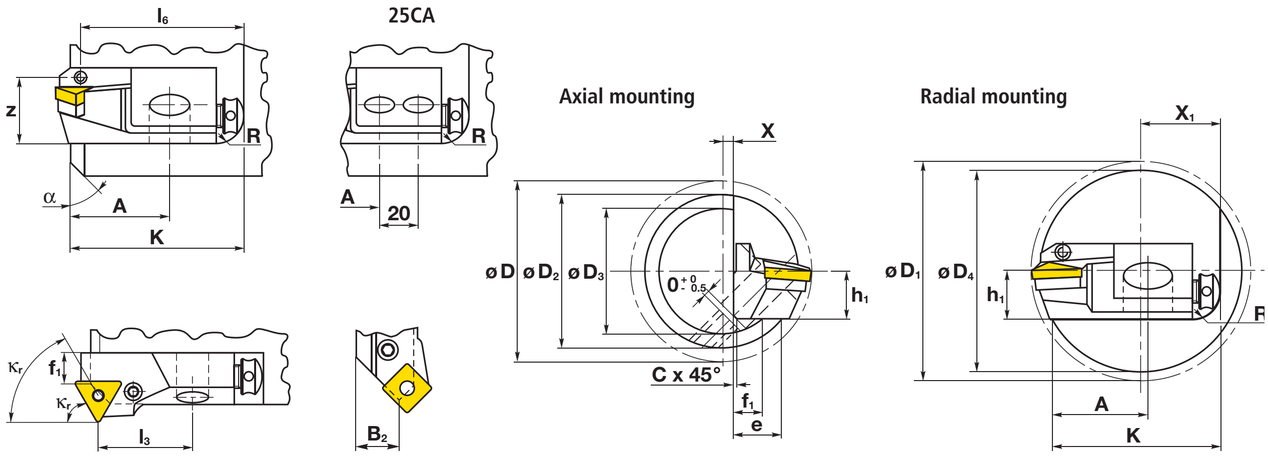


174.3-841M	174.3-821	MA2-668	179.3-852M	174.3-861	174.3-871	438.3-839	438.3-821	174.1-863	434.9-830	3411 011-084	186-843

TURNING

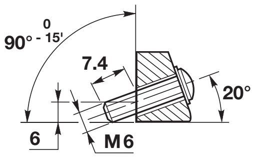
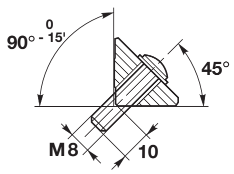
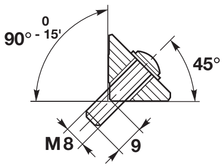
P SYSTEM FOR NEGATIVE INSERTS

Assembly dimensions (mm)

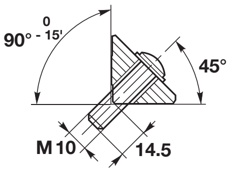


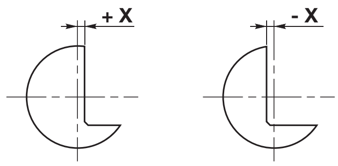
Axial adjustment = ± 1 mm
Radial adjustment = ± 0.5 mm

Axial adjustment = ± 0.5 mm
Radial adjustment = ± 1 mm

	Cartridge	κ_r	l_3	l_6	Z	B_2	D_{min}	$D_{1\,min}$	K	A	h_1	e_{max}	$f_{1\,max}$	R_{max}	C
12CA 	PSKNR/L 12CA-12	75°	35	52.0	16.0	-	50	-	56.5	36.5	12	14.0	1.0	5	0.4
	PSSNR/L 12CA-12	45°	27	40.5	16.0	9.0	50	-	52.0	32.0	12	14.0	-	5	0.4
	PTFNR/L 12CA-16	90°	35	49.0	16.0	-	50	-	53.0	33.0	12	14.0	-	5	0.4
	PTGNR/L 12CA-16	90°	35	45.0	16.0	-	50	75	50.5	30.5	12	14.0	-	5	0.4
	PTSNR/L 12CA-16	45°	27	49.0	16.0	-	50	-	53.5	33.5	12	14.0	6.5	5	0.4
	PTTNR/L 12CA-16	60°	35	49.0	16.0	-	50	75	50.5	30.5	12	14.0	10.5	5	0.4
	PTWNR/L 12CA-16	60°	27	46.0	16.0	-	50	-	50.5	30.5	12	14.0	3.5	5	0.4
16CA 	PCFNR/L 16CA-12	90°	38	55.0	20.5	-	55	-	59.0	34.0	16	17.5	-	6	0.4
	PCGNR/L 16CA-12	90°	38	52.0	20.5	-	60	75	55.5	30.5	16	18.5	-	6	0.4
	PCLNR/L 16CA-12	95°	38	54.0	20.5	-	55	75	57.0	32.0	16	17.5	-	6	0.4
	PSKNR/L 16CA-12	75°	38	55.0	20.5	-	55	-	63.5	38.5	16	17.5	6.0	6	0.4
	PSRNR/L 16CA-12	75°	38	51.0	20.5	-	60	75	52.5	27.5	16	19.0	-	6	0.4
	PSSNR/L 16CA-12	45°	28	41.0	20.5	13.3	60	75	56.5	31.5	16	17.0	-	6	0.4
	PTFNR/L 16CA-16	90°	38	54.0	20.5	-	55	-	60.0	35.0	16	17.5	-	6	0.4
	PTGNR/L 16CA-16	90°	38	52.0	20.5	-	60	75	57.0	32.0	16	18.5	-	6	0.4
	PTSNR/L 16CA-16	45°	28	54.0	20.5	-	55	-	57.5	32.5	16	17.0	11.5	6	0.4
	PTTNR 16CA-16	60°	38	54.0	20.5	-	60	75	57.0	32.0	16	19.0	11.5	6	0.4
	PTWNR 16CA-16	60°	28	52.0	20.5	-	55	-	55.0	30.0	16	17.5	11.5	6	0.4
20CA 	PSKNR 20CA-15	75°	40	67.0	25.0	-	70	-	71.0	41.0	20	16.5	1.3	6	0.4
	PSRNR/L 20CA-15	75°	40	60.0	25.0	-	70	90	63.0	33.0	20	18.0	-	6	0.4
	PSSNR/L 20CA-15	45°	30	52.0	25.0	10.2	70	70	65.0	35.0	20	15.5	-	6	0.4
	PTFNR/L 20CA-22	90°	40	61.0	25.0	-	70	-	67.0	37.0	20	15.5	-	6	0.4
	PTGNR/L 20CA-22	90°	40	56.7	25.0	-	70	90	62.5	32.5	20	16.0	-	6	0.4

P SYSTEM FOR NEGATIVE INSERTS

	Cartridge	κ_r	l_3	l_6	Z	B_2	D_{min}	$D_{1\,min}$	K	A	h_1	e_{max}	$f_{1\,max}$	R_{max}	C
25CA	PCLNR/L 25CA-19	95°	38	88.0	32.0	-	100	115	91.5	41.5	25	22.5	-	8	0.7
	PSKNR 25CA-19	75°	50	95.0	32.0	-	100	-	102.0	52.0	25	22.5	2.2	8	0.7

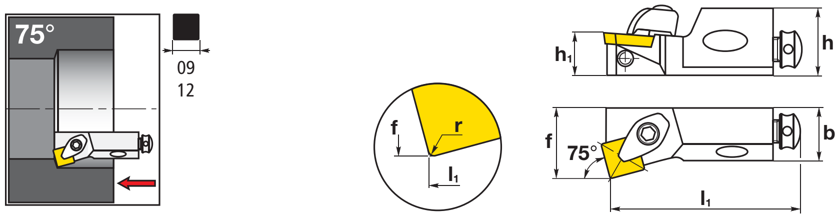
Calculation of dimensions D_2, D_3, D_4		
$D_{2\,max} = 2\sqrt{h_1^2 + (X\,(\pm)\,e_{max})^2}$ $D_{3\,max} = 2\sqrt{h_1^2 + (X\,(\pm)\,f_{1\,max})^2}$ $X = \frac{D}{2} - f$ $D_{4\,max.} = 2\sqrt{h_1^2 + (K\,(\pm)\,X_1)^2}$ $X_1 = l_1 - \frac{D_1}{2}$	$\text{tg}\,\alpha = \frac{(e-f_1).\text{tg}(90°-Kr).2}{D_2-D_3}$	 Note: X can be negative (see Sketch above)

TURNING

C SYSTEM FOR POSITIVE INSERTS

CSKPR

Right hand shown

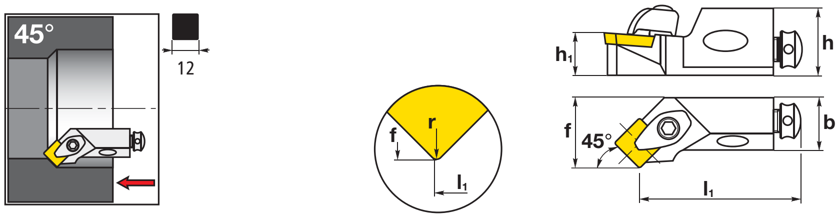


λ_s = Angle of inclination of edge
γ_n = Rake angle

Reference	Insert	Dimensions (mm)												Hand of tool	
		D_{min}	h	h_1	b	l_1	f (r = 0)	f (r = 0.2)	f (r = 0.4)	f (r = 0.8)	f (r = 1.2)	λ_s	γ_n	R	L
CSKPR 10CA-09	SP-- 0903	40	15	10	11	50	14.18	-	14.09	14	-	0°	+6°	✓	
CSKPR 12CA-12	SP-- 1203	50	20	12	15	55	20.18	-	20.09	20	19.91	0°	+6°	✓	
CSKPR 16CA-12	SP-- 1203	55	21	16	20	63	25.18	-	25.09	25	24.91	0°	+6°	✓	

CSSPR

Right hand shown



λ_s = Angle of inclination of edge
γ_n = Rake angle

Reference	Insert	Dimensions (mm)												Hand of tool	
		D_{min}	h	h_1	b	l_1	f (r = 0)	f (r = 0.2)	f (r = 0.4)	f (r = 0.8)	f (r = 1.2)	λ_s	γ_n	R	L
CSSPR 12CA -12	SP-- 1203	50	20	12	15	47	20.33	-	20.16	20	19.84	0°	5°	✓	

1) Cartridges CSSPR do not have a radial regulating screw.

Spare parts

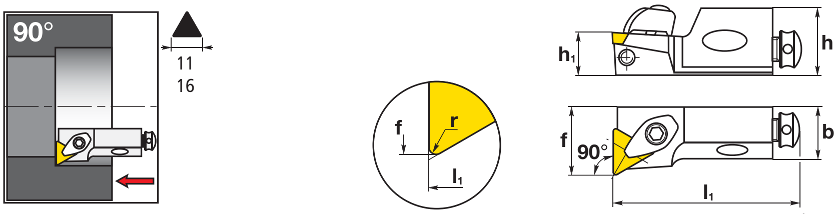
Insert	Cartridge										
SP-- 0903	10 CA-09	172.9-826-1	MA2-669	-	-	438.3-824	174.1-870	434.9-835	434.9-826	170.38-834	174-815
SP-- 1203	12 CA-12	172.9-827-1	MA2-668	-	-	438.3-824	174.1-870	434.9-836	434.9-824	3411 011-064	174-815
SP-- 1203	16 CA-12	172.9-827-1	MA2-668	174.2-850	174.1-869	438.3-828	174.1-870	434.9-836	434.9-830	3411 011-084	174-843

✓: Article which can be ordered
Ordering example: CSKPR 10CA-09

C SYSTEM FOR POSITIVE INSERTS

CTFPR/L

Right hand shown

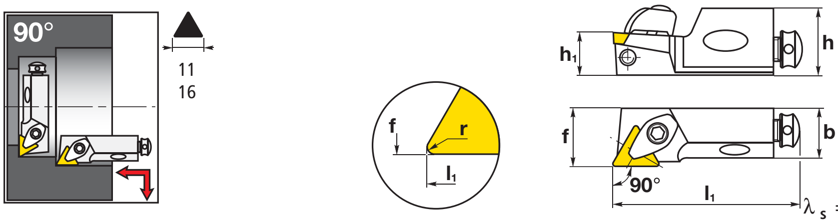


λ_s = Angle of inclination of edge
γ_n = Rake angle

Reference	Insert	Dimensions (mm)												Hand of tool	
		D_{min}	h	h_1	b	l_1	f (r = 0)	f (r = 0.2)	f (r = 0.4)	f (r = 0.8)	f (r = 1.2)	λ_s	γ_n	R	L
CTFPR/L 10CA-11	TP-- 1103	40	15	10	11	50	14.29	14.15	14	13.71	-	0°	+6°	✓	✓
CTFPR/L 12CA-16	TP-- 1603	50	20	12	15	55	20.59	-	20.29	20	-19.71	0°	+6°	✓	✓
CTFPR 16CA-16	TP-- 1603	55	21	16	20	63	25.58	-	25.29	25	24.71	0°	+6°	✓	

CTGPR/L

Right hand shown

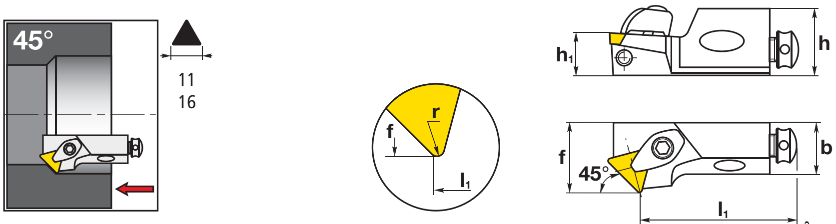


λ_s = Angle of inclination of edge
γ_n = Rake angle

Reference	Insert	Dimensions (mm)												Hand of tool	
		D_{min}	h	h_1	b	l_1	f (r = 0)	f (r = 0.2)	f (r = 0.4)	f (r = 0.8)	f (r = 1.2)	λ_s	γ_n	R	L
CTGPR/L 10CA-11	TP-- 1103	40	15	10	11	50	14.01	14.01	14	13.99	-	0°	+4°	✓	✓
CTGPR/L 12CA-16	TP-- 1603	50	20	12	15	55	20.01	-	20	20	20	0°	+4°	✓	✓
CTGPR/L 16CA-16	TP-- 1603	60	21	16	20	63	25.01	-	25.03	25	24.98	0°	+3°	✓	✓

CTSPR/L

Right hand shown



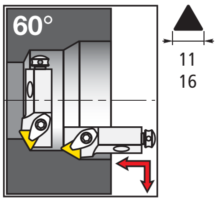
λ_s = Angle of inclination of edge
γ_n = Rake angle

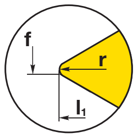
Reference	Insert	Dimensions (mm)												Hand of tool	
		D_{min}	h	h_1	b	l_1	f (r = 0)	f (r = 0.2)	f (r = 0.4)	f (r = 0.8)	f (r = 1.2)	λ_s	γ_n	R	L
CTSPR/L 10CA-11	TP-- 1103	40	15	10	11	44	14.37	14.19	14	13.63	-	0°	+4°	✓	✓
CTSPR 12CA-16	TP-- 1603	50	20	12	15	47	20.74	-	20.37	20	19.63	0°	+5°	✓	
CTSPR 16CA-16	TP-- 1603	55	21	16	20	53	25.74	-	25.37	25	24.63	0°	+4°	✓	

✓: Article which can be ordered
Ordering example: CTFPR 10CA-11

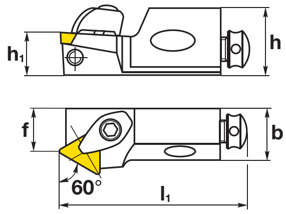
C SYSTEM FOR POSITIVE INSERTS

CTTPR/L





Right hand shown

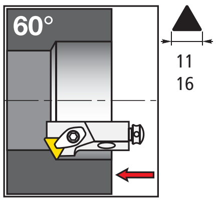


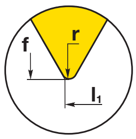
λ_s = Angle of inclination of edge
γ_n = Rake angle

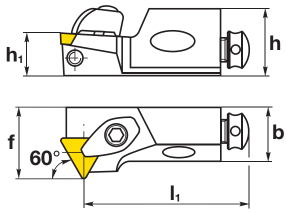
Reference	Insert	Dimensions (mm)												Hand of tool	
		D_{min}	h	h_1	b	l_1	f (r = 0)	f (r = 0.2)	f (r = 0.4)	f (r = 0.8)	f (r = 1.2)	λ_s	γ_n	R	L
CTTPR/L 10CA-11	TP-- 1103	40	15	10	11	50	8.77	8.66	9	9.23	-	0°	+5°	✓	✓
CTTPR/L 12CA-16	TP-- 1603	50	20	12	15	55	12.54	-	12.77	13	13.23	0°	+5°	✓	✓

CTWPR/L

Right hand shown







λ_s = Angle of inclination of edge
γ_n = Rake angle

Reference	Insert	Dimensions (mm)												Hand of tool	
		D_{min}	h	h_1	b	l_1	f (r = 0)	f (r = 0.2)	f (r = 0.4)	f (r = 0.8)	f (r = 1.2)	λ_s	γ_n	R	L
CTWPR/L 10CA-11	TP-- 1103	40	15	10	11	44	14.4	14.2	14	13.6	-	0°	+6°	✓	✓
CTWPR 12CA-16	TP-- 1603	50	20	12	15	47	20.8	-	20.4	20	19.6	0°	+6°	✓	

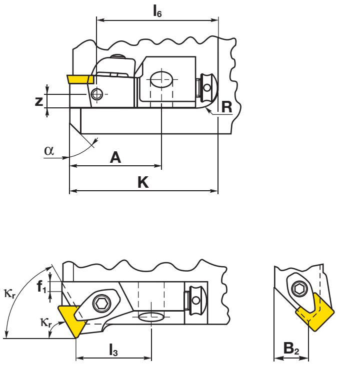
Spare parts

Insert	Cartridge										
TP-- 1103	10 CA-11	172.9-826-1	MA2-669	-	-	438.3-824	174.1-870	434.9-835	434.9-826	170.38-834	174-815
TP-- 1603	12 CA-16	172.9-827-1	MA2-668	-	-	438.3-824	174.1-870	434.9-836	434.9-824	3411 011-064	174-815
TP-- 1603	16 CA-16	172.9-827-1	MA2-668	175.2-850	174.1-869	438.3-828	174.1-870	434.9-836	434.9-830	3411 011-084	174-843

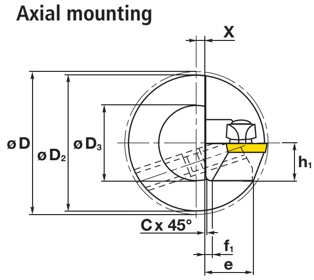
✓: Article which can be ordered
Ordering example: CTTPR 10CA-11

C SYSTEM FOR POSITIVE INSERTS

Assembly dimensions (mm)

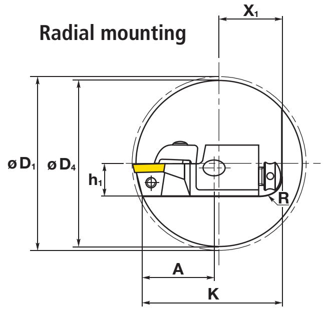


Axial mounting

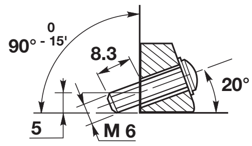
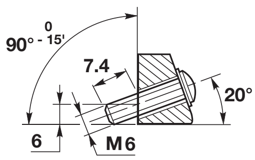
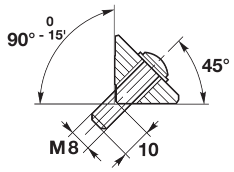


Axial adjustment = ± 1 mm
Radial adjustment = ± 0.5 mm

Radial mounting



Axial adjustment = ± 0.5 mm
Radial adjustment = ± 1 mm

	Cartridge	κ_r	l_3	l_6	Z	B_2	D_{min}	$D_{1\,min}$	K	A	h_1	e_{max}	$f_{1\,max}$	C
10CA	CSKPR 10CA-09	75°	30	47.0	3	-	40	-	51.0	31.0	10	9.5	1.0	5
	CTFPR/L 10CA-11	90°	30	46.0	3	-	40	-	48.0	28.0	10	9.0	-	5
	CTGPR/L 10CA-11	90°	30	44.0	3	-	40	55	46.5	26.5	10	9.5	-	5
	CTSPR/L 10CA-11	45°	24	43.0	3	-	40	-	49.0	29.0	10	9.0	6.5	5
	CTTPR/L 10CA-11	60°	30	45.0	3	-	40	55	46.5	26.5	10	9.0	10.5	5
	CTWPR/L 10CA-11	60°	24	43.0	3	-	40	-	47.0	27.0	10	9.0	3.0	5
12CA	CSKPR 12CA-12	75°	35	52.0	5	-	50	-	57.0	37.0	12	13.5	6.0	6
	CSSPR 12CA-12	45°	27	-	5	9.5	50	-	-	-	12	13.5	-	6
	CTFPR/L 12CA-16	90°	35	50.5	5	-	50	-	53.0	33.0	12	13.5	-	6
	CTGPR/L 12CA-16	90°	35	49.0	5	-	50	75	51.0	31.0	12	13.5	-	6
	CTSPR 12CA-16	45°	27	49.0	5	-	50	-	55.0	35.0	12	13.0	11.5	6
	CTTPR/L 12CA-16	60°	35	47.0	5	-	50	75	50.5	30.5	12	13.5	11.5	6
	CTWPR 12CA-16	60°	27	44.0	5	-	50	-	52.5	32.5	12	13.0	11.5	6
16CA	CSKPR 16CA-12	75°	38	55.3	5	-	55	-	64.0	39.0	16	17.5	-	6
	CTFPR 16CA-16	90°	38	55.0	5	-	55	-	59.5	34.5	16	17.0	4.7	6
	CTGPR/L 16CA-16	90°	38	51.0	5	-	60	75	57.0	32.0	16	18.0	-	6
	CTSPR 16CA-16	45°	28	50.5	5	-	55	-	60.0	35.0	16	17.5	10.7	6

Calculation of dimensions D_2, D_3, D_4

$$D_{2\,max} = 2\sqrt{h_1^2 + (X\,(\pm)\,e_{max})^2}$$

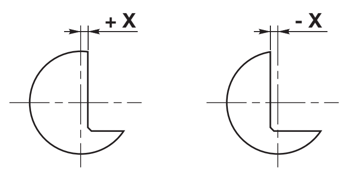
$$D_{3\,max} = 2\sqrt{h_1^2 + (X\,(\pm)\,f_{1\,max})^2}$$

$$X = \frac{D}{2} - f$$

$$D_{4\,max.} = 2\sqrt{h_1^2 + (K\,(\pm)\,X_1)^2}$$

$$X_1 = l_1 - \frac{D_1}{2}$$

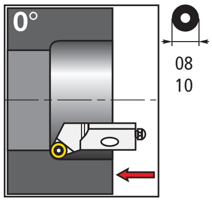
$$\text{tg}\ \alpha = \frac{(e-f_1).\text{tg}(90°-Kr).2}{D_2-D_3}$$



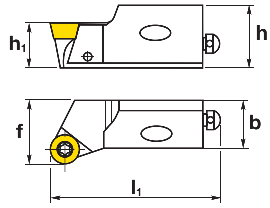
Note: X can be negative (see Sketch above)

S SYSTEM FOR POSITIVE INSERTS

SRSCR/L



Right hand shown



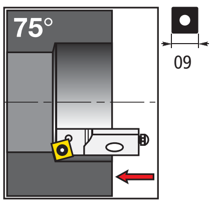
λ_s = Angle of inclination of edge
γ_n = Rake angle

Reference	Insert	Dimensions (mm)								Hand of tool	
		D_{min}	h	h_1	b	l_1	f	λ_s	γ_n	R	L
SRSCR 08CA-08	RC-- 0803	25	10.0	8	7.0	32	10.00	-4°	0°	✓	
SRSCR/L 10CA-10	RC-- 10T3	40	14.9	10	11.3	50	14.00	-4°	0°	✓	✓

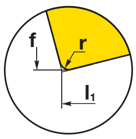
Spare parts

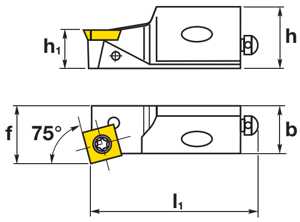
Insert	Cartridge									
RC-- 0803	08 CA-08	M 30 T9	T9 MD 703	DVR 1647	MA2-1214	DVS 1648	DVR 1645	-	-	TMD-703
RC-- 10T3	10 CA-10	DVF 0089	DMN 3121	DVR 1653	MA2-884	DVS 1651	DVR 1655	DRD 1656	174.815	-

SSKCR/L



Right hand shown





λ_s = Angle of inclination of edge
γ_n = Rake angle

Reference	Insert	Dimensions (mm)									Hand of tool	
		D_{min}	h	h_1	b	l_1	f (r = 0.4)	f (r = 0.8)	λ_s	γ_n	R	L
SSKCR/L 10CA-09 M	SC-- 09T3	40	15	10	11	50	14.09	14.00	- 4°	0°	✓	✓

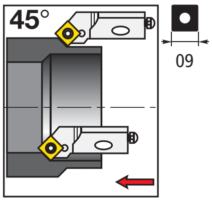
Spare parts

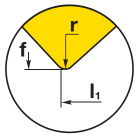
Insert	Cartridge								
SC-- 09T3	10 CA-09	DVF 0089	DMN 3121	DVR 1653	MA2-884	DVS 1651	DVR 1655	DRD 1656	174.815

✓: Article which can be ordered
Ordering example: SRSCR 08CA-08

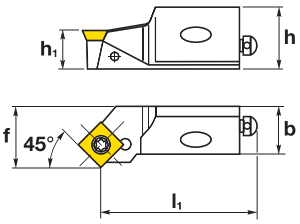
S SYSTEM FOR POSITIVE INSERTS

SSSCR/L





Right hand shown



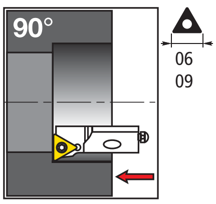
λ_s = Angle of inclination of edge
γ_n = Rake angle

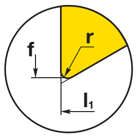
Reference	Insert	Dimensions (mm)									Hand of tool	
		D_{min}	h	h_1	b	l_1	f (r = 0.4)	f (r = 0.8)	λ_s	γ_n	R	L
SSSCR/L 10CA-09 M	SC-- 09T3	40	15	10	11	44	14.16	14.00	0°	- 5°	✓	✓

Spare parts

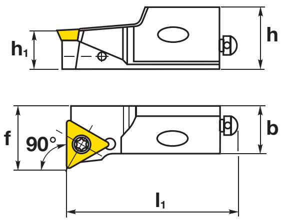
Insert	Cartridge								
SC-- 09T3	10 CA-09	DVF 0089	DMN 3121	DVR 1653	MA2-884	DVS 1651	DVR 1655	DRD 1656	174.815

STFCR/L





Right hand shown



λ_s = Angle of inclination of edge
γ_n = Rake angle

Reference	Insert	Dimensions (mm)									Hand of tool	
		D_{min}	h	h_1	b	l_1	f (r = 0.2)	f (r = 0.4)	λ_s	γ_n	R	L
STFCR/L 06CA-06	TC-- 06T1	20	8.5	6	5.8	25	8.00	7.90	-6°	0°	✓	✓
STFCR/L 08CA-09	TC-- 0902	25	10.0	8	6.8	32	10.10	10.00	-6°	0°	✓	✓

Spare parts

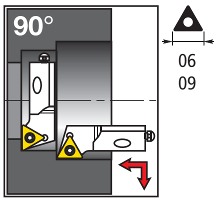
Insert	Cartridge							
TC-- 06T1	06 CA-06	DVF 1642	DMD 1650	DVR 1646	MA2-1214	DVS 1648	DVR 1644	MA2-2979
TC-- 0902	08 CA-09	DVF 0939	MA2-8304	DVR 1647	MA2-1214	DVS 1648	DVR 1645	TMD-703

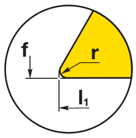
✓: Article which can be ordered
Ordering example: SSSCR 10CA-09 M

TURNING

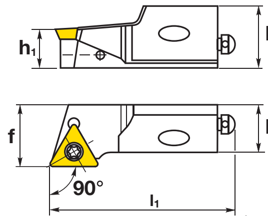
S SYSTEM FOR POSITIVE INSERTS

STGCR/L





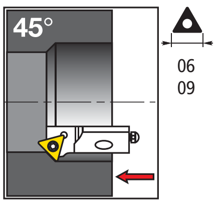
Right hand shown

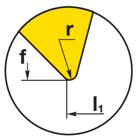


λ_s = Angle of inclination of edge
γ_n = Rake angle

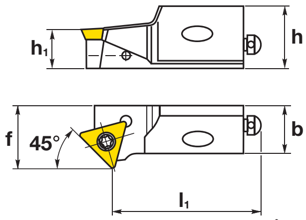
Reference	Insert	Dimensions (mm)									Hand of tool	
		D_{min}	h	h_1	b	l_1	f (r = 0.2)	f (r = 0.4)	λ_s	γ_n	R	L
STGCR/L 06CA-06	TC-- 06T1	20	8.5	6	6.0	25	8.00	8.00	0°	-10°	✓	✓
STGCR/L 08CA-09	TC-- 0902	25	10.0	8	7.0	32	10.00	10.00	0°	-8°	✓	✓

STSCR/L





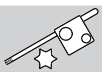
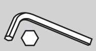
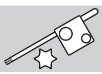
Right hand shown



λ_s = Angle of inclination of edge
γ_n = Rake angle

Reference	Insert	Dimensions (mm)									Hand of tool	
		D_{min}	h	h_1	b	l_1	f (r = 0.2)	f (r = 0.4)	λ_s	γ_n	R	L
STSCR/L 06CA-06	TC-- 06T1	20	8.5	6	5.8	21	8.00	7.80	0°	-6°	✓	✓
STSCR/L 08CA-09	TC-- 0902	25	10.0	8	6.8	28	10.20	10.00	0°	-6°	✓	✓

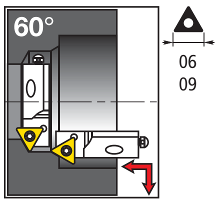
Spare parts

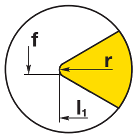
Insert	Cartridge							
TC-- 06T1	06 CA-06	DVF 1642	DMD 1650	DVR 1646	MA2-1214	DVS 1648	DVR 1644	MA2-2979
TC-- 0902	08 CA-09	DVF 0939	MA2-8304	DVR 1647	MA2-1214	DVS 1648	DVR 1645	TMD-703

✓: Article which can be ordered
Ordering example: STGCR 06CA-06

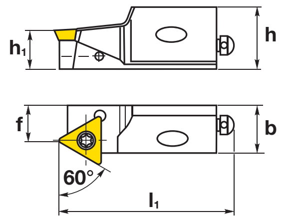
S SYSTEM FOR POSITIVE INSERTS

STTCR/L





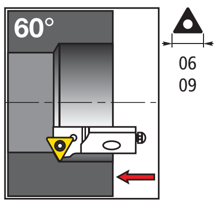
Right hand shown

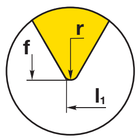


λ_s = Angle of inclination of edge
γ_n = Rake angle

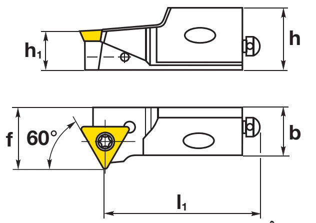
Reference	Insert	Dimensions (mm)									Hand of tool	
		D_{min}	h	h_1	b	l_1	f (r = 0.2)	f (r = 0.4)	λ_s	γ_n	R	L
STTCR/L 06CA-06	TC-- 06T1	20	8.5	6	6.2	25	5.50	5.60	0°	-9°	✓	✓
STTCR/L 08CA-09	TC-- 0902	25	10.0	8	6.8	32	5.90	6.00	0°	-8°	✓	✓

STWCR/L





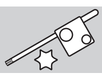
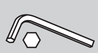
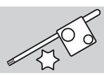
Right hand shown



λ_s = Angle of inclination of edge
γ_n = Rake angle

Reference	Insert	Dimensions (mm)									Hand of tool	
		D_{min}	h	h_1	b	l_1	f (r = 0.2)	f (r = 0.4)	λ_s	γ_n	R	L
STWCR/L 06CA-06	TC-- 06T1	20	8.5	6	5.8	21	8.00	7.80	-2°	-3°	✓	✓
STWCR/L 08CA-09	TC-- 0902	25	10.0	8	6.8	28	10.20	10.00	-4°	-4°	✓	✓

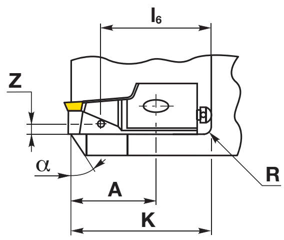
Spare parts

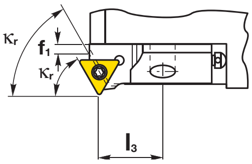
Insert	Cartridge							
TC-- 06T1	06 CA-06	DVF 1642	DMD 1650	DVR 1646	MA2-1214	DVS 1648	DVR 1644	MA2-2979
TC-- 0902	08 CA-09	DVF 0939	MA2-8304	DVR 1647	MA2-1214	DVS 1648	DVR 1645	TMD-703

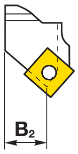
✓: Article which can be ordered
Ordering example: STTCR 06CA-06

S SYSTEM FOR POSITIVE INSERTS

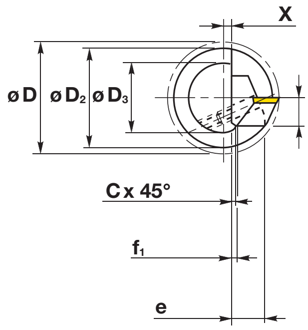
Assembly dimensions (mm)





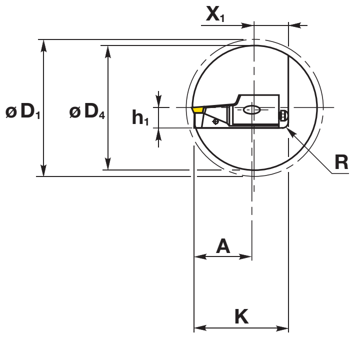


Axial mounting

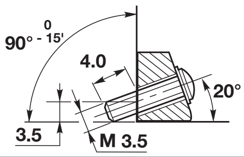
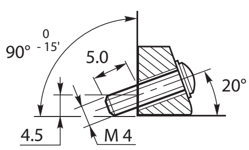
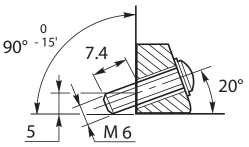


Axial adjustment = ± 1 mm
Radial adjustment = ± 0.5 mm

Radial mounting



Axial adjustment = ± 0.5 mm
Radial adjustment = ± 1 mm

	Cartridge	K_r	l_3	l_6	Z	B_2	D_{min}	$D_{1\,min}$	K	A	h_1	e_{max}	$f_{1\,max}$	R_{max}	C
06CA 	STFCR/L 06CA-06	90°	13	17.5	2.2	-	20	-	24.0	12.0	6	5.0	-	1.5	0.3
	STGCR/L 06CA-06	90°	13	17.5	2.2	-	20	30	23.0	11.0	6	5.0	-	1.5	0.3
	STSCR/L 06CA-06	45°	9	17.5	2.2	-	20	-	23.0	11.0	6	5.0	2.5	1.5	0.3
	STTCR/L 06CA-06	60°	13	17.5	2.2	-	20	30	23.0	11.0	6	5.0	3.4	1.5	0.3
	STWCR/L 06CA-06	60°	9	17.5	2.2	-	20	-	22.5	10.5	6	5.0	1.2	1.5	0.3
08CA 	SRSCR 08CA-08	-	-	24.2	2.2	-	25	-	29.7	12.7	8	6.5	-	-	-
	STFCR/L 08CA-09	90°	15	21.5	2.5	-	25	-	30.5	13.5	8	-	-	2.5	0.3
	STGCR/L 08CA-09	90°	15	21.5	2.5	-	25	37	29.2	12.2	8	-	-	2.5	0.3
	STSCR/L 08CA-09	45°	11	21.5	2.5	-	25	-	30.5	13.5	8	6.0	2.4	2.5	0.3
	STTCR/L 08CA-09	60°	15	21.5	2.5	-	25	37	29.2	12.2	8	-	2.7	2.5	0.3
	STWCR/L 08CA-09	60°	11	21.5	2.5	-	25	-	30.0	13.0	8	-	0.8	2.5	0.3
10CA 	SRSCR/L 10CA-10	-	-	39.5	3.0	-	40	-	48.0	28.0	10	10.6	-	-	-
	SSKCR/L 10CA-09 M	75°	30	41.5	3.0	-	40	-	50.5	30.5	10	9.0	0.9	4.0	0.4
	SSSCR/L 10CA-09 M	45°	24	38.0	3.0	6	40	-	47.0	27.0	10	9.0	-	4.0	0.4

Calculation of dimensions D_2, D_3, D_4

$$D_{2\,max} = 2\sqrt{h_1^2 + (X\,(\pm)\,e_{max})^2}$$

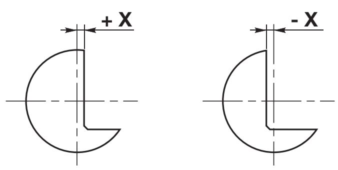
$$D_{3\,max} = 2\sqrt{h_1^2 + (X\,(\pm)\,f_{1\,max})^2}$$

$$X = \frac{D}{2} - f$$

$$D_{4\,max.} = 2\sqrt{h_1^2 + (K\,(\pm)\,X_1)^2}$$

$$X_1 = l_1 - \frac{D_1}{2}$$

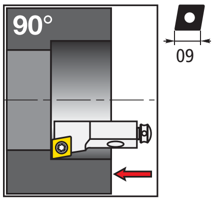
$$\text{tg}\,\alpha = \frac{(e-f_1).\text{tg}(90°-Kr).2}{D_2-D_3}$$

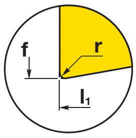


Note: X can be negative (see Sketch above)

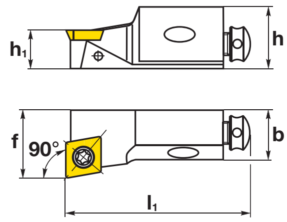
S SYSTEM FOR POSITIVE INSERTS - LIGHT ALLOYS

SCFER





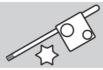
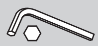
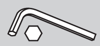
Right hand shown



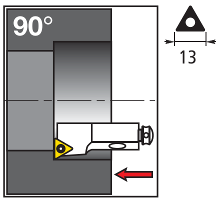
λ_s = Angle of inclination of edge
γ_n = Rake angle

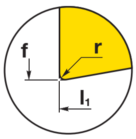
Reference	Insert	Dimensions (mm)									Hand of tool
		D_{min}	h	h_1	b	l_1	f (r = 0.4)	f (r = 0.8)	λ_s	γ_n	R
SCFER 10CA-09	CE-- 0903	30	14	10	10.5	50	14.08	14.00	0°	+12°	✓

Spare parts

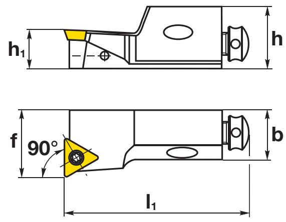
Insert	Cartridge							
CE-- 0903	10 CA-09	28106	TMD-703	27297	MA2-884	27403-08	27454-20	174-815

STFER





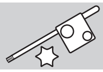
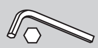
Right hand shown



λ_s = Angle of inclination of edge
γ_n = Rake angle

Reference	Insert	Dimensions (mm)									Hand of tool
		D_{min}	h	h_1	b	l_1	f (r = 0.4)	f (r = 0.8)	λ_s	γ_n	R
STFER 10CA-13	TE-- 1302	30	14	10	10.5	50	14.00	13.71	0°	+12°	✓

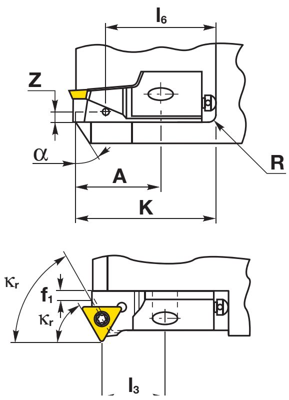
Spare parts

Insert	Cartridge							
TE-- 1302	10 CA-13	27756	TMD-703	27297	MA2-884	27403-08	27454-20	174-815

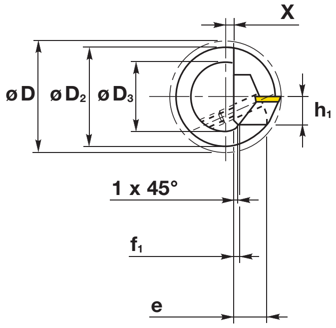
✓: Article which can be ordered
Ordering example: SCFER 10CA-09

S SYSTEM FOR POSITIVE INSERTS - LIGHT ALLOYS

Assembly dimensions (mm)

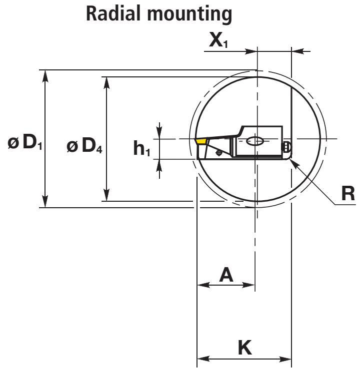


Axial mounting

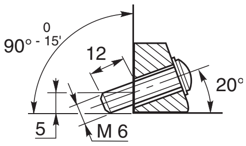


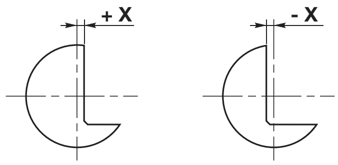
Axial adjustment = ± 1 mm
Radial adjustment = ± 0.5 mm

Radial mounting



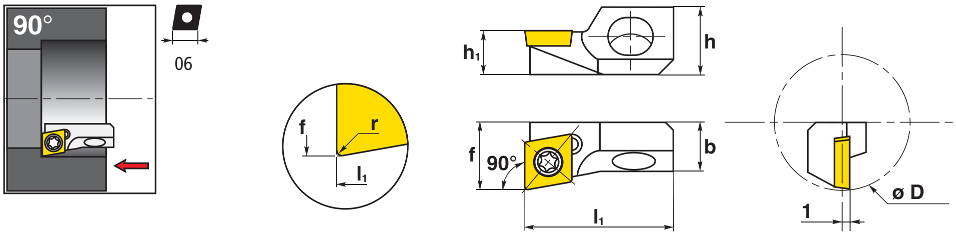
Axial adjustment = ± 0.5 mm
Radial adjustment = ± 1 mm

	Cartridge	κ_r	l_3	l_6	Z	D_{min}	$D_{1\ min}$	K	A	h_1	e_{max}	$f_{1\ max}$	R
10CA	SCFER 10CA-09	90°	30	38	3.0	30	-	-	-	10	9	4	5
	STFER 10CA-13	90°	30	38	3.0	30	-	-	-	10	9	4	5

Calculation of dimensions D_2, D_3, D_4		
$D_{2\,max} = 2\sqrt{h_1^2 + (X\,(\pm)\,e_{max})^2}$ $D_{3\,max} = 2\sqrt{h_1^2 + (X\,(\pm)\,f_{1\,max})^2}$ $X = \frac{D}{2} - f$ $D_{4\,max.} = 2\sqrt{h_1^2 + (K\,(\pm)\,X_1)^2}$ $X_1 = l_1 - \frac{D_1}{2}$	$\mathrm{tg}\,\alpha = \frac{(e-f_1).\mathrm{tg}(90°-Kr).2}{D_2-D_3}$	 Note: X can be negative (see Sketch above)

S SYSTEM FOR POSITIVE INSERTS

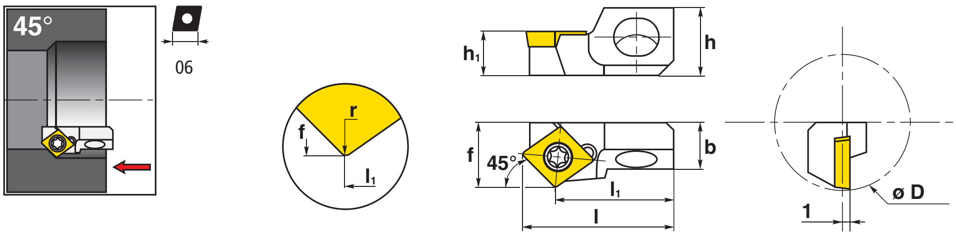
99 106 (R-90°)



λ_s = Angle of inclination of edge
γ_n = Rake angle

Reference	Insert	Dimensions (mm)									
		D_{min}	h	h_1	b	l	l_1	f (r = 0.2)	f (r = 0.4)	λ_s	γ_n
99 106 36320	CC-- 0602	13	8	5	6.0	-	20.0	8.50	8.46	0°	0°
99 106 35558	CC-- 0602	18	9	6	6.5	-	20.0	9.00	8.96	0°	0°

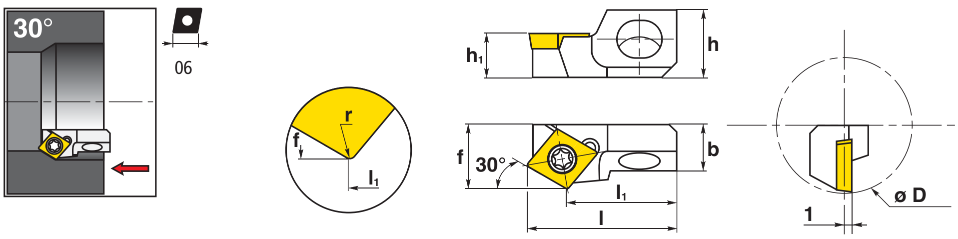
99 026 (R-45°)



λ_s = Angle of inclination of edge
γ_n = Rake angle

Reference	Insert	Dimensions (mm)									
		D_{min}	h	h_1	b	l	l_1	f (r = 0.2)	f (r = 0.4)	λ_s	γ_n
99 026 36354	CC-- 0602	18	9	6	6.5	21	16.6	9.00	8.94	0°	0°

99 026 (R-30°)



λ_s = Angle of inclination of edge
γ_n = Rake angle

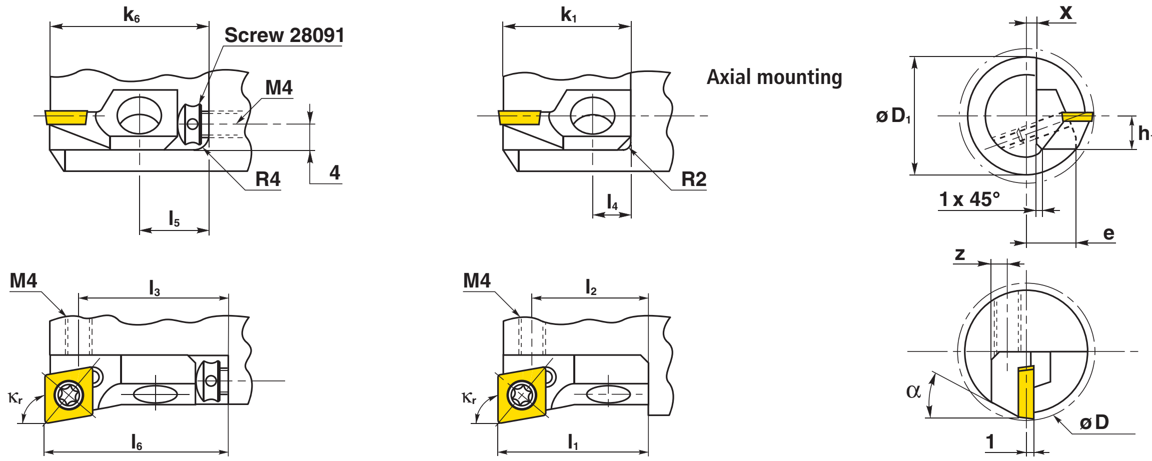
Reference	Insert	Dimensions (mm)									
		D_{min}	h	h_1	b	l	l_1	f (r = 0.2)	f (r = 0.4)	λ_s	γ_n
99 026 36355	CC-- 0602	18	9	6	6.5	21	15.6	9.00	8.94	0°	0°

Spare parts

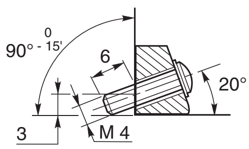
Insert				
CC-- 0602	27927	MA2-2979	27914	174.1-863

S SYSTEM FOR POSITIVE INSERTS

Assembly dimensions (mm)



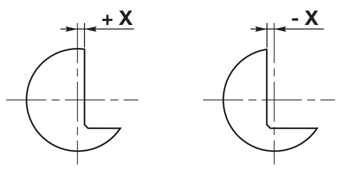
Axial adjustment = ± 1 mm
Radial adjustment = ± 0.5 mm

	Cartridge	κ_r	l_1	α	D_{min}	e_{max}	h_1	l_2	l_3	l_4	l_5	l_6	Z	k_1	k_6
	99 106 36320	90°	20	30°	13	6.0	5	16	22	5	11	26.0	2.5	19	25
	99 106 35558	90°	20	28°	18	6.5	6	16	22	5	11	26.0	2.5	19	25
	99 026 36354	45°	16.6	20°	18	6.5	5	16	22	5	11	22.6	2.5	20	26
	99 026 36355	30°	15.6	20°	18	6.5	5	16	22	5	11	21.6	2.5	20	26

Calculation of dimensions

$D_1 = D - 2.5$

$X = \frac{D}{2} - 9.1$



Note: X can be negative (see Sketch above)

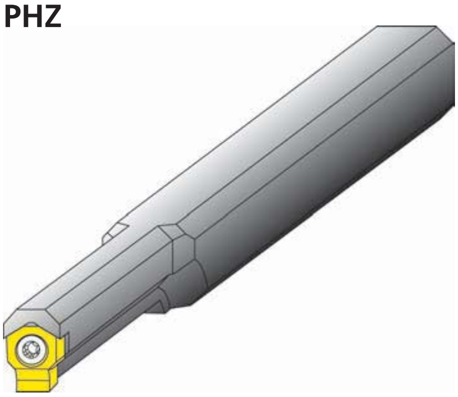
TURNING

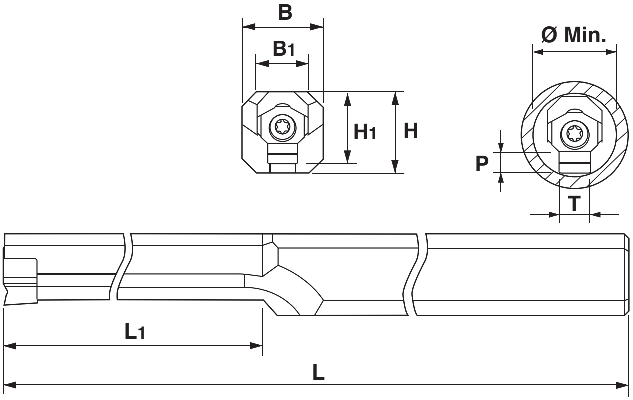
NOTES

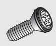

DD-16
P6-P25

TOOLS AND INSERTS FOR SLOTTING

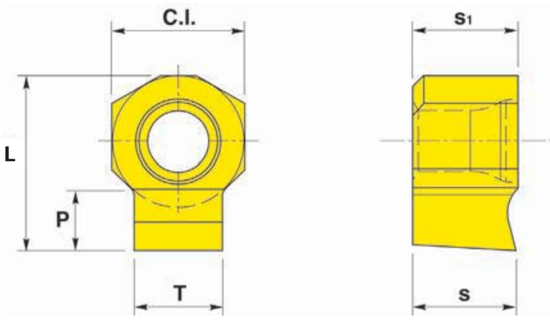
PHZ





Reference	Dimensions (mm)									Spare parts	
	H	H_1	B	B_1	L_1	L	T	Ø min.	P max		
PHZ 90 1104-06	11.3	9	11.3	8.5	35	160	3	9.5	1.6	DVF 3593	TX 207PLUS
PHZ 90 1107-06	11.3	10	11.3	7	60	200	4 5	10.9 11.1	2.5 3	DVF 3593	TX 207PLUS
PHZ 90 1111-06	11.3	12	11.3	-	60	200	4 5	14 14	2.5 3	DVF 3593	TX 207PLUS
PHZ 1512-10	15.5	16.2	12	-	-	220	6 8	17.8 18.2	4.2 5.2	DVF 2260	TX 215PLUS
PHZ 2014-13	20.6	21.5	14	-	-	250	10 12	24.2 24.7	6.2 7.2	5513 020-14	TX 225PLUS

HZ

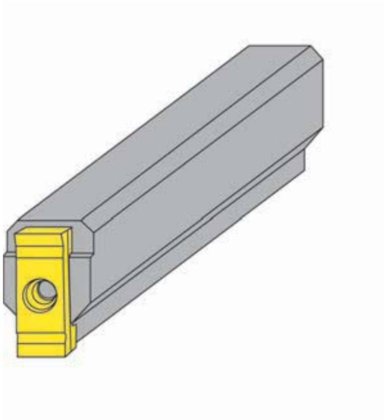


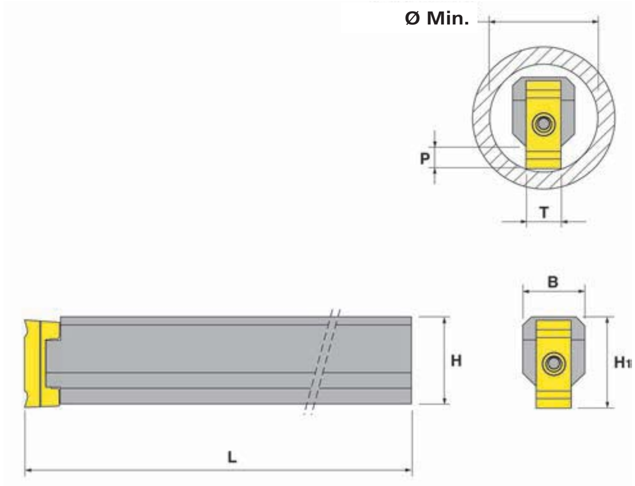
Reference	Dimensions (mm)							Grade
	C.I.	S	S_1	L	P	T	Tolerances on T	333TN
HZ 90 06 04-30 C11	6	4.66	4.76	7.5	1.6	3	+0.060 +0.012	✓
HZ 90 06 04-40 C11	6	4.66	4.76	8.0	2.5	4	+0.070 +0.145	✓
HZ 90 06 04-50 C11	6	4.66	4.76	8.0	3.0	5	+0.070 +0.145	✓
HZ 10 06-60 C11	10	6.25	6.35	13.5	4.2	6	+0.070 +0.145	✓
HZ 10 06-80 C11	10	6.25	6.35	13.5	5.2	8	+0.080 +0.170	✓
HZ 13 09-100 C11	13	9.40	9.525	18.5	6.2	10	+0.080 +0.170	✓
HZ 13 09-120 C11	13	9.40	9.525	18.5	7.2	12	+0.095 +0.205	✓
HZ 90 06 04-30 H7	6	4.66	4.76	7.5	1.6	3	+0.090 -0	✓
HZ 90 06 04-40 H7	6	4.66	4.76	8.0	2.5	4	+0.012 - 0	✓
HZ 90 06 04-50 H7	6	4.66	4.76	8.0	3.0	5	+0.012 - 0	✓
HZ 10 06-60 H7	10	6.25	6.35	13.5	4.2	6	+0.012 - 0	✓
HZ 10 06-80 H7	10	6.25	6.35	13.5	5.2	8	+0.015 - 0	✓
HZ 13 09-100 H7	13	9.40	9.525	18.5	6.2	10	+0.015 - 0	✓
HZ 13 09-120 H7	13	9.40	9.525	18.5	7.2	12	+0.018 - 0	✓
HZ 90 06 04-30 D10	6	4.66	4.76	7.5	1.6	3	+0.060 +0.002	✓
HZ 90 06 04-40 D10	6	4.66	4.76	8.0	2.5	4	+0.078 +0.030	✓
HZ 90 06 04-50 D10	6	4.66	4.76	8.0	3.0	5	+0.078 +0.030	✓

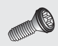
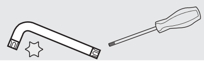
Ordering example: PHZ 90 1104-06

TOOLS AND INSERTS FOR SLOTTING

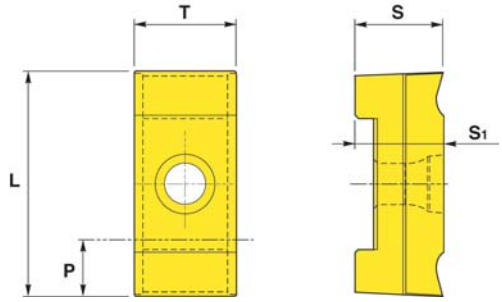
PHZ/2





Reference	Dimensions (mm)							Spare parts	
	H	H_1	B	L	T	Ø min.	P max		
PHZ/2 3625-14	36	37.5	25	300	14 16	44	8 9	5513 020-14	TX 225PLUS
PHZ/2 4838-18	48	50	32	400	18 20	58	12 13	5513 021-03	DMN 3124

HZ/2 - Two cutting edges



Reference	Dimensions (mm)						Grade
	S	S_1	L	P	T	Tolerances on T	333TN
HZ/2 14-14 C11	13.9	14	36	8	14	+0.205 +0.095	✓
HZ/2 16-16 C11	13.9	14	36	9	16	+0.205 +0.095	✓
HZ/2 18-18 C11	15.9	16	45	12	18	+0.205 +0.095	✓
HZ/2 20-20 C11	15.9	16	45	13	20	+0.240 +0.110	✓
HZ/2 14-14 H7	13.9	14	36	8	14	+0.018 -0	✓
HZ/2 16-16 H7	13.9	14	36	9	16	+0.018 - 0	✓
HZ/2 18-18 H7	15.9	16	45	12	18	+0.018 - 0	✓
HZ/2 20-20 H7	15.9	16	45	13	20	+0.021 - 0	✓

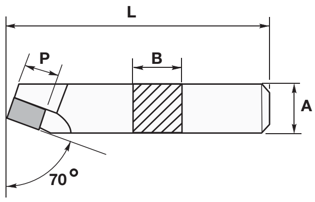
Ordering example: PHZ/2 3625-14

TURNING

ISO CONVENTIONAL TOOLS

ISO 1 R

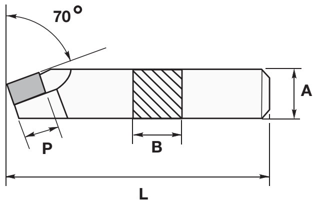
UNI 4102 R
DIN 4971



Reference	Dimensions (mm)			TIP
	A	B	L	P
ISO 1 R 1010	10	10	90	C8
ISO 1 R 1212	12	12	100	C10
ISO 1 R 1616	16	16	110	C12
ISO 1 R 2020	20	20	125	C16
ISO 1 R 2525	25	25	140	C20

ISO 1 L

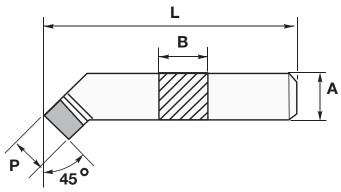
UNI 4102 L
DIN 4971



Reference	Dimensions (mm)			TIP
	A	B	L	P
ISO 1 L 1212	12	12	100	C10
ISO 1 L 1616	16	16	110	C12
ISO 1 L 2020	20	20	125	C16

ISO 2 R

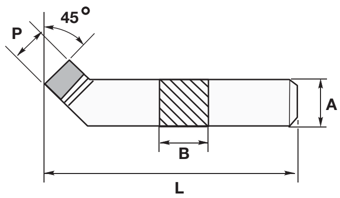
UNI 4103 R
DIN 4972



Reference	Dimensions (mm)			TIP
	A	B	L	P
ISO 2 R 1010	10	10	90	C8
ISO 2 R 1212	12	12	100	C10
ISO 2 R 1616	16	16	110	C12
ISO 2 R 2020	20	20	125	C16
ISO 2 R 2525	25	25	140	C20
ISO 2 R 3232	32	32	170	C25

ISO 2 L

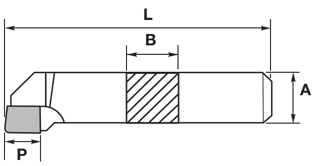
UNI 4103 L
DIN 4972



Reference	Dimensions (mm)			TIP
	A	B	L	P
ISO 2 L 1010	10	10	90	C8
ISO 2 L 1212	12	12	100	C10
ISO 2 L 1616	16	16	110	C12
ISO 2 L 2020	20	20	125	C16
ISO 2 L 2525	25	25	140	C20
ISO 2 L 3232	32	32	170	C25

ISO 6 R

UNI 4104 R
DIN 4980



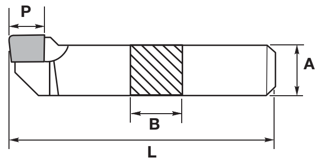
Reference	Dimensions (mm)			TIP
	A	B	L	P
ISO 6 R 1010	10	10	90	C8
ISO 6 R 1212	12	12	100	ABC 10
ISO 6 R 1616	16	16	110	ABC 12
ISO 6 R 2020	20	20	125	ABC 16
ISO 6 R 2525	25	25	140	ABC 20
ISO 6 R 3232	32	32	170	ABC 25

Ordering example: ISO 1 R 1010

ISO CONVENTIONAL TOOLS

ISO 6 L

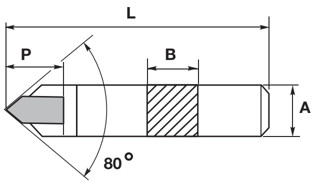
UNI 4104 L
DIN 4980



Reference	Dimensions (mm)			TIP
	A	B	L	P
ISO 6 L 1010	10	10	90	C8
ISO 6 L 1212	12	12	100	ABC 10
ISO 6 L 1616	16	16	110	ABC 12
ISO 6 L 2020	20	20	125	ABC 16
ISO 6 L 2525	25	25	140	ABC 20
ISO 6 L 3232	32	32	170	ABC 25

351

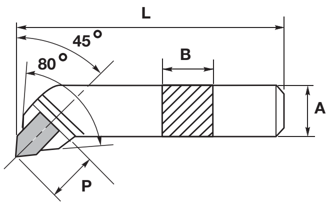
UNI 4105
DIN 4975



Reference	Dimensions (mm)			TIP
	A	B	L	P
351 1010	10	10	90	E8-IMP
351 1212	12	12	100	E10-IMP
351 1220	12	20	125	E12-IMP
351 1616	16	16	110	E12-IMP
351 1625	16	25	140	E8-ISO
351 2020	20	20	125	E8-ISO
351 2525	25	25	140	E10-ISO

ISO 3 R

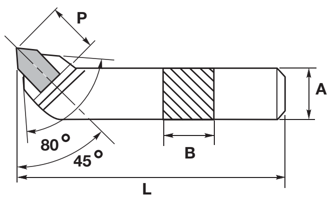
UNI 4106 R
DIN 4978



Reference	Dimensions (mm)			TIP
	A	B	L	P
ISO 3 R 1212	12	12	100	E12-IMP
ISO 3 R 1616	16	16	110	E8-ISO
ISO 3 R 2020	20	20	125	E10-ISO
ISO 3 R 2525	25	25	140	E12-ISO

ISO 3 L

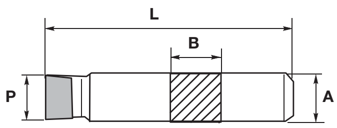
UNI 4106 L
DIN 4978



Reference	Dimensions (mm)			TIP
	A	B	L	P
ISO 3 L 1616	16	16	110	E8-ISO
ISO 3 L 2020	20	20	125	E10-ISO
ISO 3 L 2525	25	25	140	E12-ISO

ISO 4

UNI 4107
DIN 4976



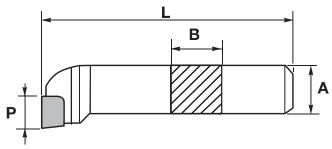
Reference	Dimensions (mm)			TIP
	A	B	L	P
ISO 4 1010	10	10	90	ABC 10
ISO 4 1212	12	12	100	ABC 12
ISO 4 1616	16	16	110	ABC 16
ISO 4 2020	20	20	125	ABC 20
ISO 4 2525	25	25	140	ABC 25

Ordering example: ISO 6 L 1010

ISO CONVENTIONAL TOOLS

ISO 5 R

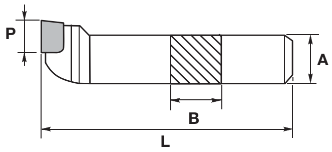
UNI 4108 R
DIN 4977



Reference	Dimensions (mm)			TIP
	A	B	L	P
ISO 5 R 1212	12	12	100	ABC 10
ISO 5 R 1616	16	16	110	ABC 12
ISO 5 R 2020	20	20	125	ABC 16

ISO 5 L

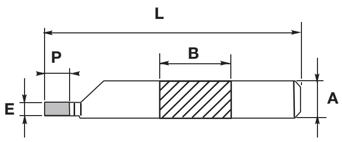
UNI 4108 L
DIN 4977



Reference	Dimensions (mm)			TIP
	A	B	L	P
ISO 5 L 2020	20	12	125	ABC 16

ISO 7 R

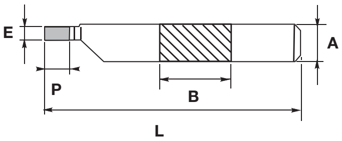
UNI 4109 R
DIN 4981



Reference	Dimensions (mm)				TIP
	A	B	L	E	P
ISO 7 R 0812	8	12	100	3	D3
ISO 7 R 1010	10	10	90	3	D3
ISO 7 R 1016	10	16	110	4	D4
ISO 7 R 1212	12	12	100	3	D3
ISO 7 R 1220	12	20	125	5	D5
ISO 7 R 1616	16	16	110	4	D4
ISO 7 R 1625	16	25	140	6	D6
ISO 7 R 2020	20	20	125	5	D5
ISO 7 R 2032	20	32	170	8	D8
ISO 7 R 2525	25	25	140	6	D6
ISO 7 R 2540	25	40	200	10	D10

ISO 7 L

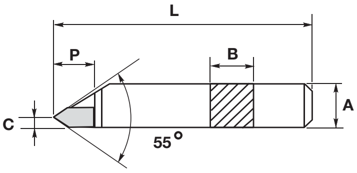
UNI 4109 L
DIN 4981



Reference	Dimensions (mm)				TIP
	A	B	L	E	P
ISO 7 L 0812	8	12	100	3	D3
ISO 7 L 1016	10	16	110	4	D4
ISO 7 L 1220	12	20	125	5	D5
ISO 7 L 1625	16	25	140	6	D6
ISO 7 L 2020	20	20	125	5	D5
ISO 7 L 2032	20	32	170	8	D8
ISO 7 L 2540	25	40	200	10	D10

352 R 55°

UI 30 R 55°



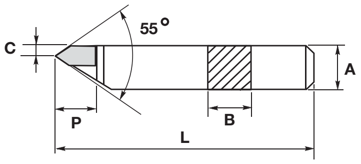
Reference	Dimensions (mm)				TIP
	A	B	L	C	P
352 R 55° 1212	12	12	100	2	FIL 3,5
352 R 55° 1616	16	16	110	2	FIL 4
352 R 55° 2020	20	20	125	2.5	FIL 5
352 R 55° 2525	25	25	140	3	FIL 6

Ordering example: ISO 5 R 1212

ISO CONVENTIONAL TOOLS

352 L 55°

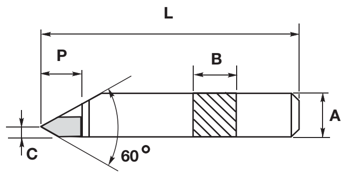
UI 30 L 55°



Reference	Dimensions (mm)				TIP
	A	B	L	C	P
352 L 55° 2020	20	20	125	2.5	FIL 5

352 R 60°

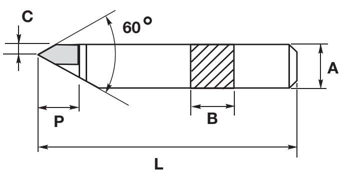
UI 30 R 60°



Reference	Dimensions (mm)				TIP
	A	B	L	C	P
352 R 60° 1212	12	12	100	2	FIL 3,5
352 R 60° 1616	16	16	110	2	FIL 4
352 R 60° 2020	20	20	125	2.5	FIL 5
352 R 60° 2525	25	25	140	3	FIL 6

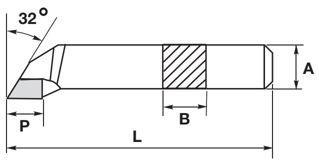
352 L 60°

UI 30 L 60°



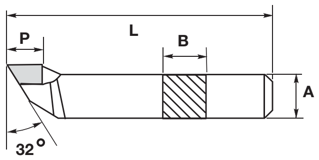
Reference	Dimensions (mm)				TIP
	A	B	L	C	P
352 L 60° 1616	16	16	110	2	FIL 4
352 L 60° 2020	20	20	125	2.5	FIL 5
352 L 60° 2525	25	25	140	3	FIL 6

UI 70 R



Reference	Dimensions (mm)				TIP
	A	B	L	C	P
UI 70 R 1616	16	16	140	-	CP 12
UI 70 R 2020	20	20	160	-	CP 16
UI 70 R 2525	25	25	200	-	CP 20

UI 70 L



Reference	Dimensions (mm)				TIP
	A	B	L	C	P
UI 70 L 2020	20	20	160	-	CPS 16

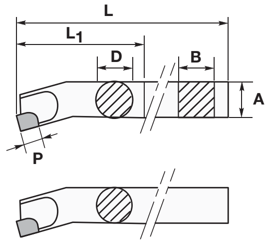
Ordering example: 352 L 55° 2020

ISO CONVENTIONAL TOOLS FOR INTERNAL MACHINING

TURNING

ISO 8

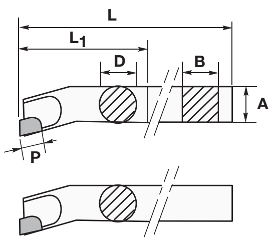
UNI 4110 R
DIN 4973



Reference	Dimensions (mm)							TIP
	A	B	D	L	L_1	P	C	P
ISO 8 0808	8	8	8	125	40	-	-	C6
ISO 8 1010	10	10	10	150	50	-	-	C7
ISO 8 1212	12	12	12	180	63	-	-	C8
ISO 8 1616	16	16	16	210	80	-	-	C10
ISO 8 2020	20	20	20	250	100	-	-	C12
ISO 8 2525	25	25	25	300	125	-	-	C16
ISO 8 3232	32	32	32	355	160	-	-	C20
ISO 8 0008	-	-	8	125	-	-	-	C6
ISO 8 0010	-	-	10	150	-	-	-	C7
ISO 8 0012	-	-	12	180	-	-	-	C8
ISO 8 0016	-	-	16	210	-	-	-	C10

ISO 9

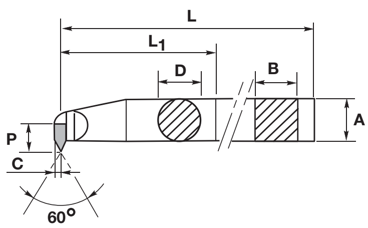
UNI 4110 R
DIN 4974



Reference	Dimensions (mm)							TIP
	A	B	D	L	L_1	P	C	P
ISO 9 0808	8	8	8	125	40	-	-	C6
ISO 9 1010	10	10	10	150	50	-	-	C7
ISO 9 1212	12	12	12	180	63	-	-	C8
ISO 9 1616	16	16	16	210	80	-	-	C10
ISO 9 2020	20	20	20	250	100	-	-	C12
ISO 9 2525	25	25	25	300	125	-	-	C16
ISO 9 3232	32	32	32	355	160	-	-	C20
ISO 9 0008	-	-	8	125	-	-	-	C6
ISO 9 0010	-	-	10	150	-	-	-	C7
ISO 9 0012	-	-	12	180	-	-	-	C8
ISO 9 0016	-	-	16	210	-	-	-	ABC 10
ISO 9 0020	-	-	20	250	-	-	-	ABC 12
ISO 9 0025	-	-	25	300	-	-	-	ABC 16

353 R 55°

UI 40 R 55°



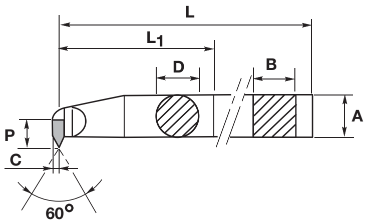
Reference	Dimensions (mm)							TIP
	A	B	D	L	L_1	P	C	P
353 R 55° 1010	10	10	10	140	52	12	1.8	FIL 3,5
353 R 55° 1212	12	12	12	160	56	12	1.8	FIL 3,5
353 R 55° 1616	16	16	16	180	63	14	2	FIL 4
353 R 55° 2020	20	20	20	210	80	14	2	FIL 4

Ordering example: ISO 8 0808

ISO CONVENTIONAL TOOLS FOR INTERNAL MACHINING

353 R 60°

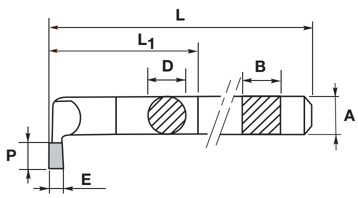
UI 40 R 60°



Reference	Dimensions (mm)							TIP
	A	B	D	L	L_1	P	C	P
353 R 60° 1010	10	10	10	140	52	12	1.8	FIL 3,5
353 R 60° 1212	12	12	12	160	56	12	1.8	FIL 3,5
353 R 60° 1616	16	16	16	180	63	14	2	FIL 4
353 R 60° 2020	20	20	20	210	80	14	2	FIL 4
353 R 60° 2525	25	25	25	250	100	16	2.5	FIL 5

354 R

UNI 4102 R
DIN 4971



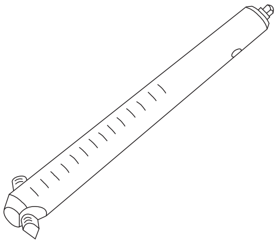
Reference	Dimensions (mm)							TIP
	A	B	D	L	L_1	P	E	P
354 R 1010	10	10	10	140	52	8	3	D3
354 R 1212	12	12	12	160	56	10	4	D4
354 R 1616	16	16	16	180	63	12	5	D5
354 R 2020	20	20	20	210	80	14	6	D6
354 R 2525	25	25	25	250	100	16	8	D8

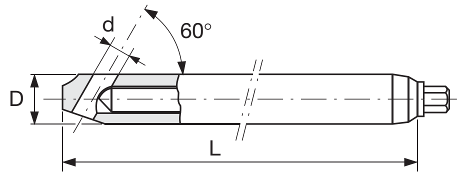
Ordering example: 353 R 60° 1010

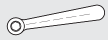
TURNING

BORING BARS

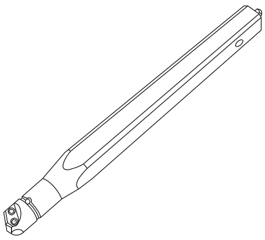
SI

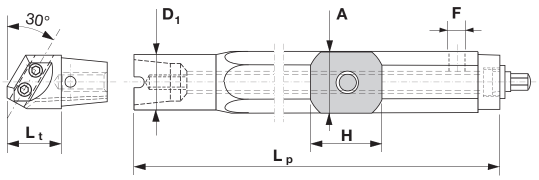




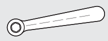
Reference	Dimensions (mm)			Spare parts		
	D	L	d			
SI-10-04	10	180	4	2005	1361	1502
SI-12-05	12	210	5	2015	1361	1502
SI-16-07	16	250	7	2025	1081	1504
SI-20-08	20	300	8	2035	1102	1504
SI-25-10	25	350	10	2055	1121	1504
SI-32-12	32	400	12	2075	1423	1504

P51





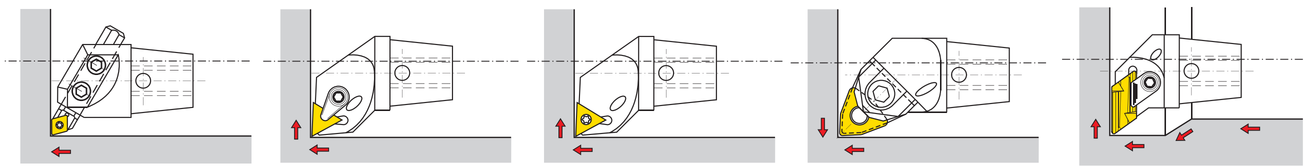
The boring bar is delivered complete with head T 51

Reference	Dimensions (mm)						Spare parts		
	H	A	D_1	L_p	L_p+L_t	F			
P51-4036-32+T51	40	36	32	446	480	3/8»Gas	1141	2335	1506
P51-5645-45+T51	56	45	45	546	590	3/8»Gas	1142	2335	1506
P51-7660-55+T51	77	58	55	700	762	3/8»Gas	1201	2346	1509
P51-8660-55+T51	86	60	55	1000	1062	3/8»Gas	1205	2346	1509

Ordering example: SI-10-04

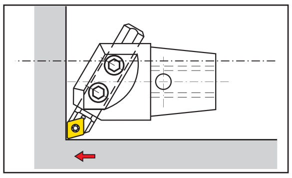
HEADS FOR BORING BARS

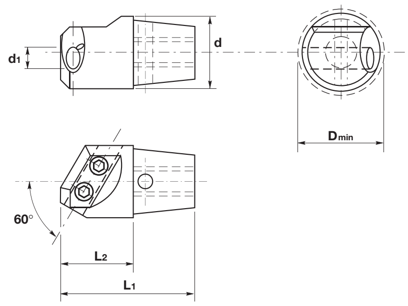
T 51/60 | T 53 C | T 53 S | T 27 M | T 64 C



Heads are provided with an internal channel allowing the coolant to reach the tip of the tool

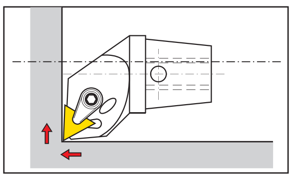
T51/60

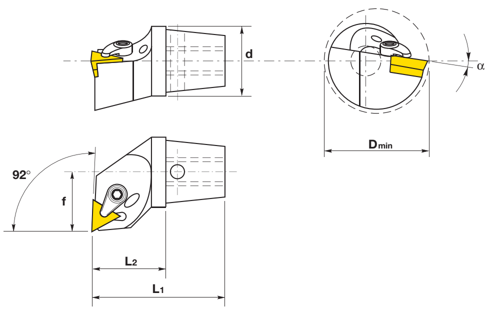




Reference	Dimensions (mm)					Spare parts	
	d	d_1	L_1	L_2	D_{min}		
T51/60-32-12	32	12	56	31	35	UNI 5923 M8x10	UNI 2415-4
T51/60-45-16	45	16	72	42	50	UNI 5923 M10x12	UNI 2415-5
T51/60-55-22	55	22	100	60	60	UNI 5923 M12x16	UNI 2415-6

T53C





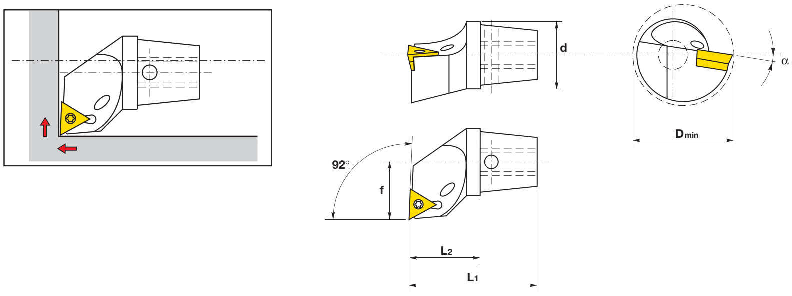
Reference	Dimensions (mm)						Spare parts				
	d	f	L_1	L_2	α	D_{min}					
T53C-32-TP16	32	27	58	33	0°	45	TP 212	S2-10	M6x19 RL	MC 2	UNI 2415-3
T53C-45-TP16	45	35	70	40	0°	60	TP 212	S2-10	M6x19 RL	MC 2	UNI 2415-3

Ordering example: T51/60-32-12

TURNING

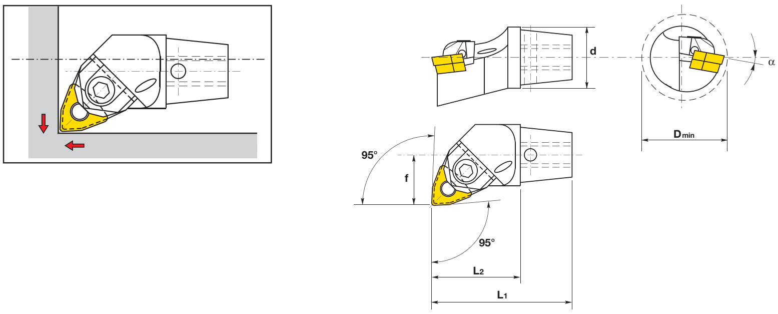
HEADS FOR BORING BARS

T53S



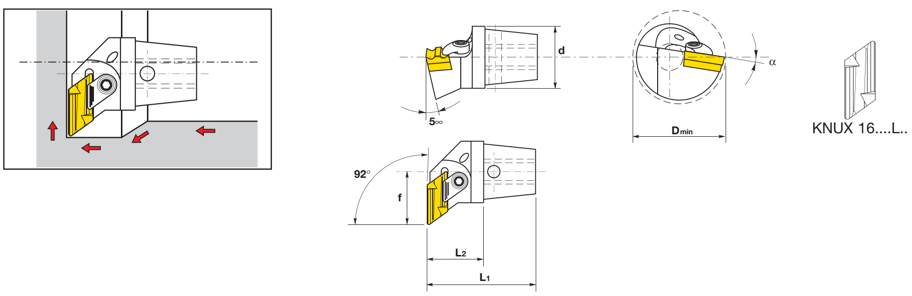
Reference	Dimensions (mm)						Spare parts				
	d	f	L_1	L_2	α	D_{min}					
T53S-32-TC16	32	27	58	33	8°	45	SZTP-322	SD 110	P-M4x10/15A	TORX-P-15	UNI 2415-3

T27M



Reference	Dimensions (mm)						Spare parts				
	d	f	L_1	L_2	α	D_{min}					
T27M-32-WN 08	32	27	65	40	9°	45	28173	28260	E.28255	MW08-524-2,5-MM	UNI 2415-2,5
T27M-45-WN 08	45	35	70	40	9°	60	28173	28260	E.28255	MW08-524-2,5-MM	UNI 2415-2,5
T27M-55-WN 08	55	47.5	94	54	9°	78	28173	28260	E.28255	MW08-524-2,5-MM	UNI 2415-2,5

T64C

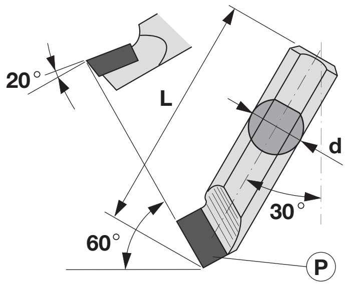


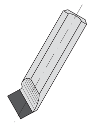
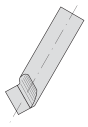
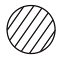
Reference	Dimensions (mm)						Spare parts				
	d	f	L_1	L_2	α	D_{min}					
T64C-32-KN16L	32	27	54	29	4°	45	KN-232 L	S2-10	M8x24 RL	MC 6 L	UNI 2415-4
T64C-45-KN16L	45	35.5	65	35	2°	60	KN-232 L	S2-10	M8x24 RL	MC 6 L	UNI 2415-4

Ordering example: T53S-32-TC16

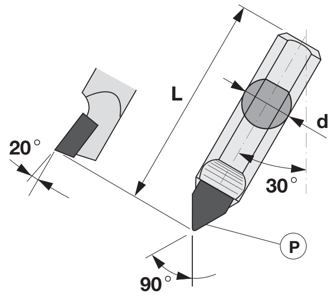
BRAZED AND SOLID TOOLS

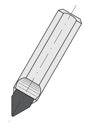
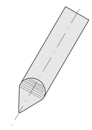
A3 A3T



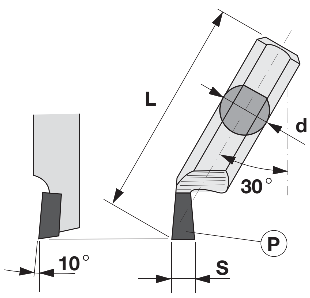
		Reference	Section	Dimensions (mm) d	Dimensions (mm) L	TIP P
A3		A3-07		7	26	C7
		A3-08		8	30	C7
		A3-10		10	45	C8
		A3-12		12	55	C10
		A3-16		16	70	C12
A3T		A3T-04		4	18	-
		A3T-05		5	20	-

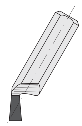
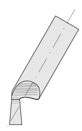
A4 A4T



		Reference	Section	Dimensions (mm) d	Dimensions (mm) L	TIP P
A4		A4-07		7	26	E8-IMP
		A4-08		8	30	E8-IMP
		A4-10		10	45	E10-IMP
		A4-12		12	55	E12-IMP
A4T		A4T-04		4	18	-
		A4T-05		5	20	-

C1 C1T



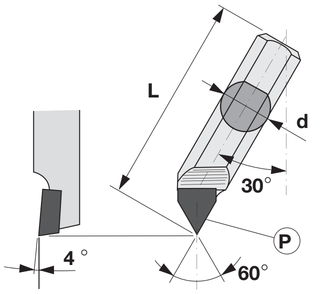
		Reference	Section	Dimensions (mm) d	Dimensions (mm) L	TIP P	S
C1		C1-07		7	26	GOR 3	3
		C1-08		8	30	GOR 3	3
		C1-10		10	45	GOR 4	4
		C1-12		12	55	GOR 5	5
		C1-16		16	70	GOR 6	6
		C1-22		22	100	GOR 8	8
C1T		C1T-04		4	18	-	2.5
		C1T-05		5	20	-	3.5

Ordering example: A3-07

TURNING

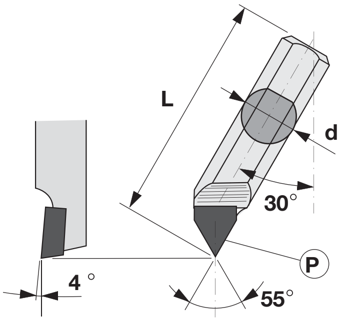
BRAZED AND SOLID TOOLS

C2/60° C2/60°T



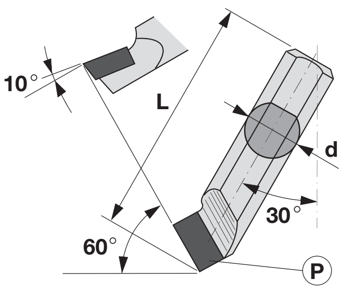
Reference		Section	Dimensions (mm) d	L	TIP P
C2/60°	C2/60°-07		7	26	E8-IMP
	C2/60°-08		8	30	E8-IMP
	C2/60°-10		10	45	E10-IMP
	C2/60°-12		12	55	E12-IMP
	C2/60°-16		16	70	DA 12
	C2/60°-22		22	100	DA 16
C2/60°T	C2/60°T-04		4	18	-
	C2/60°T-05		5	20	-

C2/55° C2/55°T



Reference		Section	Dimensions (mm) d	L	TIP P
C2/55°	C2/55°-07		7	26	E8-IMP
	C2/55°-08		8	30	E8-IMP
	C2/55°-10		10	45	E10-IMP
	C2/55°-12		12	55	E12-IMP
C2/55°T	C2/55°T-04		4	18	-
	C2/55°T-05		5	20	-

C3 C3T

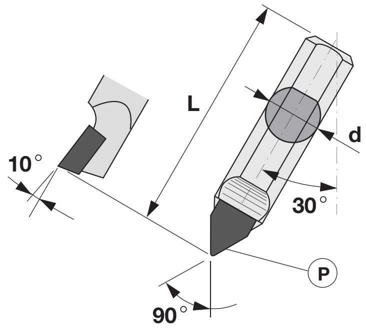


Reference		Section	Dimensions (mm) d	L	TIP P
C3	C3-07		7	26	C7
	C3-08		8	30	C7
	C3-10		10	45	C8
	C3-12		12	55	C10
	C3-16		16	70	C12
	C3-22		22	100	C16
C3T	C3T-04		4	18	-
	C3T-05		5	20	-

Ordering example: C2/60°-07

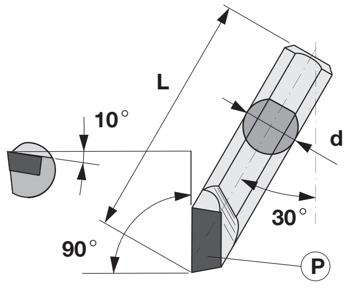
BRAZED AND SOLID TOOLS

C4 C4T



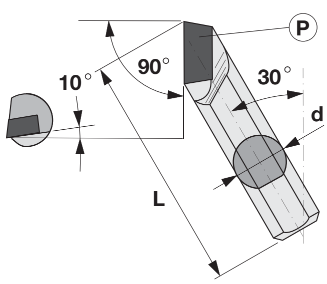
	Reference	Section	Dimensions (mm) d	Dimensions (mm) L	TIP P
C4	C4-07		7	26	E8-IMP
	C4-08		8	30	E8-IMP
	C4-10		10	45	E10-IMP
	C4-12		12	55	E12-IMP
	C4-16		16	70	FB 14
	C4-22		22	100	FB 16
C4T	C4T-04		4	18	-
	C4T-05		5	20	-

C5 C5T



	Reference	Section	Dimensions (mm) d	Dimensions (mm) L	TIP P
C5	C5-07		7	26	C7
	C5-08		8	30	C7
	C5-10		10	45	C8
	C5-12		12	55	ABC 10
	C5-16		16	70	ABC 12
	C5-22		22	100	ABC 16
C5T	C5T-04		4	18	-
	C5T-05		5	20	-

C6 C6T

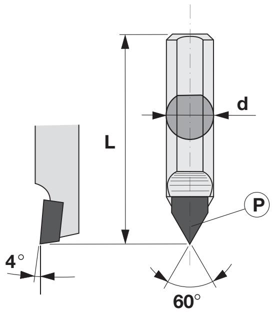


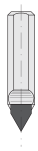
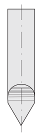
	Reference	Section	Dimensions (mm) d	Dimensions (mm) L	TIP P
C6	C6-07		7	26	C7
	C6-08		8	30	C7
	C6-10		10	45	C8
	C6-12		12	55	ABC 10
	C6-16		16	70	ABC 12
C6T	C6T-04		4	18	-
	C6T-05		5	20	-

Ordering example: C4-07

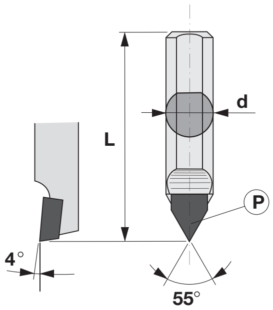
BRAZED AND SOLID TOOLS

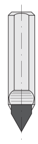
D2/60° D2/60°T



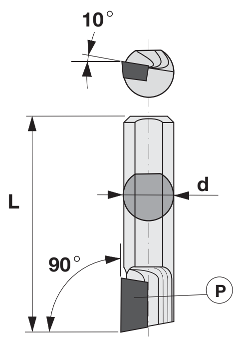
Reference		Section	Dimensions (mm)		TIP
			d	L	P
D2/60° 	D2/60°-07		7	26	E8-IMP
	D2/60°-08		8	30	E8-IMP
	D2/60°-10		10	45	E10-IMP
	D2/60°-12		12	55	E12-IMP
	D2/60°-16		16	70	FB 14
D2/60°T 	D2/60°T-04		4	18	-
	D2/60°T-05		5	20	-

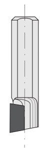
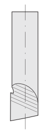
D2/55°



Reference		Section	Dimensions (mm)		TIP
			d	L	P
D2/55° 	D2/55°-08		8	30	E8-IMP
	D2/55°-10		10	45	E10-IMP
	D2/55°-12		12	55	E12-IMP

D5 D5T

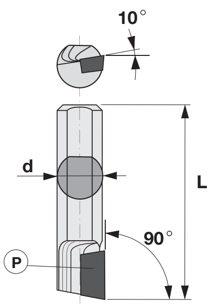


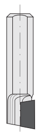
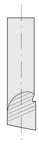
Reference		Section	Dimensions (mm)		TIP
			d	L	P
D5 	D5-07		7	26	C7
	D5-08		8	30	C7
	D5-10		10	45	C8
	D5-12		12	55	ABC 10
	D5-16		16	70	ABC 12
D5T 	D5T-04		4	18	-
	D5T-05		5	20	-

Ordering example: D2/60°-07

BRAZED AND SOLID TOOLS

D6 D6T

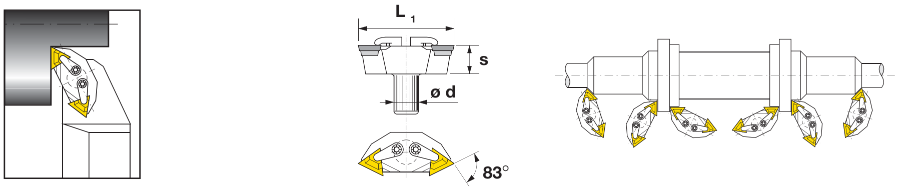


		Reference	Section	Dimensions (mm)		TIP
				d	L	P
D6		D6-07		7	26	C7
		D6-08		8	30	C7
		D6-10		10	45	C8
		D6-12		12	55	ABC 10
		D6-16		16	70	ABC 12
D6T		D6T-05		05	20	-

Ordering example: D6-07

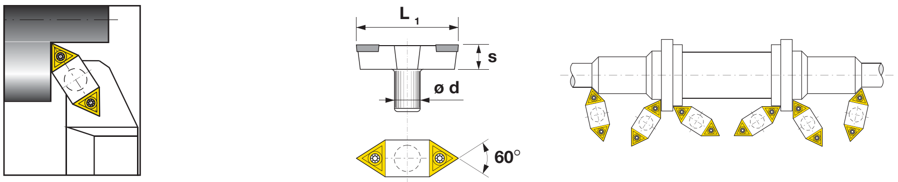
TOOLS WITH INDEXABLE INSERTS

M20C



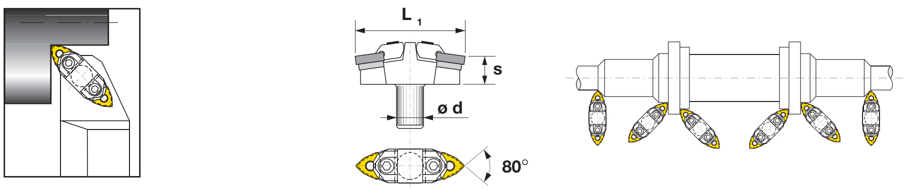
Reference	Dimensions (mm)			Spare parts						
	d	s	L_1							
M20C-RL14-TP16	14	22	54	TP 212	S2-10	MC 2	M6x19 RL	UNI 2415-3	1.5-2.5	MT21-MT22
M20C-RL16-TP16	16	22	57	TP 212	S2-10	MC 2	M6x19 RL	UNI 2415-3	1.5-2.5	MT21-MT22

M26S



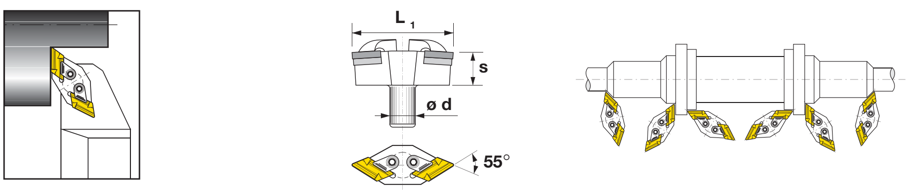
Reference	Dimensions (mm)			Spare parts				
	d	s	L_1					
M26S-RL10-TC11	10	8.5	33	-	-	-	5513 020-03	TORX 7
M26S-RL12-TC11	12	12	37.5	-	-	-	5513 020-03	TORX 7
M26S-RL14-TC16	14	15	46	-	-	-	TORX-P-M4x10/15A	TMD 703
M26S-RL16-TC16	16	17	54	SZTP 322	SD 110	UNI 2415-3	TORX-P-M4x10/15A	TMD 703
M26S-RL18-TC16	18	21	64	SZTP 322	SD 110	UNI 2415-3	TORX-P-M4x10/15A	TMD 703

M27M



Reference	Dimensions (mm)			Spare parts				
	d	s	L_1					
M27M-RL16-WN08	16	16	62	28173	28260	E.28255	MW08-524-2.5-MM	UNI 2415-2.5
M27M-RL18-WN08	18	19	66	28173	28260	E.28255	MW08-524-2.5-MM	UNI 2415-2.5

M24C

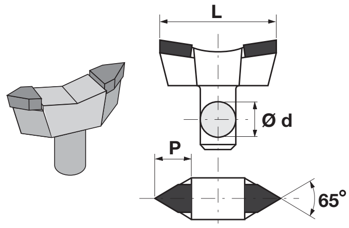


Reference	Dimensions (mm)			Spare parts						
	d	s	L_1							
M24C-RL16-KN16	16	21	64	KN-232 R	KN-232 L	S2-10	MC 6 R	MC 6 L	M8x24 RL	UNI 2415-4

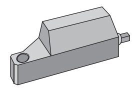
Ordering example: M20C-RL14-TP16

BRAZED TOOLS

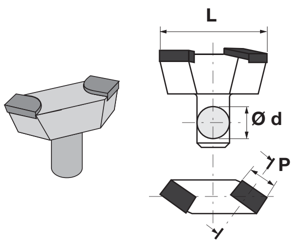
FB



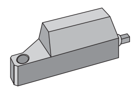
Reference	Dimensions (mm)		TIP	Use with
	d	L	P	
FB-10	10	35	FB-10	
FB-12	12	44	FB-12	
FB-14	14	52	FB-14	
FB-16	16	58	FB-16	
FB-18	18	69	FB-18	
FB-22	22	87	FB-22	


PTR

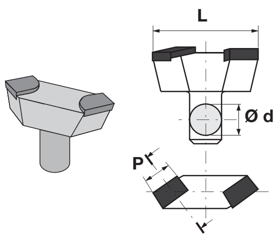
FC



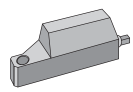
Reference	Dimensions (mm)		TIP	Use with
	d	L	P	
FC-10	10	35	ABC 10	
FC-12	12	44	ABC 12	
FC-14	14	52	ABC 12	
FC-16	16	58	ABC 16	
FC-18	18	69	ABC 20	
FC-22	22	87	ABC 25	


PTR

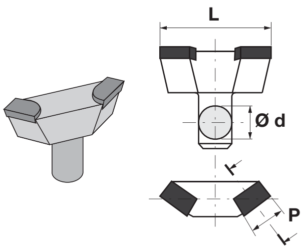
FCS



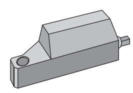
Reference	Dimensions (mm)		TIP	Use with
	d	L	P	
FCS-14	14	44	ABC 12	
FCS-16	16	52	ABC 12	


PTR

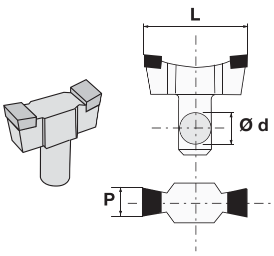
DD



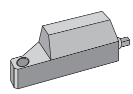
Reference	Dimensions (mm)		TIP	Use with
	d	L	P	
DD-10	10	35	ABC 10	
DD-12	12	44	ABC 12	
DD-14	14	52	ABC 12	
DD-16	16	58	ABC 16	
DD-18	18	69	ABC 20	
DD-22	22	87	ABC 25	


PTR

ST



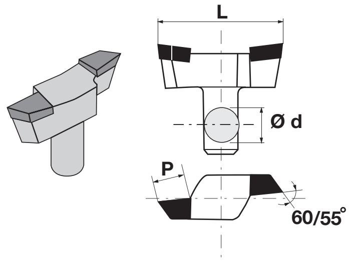
Reference	Dimensions (mm)		TIP	Use with
	d	L	P	
ST-12	12	44	ABC 12	
ST-14	14	52	ABC 12	
ST-16	16	58	ABC 16	
ST-18	18	69	ABC 20	

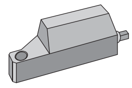

PTR

Ordering example: FB-10

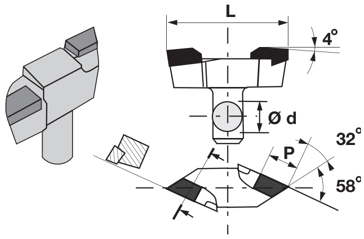
BRAZED TOOLS

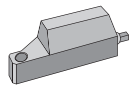
F.60°   F.55°



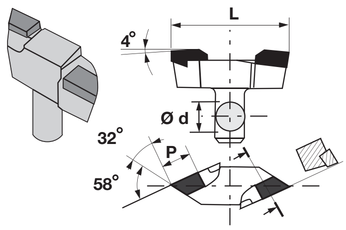
Reference	Dimensions (mm)		TIP	Use with
	d	L	P	
F.60°-12	12	44	ABC 12	
F.60°-14	14	52	ABC 12	
F.60°-16	16	58	ABC 16	 PTR
F.55°-16	16	58	ABC 16	

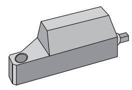
CP



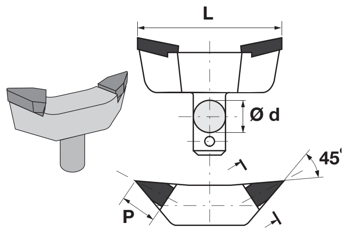
Reference	Dimensions (mm)		TIP	Use with
	d	L	P	
CP-12	12	44	CP-12	
CP-14	14	52	CP-14	 PTR
CP-16	16	60	CP-16	

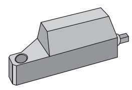
CPS



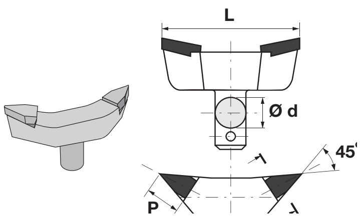
Reference	Dimensions (mm)		TIP	Use with
	d	L	P	
CPS-14	14	52	CPS-14	 PTR
CPS-16	16	60	CPS-16	

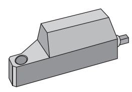
DA



Reference	Dimensions (mm)		TIP	Use with
	d	L	P	
DA-12	12	60	DA-12	
DA-14	14	70	DA-14	
DA-16	16	80	DA-16	 PTR
DA-18	18	90	DA-18	

DAI

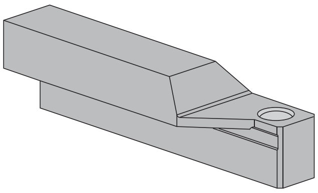


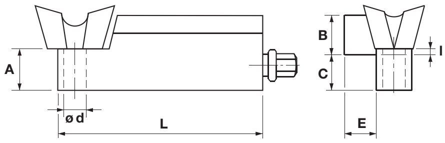
Reference	Dimensions (mm)		TIP	Use with
	d	L	P	
DAI-14	12	60	E12-IMP	 PTR
DAI-16	14	70	DA-12	
DAI-18	16	80	DA-16	

Ordering example: F.60°-12

HOLDER FOR ROTARY TOOLS & BUSHINGS FOR BORING BARS

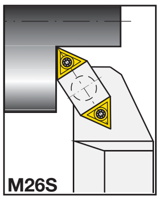
PTR

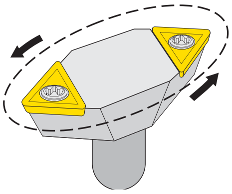


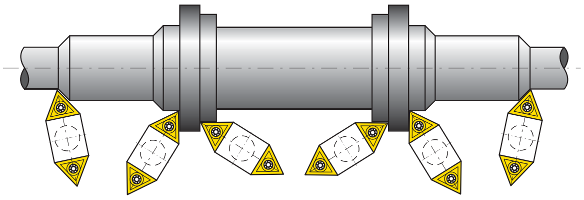


Reference	Turret	Dimensions (mm)							Spare parts	
		d	A	B	C	E	L	I		
PTR-1313-10	O	10	19.5	13	16.5	13	125	3	1121	1504
PTR-1815-12	A	12	24	18	20	15	140	4	1121	1504
PTR-2118-14	B	14	30	21	26	18	135	4	1121	1504
PTR-2424-16	C	16	31	24	25	24	150	6	1161	1506
PTR-3030-18	D	18	40	30	33	30	240	7	1161	1506

Rotary tools for supports PTR : ...

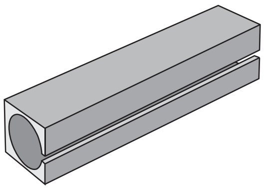


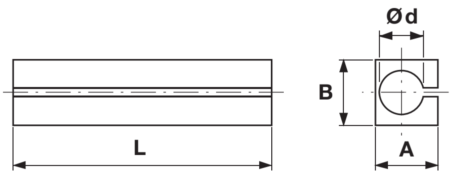




This tool can, by rotated 360° on its own axis, assume numerous operating positions and in this way replace several conventional tools.

P90





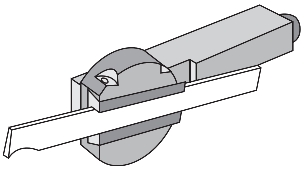
Adaptators for boring bars

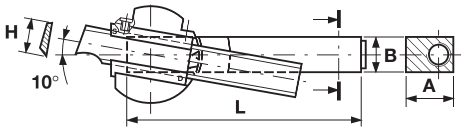
Reference	Dimensions (mm)			
	B	A	L	d
P90-1616-10	16	16	75	10
P90-1616-12	16	16	75	12
P90-2020-10	20	20	100	10
P90-2020-12	20	20	100	12
P90-2020-16	20	20	100	16
P90-2525-20	25	25	100	20
P90-3025-10	30	25	100	10
P90-3025-12	30	25	110	12
P90-3025-16	30	25	110	16
P90-3030-20	30	30	130	20
P90-3030-25	30	30	130	25
P90-3937-32	39	37	140	32

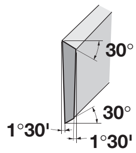
Ordering example: PTR-1313-10

DYNAMOMETRIC HOLDER FOR CUTTING-OFF

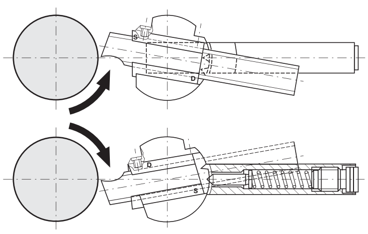
PDT

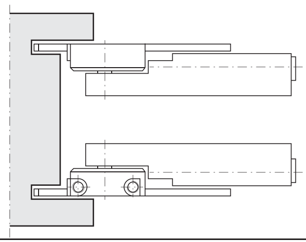






Reference	Dimensions (mm)				Spare parts	
	B	A	L	H		
PDT-2434-LU 20	24	34.5	170	20	UNI 5923 M6 x 10	UNI 2415 - 3



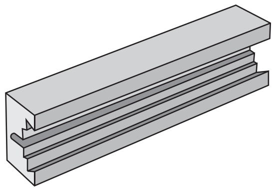


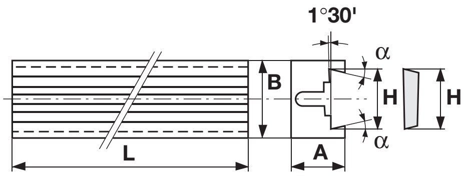
The PDT tool holder prevents blades from breaking thanks to the particular inclination of the blade and an adjustable dynamometric device which releases the blade from the part to be machined when the cutting force exceeds the set limit.

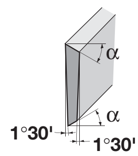
Ordering example: PDT-2434-LU 20

HOLDER FOR TRAPEZOIDAL & RHOMBOID PARTING-OFF BLADES

MLT



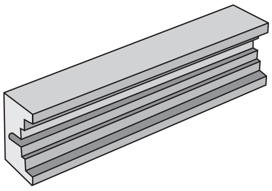


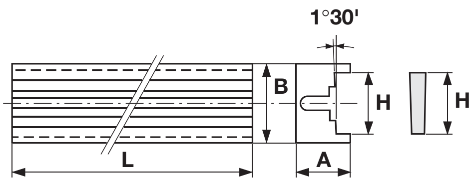


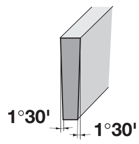
Trapezoidal section blade holders

Reference	Dimensions (mm)				
	B	A	L	H	α
MLT-1612-LM 10	16	12	100	10	13°
MLT-2014-LM 13	20	14	110	13	13°
MLT-2518-LM 17	25	18	120	17	13°
MLT-3020-LM 20	30	20	125	20	13°
MLT-3422-LU 23	34	22	130	23.5	30°

P05



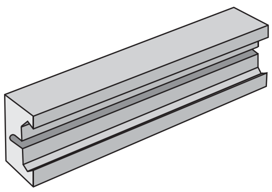


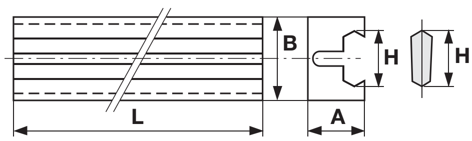


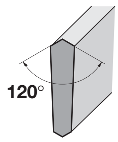
Trapezoidal section blade holders

Reference	Dimensions (mm)			
	B	A	L	H
P05-2518-15	25	18	120	15
P05-3020-20	30	20	125	20

P04







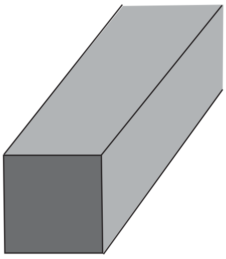
Rhomboidal section blade holders

Reference	Dimensions (mm)			
	B	A	L	H
P04-3020-LC 20	30	20	125	20

Ordering example: MLT-1612-LM 10

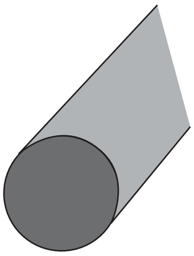
HSS TOOLBITS

Square



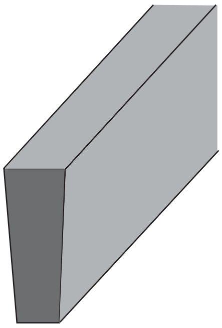
Reference	
4 x 4 x 200	15 x 15 x 200
5 x 5 x 200	16 x 16 x 200
6 x 6 x 200	18 x 18 x 200
7 x 7 x 200	20 x 20 x 200
8 x 8 x 200	25 x 25 x 200
12 x 12 x 200	30 x 30 x 200
14 x 14 x 200	

Round



Reference	
3 x 200 T	12 x 200 T
4 x 200 T	14 x 200 T
5 x 200 T	15 x 200 T
6 x 200 T	16x 200 T
7 x 200 T	18 x 200 T
8 x 200 T	20 x 200 T
10 x 200 T	

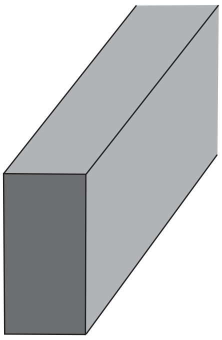
Trapezoidal



Reference	
10 x 3 x 2 x 200	18 x4 x 3 x 200
12 x 3 x 2 x 200	18 x 5 x 4 x 200
12 x 4 x 3 x 200	20 x 3 x 2 x 200
12 x 5 x 4 x 200	20 x 4 x 3 x 200
15 x 3 x 2 x 200	20 x 5 x 4 x 200
15 x 4 x 3 x 200	20 x 6 x 5 x 200
15 x 5 x 4 x 200	25 x 5 x 4 x 200
15 x 6 x 5 x 200	30 x 6 x 5 x 200
18 x 3 x 2 x 200	

HSS TOOLBITS

Rectangular

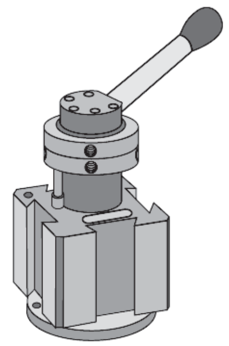


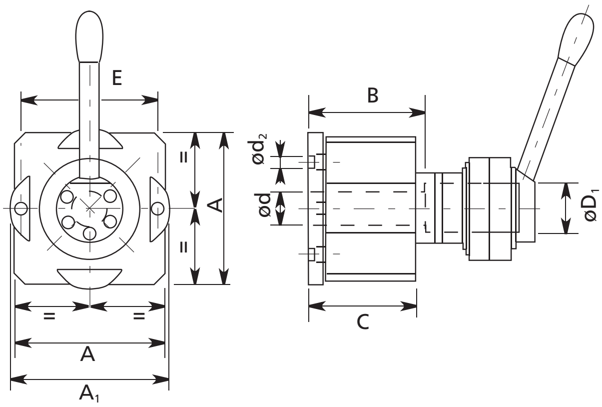
Reference	
8 x 6 x 200	20 x 3 x 200
10 x 2 x 200	20 x 4 x 200
10 x 3 x 200	20 x 5 x 200
10 x 4 x 200	20 x 6 x 200
10 x 5 x 200	20 x 8 x 200
10 x 6 x 200	20 x 10 x 200
10 x 8 x 200	20 x 12 x 200
12 x 3 x 200	20 x 15 x 200
12 x 4 x 200	25 x 5 x 200
12 x 5 x 200	25 x 6 x 200
12 x 6 x 200	25 x 8 x 200
12 x 8 x 200	25 x 10 x 200
12 x 10 x 200	25 x 12 x 200
15 x 3 x 200	25 x 15 x 200
15 x 4 x 200	30 x 4 x 200
15 x 5 x 200	30 x 5 x 200
15 x 6 x 200	30 x 6 x 200
15 x 8 x 200	30 x 8 x 200
15 x 10 x 200	30 x 10 x 200
16 x 6 x 200	30 x 12 x 200
16 x 8 x 200	30 x 15 x 200
16 x 10 x 200	30 x 20 x 200
16 x 12 x 200	

REVOLVING TOOLPOSTS

TURNING

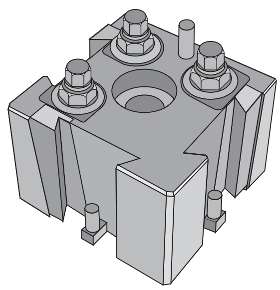
PIGRECA R

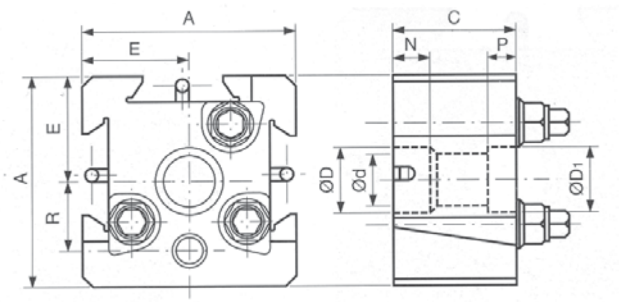




Reference	Dimensions (mm)									Xm		H P
	A	A_1	B	C	D_1	E	d	d_2		min.	max.	
PIGRECA R-B-4/125	125	133	132	105	42	116	20.5	8.5	20 25	36 41	50 55	3 ÷ 10
PIGRECA R-B-4/125 + DR	125	133	132	105	42	116	20.5	8.5	20 25	36 41	50 55	3 ÷ 10
PIGRECA R-C-4/140	140	146	132	105	42	127	20.5	8.5	20 25 32	38 43 50	50 55 62	6 ÷ 15
PIGRECA R-C-4/140 + DR	140	146	132	105	42	127	20.5	8.5	20 25 32	38 43 50	50 55 62	6 ÷ 15

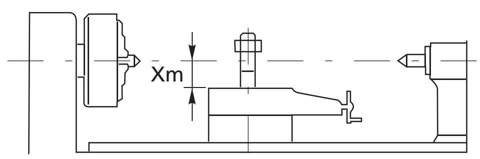
P3/70





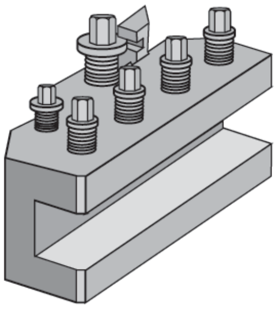
Reference	Dimensions (mm)									Xm		
	A	C	D	D_1	d	E	N	P	R	min.	max.	
P3/70-96-3-A	96	65	-	32	23	48	-	10	34.5	20	30	1517
P3/70-115-3-B	115	80	50	38	28	57.5	30	15	45	25	45	1518
P3/70-143-3-C	143	95	50	48	36	71.5	35	23	55	35	55	1519
P3/70-174-3-D	174	110	60.5	60	40	87	40	20	65	45	65	1521
P3/70-214-3-D	214	140	70	70	50	107	50	30	85	55	75	1526

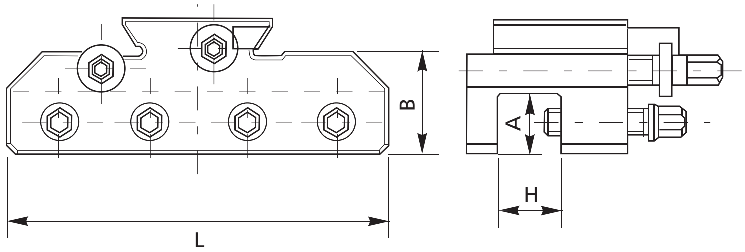
Ordering example: PIGRECA R-B-4/125

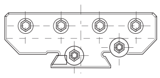


GENERAL-PURPOSE HOLDER

RM01

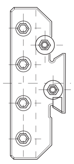


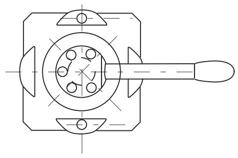




RM01

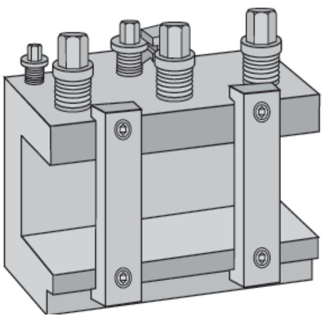
RM01

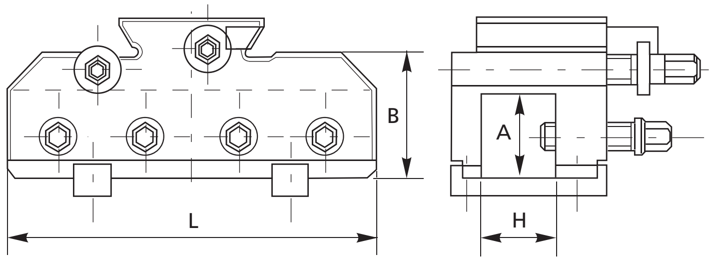




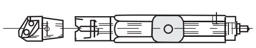
Reference	Dimensions (mm)				Spare parts
	H	A	B	L	
RM01-B-30	30	22	38	140	1534
RM01-C-32	34	25	40	160	1536

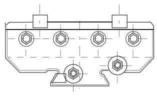
RM51





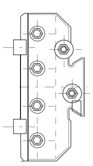
P51

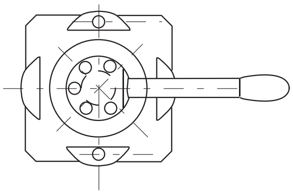




RM51

RM51





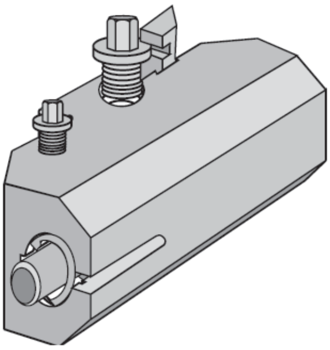
Reference	Dimensions (mm)				Spare parts	
	H	A	B	L		
RM51-B-40	40.5	37	51.5	118	1518	1534
RM51-C-40	40.5	37	52	140	1518	1536

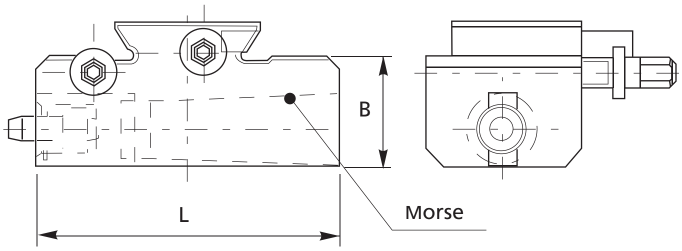
Ordering example: RM01-B-30

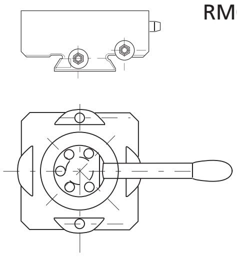
TURNING

MORSE TAPER TOOLHOLDER & MULTIPLE TOOLHOLDER

RM09

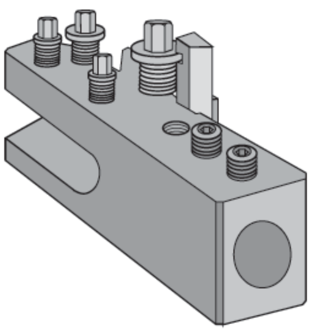


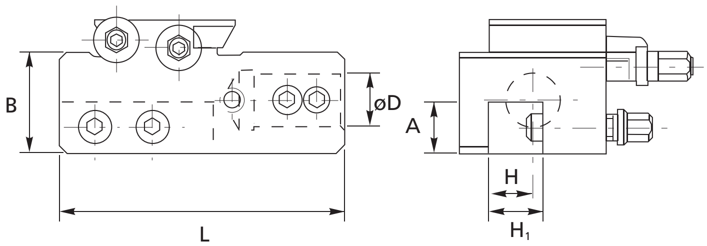


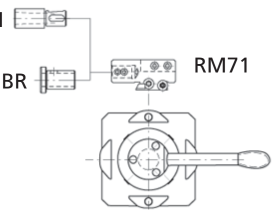


Reference	Morse	Dimensions (mm)		Spare parts
		B	L	
RM09-A/B-3	N. 3	44.5	115	1534
RM09-C-4	N. 4	52	146	1536

RM71





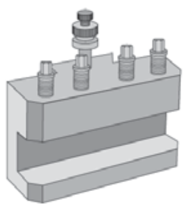


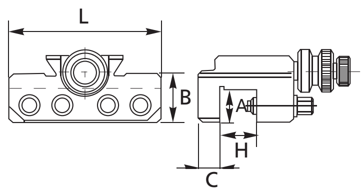
Reference	Dimensions (mm)					Spare parts
	D_{H8}	H	A	B	L	
RM71-B-032-2525	32	25	25	45	155	1534
RM71-C-032-2525	32	25	25	45	165	1536

Ordering example: RM09-A/B-3

HOLDERS FOR TOOLPOST P3/70

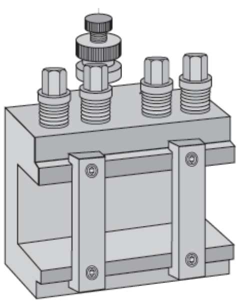
S01

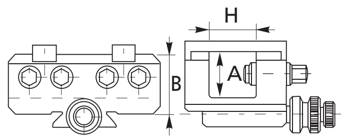




Reference	Dimensions (mm)					Spare parts		
	H	L	A	B	C			
S01-A-25	26	94	17	31	13	1101	1531	A
S01-B-30	30	108	22	33.5	15	1109	1531	B
S01-C-32	34	136	26	43	17	1121	1531	C
S01-D-32	34	162	26	44	18	1121	1531	D

S51



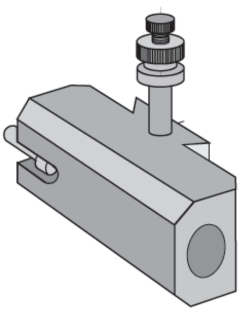


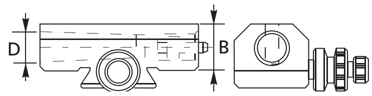
Reference	Dimensions (mm)			Spare parts		
	H	A	B			
S51R-B-40	42	41	55	1182	1519	B
S51-C-40	42	41	55	1182	1519	C
S51-C-56	58	47	73	1182	1519	C
S51-D-40	42	41	63	1182	1519	D
S51-D-56	58	47	71	1182	1519	D
S51-D-76	80	62	93	1182	1519	D

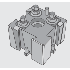
Ordering example: S51R-B-40

MORSE TAPER HOLDER FOR TOOLPOST P3/70

S09



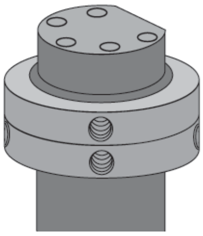


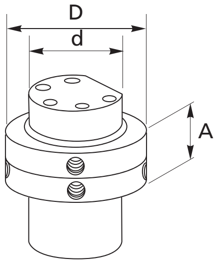
Reference	Morse taper	Dimensions (mm)		Spare parts
		D	B	
S09-A-2	N° 2	17.720	31	A
S09-B-3	N° 3	23.825	35.5	B
S09-C-4	N° 4	31.267	42	C
S09-D-5	N° 5	44.399	57	D

Ordering example: S09-A-2

COOLANT DISTRIBUTOR AND ACCESSORIES

DR

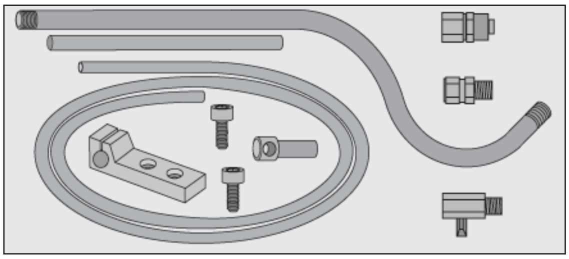




Reference	Dimensions (mm)		
	A	d	D
DR-B/C	33	65	100

Ordering example: DR-B/C

SET-ALR



SET-ALR-B/C	
1	VITE T.C.E.I. M6x14
1	VITE T.C.E.I. M8x16
1	ARRESTO ASTA PER SET ALR
1	TERMIN. PER ASTA SET ALR
1	TUBO DIS. 14455/1 POS. 3
1.5000	TUBO RILSAN NEUT. D.E.10x8
1	ASTA PER SET ALR-A-B/C
1	RACC. GIR. 1/4 GAS M2541 CL
1	RAC.R.8/10-1/4GAS M1463CL
1	GUARN.NAY.1/4GAS A.2661CL
1	RUB. RB 3831 1/4

TURNING FORMULAE

TURNING

Parameters to determine		Known parameters		Formula
Cutting speed (m/min)	v_c	Machined diameter (mm)	D_m	$v_c = \frac{\pi \times D_m \times n}{1000}$
		Spindle speed (rev/min)	n	
Spindle speed (rev/min)	n	Cutting speed (m/min)	v_c	$n = \frac{1000 \times v_c}{\pi \times D_m}$
		Machined diameter (mm)	D_m	
Cutting time (min)	T	Machined length (mm)	l_m	$T = \frac{l_m}{f_n \times n}$
		Feed per revolution (mm/rev)	f_n	
		Spindle speed (rev/min)	n	
Profile depth (μm)	R_t	Feed per revolution (mm/rev)	f_n	$R_t = \frac{f_n^{\,2}}{r_\varepsilon} \times 125$
		Insert nose radius (mm)	r_ε	
Metal removal rate (cm³/min)	Q	Cutting speed (m/min)	v_c	$Q = v_c \times a_p \times f_n$
		Depth of cut (mm)	a_p	
		Feed per revolution (mm/rev)	f_n	
Power requirement (kW)	P_c	Metal removal rate (cm³/min)	Q	$P_c = \frac{Q \times K_{c0.4}}{60000} \times \left(\frac{0.4}{f_n \times \sin \kappa_r}\right)^{0.22}$
		Specific cutting force for chip thickness = 0.4 mm (N/mm²)	$K_{c0.4}$	
		Feed per revolution (mm/rev)	f_n	
		Entering angle (degree)	κ_r	
Torque requirement (Nm)	c	Power requirement (kW)	P_c	$c = \frac{30000 \times P_c}{\pi \times n}$
		Spindle speed (rev/min)	n	

HORSEPOWER CALCULATION

Reference charts

«P_c» Unit power factor
«K_c» Specific cutting force

To optimize the application:

Step 1: Check to make sure your machine is capable of the amount of material removal.
Calculate rate of stock removal (cm³/minute). $Q = v_c \times a_p \times f_n$

Example with data from page 16 (chapter «Insert selection method»):
$Q = 366 \times 0.9 \times 0.1 = 33$ cm³/min

Step 2: Find the power required at the spindle.
Use $K_{c0.4}$ factor to calculate horsepower requirements at the spindle: $P_c = \frac{Q \times K_{c0.4}}{60000} \times \left(\frac{0.4}{f_n \times \sin \kappa_r}\right)^{0.22}$

To find $K_{c0.4}$ see below for specific cutting forces.
Example: Locate the alloy steels group and find P_c for 600 N/mm².

$$P_c = \frac{33 \times 1860}{60000} \times \left(\frac{0.4}{0.1 \times \sin 75°}\right)^{0.22} = 1.398 \text{ kW}$$

Add the idling power comsumption of the machine $\left(P_0 \approx \frac{P_{max} \times n}{3 \times n_{max}}\right)$

P_{max} and n_{max} the maximum power and revolution speed of the machine ;

Example: $P_{max} = 4$ kW, $n_{max} = 4500$ r/min => $P_0 \approx \frac{4 \times 2300}{3 \times 4500} = 0.681$ kW ; $P = P_c + P_0 = 2.079$ kW

As machine has power rating higher than 2.1 kW, there should be no problem. If you calculate a number higher than machine power rating, you will need to make adjustments to one of the parameters, v_c, f_n or a_p to reduce Q.

Step 3: Run the insert and track the insert tool life. Analyze the failure mode.
Use the charts «Insert failure mode» to optimize your application.

P Carbon steel		
Tensile strength (N/mm²)	HB	$K_{c0.4}$
200-400	100	1680
400-700	150	1860
700-950	230	1980

P Alloys & tool steel		
Tensile strength (N/mm²)	HB	$K_{c0.4}$
400-700	150	1680
700-950	230	2100
950-1200	310	2280
1200-1400	370	2580
1400-1600	420	2760
1600-1800	460	3000

M Stainless Steels		
Type	HB	$K_{c0.4}$
Ferritic	200	1680
Martensitic	300	2100
Austenitic	200	2280
Austenitic with titanium		2400
Maraging		2400

K Cast iron		
Tensile strength (N/mm²)	HB	$K_{c0.4}$
100-150	130	1100
150-220	180	1200
220-450	220	1500
450-650	250	1700
650-800	380	2300

N Non-ferrous	
Type	$K_{c0.4}$
Aluminum Si<12%	660
Aluminum Si>13%	900
Brass	700
Bronze	1000
Copper	700
Copper alloy	1000
CuproNickel	1500
Magnesium	360
Gold	1200
Plastic	360

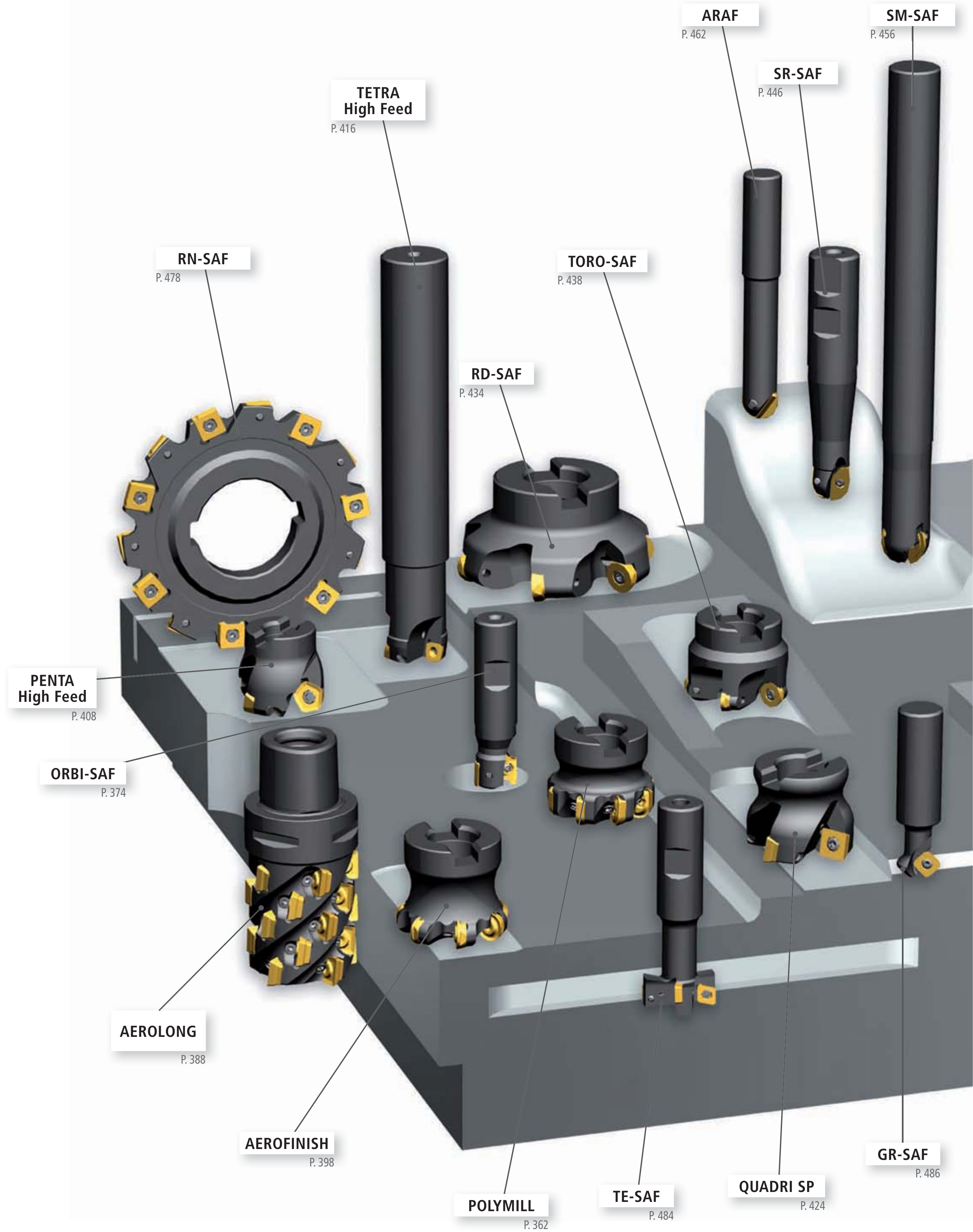
S High temperature alloys	
Type	$K_{c0.4}$
Iron base anealed	2900
Iron base aged/ hardened	3100
Nickel base anealed	3500
Nickel base aged/ hardened	4200
Cobalt base anealed	3500
Cobalt base aged/ hardened	4200
Titanium	1680

H Hardened materials	
Hardness (HRC)	$K_{c0.4}$
45	2850
50	3600
55	4400
60	5400

TURNING

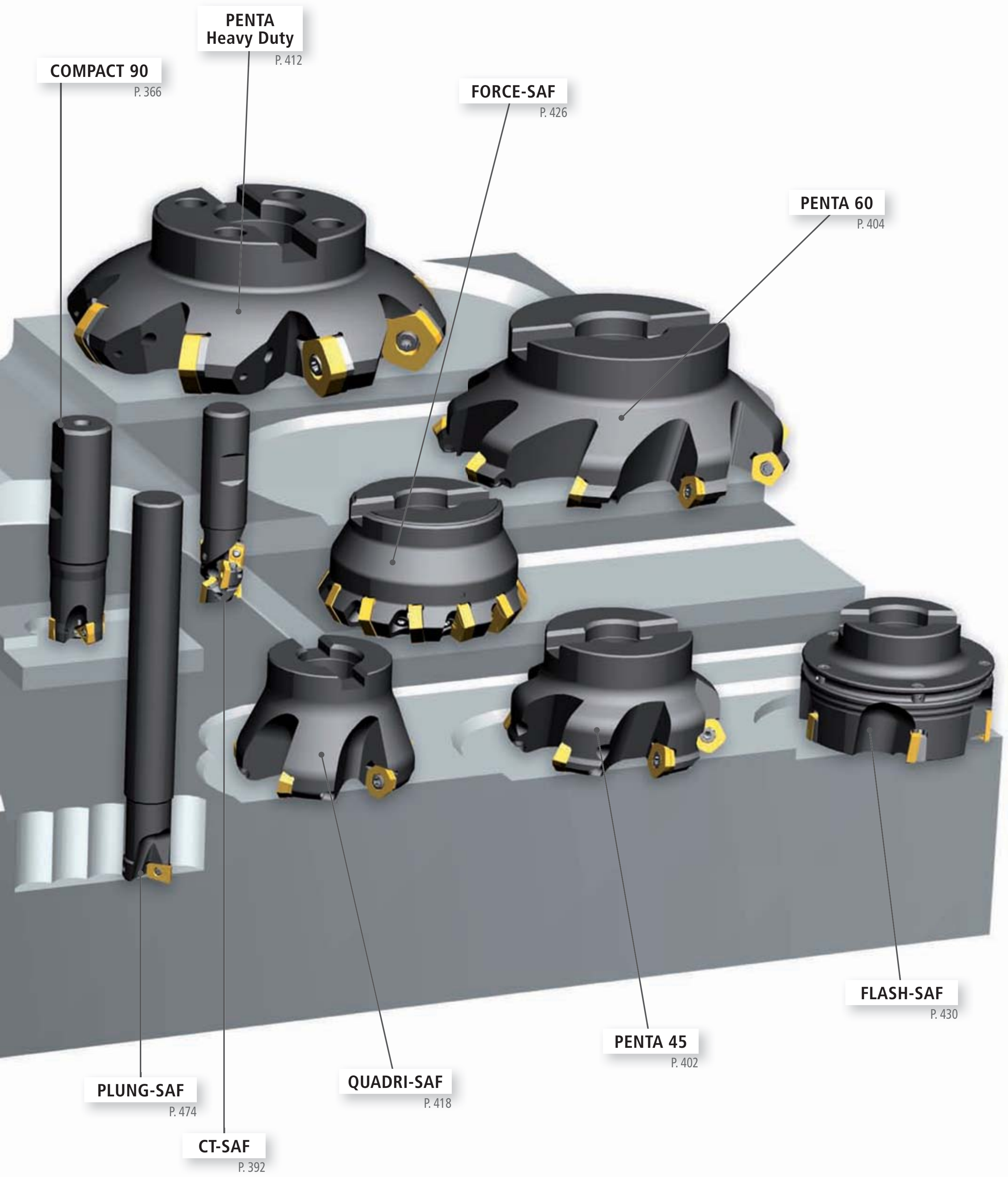
MILLING

PROGRAM OVERVIEW



MILLING

PROGRAM OVERVIEW



PROGRAM OVERVIEW

Milling family	Designation	Cutter	Diameter (mm)	Insert	Page
NEW POLYMILL	Shoulder milling cutter coarse pitch with SideLok™ technology	PM15	25 - 80	AD 15T3...	362
COMPACT 90	Shoulder milling cutter with multicorner inserts	CPE4…	12 - 20	ENMU 04 02…	366
		CPW4 (V690)	20 - 50	WNKU 04 T3… / WNMU 04 T3…	
		CPW6…	25 - 80	WNKU 06 04… / WNMU 06 04…	
ORBI-SAF	Shoulder milling cutter with positive rectangular inserts	RT-07…	10 - 20	RT 07 02…	374
		RT-10…	16 - 50	RT 10 03… / RT 10 T3… (incl. High Feed)	
		RT-13…	20 - 80	RT 13 04… (incl. High Feed)	
		RT-16…	25 - 160	RT 16 06…	
NEW AEROLONG	Contouring milling cutter with positive square inserts and SideLok™ technology	AL12	40 - 80	SDGX 120508 EN-41	388
				SDMX 120508 EN-51	
CT-SAF	Contouring milling cutter with positive rectangular inserts	CT-10…	20 - 25	RT 10 03…	392
		CT-13…	25 - 40	RT 13 04…	
		CT-16…	50 - 63	RT 16 04…	
NEW AEROFINISH	Finishing and semi-finishing face milling cutter with SideLok™ technology	AF09	32 - 80	SCKR 09 T3 40 EN-11	398
				SCKR 12 T3 60 EN-11	
PENTA 45	Face milling cutter 45° with positive pentagonal inserts	PC09…	50 - 160	PDKT 09 05 AE… (incl. High Feed)	402
				PDMT 09 05 AE…	
				PDMW 09 05 AE…	
PENTA 60	Face milling cutter 60° with positive pentagonal inserts	PS-09…	40 - 160	PDKT 09 05 DE…	404
				PDMT 09 05 DE…	
				PDHX 09 05 DE… (wiper)	
PENTA High Feed	High Feed face milling cutter with positive pentagonal inserts	PF-09…	32 - 100	PDKX 09 05 ZE…	408
				PDMX 09 05 ZE…	
				PDKT 09 05 30…	
				PDMW 09 05 30…	
PENTA Heavy Duty	Heavy Duty face milling cutter with negative pentagonal inserts	V560…	100 - 315	PNMU 13 08… (left and right)	412
TETRA High Feed	High Feed milling cutter with positive four edged inserts	MH09...	25 - 52	SDKW 09 03 TR-HF	416
QUADRI-SAF	Multi-purpose face milling cutter with positive octagonal, square and round inserts	OC-12…	32 - 160	ODKT 12 05.. / SDKT.. 12 05 / RDGT 12 05 00..F..	418
				ODMT 12 05.. / SDMT.. 12 05 / RDMT 12 05 00..F..	
		OC-15…	63 - 100	ODKT 15 06..	
				ODMT 15 06.. / SDMT 15 06.. / RDMT 15 06..	
QUADRI SP	Precision face milling cutter 90° with positive square inserts	SP12…	50 - 100	SDKT.. 12 05…	424
				SDMT.. 12 05…	
FORCE-SAF	Face milling cutter 60° for cast iron machining with negative hexagonal inserts and SideLok™ technology	V760…	80 - 250	HNEF 09 05… (incl. wiper)	426
				HNMF 09 05…	
FLASH-SAF	Face and shoulder milling cutter 90° for high speed machining of aluminum with PCD & CBN inserts	V650…	50 - 315	XOEN 12 T3 …	430

PROGRAM OVERVIEW

Milling family	Designation	Cutter	Diameter (mm)	Insert	Page
RD-SAF	Face milling and profiling cutter with positive round inserts	RD-12…	32 - 100	RCMT 12 04 M0…	**434**
		RD-16…	63 - 100	RCMT 16 06 M0…	
		RD-20…	50 - 100	RCMT 20 06 M0	
TORO-SAF	Face milling and profiling cutter with positive round inserts	TR-05…	10	RD.. 05 01 M0…	**438**
		TR-07…	12 - 20	RD.. 07 02 M0... / RD.. 07 T1 M0…	
		TR-08…	16	RD.. 08 T2 M0…	
		TR-10…	20 - 40	RD.. 10 03 M0…	
		TR-12…	25 - 66	RD.. 12 T3 M0…	
		TR-16…	52 - 100	RD.. 16 04 M0…	
SR-SAF	Ball nose roughing endmill	SR…	10 - 50	ZP…	**446**
SM-SAF	Ball nose high productivity endmill with SideLok™ technology	SM…	16 - 32	XPB…	**456**
ARAF	Ball nose finishing endmill	PPH…	6 - 32	PPH... (ARAF Original)	**462**
				PPHE... (ARAF Eco)	
				PPHF… (ARAF High Feed)	
				PPHT… (ARAF TORO)	
PLUNG-SAF	Plung milling cutter	PG…	21 - 33	PG 10 03…	**474**
				PG 13 04…	
				PG 16 04…	
RN-SAF	Slotting milling cutter	RN...	80 - 200	SNBC12...	**478**
TE-SAF	T-Slot milling cutter	CTM…	25 - 50	CCMT 06 02…	**484**
				CCMT 08 03…	
				CCMT 09 T3…	
				CCMT 12 04…	
GR-SAF	Chamfering cutter 45°	CHM…	16 - 25	SDKT 09 03 AE…	**486**
				SDKW 09 03 AE…	
				SDMT 09 03 AE…	

MILLING

CODIFICATION SYSTEM OF MILLING CUTTERS

1	Family descriptionV
CP	Family abbreviation
W4	Insert shape/size

3	Coupling and design
C	Coupling type (see opposite page)
25	Coupling size
A	A/X = Coolant/no coolant
120	Lenght (see opposite page)

1	2	3	4
CPW4	025R04	C25A120	

2	Cutting parameters
025	D_c or D_3 cutting diameter
R	Right or left hand
04	Number of teeth

4	Optional, generally not used
A-L	If important change of design
M	If special modified from Safety
R-Z	If code differentiation needed

CODIFICATION SYSTEM OF MILLING CUTTERS

Coupling type

Type	Description	Size	Example
C	Cylindrical	2 numbers, dm_m mm	C25
E	Carbide cylindrical	2 numbers, dm_m mm	E20
W	Weldon	2 numbers, dm_m mm	W32
A	Arbor	2 numbers, dm_m mm	A27
P	Modular threaded	2 numbers, thread size	P08
HS	HSK	1 number (size/10)	HS5
SC	SAF-Capto	1 number	SC6
IS	ISO 7388/I (DIN 69871-A)	1 number (size/10)	IS4
MK	Morse	1 number	MK3

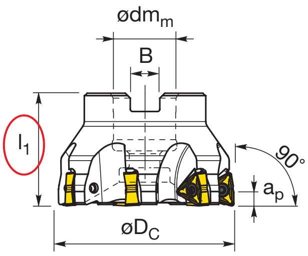
Lenght

Always 3 numbers, starting with 0 if ≤ 99 mm

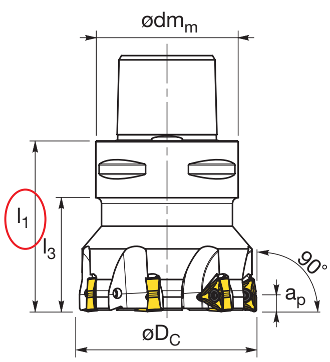
l_1 is for:
- Arbor
- SAF-Capto
- HSK
- Weldon
- Morse
- Modular

l_2 is for:
- Cylindrical

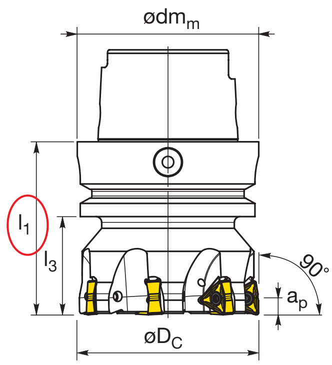
A_p Max for long edge cutters



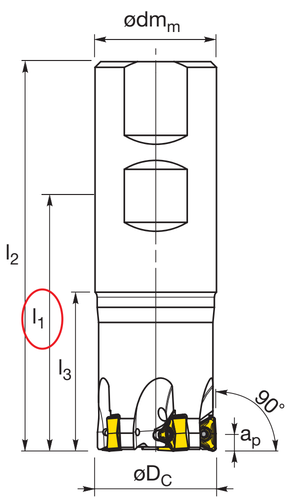
Arbor



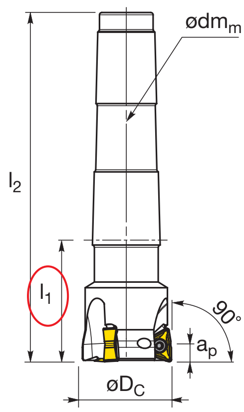
SAF-Capto



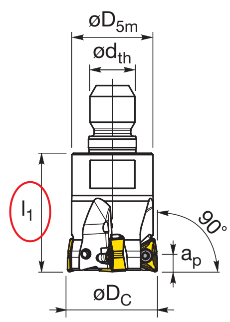
HSK



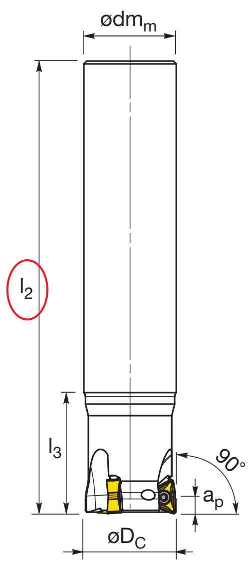
Weldon



Morse

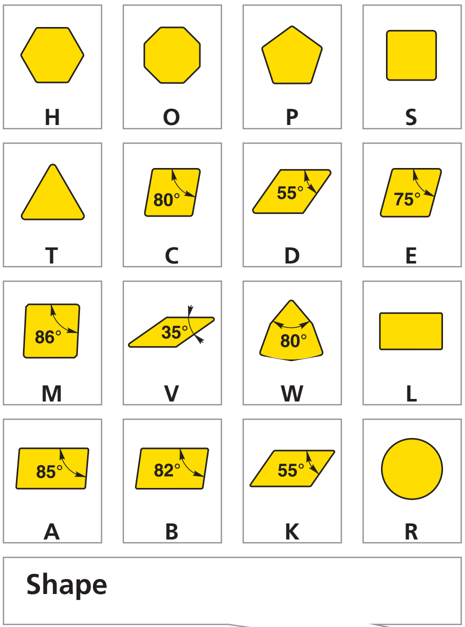


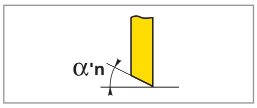
Modular



Cylindrical

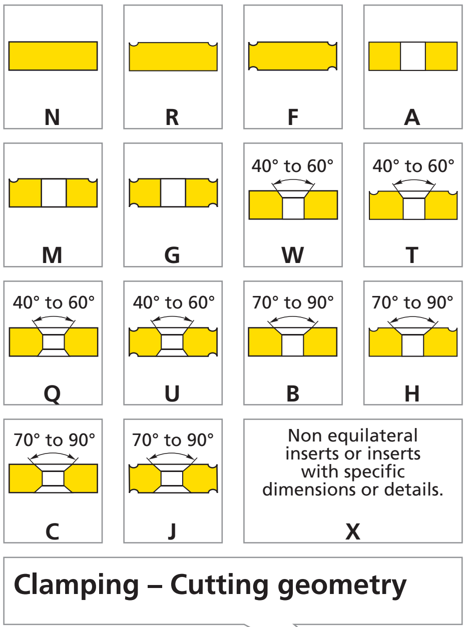
ISO CODIFICATION SYSTEM FOR INSERTS





A	3°
B	5°
C	7°
D	15°
E	20°
F	25°
G	30°
N	0°
P	11°
O	Other value

Normal clearance

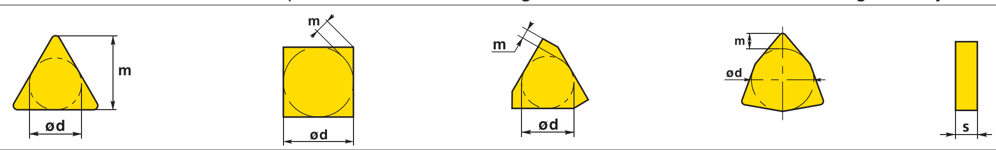


	1	2	3	4
Flat insert	S	P	K	N
Insert with geometry	A	P	M	T
Round insert with geometry	R	C	M	T

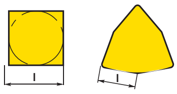
Tolerance

	A	F	C	H	E	G	J	K	L	M	N	U	Ø (d)
ød	±0.025	±0.013	±0.025	±0.013	±0.025	±0.025	±0.05 ±0.08 ±0.10 ±0.13 ±0.15	±0.05 ±0.08 ±0.10 ±0.13 ±0.15	±0.05 ±0.08 ±0.10 ±0.13 ±0.15	±0.05 ±0.08 ±0.10 ±0.13 ±0.15	±0.05 ±0.08 ±0.10 ±0.13 ±0.15	±0.08 ±0.13 ±0.18 ±0.25 ±0.25	4.76 . . . . 10.0 12.0 - 12.7 15.875 . . 20.0 25.0 - 25.4 31.75 - 32.0
s	±0.025	±0.025	±0.025	±0.025	±0.025	±0.13	±0.025	±0.025	±0.025	±0.13	±0.025	±0.13	4.76 to 32.0
m	±0.005	±0.005	±0.013	±0.013	±0.025	±0.025	±0.005	±0.013	±0.025	±0.08[(1)] ±0.13[(2)] ±0.15[(3)] ±0.18 ±0.20	±0.08[(1)] ±0.13[(2)] ±0.15[(3)] ±0.18 ±0.20	±0.13 ±0.20 ±0.27 ±0.38 ±0.38	4.76 to 9.525 12.7 15.875 - 19.05 25.4 31.75

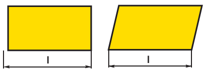
[(1)] = ±0.11 [(2)] = ±0.15 [(3)] = ±0.18 For D-shaped inserts D. If the nose angle < 55° the tolerance on m increases significantly.



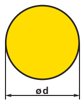
ISO CODIFICATION SYSTEM FOR INSERTS



Equilateral inserts



Non-equilateral inserts

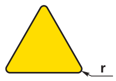


Round inserts

Example

9.525	09

Dimension



Example

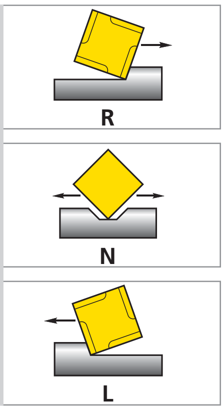
0.8	08
Sharp corner	00

Round inserts

Metric diameter
M0
Diameter converted from a value in inches
00

Radius

OPTIONAL



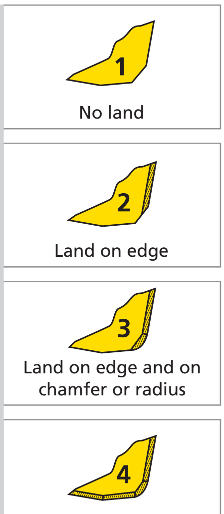
R

N

L

Cutting direction

OPTIONAL



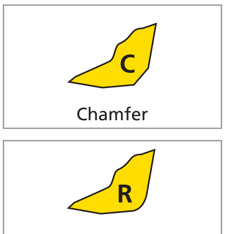
1 No land

2 Land on edge

3 Land on edge and on chamfer or radius

4 Edge land

Land



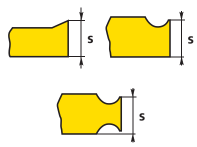
C Chamfer

R Radius

Wiper edge cutting edge link section

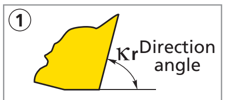
5	6	7	8	9		10
12	03	① E | D ②	S	R	-	3 | R
16	04	① P | D ②	E	R	-	21
20	06	M0	S	N	-	33

Thickness

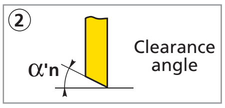


1.59	01
1.98	T1
2.38	02
3.18	03
3.97	T3
4.76	04
5.56	05
6.35	06
7.94	07
9.52	09
12.7	12

Wiper edge



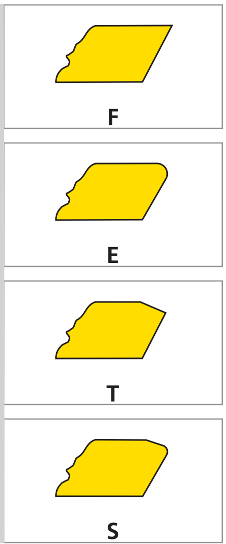
A	45°
D	60°
E	75°
F	85°
P	90°
Z	Other value



A	3°
B	5°
C	7°
D	15°
E	20°
F	25°
G	30°
N	0°
P	11°
Z	Other value

Edge finishing

OPTIONAL



F

E

T

S

Geometry

OPTIONAL

Identification of cutting geometry, specific to the manufacturer.

MILLING

GENERAL MILLING CUTTING CONDITIONS

		Cutting data - Starting values for speed (m/min)																					
		P Steels				M Stainless steels			K Cast irons				N Aluminum - Non-ferrous				S Super alloys			H Hardened materials			
Grade	Feed per tooth (mm)	Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
1020	0.05	361	326	251	157	-	-	-	267	248	219	192	-	-	-	-	-	-	-	-	-	-	-
	0.10	328	296	228	144	-	-	-	254	233	201	172	-	-	-	-	-	-	-	-	-	-	-
	0.20	261	238	181	119	-	-	-	229	204	165	131	-	-	-	-	-	-	-	-	-	-	-
1120	0.05	371	336	261	167	-	-	-	272	253	224	197	-	-	-	-	-	-	-	-	-	-	-
	0.10	338	306	238	154	-	-	-	259	238	206	177	-	-	-	-	-	-	-	-	-	-	-
	0.20	271	248	191	129	-	-	-	234	209	170	136	-	-	-	-	-	-	-	-	-	-	-
1130	0.05	-	-	-	-	-	-	-	224	206	181	158	-	-	-	-	-	-	-	-	-	-	-
	0.10	-	-	-	-	-	-	-	209	190	160	133	-	-	-	-	-	-	-	-	-	-	-
	0.20	-	-	-	-	-	-	-	177	158	118	84	-	-	-	-	-	-	-	-	-	-	-
2003	0.05	-	-	-	250	279	240	179	277	257	227	207	-	-	-	-	100	90	65	99	119	99	99
	0.10	-	-	-	240	272	230	172	264	244	214	194	-	-	-	-	90	80	60	92	112	92	92
	0.20	-	-	-	220	259	210	159	239	219	189	169	-	-	-	-	-	-	-	79	99	79	79
5005	0.05	406	364	281	201	234	206	160	-	-	-	-	1144	759	516	644	80	70	55	45	50	45	45
	0.10	371	332	258	184	219	196	150	-	-	-	-	1069	662	480	599	70	60	50	40	45	40	40
	0.20	303	269	211	150	187	178	130	-	-	-	-	917	469	408	507	-	-	-	35	40	35	35
5007	0.05	416	374	291	211	247	216	169	-	-	-	-	1164	779	531	656	85	75	60	50	55	50	50
	0.10	381	342	268	194	234	206	162	-	-	-	-	1089	682	496	613	75	65	55	45	50	45	45
	0.20	313	279	221	160	209	188	149	-	-	-	-	937	489	428	526	-	-	-	40	45	40	40
5020	0.05	351	316	241	147	213	195	139	257	238	209	182	1050	650	480	600	70	60	50	40	45	40	35
	0.10	318	286	218	134	201	185	132	244	223	191	162	970	530	430	540	60	50	45	35	40	35	30
	0.20	251	228	171	109	176	165	119	219	194	155	121	-	-	-	-	-	-	-	-	-	-	-
5040	0.05	321	286	211	117	190	175	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	0.10	288	256	188	104	160	140	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	0.20	221	198	141	79	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5050	0.05	259	229	161	95	136	88	74	-	-	-	-	-	-	-	-	53	43	35	-	-	-	-
	0.10	241	212	148	85	126	83	71	-	-	-	-	-	-	-	-	48	38	30	-	-	-	-
	0.20	205	179	121	65	108	74	65	-	-	-	-	-	-	-	-	39	29	-	-	-	-	-
8030	0.05	-	-	-	-	213	195	180	-	-	-	-	-	-	-	-	55	45	60	-	-	-	-
	0.10	-	-	-	-	180	163	153	-	-	-	-	-	-	-	-	35	30	55	-	-	-	-
	0.20	-	-	-	-	140	130	120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5135	0.05	277	250	171	99	160	140	90	-	-	-	-	-	-	-	-	58	48	40	-	-	-	-
	0.10	254	230	158	91	130	100	80	-	-	-	-	-	-	-	-	53	43	35	-	-	-	-
	0.20	209	190	131	75	-	-	-	-	-	-	-	-	-	-	-	44	34	-	-	-	-	-
KX05	400	355	270	190	205	260	240	220	-	-	-	-	1130	515	640	-	80	70	90	-	-	-	-
	350	315	250	175	190	240	225	205	-	-	-	-	1050	460	570	-	65	55	70	-	-	-	-
	300	260	200	140	155	190	175	165	-	-	-	-	900	380	490	-	-	-	-	-	-	-	-
KX20	0.05	-	-	-	-	-	-	-	262	243	214	187	-	-	-	445	77	62	52	-	-	-	-
	0.10	-	-	-	-	-	-	-	249	228	196	167	-	-	-	380	67	57	48	-	-	-	-
	0.20	-	-	-	-	-	-	-	224	199	160	126	-	-	-	-	-	-	-	-	-	-	-
KX2	0.10	-	-	-	-	-	-	-	-	-	-	-	850	480	430	470	45	40	35	-	-	-	-
	0.20	-	-	-	-	-	-	-	-	-	-	-	700	380	280	370	40	35	30	-	-	-	-
	0.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N	0.10	-	-	-	-	-	-	-	131	107	82	75	800	450	400	460	42	36	32	-	-	-	-
	0.20	-	-	-	-	-	-	-	108	87	67	65	600	350	250	360	37	30	28	-	-	-	-
	0.30	-	-	-	-	-	-	-	86	67	52	55	-	-	-	-	-	-	-	-	-	-	-
SY3	0.10	208	158	118	61	100	75	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	0.20	190	140	100	53	90	65	55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	0.30	173	123	83	46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
H15TF	0.10	-	-	-	-	-	-	-	-	-	-	-	700	400	350	450	40	32	30	-	-	-	-
	0.20	-	-	-	-	-	-	-	-	-	-	-	500	300	200	400	35	27	25	-	-	-	-
	0.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S4	0.10	198	148	108	50	96	69	55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	0.20	180	130	90	45	83	62	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	0.30	163	113	73	40	71	54	45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NTB10	0.10	430	380	300	190	300	250	200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	0.15	390	350	270	170	250	200	180	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B125	0.10	-	-	-	-	-	-	-	1000	800	-	-	-	-	-	-	-	-	-	-	-	-	-
	0.20	-	-	-	-	-	-	-	800	650	-	-	-	-	-	-	-	-	-	-	-	-	-
	0.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D720	0.07	-	-	-	-	-	-	-	-	-	-	-	4232	3275	1023	2383	-	-	-	-	-	-	-
	0.18	-	-	-	-	-	-	-	-	-	-	-	3077	2450	693	1833	-	-	-	-	-	-	-
	0.3	-	-	-	-	-	-	-	-	-	-	-	1817	1550	333	1233	-	-	-	-	-	-	-
D728	0.07	-	-	-	-	-	-	-	-	-	-	-	4232	3275	1023	2383	-	-	-	-	-	-	-
	0.18	-	-	-	-	-	-	-	-	-	-	-	3077	2450	693	1833	-	-	-	-	-	-	-
	0.3	-	-	-	-	-	-	-	-	-	-	-	1817	1550	333	1233	-	-	-	-	-	-	-
PC50	0.07	-	-	-	-	-	-	-	-	-	-	-	4232	3275	1023	2383	-	-	-	-	-	-	-
	0.18	-	-	-	-	-	-	-	-	-	-	-	3077	2450	693	1833	-	-	-	-	-	-	-
	0.3	-	-	-	-	-	-	-	-	-	-	-	1817	1550	333	1233	-	-	-	-	-	-	-

The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.
Most cutting speeds are recommended for a tool life of 15 minutes.

MILLING

CUTTING DATA FOR GENERAL MILLING INSERTS

Reference	Max. a_p	f_z (min - max)	Family	Cutter
CCMT 06 02 04 SN	- [1]	0.05 - 0.10	TE-SAF	CTM
CCMT 08 03 04 SN	- [1]	0.08 - 0.12	TE-SAF	CTM
CCMT 08 03 08 FN	- [1]	0.08 - 0.12	TE-SAF	CTM
CCMT 08 03 08 SN	- [1]	0.08 - 0.12	TE-SAF	CTM
CCMT 08 03 PC ER-21	- [1]	0.08 - 0.15	TE-SAF	CTM
CCMT 09 T3 08 SN	- [1]	0.08 - 0.12	TE-SAF	CTM
CCMT 12 04 08-PM5	- [1]	0.10 - 0.15	TE-SAF	CTM
ENMU 04 02 PN ER-22	2.0	0.03 - 0.08	COMPACT 90	CPE4
HNEF 09 05 04 W1 FN-11	6.0	0.05 - 0.30	FORCE-SAF	V760
HNEF 09 05 08 EN-41	6.0	0.05 - 0.30	FORCE-SAF	V760
HNEF 09 05 08 W1 ZZ L	6.0	0.05 - 0.15	FORCE-SAF	V760
HNEF 09 05 08 W1 ZZ R	6.0	0.05 - 0.15	FORCE-SAF	V760
HNMF 09 05 16 SN-81	6.0	0.05 - 0.40	FORCE-SAF	V760
ODKT 12 05 AD FR-11	3.0	0.05 - 0.20	QUADRI-SAF	OC12
ODKT 12 05 AD SR-41	3.0	0.08 - 0.25	QUADRI-SAF	OC12
ODKT 15 06 AD SR-41	4.0	0.08 - 0.25	QUADRI-SAF	OC15
ODMT 12 05 08 SN-81	3.0	0.15 - 0.40	QUADRI-SAF	OC12
ODMT 12 05 AD SR-41	3.0	0.08 - 0.25	QUADRI-SAF	OC12
ODMT 15 06 08 SN-81	4.0	0.15 - 0.40	QUADRI-SAF	OC15
PDHX 09 05 DE FR	5.5	-	PENTA 60	PS09
PDKT 09 05 30 ER-41	2.0 - 4.5 - 5.5	0.10 - 0.25	PENTA High Feed, 45, 60	PF09, PC09, PS09
PDKT 09 05 AE ER-41	4.5	0.10 - 0.25	PENTA 45	PC09
PDKT 09 05 AE SR-HF	1.0	0.50 - 2.50	PENTA 45	PC09
PDKT 09 05 DE ER-11	5.5	0.03 - 0.12	PENTA 60	PS09
PDKT 09 05 DE ER-41	5.5	0.10 - 0.25	PENTA 60	PS09
PDKT 09 05 DE FR-11	5.5	0.03 - 0.15	PENTA 60	PS09
PDKX 09 05 ZE ER-41	2.0	0.50 - 2.50	PENTA High Feed	PF09
PDMT 09 05 AE SR-81	4.5	0.15 - 0.40	PENTA 45	PC09
PDMT 09 05 DE SR-81	5.5	0.20 - 0.40	PENTA 60	PS09
PDMW 09 05 30 SR-91	2.0 - 4.5 - 5.5	0.12 - 0.40	PENTA High Feed, 45, 60	PF09, PC09, PS09
PDMW 09 05 AE SR-91	4.5	0.15 - 0.40	PENTA 45	PC09
PDMX 09 05 ZE ER-51	2.0	0.50 - 2.50	PENTA High Feed	PF09
PDMX 09 05 ZE SR-81	2.0	0.50 - 2.50	PENTA High Feed	PF09
PG 10 03 08 N-81	6.0	0.03 - 0.18	PLUNG-SAF	PG
PG 13 04 08 N-81	8.0	0.03 - 0.18	PLUNG-SAF	PG
PG 16 04 08 N-81	10.0	0.03 - 0.18	PLUNG-SAF	PG
PNMU 13 08 DN SL-52	10.0	0.30 - 0.70	PENTA Heavy Duty	V560
PNMU 13 08 DN SN-92	10.0	0.30 - 0.70	PENTA Heavy Duty	V560
PNMU 13 08 DN SR-52	10.0	0.30 - 0.70	PENTA Heavy Duty	V560
RCMT 12 04 M0 EN F-21	6.0	0.05 - 0.15	RD-SAF	RD12
RCMT 12 04 M0 EN F-91	6.0	0.20 - 0.50	RD-SAF	RD12
RCMT 12 04 M0 SN F-61	6.0	0.15 - 0.30	RD-SAF	RD12
RCMT 12 04 M0 SN F-91	6.0	0.20 - 0.50	RD-SAF	RD12
RCMT 16 06 M0 EN F8-21	8.0	0.05 - 0.15	RD-SAF	RD16
RCMT 16 06 M0 SN F8-61	8.0	0.15 - 0.30	RD-SAF	RD16
RCMT 16 06 M0 SN F8-91	8.0	0.20 - 0.50	RD-SAF	RD16
RCMT 20 06 M0 SN F8-33	10.0	0.20 - 0.50	RD-SAF	RD20
RCMT 20 06 M0 SN F8-61	10.0	0.15 - 0.30	RD-SAF	RD20
RCMT 20 06 M0 SN F8-91	10.0	0.20 - 0.50	RD-SAF	RD20
RDGT 10 03 M0 EN F6-11	5.0	0.08 - 0.20	TORO-SAF	TR10

[1] Related to the cutter to be used

CUTTING DATA FOR GENERAL MILLING INSERTS

Reference	Max. a_p	f_z (min - max)	Family	Cutter
RDGT 12 05 00 FN-11	6.0	0.05 - 0.20	QUADRI-SAF	OC12
RDGT 12 05 00 SN F8-41	6.0	0.08 - 0.25	QUADRI-SAF	OC12
RDGT 12 T3 M0 EN F6-11	6.0	0.08 - 0.25	TORO-SAF	TR12
RDHW 05 01 M0 EN-91	2.5	0.05 - 0.10	TORO-SAF	TR05
RDHW 07 02 M0 EN-91	3.5	0.08 - 0.22	TORO-SAF	TR07
RDHW 07 T1 M0 EN-91	3.5	0.08 - 0.22	TORO-SAF	TR07
RDHW 08 T2 M0 EN-91	4.0	0.08 - 0.25	TORO-SAF	TR08
RDHW 10 03 M0 EN F6-91	5.0	0.08 - 0.25	TORO-SAF	TR10
RDHW 12 T3 M0 EN F6-91	6.0	0.08 - 0.30	TORO-SAF	TR12
RDMT 07 02 M0 SN-61	3.5	0.10 - 0.25	TORO-SAF	TR07
RDMT 07 T1 M0 SN-61	3.5	0.10 - 0.25	TORO-SAF	TR07
RDMT 08 T2 M0 SN-61	4.0	0.10 - 0.30	TORO-SAF	TR08
RDMT 10 03 M0 SN F6-61	5.0	0.10 - 0.35	TORO-SAF	TR10
RDMT 12 05 00 SN F8-81	6.0	0.15 - 0.40	QUADRI-SAF	OC12
RDMT 12 T3 M0 SN F6-61	6.0	0.10 - 0.45	TORO-SAF	TR12
RDMT 15 06 00 SN-81	7.5	0.15 - 0.40	QUADRI-SAF	OC15
RDMT 16 04 M0 SN F6-61	8.0	0.10 - 0.60	TORO-SAF	TR16
RDMW 07 02 M0 EN	3.5	0.08 - 0.22	TORO-SAF	TR07
RDMW 07 T1 M0 EN	3.5	0.08 - 0.22	TORO-SAF	TR07
RDMW 08 T2 M0 EN	4.0	0.08 - 0.25	TORO-SAF	TR08
RDMW 10 03 M0 SN F6	5.0	0.08 - 0.35	TORO-SAF	TR10
RDMW 12 T3 M0 SN F6	6.0	0.08 - 0.45	TORO-SAF	TR12
RDMW 16 04 M0 SN F6	8.0	0.10 - 0.60	TORO-SAF	TR16
RT 07 02 02 R-11	6.0	0.03 - 0.06	ORBI-SAF	RT07
RT 07 02 04 R-11	6.0	0.03 - 0.06	ORBI-SAF	RT07
RT 07 02 04 R-81	6.0	0.03 - 0.06	ORBI-SAF	RT07
RT 07 02 08 R-11	6.0	0.03 - 0.06	ORBI-SAF	RT07
RT 10 03 02 R-31	9.0	0.03 - 0.10	ORBI-SAF	RT10
RT 10 03 04 R-11	9.0	0.03 - 0.10	ORBI-SAF	RT10
RT 10 03 04 R-31	9.0	0.03 - 0.10	ORBI-SAF	RT10
RT 10 03 04 R-41	9.0	0.03 - 0.12	ORBI-SAF	RT10
RT 10 03 04 R-81	9.0	0.05 - 0.15	ORBI-SAF	RT10
RT 10 03 04 RF-11	7.0	0.03 - 0.10	ORBI-SAF	RT10
RT 10 03 05 R-31	9.0	0.03 - 0.10	ORBI-SAF	RT10
RT 10 03 08 R-31	9.0	0.03 - 0.10	ORBI-SAF	RT10
RT 10 03 08 R-41	9.0	0.03 - 0.12	ORBI-SAF	RT10
RT 10 03 08 R-81	9.0	0.05 - 0.15	ORBI-SAF	RT10
RT 10 03 08 RF-31	6.7	0.03 - 0.10	ORBI-SAF	RT10
RT 10 03 10 HF	0.6	0.40 - 1.50	ORBI-SAF	RT10
RT 10 03 10 R-31	9.0	0.03 - 0.10	ORBI-SAF	RT10
RT 10 03 12 R-31	9.0	0.03 - 0.10	ORBI-SAF	RT10
RT 10 03 16 RC-31	9.0	0.03 - 0.10	ORBI-SAF	RT10
RT 10 03 20 RC-31	9.0	0.03 - 0.10	ORBI-SAF	RT10
RT 10 03 24 RC-31	9.0	0.03 - 0.10	ORBI-SAF	RT10
RT 10 03 30 RC-31	9.0	0.03 - 0.10	ORBI-SAF	RT10
RT 10 03 40 RC-31	9.0	0.03 - 0.10	ORBI-SAF	RT10
RT 10 T3 C5 ER-81	9.0	0.05 - 0.15	ORBI-SAF	RT10
RT 13 04 04 R-31	12.0	0.08 - 0.20	ORBI-SAF	RT13
RT 13 04 04 R-41	12.0	0.08 - 0.25	ORBI-SAF	RT13
RT 13 04 08 R-11	12.0	0.05 - 0.12	ORBI-SAF	RT13

[1)] Related to the cutter to be used

MILLING

CUTTING DATA FOR GENERAL MILLING INSERTS

Reference	Max. a_p	f_z (min - max)	Family	Cutter
RT 13 04 08 R-31	12.0	0.08 - 0.20	ORBI-SAF	RT13
RT 13 04 08 R-41	12.0	0.08 - 0.25	ORBI-SAF	RT13
RT 13 04 08 R-81	12.0	0.08 - 0.30	ORBI-SAF	RT13
RT 13 04 08 RF-11	9.9	0.05 - 0.12	ORBI-SAF	RT13
RT 13 04 10 R-31	12.0	0.08 - 0.20	ORBI-SAF	RT13
RT 13 04 12 R-31	12.0	0.08 - 0.20	ORBI-SAF	RT13
RT 13 04 14 HF	0.8	0.40 - 1.50	ORBI-SAF	RT13
RT 13 04 16 R-31	12.0	0.08 - 0.20	ORBI-SAF	RT13
RT 13 04 20 R-31	12.0	0.08 - 0.20	ORBI-SAF	RT13
RT 13 04 24 RC-31	12.0	0.08 - 0.15	ORBI-SAF	RT13
RT 13 04 30 RC-31	12.0	0.08 - 0.15	ORBI-SAF	RT13
RT 13 04 40 RC-31	12.0	0.08 - 0.15	ORBI-SAF	RT13
RT 16 04 04 ER-31	- [1]	0.10 - 0.30	CT-SAF	CT16
RT 16 04 08 ER-11	- [1]	0.10 - 0.30	CT-SAF	CT16
RT 16 04 08 ER-31	- [1]	0.10 - 0.30	CT-SAF	CT16
RT 16 04 08 ER-41	- [1]	0.10 - 0.30	CT-SAF	CT16
RT 16 04 08 FR-11	- [1]	0.10 - 0.30	CT-SAF	CT16
RT 16 04 08 SR-81	- [1]	0.10 - 0.30	CT-SAF	CT16
RT 16 04 12 ER-31	- [1]	0.10 - 0.30	CT-SAF	CT16
RT 16 04 16 ER-31	- [1]	0.10 - 0.30	CT-SAF	CT16
RT 16 04 20 ER-31	- [1]	0.10 - 0.30	CT-SAF	CT16
RT 16 04 24 ER-31	- [1]	0.10 - 0.30	CT-SAF	CT16
RT 16 06 04 ER-31	17.5	0.05 - 0.20	ORBI-SAF	RT16
RT 16 06 04 ER-41	17.5	0.05 - 0.30	ORBI-SAF	RT16
RT 16 06 08 ER-11	17.5	0.05 - 0.30	ORBI-SAF	RT16
RT 16 06 08 ER-31	17.5	0.05 - 0.20	ORBI-SAF	RT16
RT 16 06 08 ER-41	17.5	0.05 - 0.30	ORBI-SAF	RT16
RT 16 06 08 ER-81	17.5	0.05 - 0.30	ORBI-SAF	RT16
RT 16 06 08 SR-81	17.5	0.10 - 0.40	ORBI-SAF	RT16
RT 16 06 12 ER-31	17.5	0.05 - 0.20	ORBI-SAF	RT16
RT 16 06 12 ER-41	17.5	0.05 - 0.30	ORBI-SAF	RT16
RT 16 06 16 ER-31	17.5	0.05 - 0.20	ORBI-SAF	RT16
RT 16 06 16 ER-81	17.5	0.05 - 0.30	ORBI-SAF	RT16
RT 16 06 20 ER-31	17.5	0.05 - 0.20	ORBI-SAF	RT16
RT 16 06 24 ER-31	17.5	0.05 - 0.20	ORBI-SAF	RT16
RT 16 06 30 ERC-31	17.5	0.05 - 0.20	ORBI-SAF	RT16
RT 16 06 32 ERC-31	17.5	0.05 - 0.20	ORBI-SAF	RT16
RT 16 06 40 ERC-31	17.5	0.05 - 0.20	ORBI-SAF	RT16
RT 16 06 48 ERC-31	17.5	0.05 - 0.20	ORBI-SAF	RT16
RT 16 06 50 ERC-31	17.5	0.05 - 0.20	ORBI-SAF	RT16
RT 16 06 60 ERC-31	17.5	0.05 - 0.20	ORBI-SAF	RT16
RT 16 06 64 ERC-31	17.5	0.05 - 0.20	ORBI-SAF	RT16
SDKT 09 03 AE EN-41	5.0	0.08 - 0.20	GR-SAF	CHM
SDKT 12 05 PD FR-11	10.0	0.05 - 0.20	QUADRI-SAF, QUADRI SP	OC12, SP12
SDKT 12 05 PD SR-41	10.0	0.08 - 0.25	QUADRI-SAF, QUADRI SP	OC12, SP12
SDKW 09 03 AE FN-1R	5.0	0.08 - 0.20	GR-SAF	CHM
SDKW 09 03 AE TN-4R	5.0	0.08 - 0.20	GR-SAF	CHM
SDMT 09 03 AE EN-41	5.0	0.08 - 0.20	GR-SAF	CHM
SDMT 09 03 AE SN-31	5.0	0.08 - 0.20	GR-SAF	CHM
SDMT 12 05 08 EN-21	10.0	0.08 - 0.25	QUADRI-SAF, QUADRI SP	OC12, SP12

[1] Related to the cutter to be used

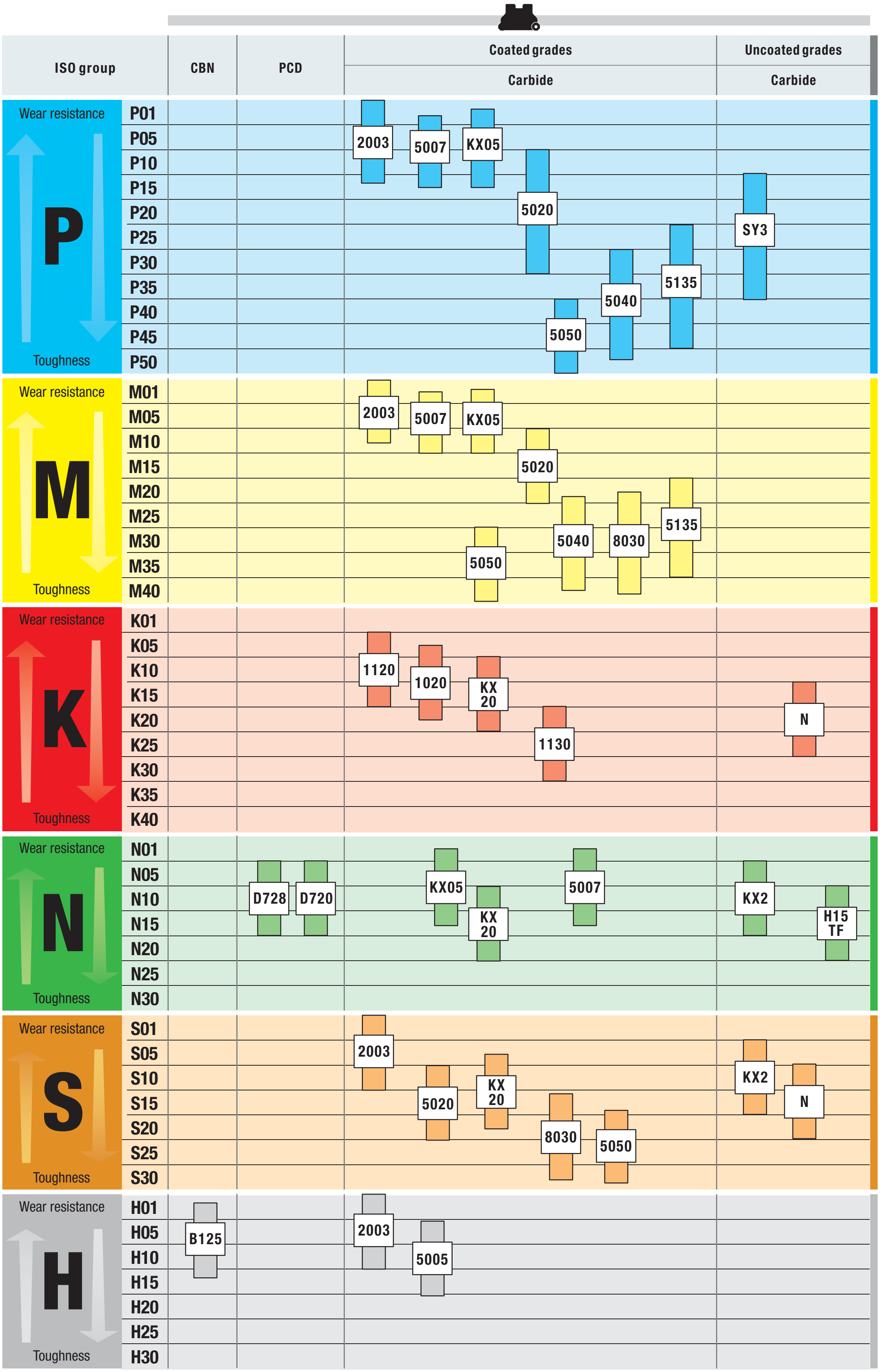
CUTTING DATA FOR GENERAL MILLING INSERTS

Reference	Max. a_p	f_z (min - max)	Family	Cutter
SDMT 12 05 08 SN-41	10.0	0.08 - 0.20	QUADRI-SAF, QUADRI SP	OC12, SP12
SDMT 12 05 08 SN-81	10.0	0.15 - 0.40	QUADRI-SAF, QUADRI SP	OC12, SP12
SDMT 15 06 08 EN-21	12.0	0.08 - 0.25	QUADRI-SAF	OC15
SDMT 15 06 08 SN-81	12.0	0.15 - 0.40	QUADRI-SAF	OC15
WNKU 04 T3 PN EN-42	3.5	0.05 - 0.18	COMPACT 90	CPW4
WNKU 06 04 PN EN-12	5.0	0.05 - 0.15	COMPACT 90	CPW6
WNKU 06 04 PN EN-42	5.0	0.05 - 0.22	COMPACT 90	CPW6
WNMU 04 T3 PN EN-82	3.5	0.05 - 0.22	COMPACT 90	CPW4
WNMU 06 04 PN EN-82	5.0	0.05 - 0.26	COMPACT 90	CPW6
XOEN 12 T3 04 LF	3.3	0.05 - 0.25	FLASH-SAF	V650
XOEN 12 T3 04 RF	3.3	0.05 - 0.25	FLASH-SAF	V650
XOEN 12 T3 04 ZZ NH	0.8	0.05 - 0.25	FLASH-SAF	V650
XOEN 12 T3 08 LF	3.3	0.05 - 0.25	FLASH-SAF	V650
XOEN 12 T3 08 RE	3.3	0.05 - 0.25	FLASH-SAF	V650
XOEN 12 T3 08 RF	3.3	0.05 - 0.25	FLASH-SAF	V650
XOEN 12 T3 08 RH	10.0	0.05 - 0.25	FLASH-SAF	V650
XOEN 12 T3 08 ZZ NH	0.8	0.05 - 0.25	FLASH-SAF	V650
XOEN 12 T3 08 ZZ NHE	0.8	0.05 - 0.25	FLASH-SAF	V650
XOEN 12 T3 AZ 08 RF	3.3	0.05 - 0.25	FLASH-SAF	V650
XOEN 12 T3 AZ 08 RH	10.0	0.05 - 0.25	FLASH-SAF	V650
XOEN 12 T3 AZZ 08 NH	0.8	0.05 - 0.25	FLASH-SAF	V650
AD 15T304 ER-11	10	0.08 - 0.26	POLYMILL	PM15
AD 15T308 ER-11	10	0.08 - 0.26	POLYMILL	PM15
AD 15T330 ER-11	10	0.08 - 0.26	POLYMILL	PM15
AD 15T340 ER-11	10	0.08 - 0.26	POLYMILL	PM15
AD 15T360 ER-11	10	0.08 - 0.26	POLYMILL	PM15
SCKR 09T340 EN-11	4	0.08 - 0.26	AEROFINISH	AF09
SCKR 12T360 EN-11	6	0.08 - 0.26	AEROFINISH	AF12
SDGX 120508 EN-41	- [1]	0.07 - 0.15	AEROLONG	AL12
SDMX 120508 EN-51	- [1]	0.07 - 0.15	AEROLONG	AL12
SNBC 123003 SN-H4-T	- [1]	0.10 - 0.60	RN-SAF	RN12
SNBC 123003 SN-H5-T	- [1]	0.10 - 0.60	RN-SAF	RN12
SNBC 123203 SN-H4-T	- [1]	0.10 - 0.60	RN-SAF	RN12
SNBC 123203 SN-H5-T	- [1]	0.10 - 0.60	RN-SAF	RN12
SNBC 124503 SN-H4-T	- [1]	0.10 - 0.60	RN-SAF	RN12
SNBC 124503 SN-H5-T	- [1]	0.10 - 0.60	RN-SAF	RN12
SNBC 125403 SN-H4-T	- [1]	0.10 - 0.60	RN-SAF	RN12
SNBC 125403 SN-H5-T	- [1]	0.10 - 0.60	RN-SAF	RN12
SNBC 126503 SN-H4-T	- [1]	0.10 - 0.60	RN-SAF	RN12
SNBC 126503 SN-H5-T	- [1]	0.10 - 0.60	RN-SAF	RN12

[1] Related to the cutter to be used

MILLING

GRADE TABLE


ISO group
CBN
PCD
Coated grades
Carbide
Uncoated grades
Carbide
Wear resistance
P
Toughness
P01 P05 P10 P15 P20 P25 P30 P35 P40 P45 P50
2003
5007
KX05
5020
5050
5040
5135
SY3
Wear resistance
M
Toughness
M01 M05 M10 M15 M20 M25 M30 M35 M40
2003
5007
KX05
5020
5050
5040
8030
5135
Wear resistance
K
Toughness
K01 K05 K10 K15 K20 K25 K30 K35 K40
1120
1020
KX 20
1130
N
Wear resistance
N
Toughness
N01 N05 N10 N15 N20 N25 N30
D728
D720
KX05
KX 20
5007
KX2
H15 TF
Wear resistance
S
Toughness
S01 S05 S10 S15 S20 S25 S30
2003
5020
KX 20
8030
5050
KX2
N
Wear resistance
H
Toughness
H01 H05 H10 H15 H20 H25 H30
B125
2003
5005

GRADE DESCRIPTION

Carbide coated grades

Grade	First choice	Additional choice	Description
1020	K **K15** (K10-K20)	P **P15** (P10-P20)	Carbide grade with PVD coating (TiAlN-TiN), color yellow. Excellent edge strength. **Applications**: finishing and light roughing of grey cast iron and nodular cast irons. Second application: steel machining.
1120	K **K10** (K05-K15)	P **P10** (P05-P15)	Carbide grade with MT/CVD coating (TiCN-Al_2O_3), color black. Wear resistant grade, excellent thermal resistance, excellent edge strength and excellent crater resistance. **Applications**: Finishing of grey cast iron. Secondary: steel machining, nodular cast iron.
1130	K **K20** (K15-K30)		Carbide grade with MT/CVD coating (TiCN-Al_2O_3), color black. Tough grade with excellent thermal resistance. Excellent crater resistance. **Applications**: Roughing to semi-finishing grade for ductile, nodular and grey cast iron. Works very well for unstable machining conditions.
2003	H **H10** (H05-H15) P **P05** (P01-P10) M **M05** (M01-M10) S **S05** (S01-S10)	K **K05** (K01-K10)	Submicrograin carbide grade with PVD coating (TiAlN), color grey. Excellent wear resistance. Applications: first choice for finishing of hard material and steel, finishing and semi-finishing for stainless steel and heat-resistant alloys. Second application: finishing for cast-iron.
5005	H **H10** (H05-H15) P **P10** (P05-P15) M **M10** (M05-M15)	N **N10** (N05-N15) S **S10** (S05-S15)	Very hard micrograin carbide grade with PVD coating (TiAlN-TiN), color yellow. Excellent wear resistance. **Applications**: finishing of steels, stainless steels and hardened materials. Continuous cutting in good machining conditions. Also suitable for aluminum and other non ferrous materials machining.
5007	P **P10** (P05-P15) M **M05** (M01-M10)	N **N10** (N05-N15) S **S10** (S05-S15)	Very hard micrograin carbide grade with PVD coating (TiAlN), color grey. Excellent wear resistance. **Applications**: recommended as alternative for hard steels machining with ball nose finishing endmill. Also suitable for heat resistant and aluminum alloys.
5020	P **P20** (P10-P30) M **M15** (M10-M20) S **S15** (S10-S20)	K **K20** (K10-K30) N **N15** (N10-N20) H **H15** (H10-H20)	Micrograin carbide grade with PVD coating (TiAlN-TiN), color yellow. Versatile grade, good balance between wear resistance and toughness. **Applications**: Finishing and light roughing of steel, stainless steel, heat-resistant alloys and titanium alloys. Milling with uninterrupted and slightly interrupted cut in good machining conditions. Additional grade for cast iron, non ferrous materials and high temp alloys.
5040	P **P40** (P30-P50) M **M30** (M20-M40)		Very tough carbide grade with PVD coating (TiAlN-TiN), color yellow. High resistance to thermal and mechanical shocks. **Applications**: roughing of steel and stainless steel. Milling with uninterrupted or interrupted cutting in hard machining conditions and with conventional cutting speeds.
5050	P **P45** (P30-P50)	M **M35** (M30-M40) S **S35** (S30-S40)	Super tough carbide grade with high cobalt content and PVD coating (TiAlN), color black. Excellent grade for very unstable conditions. **Applications**: roughing and heavy roughing for steel. Second application : roughing for stainless steel and heat-resistant alloys.
5135	P **P35** (P25-P45) M **M30** (M20-M40)	S **S25** (S20-S30)	Carbide grade with MT-CVD coating (TiCN-Al_2O_3-TiN), color yellow. **Applications**: recommended for roughing and semi-finishing of steels and stainless steel for continuous and interrupted cuts. It also provides high performance for machining of titanium alloys and heat resistant alloys with 300 HB hardness.
KX05	P **P10** (P05-P15) M **M05** (M01-M10)	N **N10** (N05-N15) S **S10** (S05-S15)	Very hard micrograin carbide with PVD coating (TiCN), color grey. Excellent wear resistance. **Applications**: recommended as alternative for hard steels machining with ball nose finishing endmill. Also suitable for heat resistant, aluminum alloys and abrasive materials.
KX20	K **K15** (K10-K20) N **N15** (N10-N20) S **S15** (S10-S20)	M **M15** (M10-M20)	Carbide grade with PVD coating (TiCN), color grey. **Applications**: milling of cast iron, aluminum and heat resistant alloys (depending on the geometry). Finishing and light roughing operations. Also suitable for stainless steel machining.
8030	M **M30**(M25-M40)	S **S30** (S25-S40)	Submicrograin carbide grade with PVD coating (TiAlN), color grey. **Applications**: First choice in roughing of stainless steel and exotic alloys.

GRADE DESCRIPTION

Advanced material grades

Grade	First choice	Additional choice	Description
B125	K **K01** (K01-K05)		CBN grade with TiN coating, color yellow. **Applications**: high speed finishing on grey cast iron
D720	N **N10** (N05-N15)		Polycristalline diamond grade. **Applications**: recommended for roughing and finishing of aluminum alloys, at high speed.
D728	N **N10** (N05-N15)		Polycristalline diamond grade. **Applications**: recommended for roughing and finishing of aluminum alloys, at high speed.
PC50	N **N10** (N05-N15)		Polycristalline diamond grade. **Applications**: recommended for roughing and finishing of aluminum alloys, at high speed.

Uncoated carbide grades

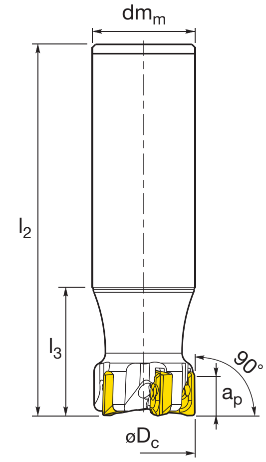
Grade	First choice	Additional choice	Description
H15TF	N **N15** (N10-N20) S **S15** (S10-S20)		Uncoated micrograin carbide grade. Very good mechanical characteristics together with the thermal properties of micrograin carbides. **Applications**: recommended for aluminum and other sticky materials.
KX2	N **N10** (N05-N15) S **S10** (S05-S15)		Uncoated micrograin carbide grade. **Applications**: suitable for milling of heat resistant alloys and aluminum. Very good grade for milling at low speed. Supports very positive cutting angles.
N	K **K20** (K15-K25) S **S15** (S10-S20)	N **N20** (N15-N25)	Uncoated carbide grade. Very good resistance to wear and abrasion. **Applications**: milling of cast iron and heat resistant alloys under moderate conditions. Also suitable with high-loaded aluminum alloys.
NTB10	P **P10** (P01-P05)	M **M05** (M01-M05)	Uncoated cermet grade. **Applications**: recommended for finishing of steels. It provides excellent stability of the cutting edge, which is essential when tight tolerances are required. Also suitable for finishing of stainless steel.
S4	P **P40** (P35-P45)		Uncoated carbide grade. **Applications**: intended for rough machining of steels, for use under hard conditions. Low cutting speeds with high cutting depth and high feed.
SY3	P **P25** (P15-P35)		Uncoated carbide grade High resistance to thermal shocks. Very high wear resistance and good toughness. **Applications**: universal grade for milling of steel.

MILLING

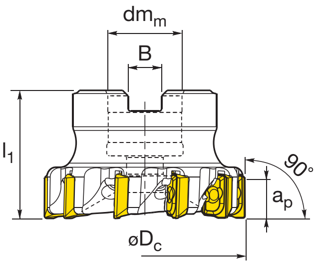
POLYMILL

Shoulder milling cutter coarse pitch with SideLok™ technology

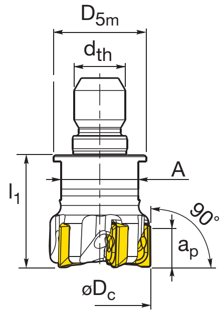
Cutter program, PM15



Cylindrical shank



Arbor



Thread modular heads

Reference	Dimensions (mm)									Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg	Ramping angle α
	D_c	Max. a_p	dm_m D_{5m}	d_{th}	l_1	l_2	l_3	A	B							
Cylindrical shank																
PM15 025R03 C25A160	25	12	25	-	-	160	40	-	-	3	AD15T3..	3	Yes	15300	0.496	1°45'
PM15 032R05 C32A200	32	12	32	-	-	200	40	-	-	5	AD15T3..	5	Yes	12000	1.039	1°15'
Arbor																
PM15 040R06 A16A040	40	12	16	-	40	-	-	-	8.4	6	AD15T3..	6	Yes	9600	0.165	0°50'
PM15 050R08 A22A040	50	12	22	-	40	-	-	-	10.4	8	AD15T3..	8	Yes	7700	0.257	0°40'
PM15 063R10 A22A040	63	12	22	-	40	-	-	-	10.4	10	AD15T3..	10	Yes	6100	0.395	0°30'
PM15 080R10 A27A050	80	12	27	-	50	-	-	-	12.4	10	AD15T3..	10	Yes	4800	0.710	0°20'
PM15 080R14 A27A050	80	12	27	-	50	-	-	-	12.4	14	AD15T3..	14	Yes	4800	0.710	0°20'
Thread modular heads																
PM15 025R03 p12A**030**	25	6	-	M12	30	-	-	17 [2]	-	3	AD15T3..	3	Yes	- [1]	0.066	1°45'
PM15 032R05 p16A**035**	32	6	-	M16	35	-	-	24 [2]	-	5	AD15T3..	5	Yes	- [1]	0.148	1°15'
PM15 040R06 p16A**035**	40	6	-	M16	35	-	-	24 [2]	-	6	AD15T3..	6	Yes	- [1]	0.183	0°50'

[1] Max. RPM values are not given for modular heads as they are always used with long extensions.
[2] Size of the wrench to be used for modular heads is given by dimension A.

Spare parts

Insert style	Diameter D_c	Insert screw			Screw driver		Torque wrench		
		Reference	Size	↻	Reference	☆	Reference	☆ Nm	Nm
AD15T3..	25 - 80 mm	DVF4506 (Drilled)	M 3.5	2.5-3 N.m	TX215PLUS	15 IP	TDX 215PLUS	15 IP	3.0

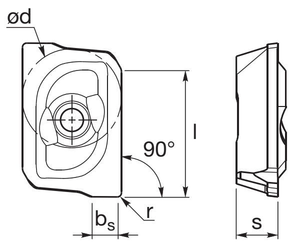
POLYMILL

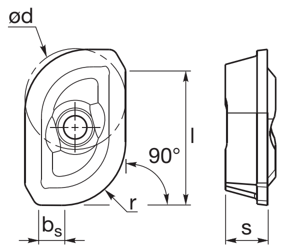
Shoulder milling cutter coarse pitch with SideLok™ technology

Insert program

AD 15T304 ER-11
AD 15T308 ER-11

AD 15T330 ER-11
AD 15T340 ER-11
AD 15T360 ER-11





Reference	Dimensions (mm)					Grades													
	d	s	l	r	b_s	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX05	KX20	KX2	N
AD 15T304 ER-11	9.525	3.97	12.20	0.4	2.6	-	-	-	-	-	✓	-	✓	✓	-	-	-	-	-
AD 15T308 ER-11	9.525	3.97	12.20	0.8	2.2	-	-	✓	-	-	✓	-	✓	✓	-	-	-	-	-
AD 15T330 ER-11	9.525	3.97	12.40	3	2.55	-	-	-	✓	-	✓	-	✓	✓	-	-	-	-	-
AD 15T340 ER-11	9.525	3.97	12.50	4	2.55	-	-	-	-	-	✓	-	✓	✓	-	-	-	-	-
AD 15T360 ER-11 [1]	9.525	3.97	12.60	6	2	-	-	-	-	-	✓	-	✓	✓	-	-	-	-	-

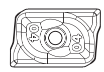
✓Article which can be ordered

Ordering example: AD 15T304 ER-11 5020

For inserts with corner radius from 0.4 to 4mm one single bodycan be used.

[1] In case of using of the inserts with corner radius 6mm, the body corner needs to be modified with a radius of 4mm.

Top form geometry

Top form geometry	Application	Max chip thickness H max (mm)	P Steel	M Stainless steel	K Cast iron	N Non-ferrous aluminum	S Super alloys	H Hardened materials	Insert
 11	Semi-Finishing & Finishing	0.08	2003 **5020** 5050	2003 **5020** 5050	**1130** 5020		2003 **5020** 5050		

POLYMILL

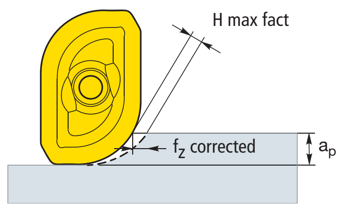
Milling cutter characteristics

Cutting data for the Titanium TA6V

Reference	Corner radius	H max fact	Feed per tooth f_z (mm) corrections according on a_p and insert corner radius						
			Finishing : $a_p < 0.5$ mm		Semi-finishing : 0.5 mm $< a_p <$ 3 mm				
			0.3	0.5	1	1.5	2	2.5	3
AD 15T304 ER-11	0.4	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
AD 15T308 ER-11	0.8	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
AD 15T330 ER-11	3	0.08	0.18	0.14	0.11	0.09	0.08	0.08	0.08
AD 15T340 ER-11	4	0.08	0.21	0.17	0.12	0.10	0.09	0.09	0.08
AD 15T360 ER-11 [1)]	6	0.08	0.26	0.20	0.14	0.12	0.11	0.10	0.09

Starting values are shown, cutting data must be optimized depending on: material, tool overhang, coolant conditions etc…

Example	
Insert	AD 15T360 ER-11
H max (mm)	0.08
a_p (mm)	3
f_z (mm)	0.09



Feed (f_Z) Correction factors - Examples

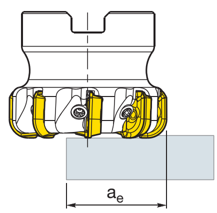
Finishing and semifinishing face milling for ap max 3 mm in titanium TA6V

For finishing face milling (ap < 3 mm) there is no need to reduce the f_Z at high width of cut a_e > 50% of D_c

Face milling, finishing	
Material	TA6V
Hardness	895 Mpa
Tool	PM15 050R08 A22A040
Diameter	50
Number of teeth	8
Insert	AD 15T360 ER-11
Grade	5020
a_p (mm)	0.5 (Face milling)
a_e (mm)	10
v_c (m/min)	50
H max (mm)	0.08
f_z corrected (radius)	0.2 (as a function of a_p and insert corner radius)[1)]
f_z corrected a_e	0.25 (depending on width of cut a_e => 0.2 x 1.28)
n (rev/min)	318
v_f (mm/min)	509

a_e	Feed per tooth f_z (mm) corrections according on a_e and D_c					
	D_c = 25	D_c = 32	D_c = 40	D_c = 50	D_c = 63	D_c = 80
2.5	1.73	1.92	2.09	2.39	2.56	2.91
5	1.28	1.40	1.52	1.72	1.85	2.07
10	1.03	1.09	1.16	1.28	1.37	1.52
16	1	1	1.01	1.08	1.15	1.23
20	1	1	1	1.03	1.07	1.16
25	1	1	1	1	1.02	1.06
32	-	1	1	1	1	1.01
40	-	-	1	1	1	1
50	-	-	-	1	1	1
63	-	-	-	-	1	1
80	-	-	-	-	-	1

note : no correction for width over 1/2 D_c



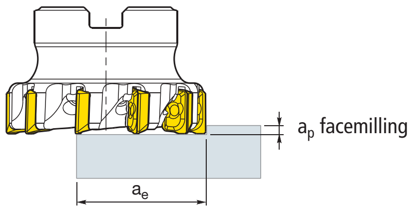
POLYMILL

Milling cutter characteristics

Facemilling , semifinishing	
Material	TA6V
Hardness	895 Mpa
Tool	PM15 050R08 A22A040
Diameter	50
Number of teeth	8
Insert	AD 15T340 ER-11
Grade	5020
a_p (mm)	2 (Face milling)
a_e (mm)	32
v_c (m/min)	50
H max (mm)	0.08
f_z corrected (radius)	0.09 (as a function of a_p and insert corner radius)
f_z corrected a_e	0.09 (depending on width of cut a_e => 0.09 x 1)
n (rev/min)	318
v_f (mm/min)	229

	Feed per tooth f_z (mm) corrections according on a_e and D_c					
a_e	$D_c = 25$	$D_c = 32$	$D_c = 40$	$D_c = 50$	$D_c = 63$	$D_c = 80$
2.5	1.73	1.92	2.09	2.39	2.56	2.91
5	1.28	1.40	1.52	1.72	1.85	2.07
10	1.03	1.09	1.16	1.28	1.37	1.52
16	1	1	1.01	1.08	1.15	1.23
20	1	1	1	1.03	1.07	1.16
25	1	1	1	1	1.02	1.06
32	-	1	1	1	1	1.01
40	-	-	1	1	1	1
50	-	-	-	1	1	1
63	-	-	-	-	1	1
80	-	-	-	-	-	1

note : no correction for width over 1/2 D_c



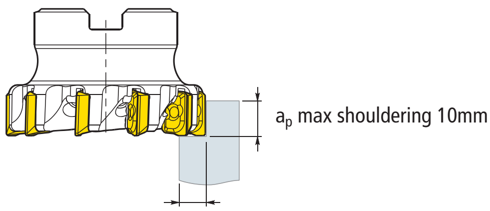
Feed recommendations for shouldering depend on width of cut ae in Titanium TA6V

For contour shouldering f_z have to be corrected according the axial depth of cut a_p and width of cut a_e.

Width of cut a_e should be limited if shouldering with a_p > 3 mm

Reference	D_c	Max a_p	Max a_e	Maximum feed per tooth values f_z depend on width of cut a_e (in TA6V)					
				$a_e = 2$	$a_e = 4$	$a_e = 6$	$a_e = 8$	$a_e = 10$	$a_e = 12$
Cylindrical shank									
PM15 025R03 C25A160	25	10	6	0.15	0.11	0.09	-	-	-
PM15 032R05 C32A200	32	10	8	0.6	0.12	0.10	0.09	-	-
Arbor									
PM15 040R06 A16A040	40	10	10	0.17	0.13	0.11	0.10	0.09	-
PM15 050R08 A22A040	50	10	12	0.18	0.14	0.12	0.11	0.10	0.09
PM15 063R10 A22A040	63	10	12	0.20	0.15	0.13	0.12	0.11	0.09
PM15 080R10 A27A050	80	10	12	0.20	0.15	0.13	0.12	0.11	0.09
PM15 080R14 A27A050	80	10	10	0.18	0.14	0.12	0.11	0.10	-
Thread modular heads									
PM15 025R03 p12A**030**	25	6	4	0.11	0.09	-	-	-	-
PM15 032R05 p16A**035**	32	6	4	0.11	0.09	-	-	-	-
PM15 040R06 p16A**035**	40	6	6	0.11	0.10	0.09	-	-	-

Facemilling , semifinishing	
Material	TA6V
Hardness	895 Mpa
Tool	PM15 050R08 A22A040
Diameter	50
Number of teeth	8
Insert	AD 15T360 ER-11
Grade	5020 (maximum)
a_p (mm)	10
a_e (mm)	8 (12mm maximum)
v_c (m/min)	50
H max (mm)	0.08
f_z max	0.11 (depending on a_e)
n (rev/min)	318
v_f (mm/min)	255



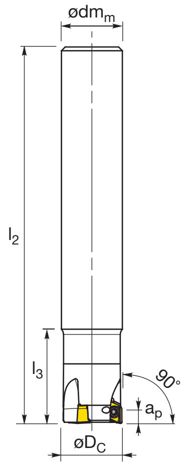
Do not use for plunging and full slotting.
In case of ramping the f_z values must be reduced in 2 times.
Reduce the cutting data accordingly in case of work with long overhang.

MILLING

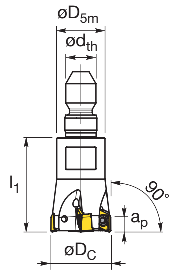
COMPACT 90

Compact milling cutter with multicorner inserts

Cutter program, CPE4



Cylindrical shank



Threaded modular heads

Reference	Dimensions (mm)									Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg
	D_c	D_3	Max. a_p	dm_m D_{5m}	d_{th}	l_1	l_2	l_3	A 2)						
Short cylindrical shank															
CPE4 012R03 C10A100	12.00	-	2.00	10.00	-	-	100.00	16.00	-	3	EN.. 04 02..	3	Yes	-	0.054
CPE4 012R03 C12A100	12.00	-	2.00	12.00	-	-	100.00	16.00	-	3	EN.. 04 02..	3	Yes	-	0.079
CPE4 014R03 C12A100	14.00	-	2.00	12.00	-	-	100.00	20.00	-	3	EN.. 04 02..	3	Yes	-	0.080
CPE4 016R04 C16A100	16.00	-	2.00	16.00	-	-	100.00	25.00	-	4	EN.. 04 02..	4	Yes	-	0.138
CPE4 020R05 C20A110	20.00	-	2.00	20.00	-	-	110.00	30.00	-	5	EN.. 04 02..	5	Yes	-	0.234
Threaded modular heads															
CPE4 016R04 P08A025	16.00	-	2.00	12.80	M8	25.00	-	-	10.00	4	EN.. 04 02..	4	Yes	- 1)	0.026
CPE4 020R05 P10A030	20.00	-	2.00	17.80	M10	30.00	-	-	14.00	5	EN.. 04 02..	5	Yes	- 1)	0.056

1) Max. RPM values are not given for modular heads as they are always used with long extensions.
2) Size of the wrench to be used for modular heads is given by dimension A.

Spare parts

Insert style	Diameter D_c	Insert screw			Screw driver		Torque wrench		
		Reference	Size		Reference		Reference		Nm
EN.. 04 02..	12 - 20 mm	5513 020-27	M 2.0	0.6 N.m	PT-8000	6 IP	TDX 206PLUS	6 IP	0.6

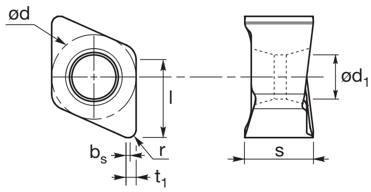
MILLING

COMPACT 90

Compact milling cutter with multicorner inserts

Insert program

ENMU... ER-22



Reference	Dimensions (mm)							Grades													
	d	s	d_1	l	r	b_s	t_1	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX05	KX20	KX2	N
ENMU 04 02 PN ER-22	4.20	3.41	2.2	3.85	0.4	0.12	0.46	-	-	-	-	-	✓	-	✓	✓	-	-	-	-	-

✓Article which can be ordered

Ordering example: ENMU 04 02 PN ER-22 5020

Cutting conditions

Grade	Feed per tooth (mm)	P Steel				M Stainless steel			K Cast iron				N Non-ferrous aluminum				S Super alloys			H Hardened materials			
		Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
5020	v_{c1}	365	327	251	152	218	199	141	262	244	217	190	1082	698	500	624	74	64	52	42	47	42	37
	f_{z1}	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	v_{c2}	331	298	227	139	206	189	135	249	229	198	170	1050	650	480	600	70	60	50	40	45	40	35
	f_{z2}	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
5050	v_{c1}	267	235	167	99	139	90	76	-	-	-	-	-	-	-	-	55	45	37	-	-	-	-
	f_{z1}	0.03	0.03	0.03	0.03	0.03	0.03	0.03	-	-	-	-	-	-	-	-	0.03	0.03	0.03	-	-	-	-
	v_{c2}	248	219	153	89	130	82	72	-	-	-	-	-	-	-	-	50	40	35	-	-	-	-
	f_{z2}	0.08	0.08	0.08	0.08	0.08	0.08	0.08	-	-	-	-	-	-	-	-	0.08	0.08	0.05	-	-	-	-
8030	v_{c1}	-	-	-	-	178	144	108	-	-	-	-	-	-	-	-	64	54	45	-	-	-	-
	f_{z1}	-	-	-	-	0.03	0.03	0.03	-	-	-	-	-	-	-	-	0.03	0.03	0.03	-	-	-	-
	v_{c2}	-	-	-	-	168	135	103	-	-	-	-	-	-	-	-	60	50	42	-	-	-	-
	f_{z2}	-	-	-	-	0.08	0.08	0.08	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-

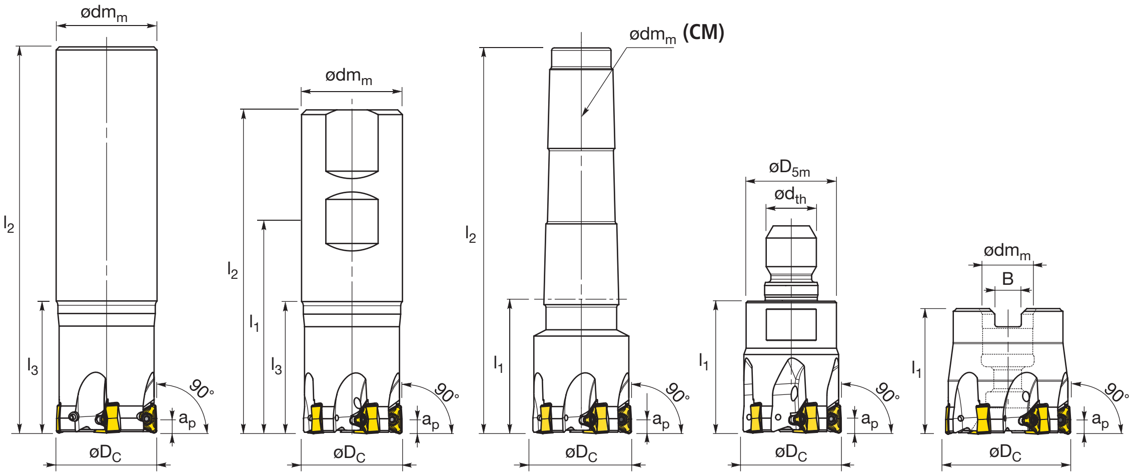
The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

MILLING

COMPACT 90

Compact milling cutter with multicorner inserts

Cutter program, CPW4



Cylindrical shank | Weldon shank | Morse taper | Threaded modular heads | Arbor mounting

Reference	Dimensions (mm)										Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg
	D_c	D_3	Max. a_p	dm_m D_{5m}	d_{th}	l_1	l_2	l_3	A 2)	B						
Short cylindrical shank																
CPW4 020R03 C20A110	20.00	-	3.50	20.00	-	-	110.00	30.00	-	-	3	WN.. 04 T3..	3	Yes	37100	0.229
CPW4 025R04 C25A120	25.00	-	3.50	25.00	-	-	120.00	36.00	-	-	4	WN.. 04 T3..	4	Yes	33200	0.403
CPW4 032R05 C32A130	32.00	-	3.50	32.00	-	-	130.00	42.00	-	-	5	WN.. 04 T3..	5	Yes	29300	0.695
Long cylindrical shank																
CPW4 020R02 C20X200	20.00	-	3.50	20.00	-	-	200.00	30.00	-	-	2	WN.. 04 T3..	2	No	11180	0.477
CPW4 025R03 C25X250	25.00	-	3.50	25.00	-	-	250.00	36.00	-	-	3	WN.. 04 T3..	3	No	8900	0.936
CPW4 032R04 C32X250	32.00	-	3.50	32.00	-	-	250.00	42.00	-	-	4	WN.. 04 T3..	4	No	13200	1.529
Undersized cylindrical shank																
CPW4 020R02 C19X200	20.00	-	3.50	19.00	-	-	200.00	30.00	-	-	2	WN.. 04 T3..	2	No	10900	0.435
CPW4 025R03 C24X250	25.00	-	3.50	24.00	-	-	250.00	36.00	-	-	3	WN.. 04 T3..	3	No	8700	0.869
Weldon shank																
CPW4 020R03 W20A056	20.00	-	3.50	20.00	-	56.50	81.00	30.00	-	-	3	WN.. 04 T3..	3	Yes	37100	0.161
CPW4 025R04 W25A061	25.00	-	3.50	25.00	-	61.50	93.00	36.00	-	-	4	WN.. 04 T3..	4	Yes	33200	0.298
CPW4 032R05 W32A067	32.00	-	3.50	32.00	-	67.50	103.00	42.00	-	-	5	WN.. 04 T3..	5	Yes	29300	0.532
Morse taper																
CPW4 032R05 MK3X042	32.00	-	3.50	CM3	-	42.00	122.70	-	-	-	5	WN.. 04 T3..	5	No	29300	0.373
Threaded modular heads																
CPW4 020R03 P10A030	20.00	-	3.50	17.80	M10	30.00	-	-	14.00	-	3	WN.. 04 T3..	3	Yes	- 1)	0.051
CPW4 025R04 P12A036	25.00	-	3.50	20.80	M12	36.00	-	-	17.00	-	4	WN.. 04 T3..	4	Yes	- 1)	0.096
CPW4 032R05 P16A042	32.00	-	3.50	20.80	M16	42.00	-	-	24.00	-	5	WN.. 04 T3..	5	Yes	- 1)	0.214
Arbor mounting																
CPW4 040R06 A16A040	40.00	-	3.50	16.00	-	40.00	-	-	-	8.40	6	WN.. 04 T3..	6	Yes	26200	0.219
CPW4 050R08 A22A040	50.00	-	3.50	22.00	-	40.00	-	-	-	10.40	8	WN.. 04 T3..	8	Yes	23400	0.327

1) Max. RPM values are not given for modular heads as they are always used with long extensions
2) Size of the wrench to be used for modular heads is given by dimension A

Spare parts

Insert style	Diameter D_c	Insert screw			Screw driver		Torque wrench		
		Reference	Size		Reference		Reference		Nm
WN.. 04 T3..	20 - 50 mm	5513 020-19	M 2.2	0.9 N.m	PT-8001	7 IP	TDX 207PLUS	7 IP	0.9

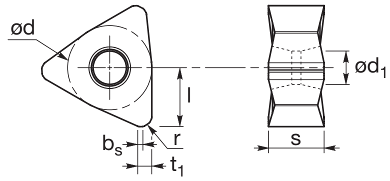
COMPACT 90

Compact milling cutter with multicorner inserts

Insert program

WNKU... EN-42

WNMU... EN-82



Reference	Dimensions (mm)							Grades													
	d	s	d_1	l	r	b_s	t_1	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX05	KX20	KX2	N
WNKU 04 T3 PN EN-42	6.30	4.14	2.5	4.50	0.8	0.22	0.90	-	-	-	✓	-	✓	-	✓	✓	-	-	-	-	-
WNMU 04 T3 PN EN-82	6.30	4.14	2.5	4.50	0.8	0.22	0.90	-	-	-	-	-	✓	-	✓	✓	-	-	-	-	-

✓Article which can be ordered

Ordering example: WNKU 04 T3 PN EN-42 5020

Cutting conditions

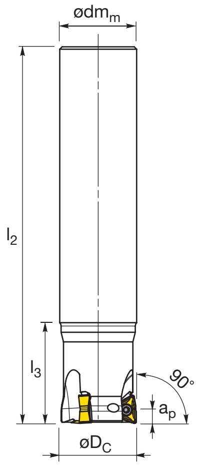
		P Steel				M Stainless steel			K Cast iron				N Non-ferrous aluminum				S Super alloys			H Hardened materials			
Grade	Feed per tooth (mm)	Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
2003	v_{c1}	-	-	-	250	279	240	179	277	257	227	207	-	-	-	-	100	90	65	99	119	99	99
	f_{z1}	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	-	-	-	220	259	210	159	239	219	189	169	-	-	-	-	90	80	60	79	99	79	79
	f_{z2}	-	-	-	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	-	-	-	-	0.10	0.10	0.10	0.20	0.20	0.20	0.20
5020	v_{c1}	351	316	241	147	213	195	139	257	238	209	182	1050	650	480	600	70	60	50	40	45	40	35
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	251	228	171	109	176	165	119	219	194	155	121	970	530	430	540	60	50	45	35	40	35	30
	f_{z2}	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
5050	v_{c1}	259	229	161	95	136	88	74	-	-	-	-	-	-	-	-	53	43	35	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	205	179	121	65	108	74	65	-	-	-	-	-	-	-	-	39	29	30	-	-	-	-
	f_{z2}	0.20	0.20	0.20	0.20	0.20	0.20	0.20	-	-	-	-	-	-	-	-	0.20	0.20	0.10	-	-	-	-
8030	v_{c1}	-	-	-	-	174	141	106	-	-	-	-	-	-	-	-	62	52	42	-	-	-	-
	f_{z1}	-	-	-	-	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	-	-	-	-	142	120	102	-	-	-	-	-	-	-	-	50	40	37	-	-	-	-
	f_{z2}	-	-	-	-	0.20	0.20	0.20	-	-	-	-	-	-	-	-	0.2	0.2	0.2	-	-	-	-

The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

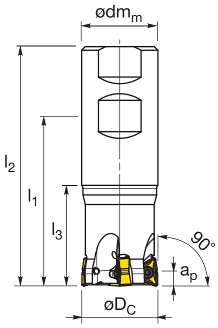
COMPACT 90

Compact milling cutter with multicorner inserts

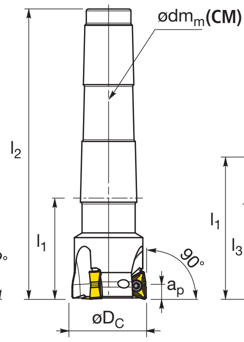
Cutter program, CPW6



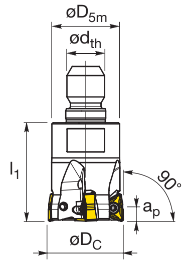
Cylindrical shank



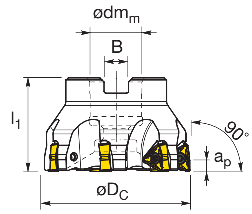
Weldon shank



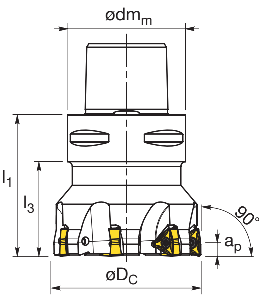
Morse Taper



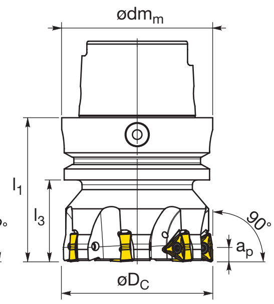
Thread modular heads



Arbor mounting



SAF-Capto



HSK

Reference	Dimensions (mm)										Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg
	D_c	D_3	Max. a_p	dm_m D_{5m}	d_{th}	l_1	l_2	l_3	A [2]	B						
Short cylindrical shank																
CPW6 025R03 C25A120	25.00	-	5.00	25.00	-	-	120.00	36.00	-	-	3	WN.. 06 04..	3	Yes	30300	0.390
CPW6 032R04 C32A130	32.00	-	5.00	32.00	-	-	130.00	42.00	-	-	4	WN.. 06 04..	4	Yes	26700	0.669
Long cylindrical shank																
CPW6 025R02 C25X250	25.00	-	5.00	25.00	-	-	250.00	36.00	-	-	2	WN.. 06 04..	2	No	8900	0.925
CPW6 032R03 C25X250	32.00	-	5.00	25.00	-	-	250.00	42.00	-	-	3	WN.. 06 04..	3	No	13200	0.979
CPW6 032R03 C32X250	32.00	-	5.00	32.00	-	-	250.00	42.00	-	-	3	WN.. 06 04..	3	No	13200	1.506
Undersized cylindrical shank																
CPW6 025R02 C24X250	25.00	-	5.00	24.00	-	-	250.00	36.00	-	-	2	WN.. 06 04..	2	No	8700	0.859
Weldon shank																
CPW6 025R03 W25A061	25.00	-	5.00	25.00	-	61.50	93.00	36.00	-	-	3	WN.. 06 04..	3	Yes	30300	0.285
CPW6 032R04 W32A067	32.00	-	5.00	32.00	-	67.50	103.00	42.00	-	-	4	WN.. 06 04..	4	Yes	26700	0.506
Morse taper																
CPW6 032R04 MK3X042	32.00	-	5.00	CM3	-	42.00	122.70	-	-	-	4	WN.. 06 04..	4	No	26700	0.349
Threaded modular heads																
CPW6 025R03 P12A036	25.00	-	5.00	20.80	M12	36.00	-	-	17.00	-	3	WN.. 06 04..	3	Yes	- [1]	0.082
CPW6 032R04 P16A042	32.00	-	5.00	28.80	M16	42.00	-	-	24.00	-	4	WN.. 06 04..	4	Yes	- [1]	0.202
HSK																
CPW6 050R06 HS6A060	50.00	-	5.00	63.00	-	60.00	-	34.00	-	-	6	WN.. 06 04..	6	Yes	21400	1.005
CPW6 063R07 HS6A060	63.00	-	5.00	63.00	-	60.00	-	34.00	-	-	7	WN.. 06 04..	7	Yes	19000	1.206
SAF-Capto																
CPW6 050R06 SC5A060	50.00	-	5.00	C5	-	60.00	-	40.00	-	-	6	WN.. 06 04..	6	Yes	21400	0.884
CPW6 063R07 SC5A060	63.00	-	5.00	C5	-	60.00	-	40.00	-	-	7	WN.. 06 04..	7	Yes	19000	1.051
CPW6 063R07 SC6A080	63.00	-	5.00	C6	-	80.00	-	58.00	-	-	7	WN.. 06 04..	7	Yes	19000	1.891
Arbor mounting																
CPW6 040R05 A16A040	40.00	-	5.00	16.00	-	40.00	-	-	-	8.40	5	WN.. 06 04..	5	Yes	23900	0.196
CPW6 050R06 A22A040	50.00	-	5.00	22.00	-	40.00	-	-	-	10.40	6	WN.. 06 04..	6	Yes	21400	0.300
CPW6 063R07 A22A040	63.00	-	5.00	22.00	-	40.00	-	-	-	10.40	7	WN.. 06 04..	7	Yes	19000	0.422
CPW6 080R09 A27A050	80.00	-	5.00	27.00	-	50.00	-	-	-	12.40	9	WN.. 06 04..	9	Yes	16900	0.930

[1] Max. RPM values are not given for modular heads as they are always used with long extensions
[2] Size of the wrench to be used for modular heads is given by dimension A

Spare parts

Insert style	Diameter D_c	Insert screw			Screw driver		Torque wrench		
		Reference	Size		Reference		**Reference**		**Nm**
WN.. 06 04..	25 - 80 mm	5513 020-57	M 3.0	1.4 N.m	PT-8003	9 IP	TDX 209PLUS	9 IP	1.4

COMPACT 90

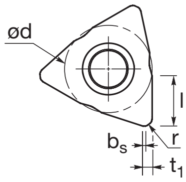
Compact milling cutter with multicorner inserts

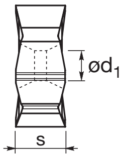
Insert program

WNKU... EN-12

WNMU... EN-42

WNMU... EN-82





Reference	Dimensions (mm)							Grades													
	d	s	d_1	l	r	b_s	t_1	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX05	KX20	KX2	N
WNKU 06 04 PN EN-12	8.50	4.76	3.5	4.85	0.8	0.24	0.90	-	-	-	-	-	✓	-	✓	✓	-	-	-	-	-
WNKU 06 04 PN EN-42	8.50	4.76	3.5	4.85	0.8	0.24	0.90	-	-	-	✓	-	✓	-	✓	✓	-	-	-	-	-
WNKU 06 04 PN EN-82	8.50	4.76	3.5	4.85	0.8	0.24	0.90	-	-	-	-	-	✓	-	✓	✓	-	-	-	-	-

✓Article which can be ordered

Ordering example: WNKU 06 04 PN EN-42 5020

Cutting conditions

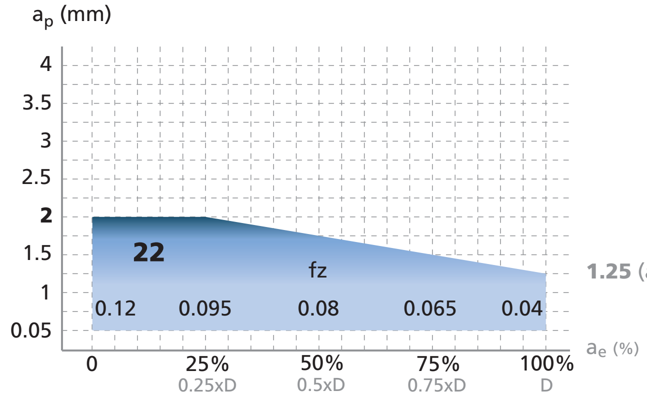
Grade	Feed per tooth (mm)	P Steel				M Stainless steel			K Cast iron				N Non-ferrous aluminum				S Super alloys			H Hardened materials			
		Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
2003	v_{c1}	-	-	-	250	279	240	179	277	257	227	207	-	-	-	-	100	90	65	99	119	99	99
	f_{z1}	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	-	-	-	210	253	200	153	226	206	176	156	-	-	-	-	80	70	55	73	93	73	73
	f_{z2}	-	-	-	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	-	-	-	-	0.15	0.15	0.15	0.25	0.25	0.25	0.25
5020	v_{c1}	351	316	241	147	213	195	139	257	238	209	182	1050	650	480	600	70	60	50	40	45	40	35
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	217	199	147	96	164	155	113	206	179	136	101	890	410	380	480	50	40	40	30	35	30	25
	f_{z2}	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
5050	v_{c1}	259	229	161	95	136	88	74	-	-	-	-	-	-	-	-	53	43	35	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	186	163	107	55	99	69	61	-	-	-	-	-	-	-	-	34	24	25	-	-	-	-
	f_{z2}	0.25	0.25	0.25	0.25	0.25	0.25	0.25	-	-	-	-	-	-	-	-	0.25	0.25	0.15	-	-	-	-
8030	v_{c1}	-	-	-	-	174	141	106	-	-	-	-	-	-	-	-	62	52	42	-	-	-	-
	f_{z1}	-	-	-	-	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	-	-	-	-	131	112	87	-	-	-	-	-	-	-	-	42	32	31	-	-	-	-
	f_{z2}	-	-	-	-	0.25	0.25	0.25	-	-	-	-	-	-	-	-	0.25	0.25	0.15	-	-	-	-

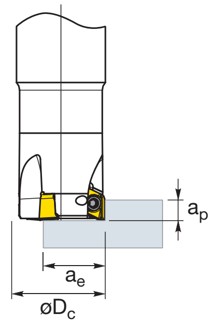
The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

COMPACT 90

Milling cutter characteristics

Feed rate recommendation for CPE4





CPE4

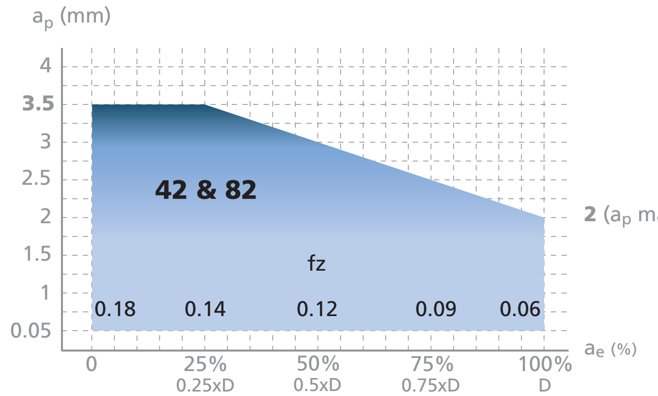
Examples

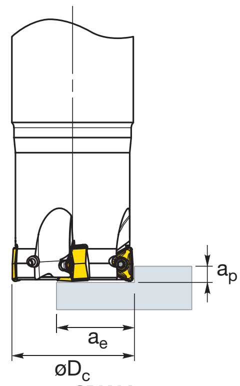
Endmill and square shoulder facing	
Material	35 NCD16
Hardness	200 HB
Tool	CPE4 012R03 C10A100
Insert	ENMU0402PNER-22
Grade	5050
a_e (mm)	3 (25% of diameter)
a_p (mm)	2 (because a_e = 25% of diameter)
V_c (m/min)	148
h Max (mm)	0.08
f_z (mm)	0.095 correction for a_e = 25% of diameter
V_f (mm/min)	1118
n (rpm)	3925

Facing	
Material	**35 NCD16**
Hardness	**200 HB**
Tool	**CPE4 012R03 C10A100**
Insert	**ENMU0402PNER-22**
Grade	**5050**
a_e (mm)	**9 (75% of diameter)**
a_p (mm)	**1.5 (because a_e = 75% of diameter)**
V_c (m/min)	**148**
h Max (mm)	**0.08**
f_z (mm)	**0.065 correction for a_e = 75% of diameter**
V_f (mm/min)	**765**
n (rpm)	**3925**

Note: No ramping, no helical interpolation, no plunging.

Feed rate recommendation for CPW4





CPW4

Examples

Endmill and square shoulder facing	
Material	35 NCD16
Hardness	200 HB
Tool	CPW4 050R08 A22A040
Insert	WNKU04T3PNEN-42
Grade	5020
a_e (mm)	25 (50% of diameter)
a_p (mm)	3 (because a_e = 50% of diameter)
V_c (m/min)	218
h Max (mm)	0.12
f_z (mm)	0.12 correction for a_e = 50% of diameter
V_f (mm/min)	1331
n (rpm)	1387

Facing	
Material	35 NCD16
Hardness	200 HB
Tool	CPW4 050R08 A22A040
Insert	WNKU04T3PNEN-42
Grade	5020
a_e (mm)	45 (95% of diameter)
a_p (mm)	2 (because a_e = 95% of diameter)
V_c (m/min)	218
h Max (mm)	0.12
f_z (mm)	0.06 correction for a_e = 95% of diameter
V_f (mm/min)	665
n (rpm)	1387

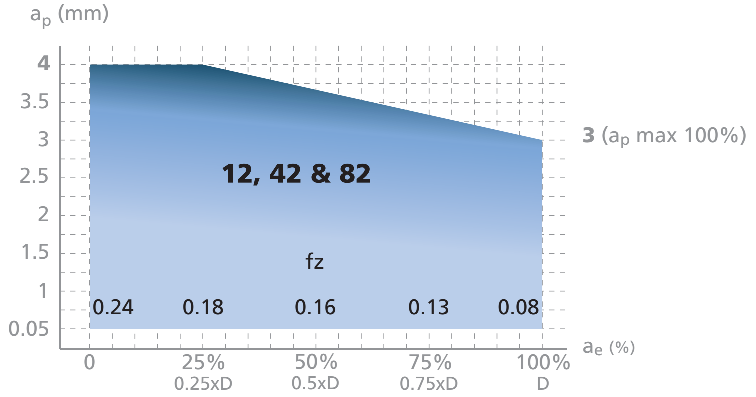
Note: No ramping, no helical interpolation, no plunging.

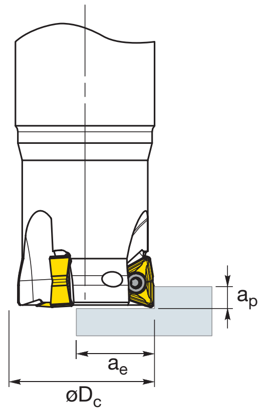
MILLING

COMPACT 90

Milling cutter characteristics

Feed rate recommendation for CPW6





CPW6

Examples

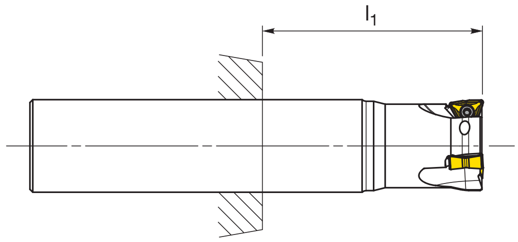
Endmill and square shoulder facing	
Material	35 NCD16
Hardness	200 HB
Tool	CPW6 050R06 A22A040
Insert	WNMU0604PNEN-82
Grade	5020
a_e (mm)	12.5 (25% of diameter)
a_p (mm)	4 (because a_e = 25% of diameter)
V_c (m/min)	218
h Max (mm)	0.16
f_z (mm)	0.18 correction for a_e = 25% of diameter
V_f (mm/min)	1497
n (rpm)	1387

Note: No ramping, no helical interpolation, no plunging.

Facing	
Material	35 NCD16
Hardness	200 HB
Tool	CPW6 050R06 A22A040
Insert	WNMU0604PNEN-82
Grade	5020
a_e (mm)	40 (75% of diameter)
a_p (mm)	3.25 (because a_e = 75% of diameter)
V_c (m/min)	218
h Max (mm)	0.16
f_z (mm)	0.13 correction for a_e = 75% of diameter
V_f (mm/min)	998
n (rpm)	1387

Complementary information

Milling tool with "long cylindrical shank" used with greater overhang



Decrease the values V_c, f_z and a_e with the information:

Standard overhang	$1xD_c < L1 < 2xD_c$	$2xD_c < L1 < 4xD_c$	$4xD_c < L1 < 6xD_c$
V_c correction	V_c	0.7 V_c	0.5 V_c
a_p	standard	0.6 a_p maxi	0.3 a_p maxi
a_e maxi	100% diameter	0.7 diameter maxi	0.4 diameter maxi
f_z or Hm maxi	standard	0.1 maxi	0.07 maxi

Note : If the overhang is greater to 4øD_c, it is better to used modular head with carbide modular shank.

Milling operation with CPW4 diameter 20 (L1 = 2xD_c)	
Material	35 NCD16
Hardness	200 HB
Tool	CPW4 020R02 C20X200
Insert	WNKU04T3PNEN-42
Grade	5020
a_e (mm)	15 (75% of diameter)
a_p (mm)	2.5 (because a_e = 75% of diameter)
V_c (m/min)	218
h Max (mm)	0.12
f_z (mm)	0.1 correction for 75% of diameter
V_f (mm/min)	971
n (rpm)	3469

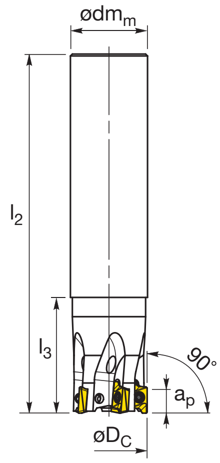
No ramping, no helical interpolation, no plunging.

Milling operation with CPW4 diameter 20 (L1 = 5xD_c)	
Material	35 NCD16
Hardness	200 HB
Tool	CPW4 020R02 C20X200
Insert	WNKU04T3PNEN-42
Grade	5020
a_e (mm)	8 max = 0.4 diameter
a_p (mm)	1 max = 0.3 a_p maxi 3.5
V_c (m/min)	109 (0.5 V_c standard)
h Max (mm)	0.12
f_z (mm)	0.07 maxi
V_f (mm/min)	364
n (rpm)	1734

ORBI-SAF

Shoulder milling cutter with positive rectangular inserts

Cutter program, RT 07



Short cylindrical shank

Reference	Dimensions (mm)							Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg
	D_c	D_3	Max. a_p	dm_m	l_1	l_2	l_3						
Short cylindrical shank													
RT-07/010-02-QCC10-070-R	10.00	-	6.00	10.00	-	70.00	30.00	2	RT 07 02..	2	Yes	62400	0.030
RT-07/010-02-QCC10-100-R	10.00	-	6.00	10.00	-	100.00	30.00	2	RT 07 02..	2	Yes	48000	0.045
RT-07/012-02-QCC12-075-R	12.00	-	6.00	12.00	-	75.00	30.00	2	RT 07 02..	2	Yes	62400	0.048
RT-07/012-02-QCC12-100-R	12.00	-	6.00	12.00	-	100.00	30.00	2	RT 07 02..	2	Yes	48000	0.066
RT-07/014-02-QCC12-075-R	14.00	-	6.00	12.00	-	75.00	30.00	2	RT 07 02..	2	Yes	54600	0.053
RT-07/014-02-QCC12-100-R	14.00	-	6.00	12.00	-	100.00	30.00	2	RT 07 02..	2	Yes	42000	0.071
RT-07/016-03-QCC16-100-R	16.00	-	6.00	16.00	-	100.00	30.00	3	RT 07 02..	3	Yes	42000	0.123
RT-07/018-04-QCC16-100-R	18.00	-	6.00	16.00	-	100.00	30.00	4	RT 07 02..	4	Yes	40000	0.127
RT-07/020-05-QCC20-110-R	20.00	-	6.00	20.00	-	110.00	30.00	5	RT 07 02..	5	Yes	36700	0.223

Spare parts

Insert style	Diameter D_c	Insert screw			Screw driver		Torque wrench		
		Reference	Size		Reference		Reference		Nm
RT 07 02..	10 - 20 mm	5513 020-28	M 2.0	0.6 N.m	PT-8000	6 IP	TDX 206PLUS	6 IP	0.6

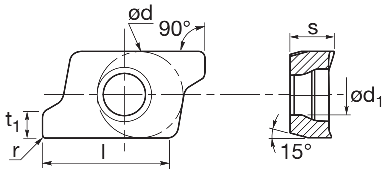
ORBI-SAF

Shoulder milling cutter with positive rectangular inserts

Insert program

RT 07... R-11

RT 07... R-81



Reference	Dimensions (mm)							Grades													
	d	s	d_1	l	r	b_s	t_1	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX05	KX20	KX2	N
Inserts for general machining																					
RT 07 02 02 R-11	4.30	2.38	2.2	6.40	0.2	-	1.10	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
RT 07 02 04 R-11	4.30	2.38	2.2	6.40	0.4	-	1.10	-	-	-	✓	-	✓	-	-	-	-	-	-	-	-
RT 07 02 04 R-81	4.30	2.38	2.2	6.40	0.4	-	1.10	-	-	-	✓	-	✓	✓	✓	-	✓	-	-	-	-
RT 07 02 08 R-11	4.30	2.38	2.2	6.40	0.8	-	1.10	-	-	-	✓	-	✓	-	-	-	-	-	-	-	-

✓Article which can be ordered

Ordering example: RT 07 02 04 R-11 5020

Cutting conditions

Grade	Feed per tooth (mm)	P Steel				M Stainless steel			K Cast iron				N Non-ferrous aluminum				S Super alloys			H Hardened materials			
		Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
2003	v_{c1}	-	-	-	254	281	244	181	282	262	232	212	-	-	-	-	104	94	67	101	121	101	101
	f_{z1}	-	-	-	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	-	-	-	-	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	v_{c2}	-	-	-	248	277	238	177	275	255	255	205	-	-	-	-	100	90	65	97	117	97	97
	f_{z2}	-	-	-	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	-	-	-	-	0.05	0.05	0.05	0.06	0.06	0.06	0.06
5020	v_{c1}	365	327	251	152	218	199	141	262	244	217	190	1082	698	500	624	74	64	52	42	47	42	37
	f_{z1}	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	v_{c2}	345	310	237	145	210	193	137	255	235	206	178	1050	650	480	600	70	60	50	40	45	40	35
	f_{z2}	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
5040	v_{c1}	335	297	221	122	202	189	114	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.03	0.03	0.03	0.03	0.03	0.03	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	315	280	207	115	190	175	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.06	0.06	0.06	0.06	0.05	0.05	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5050	v_{c1}	267	235	167	99	139	90	76	-	-	-	-	-	-	-	-	55	45	37	-	-	-	-
	f_{z1}	0.03	0.03	0.03	0.03	0.03	0.03	0.03	-	-	-	-	-	-	-	-	0.03	0.03	0.03	-	-	-	-
	v_{c2}	256	225	159	93	134	87	74	-	-	-	-	-	-	-	-	52	42	35	-	-	-	-
	f_{z2}	0.06	0.06	0.06	0.06	0.06	0.06	0.06	-	-	-	-	-	-	-	-	0.06	0.06	0.05	-	-	-	-
5135	v_{c1}	286	258	177	103	172	156	94	-	-	-	-	-	-	-	-	60	50	42	-	-	-	-
	f_{z1}	0.03	0.03	0.03	0.03	0.03	0.03	0.03	-	-	-	-	-	-	-	-	0.03	0.03	0.03	-	-	-	-
	v_{c2}	273	246	169	98	160	140	90	-	-	-	-	-	-	-	-	57	47	40	-	-	-	-
	f_{z2}	0.06	0.06	0.06	0.06	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.06	0.06	0.05	-	-	-	-

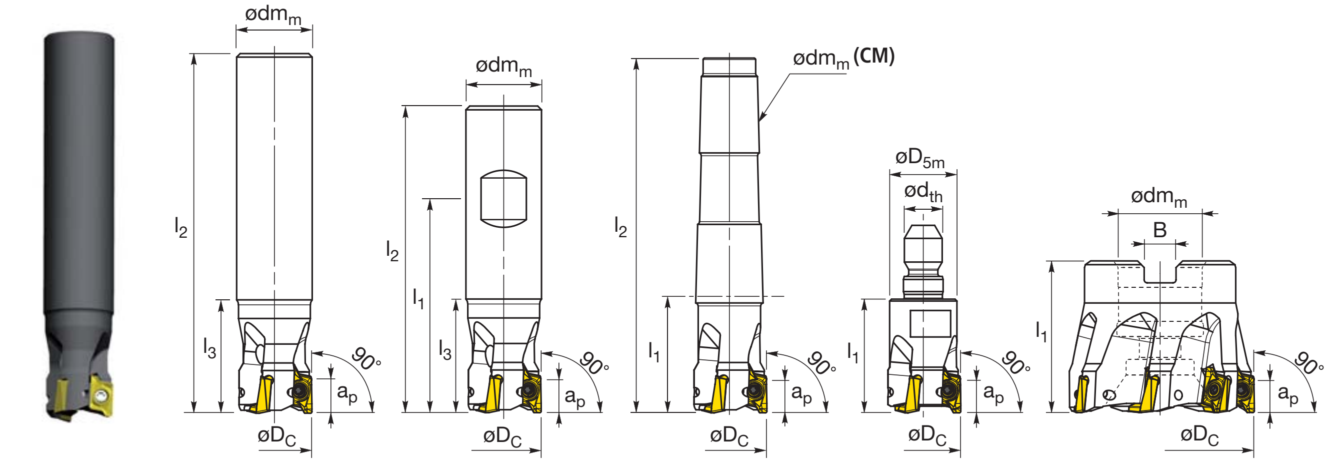
The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

MILLING

ORBI-SAF

Shoulder milling cutter with positive rectangular inserts

Cutter program, RT 10



Cylindrical shank | Weldon shank | Morse taper | Threaded modular heads | Arbor mounting

Reference	Dimensions (mm)										Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg
	D_c	D_3	Max. a_p	dm_m D_{5m}	d_{th}	l_1	l_2	l_3	A [1]	B						
Short cylindrical shank																
RT-10/016-02-QCC16-100-R	16.00	-	9.00	16.00	-	-	100.00	30.00	-	-	2	RT 10 03/T3..	2	Yes	40000	0.120
RT-10/020-02-QCC16-100-R	20.00	-	9.00	16.00	-	-	100.00	30.00	-	-	2	RT 10 03/T3..	2	Yes	35000	0.130
RT-10/020-03-QCC20-110-R	20.00	-	9.00	20.00	-	-	110.00	30.00	-	-	3	RT 10 03/T3..	3	Yes	35000	0.215
RT-10/025-03-QCC20-110-R	25.00	-	9.00	20.00	-	-	110.00	40.00	-	-	3	RT 10 03/T3..	3	Yes	33100	0.215
RT-10/025-04-QCC25-120-R	25.00	-	9.00	25.00	-	-	120.00	40.00	-	-	4	RT 10 03/T3..	4	Yes	33100	0.360
RT-10/032-03-QCC25-120-R	32.00	-	9.00	25.00	-	-	120.00	50.00	-	-	3	RT 10 03/T3..	3	Yes	29500	0.400
RT-10/032-05-QCC32-130-R	32.00	-	9.00	32.00	-	-	130.00	50.00	-	-	5	RT 10 03/T3..	5	Yes	29500	0.645
Long cylindrical shank																
RT-10/016-02-QC16-160-R	16.00	-	9.00	16.00	-	-	160.00	30.00	-	-	2	RT 10 03/T3..	2	No	11500	0.230
RT-10/020-03-QC20-200-R	20.00	-	9.00	20.00	-	-	200.00	30.00	-	-	3	RT 10 03/T3..	3	No	10300	0.455
RT-10/025-04-QC25-250-R	25.00	-	9.00	25.00	-	-	250.00	40.00	-	-	4	RT 10 03/T3..	4	No	9700	0.895
Undersized cylindrical shank																
RT-10/016-02-QC15-160-R	16.00	-	9.00	15.00	-	-	160.00	25.00	-	-	2	RT 10 03/T3..	2	No	11500	0.204
RT-10/020-03-QC19-200-R	20.00	-	9.00	19.00	-	-	200.00	25.00	-	-	3	RT 10 03/T3..	3	No	10300	0.416
RT-10/025-03-QC24-250-R	25.00	-	9.00	24.00	-	-	250.00	34.50	-	-	3	RT 10 03/T3..	3	No	9700	0.831
Weldon shank																
RT-10/016-02-QWC16-030-R	16.00	-	9.00	16.00	-	55.50	79.00	30.00	-	-	2	RT 10 03/T3..	2	Yes	40000	0.090
RT-10/020-03-QWC20-030-R	20.00	-	9.00	20.00	-	56.50	81.00	30.00	-	-	3	RT 10 03/T3..	3	Yes	35000	0.150
RT-10/025-04-QWC25-040-R	25.00	-	9.00	25.00	-	65.50	97.00	40.00	-	-	4	RT 10 03/T3..	4	Yes	33100	0.275
RT-10/032-05-QWC32-050-R	32.00	-	9.00	32.00	-	75.50	111.00	50.00	-	-	5	RT 10 03/T3..	5	Yes	29500	0.535
Morse taper																
RT-10/016-02-CMC2-030-R	16.00	-	9.00	CM2	-	30.00	93.70	-	-	-	2	RT 10 03/T3..	2	No	40000	0.100
RT-10/020-03-CMC2-030-R	20.00	-	9.00	CM2	-	30.00	93.70	-	-	-	3	RT 10 03/T3..	3	No	35000	0.105
RT-10/025-04-CMC3-040-R	25.00	-	9.00	CM3	-	40.00	120.70	-	-	-	4	RT 10 03/T3..	4	No	33100	0.260
RT-10/032-05-CMC3-040-R	32.00	-	9.00	CM3	-	40.00	120.70	-	-	-	5	RT 10 03/T3..	5	No	29500	0.300
Threaded modular heads																
RT-10/016-02-025DP08	16.00	-	9.00	12.80	M8	25.00	-	-	10	-	2	RT 10 03/T3..	2	No	- [3]	0.025
RT-10/020-03-030DP10	20.00	-	9.00	17.80	M10	30.00	-	-	14	-	3	RT 10 03/T3..	3	No	- [3]	0.050
RT-10/025-04-035DP12	25.00	-	9.00	20.80	M12	35.00	-	-	17	-	4	RT 10 03/T3..	4	No	- [3]	0.090
RT-10/032-05-043DP16	32.00	-	9.00	28.80	M16	43.00	-	-	24	-	5	RT 10 03/T3..	5	No	- [3]	0.210
Arbor Mounting																
RT-10/040-06-ALC16-R	40.00	-	9.00	16.00	-	40.00	-	-	-	8.40	6	RT 10 03/T3..	6	No [2]	25500	0.185
RT-10/050-07-ALC22-R	50.00	-	9.00	22.00	-	40.00	-	-	-	10.40	7	RT 10 03/T3..	7	No [2]	23000	0.290

[1] Size of the wrench to be used for modular heads is given by dimension A

[2] Optional coolant screw can be ordered separately

[3] Max. RPM values are not given for modular heads as they are always used with long extensions

Spare parts

Insert style	Diameter D_c	Insert screw			Screw driver		Torque wrench		
		Reference	Size	Torque	Reference		Reference		Nm
RT 10 03/T3..	16 - 50 mm	5513 020-35	M 2.5	1.2 N.m	PT-8006	8 IP	TDX 208PLUS	8 IP	1.2

Optional spare parts

Insert style	Diameter D_c	Coolant screw
		Reference
RT 10 03/T3..	40 mm	DVZ 3944
RT 10 03/T3..	50 mm	DVZ 3523

MILLING

ORBI-SAF

Shoulder milling cutter with positive rectangular inserts

Insert program

Inserts for general machining

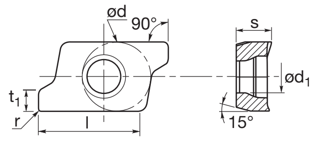
RT 10... R-11

RT 10... R-41

RT 10... R-81

Inserts for high feed milling

RT 10... HF



Inserts with radius

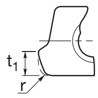
RT 10... R-31

RT 10... RC-31

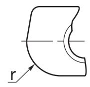
Inserts for precision shoulder

RT 10... RF-11

RT 10... RF-31



HF



RC

Reference	Dimensions (mm)							Grades													
	d	s	d_1	l	r	b_s	t_1	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX05	KX20	KX2	N
Inserts for general machining																					
RT 10 03 04 R-11	6.35	3.40	2.9	9.10	0.4	-	1.80	-	-	-	✓	-	✓	✓	-	-	-	-	-	✓	✓
RT 10 03 04 R-41	6.35	3.40	2.9	9.10	0.4	-	1.60	-	-	-	✓	-	✓	-	✓	✓	-	-	-	-	-
RT 10 03 04 R-81	6.35	3.40	2.9	9.10	0.4	-	1.60	-	-	-	✓	-	✓	✓	✓	-	✓	-	-	-	-
RT 10 03 08 R-41	6.35	3.40	2.9	9.10	0.8	-	1.60	-	-	-	✓	-	✓	-	✓	✓	-	-	-	-	-
RT 10 03 08 R-81	6.35	3.40	2.9	9.10	0.8	-	1.60	-	-	-	✓	-	✓	✓	✓	-	✓	-	-	-	-
RT 10 T3 C5 ER-81	6.35	3.77	3.1	8.50	0.5x45°	-	1.90	-	-	-	✓	-	✓	✓	✓	✓	-	-	-	-	-
Inserts with radius																					
RT 10 03 02 R-31	6.35	3.40	2.9	9.10	0.2	-	1.80	-	-	-	✓	-	✓	✓	-	✓	-	-	-	-	-
RT 10 03 04 R-31	6.35	3.40	2.9	9.10	0.4	-	1.80	-	-	-	-	-	✓	-	-	✓	-	-	-	-	-
RT 10 03 05 R-31	6.35	3.40	2.9	9.10	0.5	-	1.80	-	-	-	-	-	✓	-	-	-	-	-	-	-	-
RT 10 03 08 R-31	6.35	3.40	2.9	9.10	0.8	-	1.80	-	-	-	✓	-	✓	✓	-	✓	-	-	-	-	-
RT 10 03 10 R-31	6.35	3.40	2.9	9.10	1.0	-	1.80	-	-	-	✓	-	✓	✓	✓	✓	-	-	-	-	-
RT 10 03 12 R-31	6.35	3.40	2.9	9.10	1.2	-	1.80	-	-	-	✓	-	✓	✓	✓	✓	-	-	-	-	-
RT 10 03 16 RC-31 [3]	6.35	3.32	2.9	7.80	1.6	-	-	-	-	-	✓	-	✓	-	✓	✓	-	-	-	-	-
RT 10 03 20 RC-31 [3]	6.35	3.28	2.9	7.70	2.0	-	-	-	-	-	-	-	✓	✓	✓	✓	-	-	-	-	-
RT 10 03 24 RC-31 [3]	6.35	3.25	2.9	7.60	2.4	-	-	-	-	-	✓	-	✓	-	✓	-	-	-	-	-	-
RT 10 03 30 RC-31 [3]	6.35	3.19	2.9	7.50	3.0	-	-	-	-	-	-	-	✓	-	✓	-	-	-	-	-	-
RT 10 03 40 RC-31 [3]	6.35	3.09	2.9	7.30	4.0	-	-	-	-	-	-	-	✓	-	✓	-	-	-	-	-	-
Inserts for high feed milling																					
RT 10 03 10 HF	6.35	3.38	2.9	8.30	1.0 [1]	-	2.2 [2]	-	-	-	✓	-	✓	✓	✓	-	-	-	-	-	-
Inserts for precision shoulder																					
RT 10 03 04 RF-11	6.35	3.40	2.9	7.00	0.4	-	1.80	-	-	-	✓	-	-	-	✓	-	-	-	-	-	-
RT 10 03 08 RF-31	6.35	3.40	2.9	6.70	0.8	-	1.80	-	-	-	✓	-	-	-	✓	-	-	-	-	-	-

[1] Radius for programming [2] High feed corner width [3] Cutter bodies will need to be modified ✓Article which can be ordered Ordering example: RT 10 03 04 R-11 5020

Cutting conditions

Grade	Feed per tooth (mm)	P Steel				M Stainless steel			K Cast iron				N Non-ferrous aluminum				S Super alloys			H Hardened materials			
		Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
2003	v_{c1}	-	-	-	254	281	244	181	282	262	232	212	-	-	-	-	104	94	67	101	121	101	101
	f_{z1}	-	-	-	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	-	-	-	-	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	v_{c2}	-	-	-	230	266	220	166	251	231	201	181	-	-	-	-	90	80	60	86	106	86	86
	f_{z2}	-	-	-	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-	-	-	-	0.10	0.10	0.10	0.15	0.15	0.15	0.15
5020	v_{c1}	365	327	251	152	218	199	141	262	244	217	190	1082	698	500	624	74	64	52	42	47	42	37
	f_{z1}	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	v_{c2}	284	257	194	121	189	175	126	231	209	173	141	970	530	430	540	60	50	45	35	40	35	30
	f_{z2}	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
5040	v_{c1}	301	268	197	109	172	154	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.08	0.08	0.08	0.08	0.08	0.08	0.08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	187	169	117	66	100	70	80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.25	0.25	0.25	0.25	0.20	0.20	0.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5050	v_{c1}	248	219	153	89	130	85	72	-	-	-	-	-	-	-	-	50	40	32	-	-	-	-
	f_{z1}	0.08	0.08	0.08	0.08	0.08	0.08	0.08	-	-	-	-	-	-	-	-	0.08	0.08	0.08	-	-	-	-
	v_{c2}	186	163	107	55	99	69	61	-	-	-	-	-	-	-	-	34	24	20	-	-	-	-
	f_{z2}	0.25	0.25	0.25	0.25	0.20	0.20	0.20	-	-	-	-	-	-	-	-	0.20	0.20	0.20	-	-	-	-
8030	v_{c1}	-	-	-	-	174	141	106	-	-	-	-	-	-	-	-	62	52	42	-	-	-	-
	f_{z1}	-	-	-	-	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	-	-	-	-	142	120	102	-	-	-	-	-	-	-	-	50	40	37	-	-	-	-
	f_{z2}	-	-	-	-	0.20	0.20	0.20	-	-	-	-	-	-	-	-	0.20	0.20	0.20	-	-	-	-
5135	v_{c1}	263	238	163	94	142	116	84	-	-	-	-	-	-	-	-	55	45	37	-	-	-	-
	f_{z1}	0.08	0.08	0.08	0.08	0.08	0.08	0.08	-	-	-	-	-	-	-	-	0.08	0.08	0.08	-	-	-	-
	v_{c2}	186	170	117	66	70	20	60	-	-	-	-	-	-	-	-	39	29	25	-	-	-	-
	f_{z2}	0.25	0.25	0.25	0.25	0.20	0.20	0.20	-	-	-	-	-	-	-	-	0.20	0.20	0.20	-	-	-	-
KX2	v_{c1}	-	-	-	-	-	-	-	-	-	-	-	850	480	430	370	45	40	35	-	-	-	-
	f_{z1}	-	-	-	-	-	-	-	-	-	-	-	0.10	0.10	0.10	0.10	0.10	0.10	0.10	-	-	-	-
	v_{c2}	-	-	-	-	-	-	-	-	-	-	-	700	380	280	370	40	35	30	-	-	-	-
	f_{z2}	-	-	-	-	-	-	-	-	-	-	-	0.20	0.20	0.20	0.20	0.20	0.20	0.20	-	-	-	-
N	v_{c1}	-	-	-	-	-	-	-	147	121	92	82	940	520	505	530	46	40	35	-	-	-	-
	f_{z1}	-	-	-	-	-	-	-	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	-	-	-	-
	v_{c2}	-	-	-	-	-	-	-	131	107	82	75	840	470	430	480	43	37	33	-	-	-	-
	f_{z2}	-	-	-	-	-	-	-	0.10	0.10	0.10	0.10	0.08	0.08	0.08	0.08	0.10	0.10	0.10	-	-	-	-

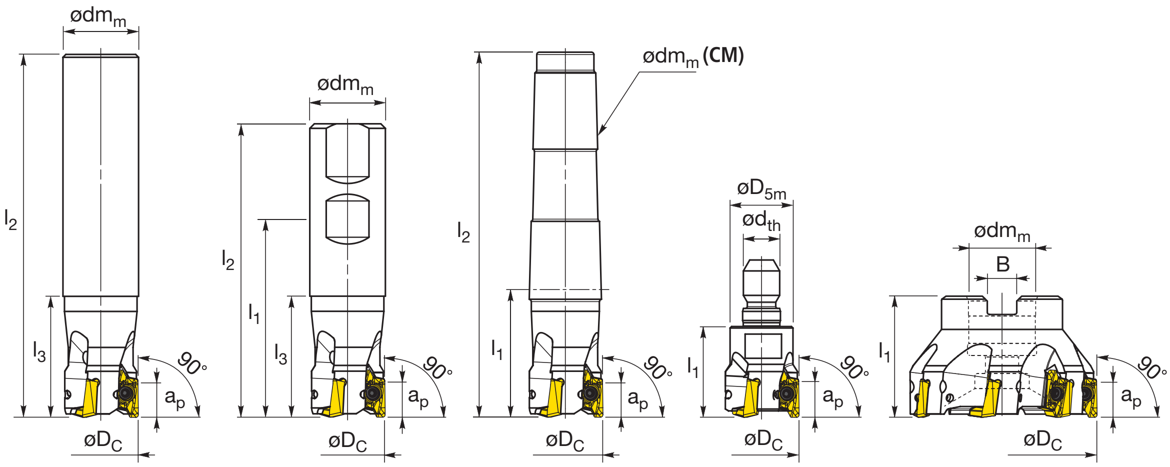
The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

MILLING

ORBI-SAF

Shoulder milling cutter with positive rectangular inserts

Cutter program, RT 13



Cylindrical shank | Weldon shank | Morse taper | Threaded modular heads | Arbor mounting

Reference	Dimensions (mm)										Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg
	D_c	D_3	Max. a_p	dm_m D_{5m}	d_{th}	l_1	l_2	l_3	A [1]	B						
Short cylindrical shank																
RT-13/020-02-QCC20-110-R	20.00	-	12.00	20.00	-	-	110.00	30.00	-	-	2	RT 13 04..	2	Yes	32100	0.215
RT-13/025-03-QCC25-120-R	25.00	-	12.00	25.00	-	-	120.00	40.00	-	-	3	RT 13 04..	3	Yes	30300	0.355
RT-13/032-04-QCC32-130-R	32.00	-	12.00	32.00	-	-	130.00	50.00	-	-	4	RT 13 04..	4	Yes	27000	0.650
Long cylindrical shank																
RT-13/020-02-QC20-200-R	20.00	-	12.00	20.00	-	-	200.00	30.00	-	-	2	RT 13 04..	2	No	9400	0.455
RT-13/025-03-QC25-250-R	25.00	-	12.00	25.00	-	-	250.00	40.00	-	-	3	RT 13 04..	3	No	8900	0.890
RT-13/032-04-QC32-250-R	32.00	-	12.00	32.00	-	-	250.00	50.00	-	-	4	RT 13 04..	4	No	7900	1.465
Undersized cylindrical shank																
RT-13/020-02-QC19-200-R	20.00	-	12.00	19.00	-	-	200.00	30.00	-	-	2	RT 13 04..	2	No	9400	0.455
RT-13/025-03-QC24-250 R	25.00	-	12.00	24.00	-	-	250.00	40.00	-	-	3	RT 13 04..	3	No	8900	0.870
Weldon shank																
RT-13/020-02-QWC20-030-R	20.00	-	12.00	20.00	-	56.50	81.00	30.00	-	-	2	RT 13 04..	2	Yes	32100	0.150
RT-13/025-03-QWC25-040-R	25.00	-	12.00	25.00	-	65.50	97.00	40.00	-	-	3	RT 13 04..	3	Yes	30300	0.275
RT-13/032-04-QWC32-050-R	32.00	-	12.00	32.00	-	75.50	111.00	50.00	-	-	4	RT 13 04..	4	Yes	27000	0.535
Morse taper																
RT-13/020-02-CMC2-030-R	20.00	-	12.00	CM2	-	30.00	94.00	-	-	-	2	RT 13 04..	2	No	32100	0.100
RT-13/025-03-CMC3-040-R	25.00	-	12.00	CM3	-	40.00	120.70	-	-	-	3	RT 13 04..	3	No	30300	0.255
RT-13/032-04-CMC3-040-R	32.00	-	12.00	CM3	-	40.00	120.70	-	-	-	4	RT 13 04..	4	No	27000	0.295
RT-13/040-04-CMC3-040-R	40.00	-	12.00	CM3	-	40.00	120.70	-	-	-	4	RT 13 04..	4	No	23400	0.365
Threaded modular heads																
RT-13/020-02-025DP10	20.00	-	12.00	17.80	M10	25.00	-	-	14	-	2	RT 13 04..	2	No	- [3]	0.040
RT-13/025-03-030DP12	25.00	-	12.00	20.80	M12	30.00	-	-	17	-	3	RT 13 04..	3	No	- [3]	0.070
RT-13/032-04-040DP16	32.00	-	16.00	28.80	M16	40.00	-	-	24	-	4	RT 13 04..	4	No	- [3]	0.185
Arbor mounting																
RT-13/040-05-ALC16-R	40.00	-	12.00	16.00	-	40.00	-	-	-	8.40	5	RT 13 04..	5	No [2]	23400	0.175
RT-13/050-04-ALC22-R	50.00	-	12.00	22.00	-	40.00	-	-	-	10.40	4	RT 13 04..	4	No [2]	21100	0.275
RT-13/050-06-ALC22-R	50.00	-	12.00	22.00	-	40.00	-	-	-	10.40	6	RT 13 04..	6	No [2]	21100	0.265
RT-13/063-07-ALC22-R	63.00	-	12.00	22.00	-	40.00	-	-	-	10.40	7	RT 13 04..	7	No [2]	18300	0.375
RT-13/080-09-ALC27-R	80.00	-	12.00	27.00	-	50.00	-	-	-	12.40	9	RT 13 04..	9	No [2]	16000	0.930

[1] Size of the wrench to be used for modular heads is given by dimension A
[2] Optional coolant screw can be ordered separately
[3] Max. RPM values are not given for modular heads as they are always used with long extensions

Spare parts

Insert style	Diameter D_c	Insert screw			Screw driver		Torque wrench		
		Reference	Size		Reference		Reference		Nm
RT 13 04..	20 - 80 mm	DVF 0943	M 3.0	1.4 N.m	PT-8003	9 IP	TDX 209PLUS	9 IP	1.4

Optional spare parts

Insert style	Diameter D_c	Coolant screw
		Reference
RT 13 04..	40 mm	DVZ 3944
RT 13 04..	50 mm	DVZ 3523
RT 13 04..	63 mm	DVZ 3523
RT 13 04..	80 mm	DVZ 3535
RT 13 04..	100 mm	DVZ 3536

MILLING

ORBI-SAF

Shoulder milling cutter with positive rectangular inserts

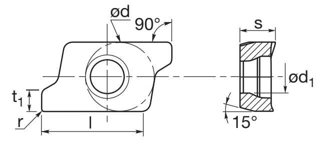
Insert program

Inserts for general machining

RT 13... R-11 RT 13... R-41 RT 13... R-81

Inserts for high feed milling

RT 13... HF

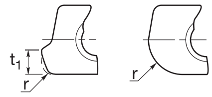


Inserts with radius

RT 13... R-31 RT 13... RC-31

Inserts for precision shoulder

RT 13... RF-11



HF RC

Reference	Dimensions (mm)							Grades													
	d	s	d_1	l	r	b_s	t_1	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX05	KX20	KX2	N
Inserts for general machining																					
RT 13 04 04 R-41	7.94	4.50	3.4	12.10	0.4	-	2.60	-	✓	-	✓	-	✓	-	✓	✓	-	-	-	-	-
RT 13 04 08 R-11	7.94	4.50	3.4	12.10	0.8	-	2.60	-	-	-	✓	-	✓	-	-	-	-	-	-	✓	✓
RT 13 04 08 R-41	7.94	4.50	3.4	12.10	0.8	-	2.60	-	✓	-	✓	-	✓	-	✓	✓	-	-	-	-	-
RT 13 04 08 R-81	7.94	4.50	3.4	12.10	0.8	-	2.40	-	✓	-	✓	-	✓	✓	✓	-	✓	-	-	-	-
Inserts with radius																					
RT 13 04 04 R-31	7.94	4.50	3.4	12.10	0.4	-	2.60	-	-	-	✓	-	✓	✓	-	✓	-	-	-	-	-
RT 13 04 08 R-31	7.94	4.50	3.4	12.10	0.8	-	2.60	-	-	-	✓	-	✓	✓	-	✓	-	-	-	-	-
RT 13 04 10 R-31	7.94	4.50	3.4	12.10	1.0	-	2.60	-	-	-	✓	-	✓	✓	✓	✓	-	-	-	-	-
RT 13 04 12 R-31	7.94	4.50	3.4	12.10	1.2	-	2.60	-	-	-	✓	-	✓	-	✓	✓	-	-	-	-	-
RT 13 04 16 R-31	7.94	4.50	3.4	12.10	1.6	-	2.60	-	-	-	✓	-	✓	✓	✓	-	-	-	-	-	-
RT 13 04 20 R-31	7.94	4.50	3.4	12.10	2.0	-	2.60	-	-	-	-	-	✓	✓	✓	-	-	-	-	-	-
RT 13 04 24 RC-31 [3]	7.94	4.37	3.4	10.20	2.4	-	-	-	-	-	-	-	✓	-	✓	-	-	-	-	-	-
RT 13 04 30 RC-31 [3]	7.94	4.31	3.4	10.10	3.0	-	-	-	-	-	-	-	✓	✓	✓	✓	-	-	-	-	-
RT 13 04 40 RC-31 [3]	7.94	4.22	3.4	9.90	4.0	-	-	-	-	-	-	-	✓	✓	✓	✓	-	-	-	-	-
Inserts for high feed milling																					
RT 13 04 14 HF	7.94	4.50	3.4	11.10	1.4 [1]	-	2.7 [2]	-	-	-	✓	-	✓	✓	✓	-	-	-	-	-	-
Inserts for precision shoulder																					
RT 13 04 08 RF-11	7.94	4.50	3.4	9.90	0.8	-	2.60	-	-	-	✓	-	-	-	✓	-	-	-	-	-	-

[1] Radius for programming [2] High feed corner width [3] Cutter bodies will need to be modified ✓Article which can be ordered Ordering example: RT 13 04 08 R-41 5020

Cutting conditions

Grade	Feed per tooth (mm)	P Steel				M Stainless steel			K Cast iron				N Non-ferrous aluminum				S Super alloys			H Hardened materials			
		Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
1120	v_{c1}	351	318	247	159	-	-	-	264	244	213	185	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.08	0.08	0.08	0.08	-	-	-	0.08	0.08	0.08	0.08	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	237	219	167	116	-	-	-	221	194	151	116	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.25	0.25	0.25	0.25	-	-	-	0.25	0.25	0.25	0.25	-	-	-	-	-	-	-	-	-	-	-
2003	v_{c1}	-	-	-	250	279	240	179	277	257	227	207	-	-	-	-	100	90	65	99	119	99	99
	f_{z1}	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	-	-	-	210	253	200	153	226	206	176	156	-	-	-	-	80	70	55	73	93	73	73
	f_{z2}	-	-	-	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	-	-	-	-	0.15	0.15	0.15	0.25	0.25	0.25	0.25
5020	v_{c1}	351	316	241	147	213	195	139	257	238	209	182	1050	650	480	600	70	60	50	40	45	40	35
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	217	199	147	96	164	155	113	206	179	136	101	890	410	380	480	50	40	40	30	35	30	25
	f_{z2}	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
5040	v_{c1}	301	268	197	109	172	154	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.08	0.08	0.08	0.08	0.08	0.08	0.08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	187	169	117	66	130	105	90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.25	0.25	0.25	0.25	0.25	0.25	0.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5050	v_{c1}	248	219	153	89	130	85	72	-	-	-	-	-	-	-	-	50	40	32	-	-	-	-
	f_{z1}	0.08	0.08	0.08	0.08	0.08	0.08	0.08	-	-	-	-	-	-	-	-	0.08	0.08	0.08	-	-	-	-
	v_{c2}	186	163	107	55	99	69	61	-	-	-	-	-	-	-	-	34	24	25	-	-	-	-
	f_{z2}	0.25	0.25	0.25	0.25	0.25	0.25	0.25	-	-	-	-	-	-	-	-	0.25	0.25	0.15	-	-	-	-
8030	v_{c1}	-	-	-	-	174	141	106	-	-	-	-	-	-	-	-	62	52	42	-	-	-	-
	f_{z1}	-	-	-	-	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	-	-	-	-	131	112	87	-	-	-	-	-	-	-	-	42	32	31	-	-	-	-
	f_{z2}	-	-	-	-	0.25	0.25	0.25	-	-	-	-	-	-	-	-	0.25	0.25	0.15	-	-	-	-
5135	v_{c1}	263	238	163	94	142	116	84	-	-	-	-	-	-	-	-	55	45	37	-	-	-	-
	f_{z1}	0.08	0.08	0.08	0.08	0.08	0.08	0.08	-	-	-	-	-	-	-	-	0.08	0.08	0.08	-	-	-	-
	v_{c2}	189	170	117	66	100	60	70	-	-	-	-	-	-	-	-	39	29	30	-	-	-	-
	f_{z2}	0.25	0.25	0.25	0.25	0.25	0.25	0.25	-	-	-	-	-	-	-	-	0.25	0.25	0.15	-	-	-	-
KX2	v_{c1}	-	-	-	-	-	-	-	-	-	-	-	925	530	505	480	48	43	38	-	-	-	-
	f_{z1}	-	-	-	-	-	-	-	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-
	v_{c2}	-	-	-	-	-	-	-	-	-	-	-	865	490	445	480	46	41	36	-	-	-	-
	f_{z2}	-	-	-	-	-	-	-	-	-	-	-	0.09	0.09	0.09	0.09	0.09	0.09	0.09	-	-	-	-
N	v_{c1}	-	-	-	-	-	-	-	142	117	89	80	900	500	475	510	45	39	34	-	-	-	-
	f_{z1}	-	-	-	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-
	v_{c2}	-	-	-	-	-	-	-	126	103	79	73	820	460	415	470	43	37	32	-	-	-	-
	f_{z2}	-	-	-	-	-	-	-	0.12	0.12	0.12	0.12	0.09	0.09	0.09	0.09	0.09	0.09	0.09	-	-	-	-

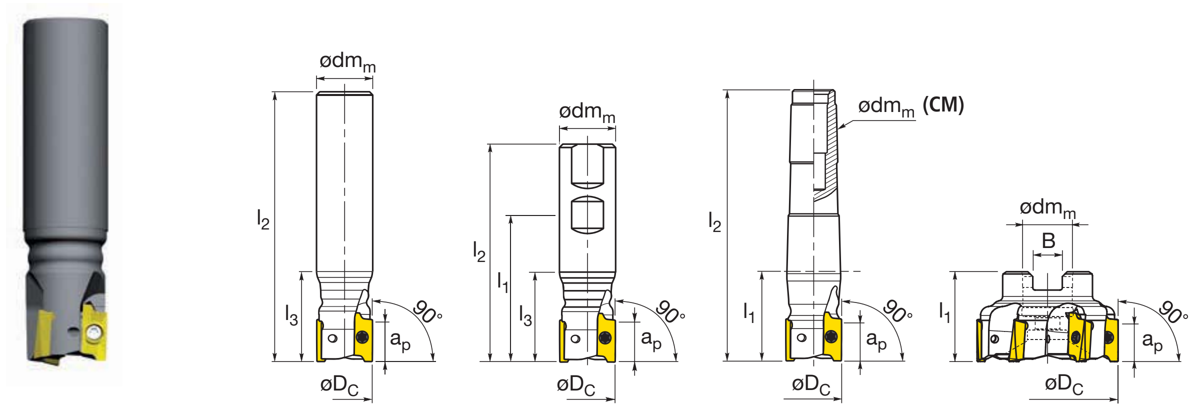
The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

MILLING

ORBI-SAF

Shoulder milling cutter with positive rectangular inserts

Cutter program, RT 16



Cylindrical shank | Weldon shank | Morse taper | Arbor mounting

Reference	Dimensions (mm)										Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg
	D_c	D_3	Max. a_p	dm_m	d_{th}	l_1	l_2	l_3	B	F						
Short cylindrical shank																
RT16 025 02 QCC25 120 RM	25.00	-	17.50	25.00	-	-	120.00	40.00	-	-	2	RT 16 06..	2	Yes	27000	0.345
RT16 032 02 QCC25 120 RM	32.00	-	17.50	25.00	-	-	120.00	50.00	-	-	2	RT 16 06..	2	Yes	23000	0.420
RT16 032 03 QCC32 130 RM	32.00	-	17.50	32.00	-	-	130.00	50.00	-	-	3	RT 16 06..	3	Yes	23000	0.623
RT16 040 03 QCC25 120 RM	40.00	-	17.50	25.00	-	-	120.00	50.00	-	-	3	RT 16 06..	3	Yes	20000	0.710
RT16 040 04 QCC32 130 RM	40.00	-	17.50	32.00	-	-	130.00	50.00	-	-	4	RT 16 06..	4	Yes	20000	0.735
Long cylindrical shank																
RT16 025 02 QC25 250 RM	25.00	-	17.50	25.00	-	-	250.00	40.00	-	-	2	RT 16 06..	2	No	7900	0.879
RT16 032 03 QC32 250 RM	32.00	-	17.50	32.00	-	-	250.00	50.00	-	-	3	RT 16 06..	3	No	6700	1.437
RT16 040 04 QC32 250 RM	40.00	-	17.50	32.00	-	-	250.00	50.00	-	-	4	RT 16 06..	4	No	5800	1.527
Weldon shank																
RT16 025 02 QWC25 040 RM	25.00	-	17.50	25.00	-	65.50	97.00	40.00	-	-	2	RT 16 06..	2	Yes	27000	0.287
RT16 032 03 QWC32 050 RM	32.00	-	17.50	32.00	-	75.50	111.00	50.00	-	-	3	RT 16 06..	3	Yes	23000	0.510
RT16 040 04 QWC32 050 RM	40.00	-	17.50	32.00	-	75.50	111.00	50.00	-	-	4	RT 16 06..	4	Yes	20000	0.602
Morse taper																
RT16 025 02 CMC3 040 RM	25.00	-	17.50	CM3	-	40.00	120.70	-	-	-	2	RT 16 06..	2	No	27000	0.248
RT16 032 03 CMC3 050 RM	32.00	-	17.50	CM3	-	50.00	130.70	-	-	-	3	RT 16 06..	3	No	23000	0.318
RT16 040 04 CMC3 050 RM	40.00	-	17.50	CM3	-	50.00	130.70	-	-	-	4	RT 16 06..	4	No	20000	0.398
Arbor Mounting																
RT16 040 04 AL16 040 RM	40.00	-	17.50	16.00	-	40.00	-	-	8.40	-	4	RT 16 06..	4	No [1]	20000	0.151
RT16 050 05 AL22 040 RM	50.00	-	17.50	22.00	-	40.00	-	-	10.40	-	5	RT 16 06..	5	No [1]	16000	0.239
RT16 063 06 AL22 040 RM	63.00	-	17.50	22.00	-	40.00	-	-	10.40	-	6	RT 16 06..	6	No [1]	14000	0.356
RT16 080 07 AL27 050 RM	80.00	-	17.50	27.00	-	50.00	-	-	12.40	-	7	RT 16 06..	7	No [1]	13000	0.776
RT16 100 08 AL32 050 RM	100.00	-	17.50	32.00	-	50.00	-	-	14.40	-	8	RT 16 06..	8	No [1]	11000	1.220
RT16 125 09 AL40 063 RM	125.00	-	17.50	40.00	-	63.00	-	-	16.40	-	9	RT 16 06..	9	No [1]	10000	2.381
RT16 160 10 AL40 063 RM	160.00	-	17.50	40.00	-	63.00	-	-	16.40	66.70	10	RT 16 06..	10	No	9000	4.681

[1] Optional coolant screw can be ordered separately

Spare parts

Insert style	Diameter D_c	Insert screw			Screw driver		Torque wrench		
		Reference	Size		Reference		Reference		Nm
RT 16 06..	25 - 160 mm	5513 020-02	M 4.0	3.0 N.m	DMP 3125	15 IP	TDX 215PLUS	15 IP	3.0

Optional spare parts

Insert style	Diameter D_c	Coolant screw
		Reference
RT 16 06..	40 mm	DVZ 3944
RT 16 06..	50 mm	DVZ 3523
RT 16 06..	63 mm	DVZ 3523
RT 16 06..	80 mm	DVZ 3535
RT 16 06..	100 mm	DVZ 3536
RT 16 06..	125 mm	DVZ 3537
RT 16 06..	160 mm	-

MILLING

ORBI-SAF

Shoulder milling cutter with positive rectangular inserts

Insert program

RT 16 06... R-11

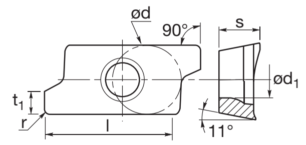
RT 16 06... R-41

RT 16 06... R-81

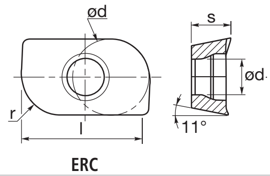
RT 16 06... ER-31

RT 16 06... ERC-31

Inserts for general machining



Inserts with radius



ERC

Reference	d	s	d_1	l	r	b_s	t_1	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX05	KX20	KX2	N
	Dimensions (mm)							Grades													
Inserts for general machining																					
RT 16 06 04 ER-41	9.30	6.40	4.7	18.00	0.4	-	-	-	-	-	✓	-	✓	-	✓	✓	-	-	-	-	-
RT 16 06 08 ER-11	9.30	6.42	4.7	18.00	0.8	-	3.30	-	-	-	✓	-	✓	-	-	-	-	-	-	-	✓
RT 16 06 08 ER-41	9.30	6.40	4.7	18.00	0.8	-	-	-	✓	-	✓	-	✓	-	✓	✓	-	-	-	-	-
RT 16 06 08 ER-81	9.30	6.40	4.7	18.00	0.8	-	2.90	-	✓	-	✓	-	✓	✓	✓	-	✓	-	-	-	-
RT 16 06 08 SR-81	9.30	6.40	4.7	18.00	0.8	-	2.90	-	-	-	-	-	✓	✓	✓	-	✓	-	-	-	-
RT 16 06 12 ER-41	9.30	6.40	4.7	18.00	1.2	-	-	-	-	-	✓	-	✓	-	✓	✓	-	-	-	-	-
RT 16 06 16 ER-81	9.30	6.40	4.7	18.00	1.6	-	3.00	-	-	-	-	-	-	✓	✓	-	-	-	-	-	-
Inserts with radius																					
RT 16 06 04 ER-31	9.30	6.48	4.7	18.00	0.4	-	3.00	-	-	-	✓	-	✓	-	-	-	-	-	-	-	-
RT 16 06 08 ER-31	9.30	6.44	4.7	18.00	0.8	-	3.00	-	-	-	✓	-	✓	-	-	-	-	-	-	-	-
RT 16 06 12 ER-31	9.30	6.40	4.7	18.00	1.2	-	3.00	-	-	-	✓	-	✓	-	-	-	-	-	-	-	-
RT 16 06 16 ER-31	9.30	6.36	4.7	18.00	1.6	-	3.00	-	-	-	✓	-	✓	-	✓	-	-	-	-	-	-
RT 16 06 20 ER-31	9.30	6.35	4.7	18.00	2.0	-	3.30	-	-	-	-	-	✓	-	✓	-	-	-	-	-	-
RT 16 06 24 ER-31	9.30	6.30	4.7	18.00	2.4	-	3.30	-	-	-	-	-	✓	✓	✓	-	-	-	-	-	-
RT 16 06 30 ERC-31 [1)]	9.30	6.10	4.7	15.90	3.0	-	-	-	-	-	-	-	✓	-	✓	-	-	-	-	-	-
RT 16 06 32 ERC-31 [1)]	9.30	6.09	4.7	15.90	3.2	-	-	-	-	-	-	-	✓	-	✓	-	-	-	-	-	-
RT 16 06 40 ERC-31 [1)]	9.30	6.03	4.7	15.80	4.0	-	-	-	-	-	-	-	✓	-	✓	-	-	-	-	-	-
RT 16 06 48 ERC-31 [1)]	9.30	5.97	4.7	15.70	4.8	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-
RT 16 06 50 ERC-31 [1)]	9.30	5.96	4.7	15.70	5.0	-	-	-	-	-	-	-	✓	-	✓	-	-	-	-	-	-
RT 16 06 60 ERC-31 [1)]	9.30	5.89	4.7	15.60	6.0	-	-	-	-	-	-	-	✓	-	✓	-	-	-	-	-	-
RT 16 06 64 ERC-31 [1)]	9.30	5.86	4.7	15.60	6.4	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-

[1)] Cutter bodies will need to be modified

✓Article which can be ordered

Ordering example: RT 16 06 08 ER-81 5020

Cutting conditions

Grade	Feed per tooth (mm)	P Steel: Free machining and low carbon (120-170 HB)	P Steel: Medium and high carbon (180-220 HB)	P Steel: Alloy and easy to machine tool steels (200-240 HB)	P Steel: Tool and die steels (220-260 HB)	M Stainless steel: Ferritic and martensitic (180-240 HB)	M Stainless steel: Austenitic (140-180 HB)	M Stainless steel: Ph and duplex (220-260 HB)	K Cast iron: Gray cast iron (180-220 HB)	K Cast iron: Gray cast iron (220-260 HB)	K Cast iron: Ductile iron (180-220 HB)	K Cast iron: Ductile iron (220-260 HB)	N Non-ferrous aluminum: Aluminum < 7% Si (<100 HB)	N Non-ferrous aluminum: Aluminum 7% - 12% Si (<100 HB)	N Non-ferrous aluminum: Aluminum > 12% Si (<130 HB)	N Non-ferrous aluminum: Non-ferrous (<100 HB)	S Super alloys: Iron based alloys (200-300 HB)	S Super alloys: Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	S Super alloys: Titanium alloys 6AL-V4 (110-450 HB)	H Hardened materials: Case hardened carbon steels (50Rc - 62Rc)	H Hardened materials: Case hardened alloy steels (40Rc - 50Rc)	H Hardened materials: Hardened tools steels (45Rc - 62Rc)	H Hardened materials: Hardened irons (400 BHN)
1120	v_{c1}	371	336	261	167	-	-	-	272	253	224	197	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	-	-	-	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	204	189	144	103	-	-	-	208	180	133	95	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.30	0.30	0.30	0.30	-	-	-	0.30	0.30	0.30	0.30	-	-	-	-	-	-	-	-	-	-	-
2003	v_{c1}	-	-	-	250	279	240	179	277	257	227	207	-	-	-	-	100	90	65	99	119	99	99
	f_{z1}	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	-	-	-	200	246	190	146	213	193	163	143	-	-	-	-	70	60	50	66	86	66	66
	f_{z2}	-	-	-	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	-	-	-	-	0.20	0.20	0.20	0.30	0.30	0.30	0.30
5020	v_{c1}	351	316	241	147	213	195	139	257	238	209	182	1050	650	480	600	70	60	50	40	45	40	35
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	184	169	124	83	152	145	106	193	165	118	80	810	290	330	420	40	30	35	25	30	25	20
	f_{z2}	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
5040	v_{c1}	321	286	211	117	190	175	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	154	139	94	53	100	70	80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.30	0.30	0.30	0.30	0.20	0.20	0.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5050	v_{c1}	259	229	161	95	136	88	74	-	-	-	-	-	-	-	-	53	43	35	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	168	146	94	45	89	65	58	-	-	-	-	-	-	-	-	30	20	20	-	-	-	-
	f_{z2}	0.30	0.30	0.30	0.30	0.30	0.30	0.30	-	-	-	-	-	-	-	-	0.30	0.30	0.20	-	-	-	-
8030	v_{c1}	-	-	-	-	174	141	106	-	-	-	-	-	-	-	-	62	52	42	-	-	-	-
	f_{z1}	-	-	-	-	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	-	-	-	-	131	112	87	-	-	-	-	-	-	-	-	42	32	31	-	-	-	-
	f_{z2}	-	-	-	-	0.30	0.30	0.30	-	-	-	-	-	-	-	-	0.30	0.30	0.20	-	-	-	-
5135	v_{c1}	277	250	171	99	160	140	90	-	-	-	-	-	-	-	-	58	48	40	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	163	150	104	58	70	20	60	-	-	-	-	-	-	-	-	35	25	25	-	-	-	-
	f_{z2}	0.30	0.30	0.30	0.30	0.20	0.20	0.20	-	-	-	-	-	-	-	-	0.30	0.30	0.20	-	-	-	-
N	v_{c1}	-	-	-	-	-	-	-	142	117	89	80	900	500	475	510	45	39	34	-	-	-	-
	f_{z1}	-	-	-	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-
	v_{c2}	-	-	-	-	-	-	-	86	67	52	55	600	350	250	360	37	30	28	-	-	-	-
	f_{z2}	-	-	-	-	-	-	-	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20	0.20	0.20	-	-	-	-

The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

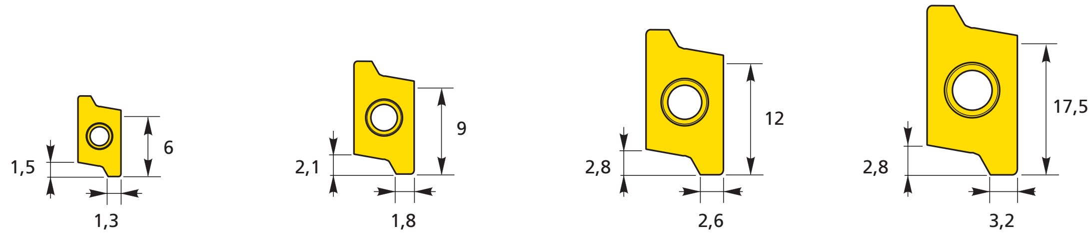
MILLING

ORBI-SAF

Milling cutter characteristics

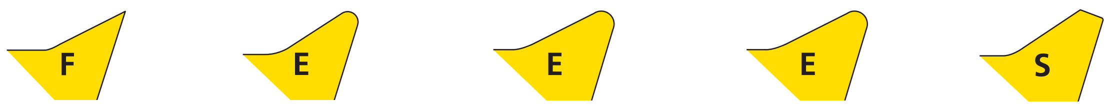
Insert dimensions

RT 07	RT 10	RT 13	RT 16 06



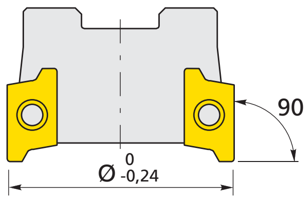
Edge condition

11		31	81	
... **R-11** uncoated	... **R-11** coated	... **R-31**	... **ER-81**	... **R-81**
... **FR-11**	... **ER-11**	... **ER-31**		... **SR-81**
		.... **ERC-31**		
		... **RC-31**		

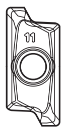
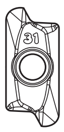
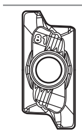


Cutter tolerance

The ORBI-SAF cutters have been designed to obtain cutting diameters with finish inserts fitted, not exceeding the cutter nominal value.
E.g. : On a cutter of 20 mm in diameter, ref. RT-10/020-03... the maximum diameter will be 20.00 mm.



Radius program

Geometry			02	04	08	10	12	16	20	24	30	32	40	48	50	60	64
	11	RT 07	●	●	●												
		RT 10		●													
		RT 13			●												
		RT 16			●												
	R-31	RT 10	●	●	●	●	●										
		RT 13		●	●	●	●	●	●								
		RT 16		●	●		●	●	●	●							
	RC-31	RT 10						●	●	●	●	●					
		RT 13								●	●	●					
	ERC-31	RT 16									●	●	●	●	●	●	●
	81	RT 07		●													
		RT 10		●	●												
		RT 13			●												
		RT 16			●			●									

● With modification of the cutter body. Can be used in 2D machining, X and Y axis.

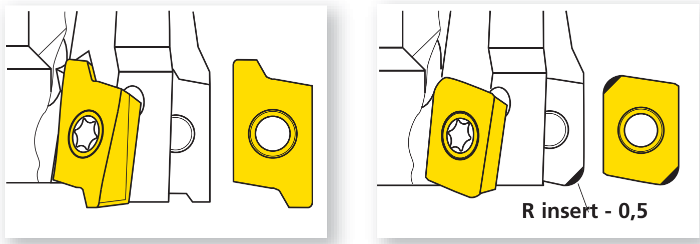
ORBI-SAF

Milling cutter characteristics

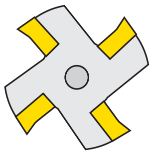
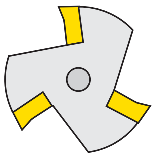
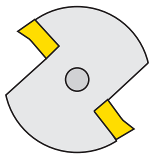
Modification of cutter body

The cutter body must be modified in the following cases :
- Use of ERC-31 type inserts, "short" inserts.
- Use of AP - - 16 04 - - type inserts.

Cutter modification



Application depending on the number of teeth

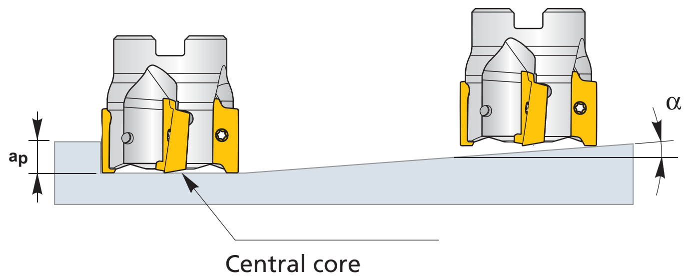
Close pitch	Normal pitch	Large pitch
 - Shoulder - Short chips - Interrupted cutting - High output	 - General machining - Machine stable	 - Slotting - Solid material - High overhang - Long chips - Light machine - Machining of aluminium

Chip evacuation

When machining in cylindrical, helical or linear interpolation, provide efficient coolant pressure to flush out the chips and prevent their recycling by the cutter.

Oblique dip or "ramping"

The cutter must plunge with a penetration angle determined by a feed ratio in the X-Y plane and a descent along the Z axis.
In this configuration, the insert works with the main edge on the outside of the cutter and the secondary edge on the inside where a material "core" builds up.
The infeed angle remains constant for a given cutter diameter. Once the diameter is taken into account, the angle will no longer change.
This does not apply to the maximum cutting height "a_p", but it is important not to exceed this value while machining.

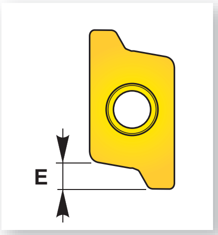


	ap	α max.														
	max.	Ø10	Ø12	Ø14	Ø16	Ø18	Ø20	Ø25	Ø32	Ø40	Ø50	Ø63	Ø80	Ø100	Ø125	Ø160
RT07	4	13°.2	9°.8	7°.8	6°.5	5°.5	4°.8	-	-	-	-	-	-	-	-	-
RT10 r=0,2-1,2	7	-	-	-	11°.7	-	8°.3	6°.1	4°.4	3°.4	2°.6	-	-	-	-	-
RT10 r>1,2		No ramping														
RT13	10	-	-	-	-	-	12°.3	8°.8	6°.2	4°.7	3°.6	2°.7	2°.1	-	-	-
RT16	17,5	-	-	-	-	-	-	12°	8°	5°	4°	3°	2°	1,5°	1°	1°

ORBI-SAF

Milling cutter characteristics

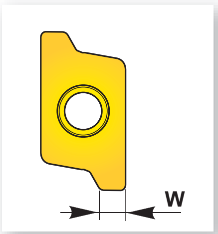
Maximum axial infeed



If it is impossible to start machining in ramping,
a direct plunge can be made along the "Z" axis only.
In this case, the feed must be broken down into stages and the infeed into the material must not exceed the values shown in the table below.
The purpose of breaking down into stages is to limit chip length.
A stop of 0.5 s every 0.3 - 0.5 mm of plunge must be provided.

	RT 07	RT 10	RT 13	RT 16
E	1.5	2.1	2.8	2.8

Drilling in helical interpolation into solid material

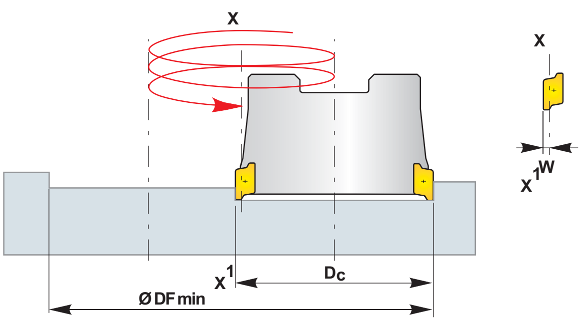


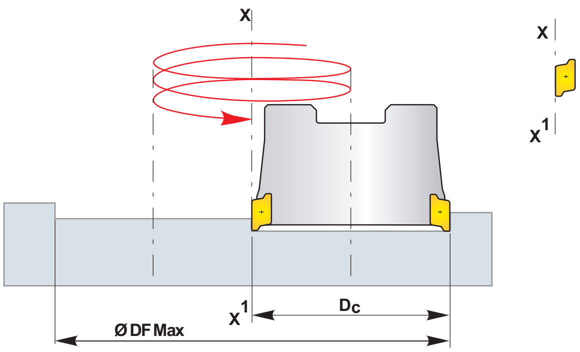
The value of "W" must be known since it is used to determine the drilling diameter.
This value is specific to each insert (see table below)

	RT 07	RT 10	RT 13	RT 16
W	1.3	1.8	2.6	3.2

Determining the minimum and maximum drilling diameters in helical interpolation.

In solid material





Minimum drilling diameter.
DF min = (D_C - W) x 2
D_C = Cutting diameter
W = Maximum insert infeed
Example :
D_C = 25 mm , W = 3.2 mm
DF min = (25 - 3.2) x 2 = 43.6 mm

Maximum drilling diameter.
DF Max = (D_C - r) x 2
D_C = Cutting diameter
r = Insert radius
Example :
D_C = 25 mm , r = 0.8 mm
DF Max = (25 - 0.8) x 2 = 48.4 mm

ORBI-SAF

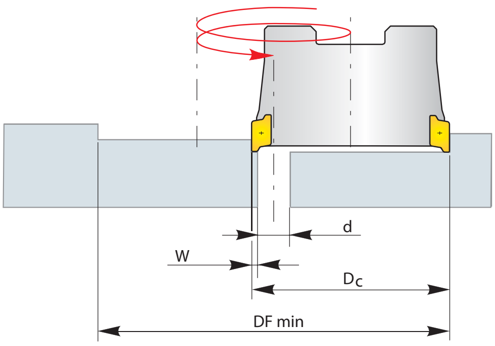
Milling cutter characteristics

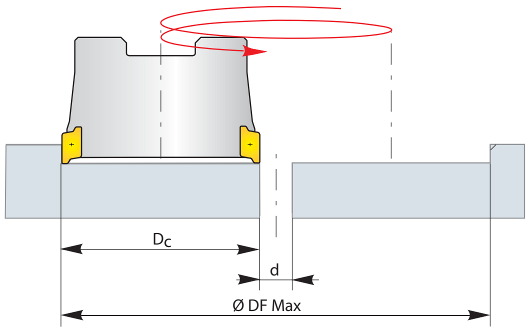
Examples

Conical helical interpolation	
Material	INOX316L
Hardness HB / MPa	190 / 650
Cutter	RT-10/020-03-QCC20-110-R
Insert	RT 10 03 04 R-81
Grade	KR 5020
Slope angle	3°
Cutter Ø (mm)	20
a_p (mm)	2
a_e (mm)	20
v_c (m/min)	130
f_z(mm)	0.05
n (rev/min)	1650
v_f (mm/min)	495

Helical Interpolation	
Material	35NCD16
Hardness HB / MPa	200 / 800
Cutter	RT-13/025-03-QCC25-120-R
Insert	RT 13 04 08 R-81
Grade	KR 5020
Slope angle	8°
Cutter Ø (mm) :	25
a_p (mm)	9
a_e (mm)	22.5
v_c (m/min)	130
f_z(mm)	0.05
n (rev/min)	1650
v_f (mm/min)	250

With existing hole



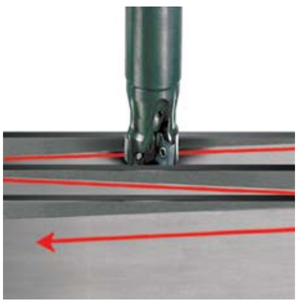


Minimum drilling diameter.
DF min = (Dc - (d/2 + W)) x 2
Dc = Cutting diameter
d = Hole diameter
W = Maximum insert infeed
Example :
Dc = 25 mm , d = 10 mm , W = 3.2 mm
DF min = (25 - (10/2 + 3.2)) x 2 = 33.6 mm

Maximum drilling diameter.
DF Max = (Dc x 2) + d
Dc = Cutting diameter
d = Hole diameter
Example :
Dc = 25 mm , d = 10 mm
DF Max = (25 x 2) + 10 = 60 mm

In helical interpolation, the helix angle is equal to the ramping angle α°.

Examples



Linear slotting (ramping)	
Material	35NCD16
Hardness HB / MPa	200 / 800
Cutter	RT-10/020-03-QCC20-110-R
Insert	RT 10 03 04 R-81
Grade	KR 5020
Slope angle	3°
Cutter Ø (mm)	20
a_p (mm)	8
a_e (mm)	20
v_c (m/min)	141
f_z(mm)	0.15
n (rev/min)	2250
v_f (mm/min)	2012

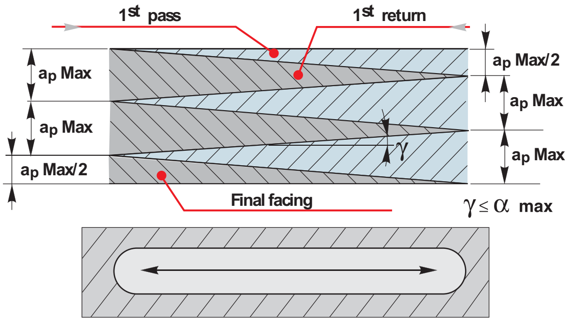
Slotting	
Material	Inox 304 L
Hardness HB / MPa	190 / 650
Cutter	RT-07/014-02-QCC12-075-R
Insert	RT 07 02 04 R-81
Grade	KR 5020
Cutter Ø (mm)	14
a_p (mm)	3
a_e (mm)	14
v_c (m/min)	90
f_z(mm)	0.04
n (rev/min)	2045
v_f (mm/min)	164

ORBI-SAF

Milling cutter characteristics

Linear slotting

During the first feed, the milling cutter descends aiming at an end point located at "ap Max" divided by 2 at the slot end.
The return feed will follow a symmetrical path to a point located under the starting point at a "ap Max" distance.
This operation will be repeated several times depending on the depth of the slot.

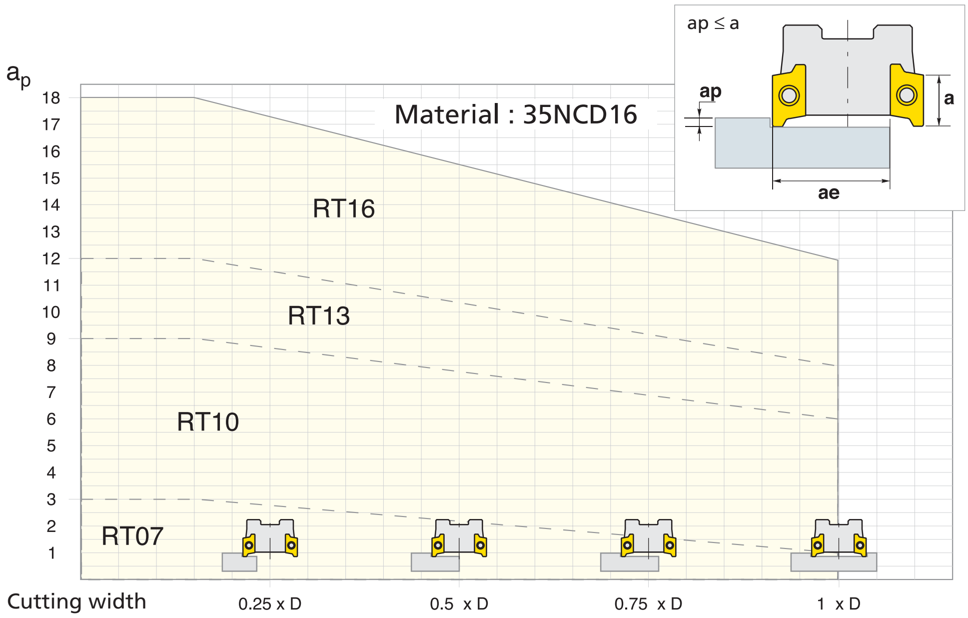


Examples

Deep end milling	
Material	TITANIUM TA6V
Hardness HB / MPa	235 / 800
Cutter	RT-10/020-03-QCC20-110-R
Insert	RT 10 03 04 R-81
Grade	KR 5020
Slope angle	3°
Cutter Ø (mm)	20
a_p (mm)	3.5
a_e (mm)	20
v_c (m/min)	41
f_z(mm)	0.10
n (rev/min)	660
v_f (mm/min)	198

Deep end milling & helical interpolation	
Material	INCONEL 718
Hardness HB / MPa	300 / 900
Cutter	RT-10/020-03-QCC20-110-R
Insert	RT 10 03 04 R-81
Grade	KR 5020
Slope angle	3°
Cutter Ø (mm)	20
a_p (mm)	3.5
a_e (mm)	20
v_c (m/min)	22
f_z(mm)	0.10
n (rev/min)	355
v_f (mm/min)	106

ORBI-SAF diagram



f_z :

RT 07 :	0.06 →	0.03
RT 10 :	0.10 →	0.05
RT 13 :	0.20 →	0.08
RT 16 :	0.30 →	0.1

MILLING

ORBI-SAF
Milling cutter characteristics

Feed (f_z) correction factor table

Feed (f_z) correction factor in relation to cutter diameter D_c and infeed a_e.								
a_e	D_c							
	25	32	40	50	80	100	125	160
0.80	3.00	3.35	3.66	4.22	5.16	5.95	6.64	7.28
1.50	2.11	2.34	2.56	2.94	3.58	4.13	4.61	5.05
2.50	1.73	1.92	2.09	2.39	2.91	3.34	3.73	4.08
3.00	1.52	1.68	1.82	2.08	2.52	2.90	3.23	3.53
5.00	1.28	1.40	1.52	1.72	2.07	2.38	2.64	2.89
6.00	1.16	1.25	1.35	1.52	1.82	2.07	2.30	2.51
10.00	1.03	1.09	1.16	1.28	1.52	1.72	1.90	2.07
12.50	1.00	1.02	1.06	1.16	1.34	1.51	1.67	1.81
16.00	0.95	1.00	1.01	1.08	1.23	1.38	1.51	1.64
20.00	0.80	0.95	1.00	1.03	1.16	1.28	1.40	1.51
25.00	0.50	0.80	0.95	1.00	1.06	1.16	1.25	1.34
32.00	-	0.50	0.80	0.95	1.01	1.08	1.16	1.23
40.00	-	-	0.50	0.80	1.00	1.03	1.09	1.16
45.00	-	-	-	0.70	0.90	1.01	1.05	1.10
50.00	-	-	-	0.50	0.86	1.00	1.02	1.06
60.00	-	-	-	-	0.77	0.98	1.01	1.03
65.00	-	-	-	-	0.72	0.95	1.00	1.01
70.00	-	-	-	-	0.65	0.88	1.00	1.00
80.00	-	-	-	-	0.50	0.75	0.95	1.00
100.00	-	-	-	-	-	0.50	0.75	0.95
125.00	-	-	-	-	-	-	0.50	0.75
160.00	-	-	-	-	-	-	-	0.50

Example : With a cutter of D_c = 32 mm, infeed a_e = 2.50 mm and nominal feed f_z = 0.13 mm,
corrected f_z becomes f_z x coefficient = 0.13 x 1.92 = 0.25 mm/tooth.

MILLING

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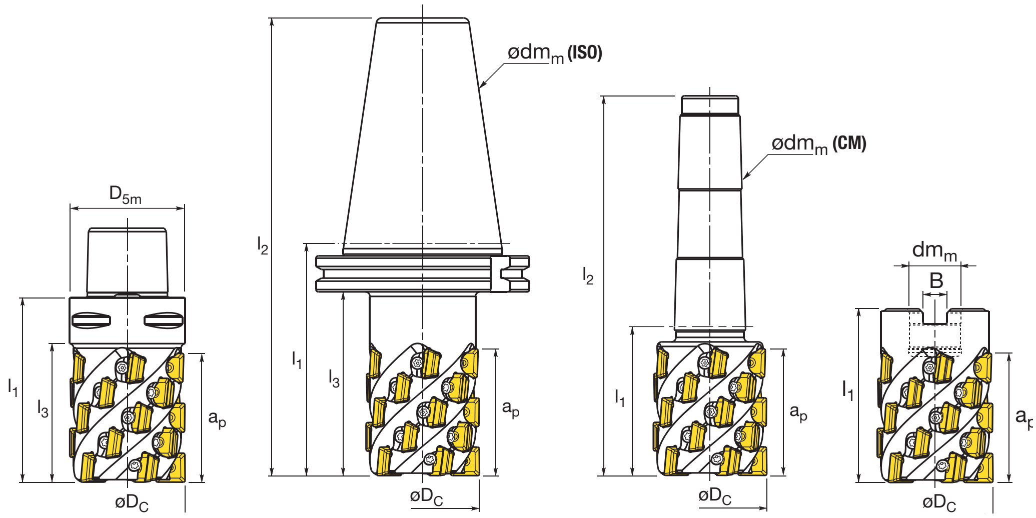
Contouring milling cutter with positive square inserts with SideLok™ technology

Cutter program, AL12



SAF-Capto   ISO 7:24   Morse taper   Arbor

Reference	Dimensions (mm)							Z	Nb of inserts	Insert style	Coolant channels	Max. RPM	kg
	D_c	Max. a_p	dm_m D_{5m}	l_1	l_2	l_3	B						
SAF-Capto													
AL12 040R04 SC5A044	40.00	44.1	C5	80	-	59	-	4	16	SD.X 1205..	Yes [1]	4000	0.713
AL12 050R05 SC5A055	50.00	54.9	C5	80	-	59	-	5	25	SD.X 1205..	Yes [1]	3200	0.900
AL12 063R06 SC6A066	63.00	65.7	C6	95	-	72	-	6	36	SD.X 1205..	Yes [1]	2500	1.862
ISO 7:24													
AL12 040R04 IS4A044	40.00	44.1	ISO40	90	158.4	70	-	4	16	SD.X 1205..	Yes [1]	4000	1.172
AL12 050R05 IS5A055	50.00	54.9	ISO50	100	201.7	80	-	5	25	SD.X 1205..	Yes [1]	3200	3.349
AL12 063R06 IS5A066	63.00	65.7	ISO50	110	211.7	90	-	6	36	SD.X 1205..	Yes [1]	2500	4.096
AL12 080R08 IS5A088	80.00	87.3	ISO50	130	231.9	110	-	8	64	SD.X 1205..	Yes [1]	2000	5.492
Morse taper													
AL12 050R05 MK4A055	50.00	54.9	CM4	65	167.5	-	-	5	25	SD.X 1205..	Yes [1]	3200	0.897
Arbor													
AL12 050R05 A22X055	50.00	54.9	22	78	-	-	10.40	5	25	SD.X 1205..	No	3200	0.615
AL12 063R06 A27X066	63.00	65.7	27	90	-	-	12.40	6	36	SD.X 1205..	No	2500	1.300
AL12 080R08 A40X088	80.00	87.3	40	115	-	-	16.40	8	64	SD.X 1205..	No	2000	2.707

[1] Non drilled screws DVF3992 can be used to limit the coolant volume or locate the coolant flow in the part of the cutter (to be oredered seperately)

Spare parts

Insert style	Diameter D_c	Insert screw			Screw driver		Torque wrench		
		Reference	Size	Torque	Reference	Torx	Reference	Torx	Nm
SD.X 1205..	40 - 80 mm	DVF4506 (Drilled)	M 3.5	3 N.m	TX215PLUS	15 IP	TDX 215PLUS	15 IP	3.0
SD.X 1205..	40 - 80 mm	DVF3992 (Non drilled)	M 3.5	3 N.m	TX215PLUS	15 IP	TDX 215PLUS	15 IP	3.0

Cutter	Diameter D_c	Mounting screw		
		Reference	Torque	Hex
AL12 050R05 A22X055	50 mm	ISO4762-M10X70	65 N.m	8
AL12 063R06 A27X066	63 mm	ISO4762-M12X80	110 N.m	10
AL12 080R08 A40X088	80	ISO4762-M20X100	530 N.m	17

Nota: It is strongly recommended to change the insert screws every 50 clamping opérations

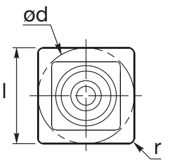
AEROLONG

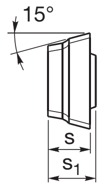
Contouring milling cutter with positive square inserts with SideLok™ technology

Insert program

SDGX... EN-41

SDMX... EN-51



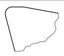
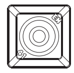
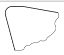
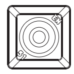


Reference	Dimensions (mm)					Grades													
	d	s	s_1	l	r	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX05	KX20	KX2	N
SDGX 120508 EN-41	12.7	5.56	6.35	12.7	0.8	-	-	-	-	-	✓	-	✓	✓	-	-	-	-	-
SDMX 120508 EN-51	12.7	5.56	6.35	12.7	0.8	-	-	-	-	-	✓	-	✓	✓	-	-	-	-	-

✓Article which can be ordered

Ordering example: SDGX 120508 EN-41 5020

Top form geometry

Top form geometry	Application	Max chip thickness H max (mm)	P Steel	M Stainless steel	K Cast iron	N Non-ferrous aluminum	S Super alloys	H Hardened materials	Insert
 41	Light roughing & semi-finishing	0.05 - 0.15	5020 **5050**	5020 **5050**	**5020**		5020 **5050**		
 51	Light roughing	0.08 - 0.18	5020 **5050**		**5020**				

Cutting conditions

		P Steels				M Stainless steels			K Cast irons				N Aluminum - Non-ferrous				S Super alloys			H Hardened materials			
Grade	Feed per tooth (mm)	Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
5020	0.07	270	245	185	115	170	155	110	205	190	165	145	-	-	-	-	55	40	50	-	-	-	-
	0.10	255	230	175	110	160	150	105	195	180	155	130	-	-	-	-	50	35	40	-	-	-	-
	0.15	230	205	155	100	150	140	100	185	165	140	115	-	-	-	-	-	-	-	-	-	-	-
5050	0.07	200	180	125	75	110	70	60	-	-	-	-	-	-	-	-	45	30	35	-	-	-	-
	0.10	195	170	120	70	100	65	55	-	-	-	-	-	-	-	-	40	25	30	-	-	-	-
	0.15	180	155	105	60	95	60	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8030	0.07	-	-	-	-	140	112	85	-	-	-	-	-	-	-	-	50	35	42	-	-	-	-
	0.10	-	-	-	-	130	107	80	-	-	-	-	-	-	-	-	45	30	35	-	-	-	-
	0.15	-	-	-	-	122	100	75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

MILLING

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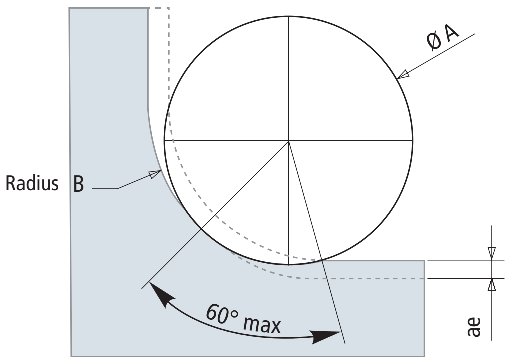
Milling cutter characteristics

Technical recommendations when internal contouring

60° max teeth contact with DOC = 40

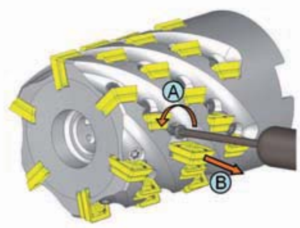


Example		
Ø A	Radius B	ae
63	75	10
63	45	5
63	35	1,5
50	100	10
50	40	5
50	27	1
40	85	8
40	35	5
40	22	1

Cleaning instructions for insert seats

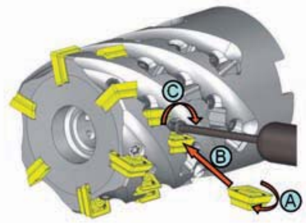
1- Clean (blow) completely the cutter.

2- Remove all the inserts to be changed.



3- Clean carefully all the insert seats

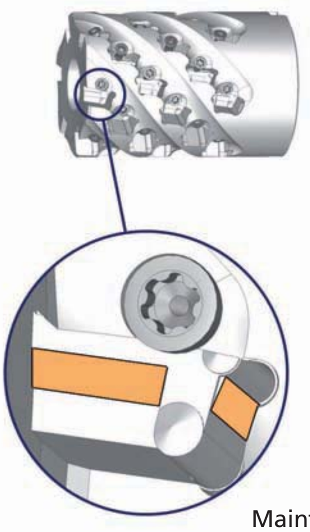
4- Clean and "turn" the inserts then put them back *



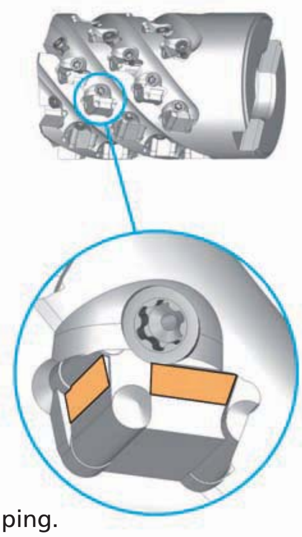
* According to the assembly instructions.

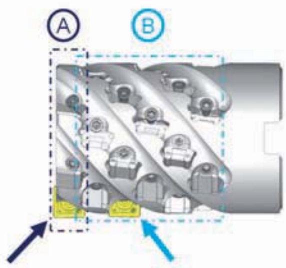
Assembly instructions

Ⓐ First row only



Ⓑ Second and upper rows





Insert maintaining direction

Contact surfaces

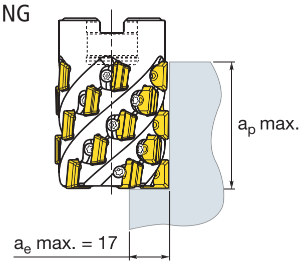
Maintain insert on contact surfaces during clamping.
Use a torque screwdriver set at 3 Nm.

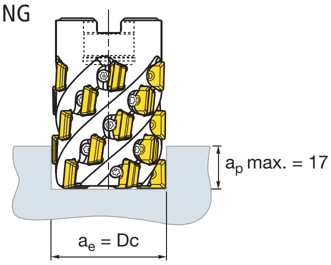
MILLING

AEROLONG

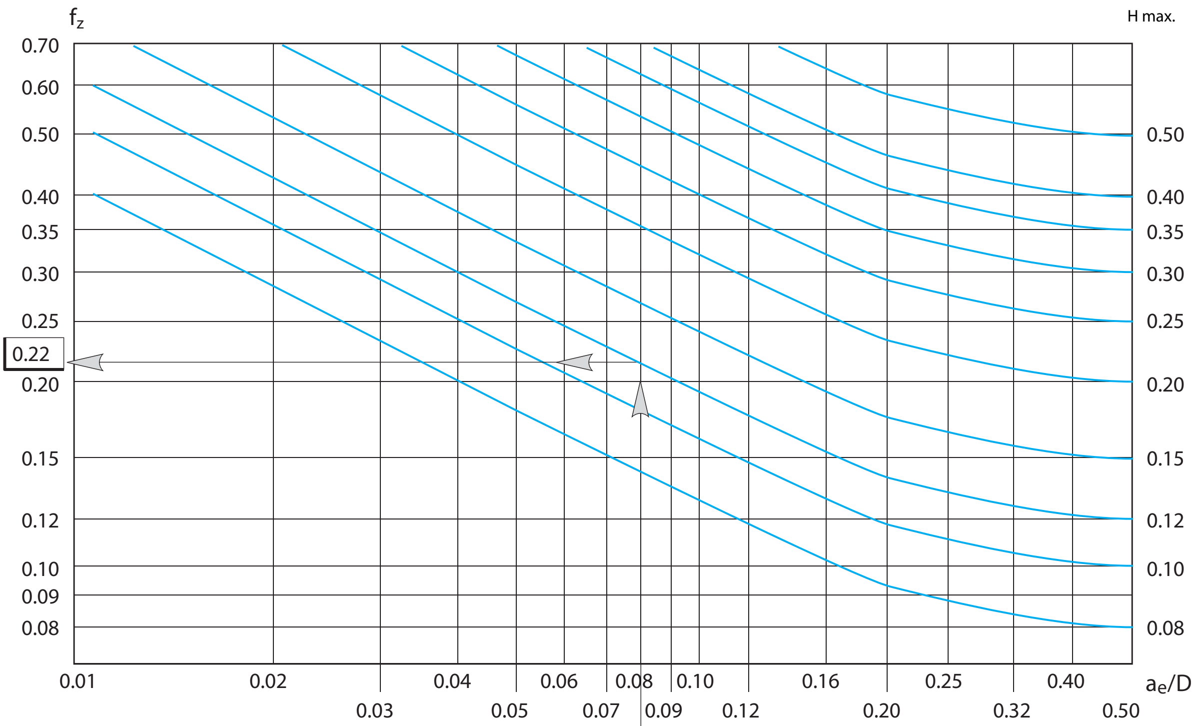
Milling cutter characteristics

Working limits





Feed increace factors (valid for all types of milling cutters)



Example :
Reference = AL12 063R06 ....
Tool Ø = 63 mm
Number of teeth (Z) = 6
a_e = 5 mm
v_c = 130 m/min
f_z = 0.22 mm

a_e /D = 0.08 → Desirable maximum chip thickness: H max = 0.12 mm → Feed per tooth for programming: f_z = 0.22

Revolutions per minute : n = $\frac{1000 \times v_c}{\pi \times D}$ = 656 rev/min → Table feed: $v_f = f_z \times z \times n$ = 866 mm/min

Chip thickness

Maximum chip thicknesss formulas:

$$H\ max = 2\, f_z \sqrt{\frac{a_e}{D}\left(1 - \frac{a_e}{D}\right)} \qquad f_z = \frac{H\ max}{2\sqrt{\frac{a_e}{D}\left(1 - \frac{a_e}{D}\right)}}$$

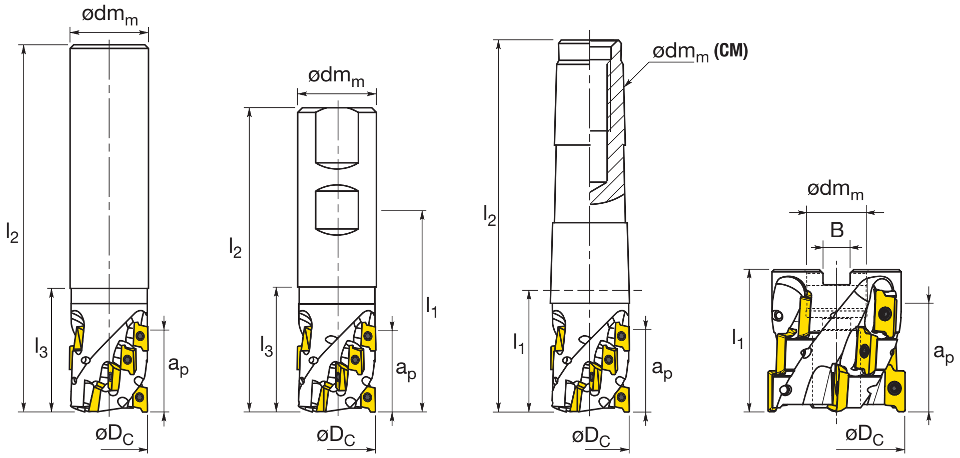
Average chip thickness formulas:

$$h_m = f_z \sqrt{\frac{a_e}{D}} \qquad f_z = \frac{h_m}{\sqrt{\frac{a_e}{D}}}$$

CT-SAF

Contouring milling cutter with positive rectangular inserts

Cutter program, CT 10, CT 13, CT 16



Cylindrical shank | Weldon shank | Morse taper | Arbor mounting

Reference	Dimensions (mm)								Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg
	D_c	D_3	Max. a_p	dm_m	l_1	l_2	l_3	B						
Cylindrical shank														
CT-10/025-02-25-QC25-120	25.00	-	25.00	25.00	-	120.00	40.00	-	2	RT 10 03..	6	No	20000	0.380
CT-10/032-03-34-QC32-130	32.00	-	34.00	32.00	-	130.00	45.00	-	3	RT 10 03..	12	No	15000	0.700
CT-13/032-02-35-QC32-130	32.00	-	35.00	32.00	-	130.00	45.00	-	2	RT 13 04..	6	No	15000	0.700
Weldon shank														
CT-10/020-02-25-QW20-035	20.00	-	25.00	20.00	61.50	86.00	35.00	-	2	RT 10 03..	6	No	25000	0.170
CT-13/025-02-35-QW32-045	25.00	-	35.00	32.00	70.50	106.00	45.00	-	2	RT 13 04..	6	No	20000	0.460
CT-13/032-02-35-QW32-045	32.00	-	35.00	32.00	70.50	106.00	45.00	-	2	RT 13 04..	6	No	15000	0.540
CT-13/040-03-46-QW32-058	40.00	-	46.00	32.00	83.50	120.00	58.00	-	3	RT 13 04..	12	No	8000	0.700
Morse taper														
CT-10/025-02-25-CM3-040	25.00	-	25.00	M3	40.00	121.00	-	-	2	RT 10 03..	6	No	20000	0.270
CT-10/032-03-34-CM4-045	32.00	-	34.00	M4	45.00	147.50	-	-	3	RT 10 03..	12	No	15000	0.600
CT-13/032-02-46-CM4-060	32.00	-	46.00	M4	60.00	162.50	-	-	2	RT 13 04..	8	No	15000	0.640
CT-13/040-03-46-CM4-060	40.00	-	46.00	M4	60.00	162.50	-	-	3	RT 13 04..	12	No	8000	0.760
Arbor mounting														
CT-16/050-04-52-AL22-065	50.00	-	52.00	22.00	65.00	-	-	10.40	4	RT 16 04..	12	No	6300	0.410
CT-16/063-04-52-AL27-065	63.00	-	52.00	27.00	65.00	-	-	10.40	4	RT 16 04..	12	No	5000	0.670

Spare parts

Insert style	Diameter D_c	Insert screw			Screw driver		Torque wrench		
		Reference	Size		Reference		Reference		Nm
RT 10 03..	20 - 32 mm	5513 020-35	M 2.5	1.2 N.m	PT-8006	8 IP	TDX 208PLUS	8 IP	1.2
RT 13 04..	25 - 40 mm	DVF 0943	M 3.0	1.2 N.m	PT-8003	9 IP	TDX 209PLUS	9 IP	1.4
RT 16 04..	50 - 63 mm	416.1-834	M 4.0	3.0 N.m	DMP 3125	15 IP	TDX 215PLUS	15 IP	3.0

MILLING

CT-SAF

Contouring milling cutter with positive rectangular inserts

Insert program

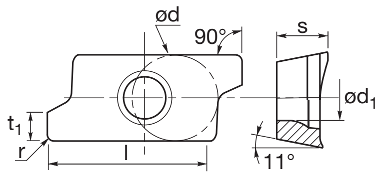
For cutters CT-10 see insert program RT 10 03.. on page 377
For cutters CT-13 see insert program RT 13 04.. on page 379


RT 16 04... R-11


RT 16 04... R-41


RT 16 04... R-81

Inserts for general machining




RT 16 04... R-31

Inserts with radius

Reference	Dimensions (mm)							Grades													
	d	s	d_1	l	r	b_s	t_1	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX05	KX20	KX2	N
Inserts for general machining																					
RT 16 04 08 ER-11	9.52	4.76	4.7	16.00	0.8	-	3.20	-	-	-	-	-	✓	-	-	-	-	-	-	-	-
RT 16 04 08 FR-11	9.52	4.76	4.7	16.00	0.8	-	3.20	-	-	-	-	-	-	-	-	-	-	-	-	-	✓
RT 16 04 08 ER-41	9.52	4.76	4.7	16.00	0.8	-	3.10	-	-	-	-	-	✓	✓	-	-	✓	-	-	-	-
RT 16 04 08 SR-81	9.52	4.76	4.7	16.00	0.8	-	3.10	-	-	-	-	-	✓	✓	-	-	✓	-	-	-	-
Inserts with radius																					
RT 16 04 04 ER-31	9.52	4.76	4.7	16.00	0.4	-	3.20	-	-	-	-	-	✓	-	-	-	-	-	-	-	-
RT 16 04 08 ER-31	9.52	4.76	4.7	16.00	0.8	-	3.20	-	-	-	-	-	✓	-	-	-	-	-	-	-	-
RT 16 04 12 ER-31	9.52	4.76	4.7	16.00	1.2	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-
RT 16 04 16 ER-31	9.52	4.76	4.7	16.00	1.6	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-
RT 16 04 20 ER-31	9.52	4.76	4.7	16.00	2.0	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-
RT 16 04 24 ER-31	9.52	4.76	4.7	16.00	2.4	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-

✓Article which can be ordered

Ordering example: RT 16 04 08 SR-81 5020

Cutting conditions

Grade		P Steel				M Stainless steel			K Cast iron				N Aluminum - Non-ferrous				S Super alloys			H Hardened materials			
		Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
1120	v_{c1}	351	318	247	159	-	-	-	264	244	213	185	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.08	0.08	0.08	0.08	-	-	-	0.08	0.08	0.08	0.08	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	237	219	167	116	-	-	-	221	194	151	116	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.25	0.25	0.25	0.25	-	-	-	0.25	0.25	0.25	0.25	-	-	-	-	-	-	-	-	-	-	-
2003	v_{c1}	-	-	-	254	281	244	181	282	262	232	212	-	-	-	-	104	94	67	101	121	101	101
	f_{z1}	-	-	-	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	-	-	-	-	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	v_{c2}	-	-	-	210	253	200	153	226	206	176	156	-	-	-	-	80	70	55	73	93	73	73
	f_{z2}	-	-	-	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	-	-	-	-	0.15	0.15	0.15	0.25	0.25	0.25	0.25
5020	v_{c1}	318	286	218	134	201	185	132	224	223	191	162	970	530	430	540	60	50	45	35	40	35	30
	f_{z1}	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
	v_{c2}	217	199	147	96	164	155	113	206	179	136	101	890	410	380	480	50	40	40	30	35	30	25
	f_{z2}	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
5040	v_{c1}	288	256	188	104	160	140	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.10	0.10	0.10	0.10	0.10	0.10	0.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	187	169	117	66	130	105	90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.25	0.25	0.25	0.25	0.15	0.15	0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5050	v_{c1}	248	219	153	89	130	85	72	-	-	-	-	-	-	-	-	50	40	32	-	-	-	-
	f_{z1}	0.08	0.08	0.08	0.08	0.08	0.08	0.08	-	-	-	-	-	-	-	-	0.08	0.08	0.08	-	-	-	-
	v_{c2}	186	163	107	55	99	69	61	-	-	-	-	-	-	-	-	34	24	25	-	-	-	-
	f_{z2}	0.25	0.25	0.25	0.25	0.25	0.25	0.25	-	-	-	-	-	-	-	-	0.25	0.25	0.15	-	-	-	-
5135	v_{c1}	254	230	158	91	130	100	80	-	-	-	-	-	-	-	-	53	43	35	-	-	-	-
	f_{z1}	0.10	0.10	0.10	0.10	0.10	0.10	0.10	-	-	-	-	-	-	-	-	0.10	0.10	0.10	-	-	-	-
	v_{c2}	186	170	117	66	100	60	70	-	-	-	-	-	-	-	-	39	29	30	-	-	-	-
	f_{z2}	0.25	0.25	0.25	0.25	0.15	0.15	0.15	-	-	-	-	-	-	-	-	0.25	0.25	0.15	-	-	-	-
KX2	v_{c1}	-	-	-	-	-	-	-	-	-	-	-	880	500	450	510	48	45	40	-	-	-	-
	f_{z1}	-	-	-	-	-	-	-	-	-	-	-	0.10	0.10	0.10	0.10	0.10	0.10	0.10	-	-	-	-
	v_{c2}	-	-	-	-	-	-	-	-	-	-	-	805	450	375	460	46	42	38	-	-	-	-
	f_{z2}	-	-	-	-	-	-	-	-	-	-	-	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-	-	-	-
N	v_{c1}	-	-	-	-	-	-	-	131	107	82	75	800	450	400	460	42	36	32	-	-	-	-
	f_{z1}	-	-	-	-	-	-	-	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	-	-	-	-
	v_{c2}	-	-	-	-	-	-	-	97	77	59	60	700	400	325	410	40	33	30	-	-	-	-
	f_{z2}	-	-	-	-	-	-	-	0.25	0.25	0.25	0.25	0.15	0.15	0.15	0.15	0.15	0.15	0.15	-	-	-	-

The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

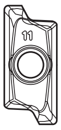
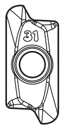
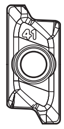
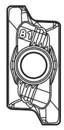
MILLING

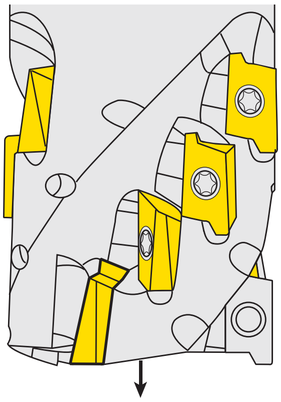
CT-SAF

Milling cutter characteristics

MILLING

Radius program

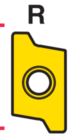
GEOMETRY			08	10	12	16	20	24
	11	RT 13	●					
		RT 16	●					
	31	RT 10	●	●	●			
		RT 13	●	●	●	●	●	
		RT 16	●		●	●	●	●
	41	RT 16	●					
	81	RT 10	●					
		RT 13	●					
		RT 16	●					

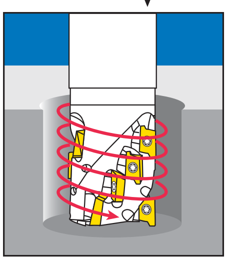


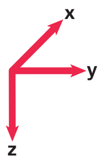
Inserts with radius of 08

Inserts RT 10 : Radius of 08 - 10 -12
Inserts RT 13 : Radius of 08 - 10 - 12 - 16 - 20
Inserts RT 16 : Radius of 08 - 12 - 16 - 20 - 24

R

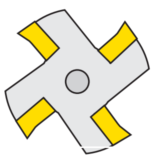
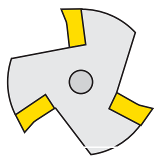
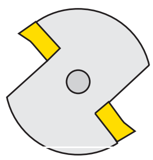






Machining along 3 axis

Application depending on the number of teeth

CLOSE PITCH		NORMAL PITCH		LARGE PITCH	
	- Shoulder - Short chips - Interrupted cutting - High output		- General machining - Machine stable		- Slotting - Solid material - High hoverhang - Long chips - Light machine - Machining of aluminium

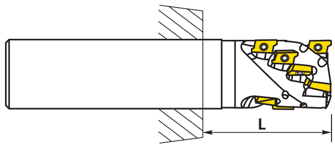
CT-SAF
Milling cutter characteristics

Chip evacuation

When machining in cylindrical, helical or linear interpolation, provide efficient coolant pressure to flush out the chips and prevent their recycling by the cutter.

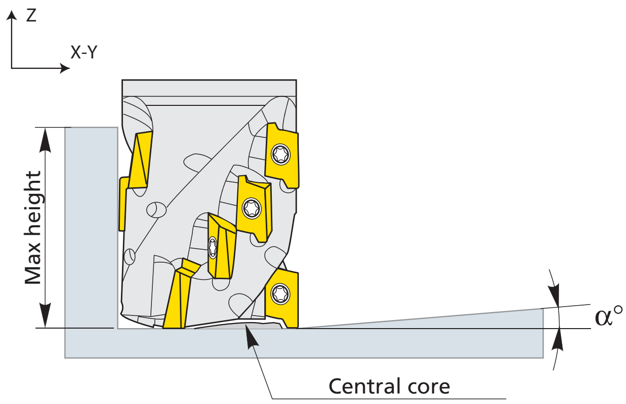
CT-SAF cylindrical shank milling-cutter clamping

The L dimension of these milling cutters in relation to the attachment can be adjusted as necessary.
Make sure However, that the shank is correctly clamped. If necessary, carry out a Weldon-type flat.



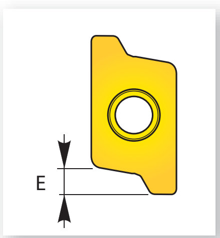
Oblique dip or "ramping"

The cutter must plunge with a penetration angle determined by a feed ratio in the X-Y plane and a descent along the Z axis.
In this configuration, the insert works with the main edge on the outside of the cutter and the secondary edge on the inside where a material "core" builds up.
The infeed angle remains constant for a given cutter diameter. Once the diameter is taken into account, the angle will no longer change.
This does not apply to the maximum cutting height "ap", but it is important not to exceed this value while machining (see page 397).



		α max.									
		Ø10	Ø12	Ø14	Ø16	Ø18	Ø20	Ø25	Ø32	Ø40	Ø50
CT-10	r=0,2-1,2	-	-	-	-	-	8°.3	6°.1	4°.4	-	-
CT-10	r>1,2	No ramping									
CT-13		-	-	-	-	-	-	8°.8	6°.2	4°.7	-
CT-16		-	-	-	-	-	-	-	-	-	3°.7

Maximum axial infeed



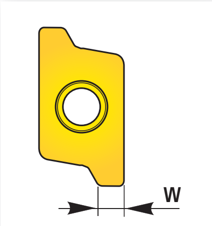
If is impossible to start machining in ramping,
a direct plunge can be made along the "Z" axis only.
In this case, the feed must be broken down into stages and the infeed into the material must not exceed the values shown in the table below.
The purpose of breaking down into stages is to limit chip length.
A stop of 0,5 s every 0,3 - 0,5 mm of plunge must be provided.

	RT 10	RT 13	RT 16
E	2,1	2.8	2.8

CT-SAF

Milling cutter characteristics

Drilling in helical interpolation into solid material

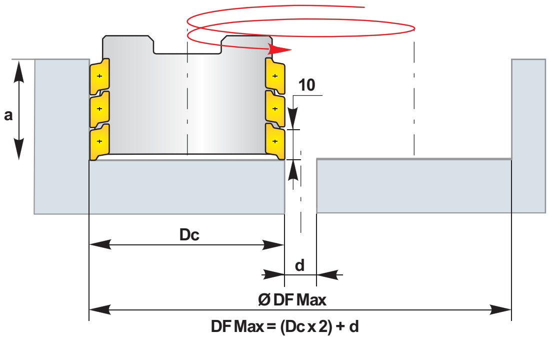


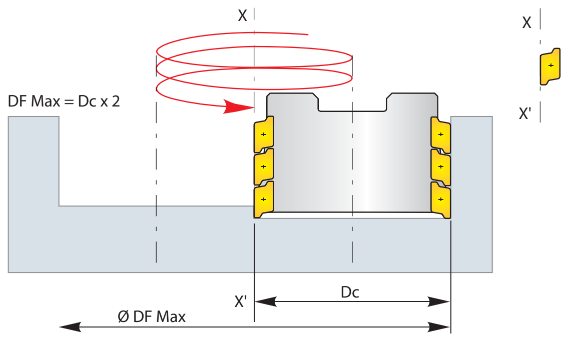
	RT 10	RT 13	RT 16
W	1.8	2.6	3.2

The value of "W" must be known since it is used to determine the drilling diameter.
This value is specific to each insert (see table below)

Determining the minimum and maximum drilling diameters in helical interpolation.

In solid material

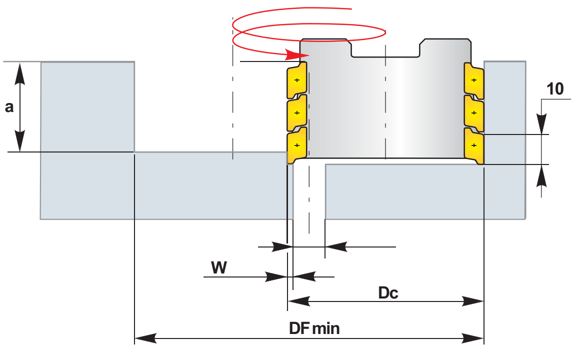


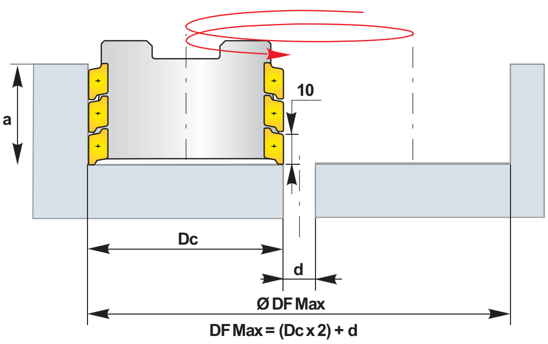


Minimum drilling diameter.
DF min = (D_C - W) x 2
D_C = Cutting diameter
W = Maximum insert infeed
Example :
D_C = 25 mm , W = 3,2 mm
DF min = (25 - 3,2) x 2 = 43,6 mm

Minimum drilling diameter.
DF Max = (D_C - r) x 2
D_C = Cutting diameter
r = Insert radius
Example :
D_C = 25 mm , r = 0,8 mm
DF Max = (25 - 0,8) x 2 = 48,4 mm

With existing hole





Minimum drilling diameter.
DF min = (D_C - (d/2 + W)) x 2
D_C = Cutting diameter
d = Hole diameter
W = Maximum insert infeed
Example :
D_C = 25 mm , d = 10 mm , W = 3,2 mm
DF min = (25 - (10/2 + 3,2)) x 2 = 33,6 mm

Minimum drilling diameter.
DF Max = (D_C x 2) + d
D_C = Cutting diameter
d = Hole diameter
Example :
D_C = 25 mm , d = 10 mm
DF Max = (25 x 2) + 10 = 60 mm

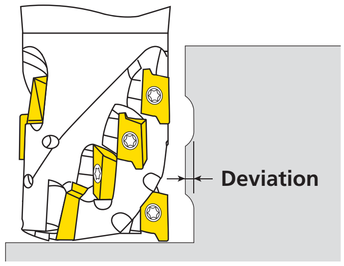
In helical interpolation, the helix angle is equal to the ramping angle α°.

CT-SAF
Milling cutter characteristics

Shoulder milling with a CT-SAF cutter

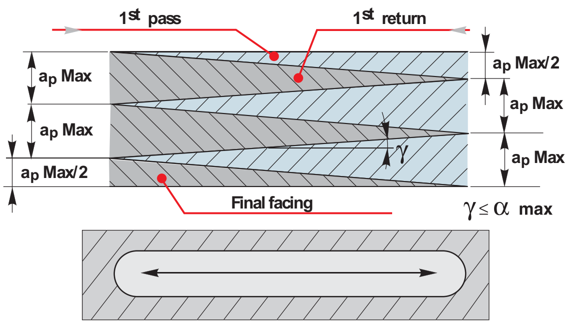
Maximum deviation measured on CT-SAF cutters

CT-10 = 0,07 mm
CT-13 = 0,10 mm
CT-16 = 0,15 mm



Linear slotting

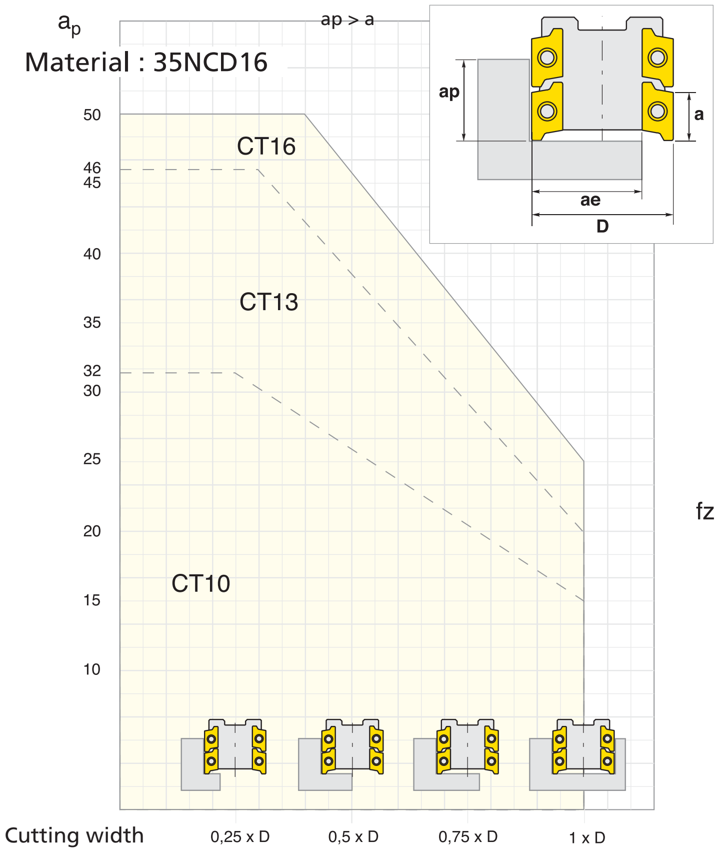
During the first feed, the milling cutter descends aiming at an end point located at "ap Max" divided by 2 at the slot end.
The return feed will follow a symmetrical path to a point located under the starting point at a "ap Max" distance.
This operation will be repeated several times depending on the depth of the slot.



CT-SAF example

Cutter :	CT-16/050-03-52-IS40-084	**Hardness MPa :**	1400	**a_e (mm) :**	12
Insert :	RT 16 04 08 SR-81	**v_c (m/min) :**	70	**a_p (mm) :**	40
Grade :	5020	**n (rpm) :**	445	**f_z (mm) :**	0,10
Material :	35NCD16	**v_f (mm/min) :**	133,5	**Cutter Ø (mm) :**	50

CT-SAF diagram



When slotting on an insert height (ap ≤ a), refer to the ORBI-SAF diagram on page 386.

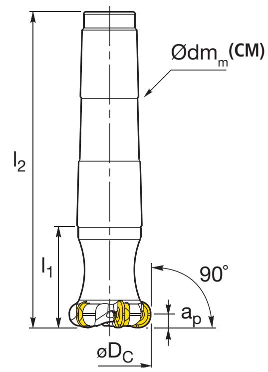
fz :
CT 10 : 0,10 → 0,05
CT 13 : 0,15 → 0,08
CT 16 : 0,30 → 0,1

MILLING

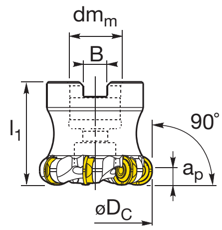
AEROFINISH

Finishing and semi-finishing face milling cutter with SideLok™ technology

Cutter program, AF09, AF12



Morse Taper



Arbor

Reference	Dimensions (mm)						Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg	Ramping angle α
	D_c	Max. a_p finishing	dm_m	l_1	l_2	B							
For insert IC 9.52mm with corner radius 4 mm													
Morse taper													
AF09 032R05 MK3X050	32.00	0.5	CM3	50	130.7	-	5	SC.. 09 T3 40..	5	No	12000	0.321	1°30′
Arbor													
AF09 040R06 A16A040	40.00	0.5	16	40	-	8.4	6	SC.. 09 T3 40..	6	Yes	9600	0.141	1°
AF09 050R08 A22A045	50.00	0.5	22	45	-	10.4	8	SC.. 09 T3 40..	8	Yes	7700	0.281	0°45′
AF09 063R10 A22A050	63.00	0.5	22	50	-	10.4	10	SC.. 09 T3 40..	10	Yes	6100	0.521	0°30′
For insert IC 12,7mm with corner radius 6 mm													
Morse taper													
AF12 032R03 MK3X050	32.00	0.5	CM3	50	130.7	-	3	SC.. 12 T3 60..	3	No	12000	0.313	1°30′
AF12 040R05 MK4X050	40.00	0.5	CM4	50	152.2	-	5	SC.. 12 T3 60..	5	No	9600	0.631	1°
Arbor													
AF12 050R07 A22A045	50.00	0.5	22	45	-	10.4	7	SC.. 12 T3 60..	7	Yes	7700	0.266	0°45′
AF12 063R09 A22A050	63.00	0.5	22	50	-	10.4	9	SC.. 12 T3 60..	9	Yes	6100	0.485	0°30′
AF12 080R10 A27A050	80.00	0.5	27	50	-	120.4	10	SC.. 12 T3 60..	10	Yes	4800	0.866	0°25′

Spare parts

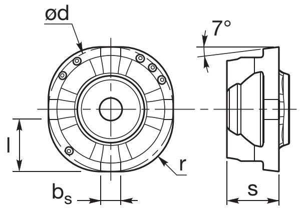
Insert style	Diameter D_c	Insert screw			Screw driver		Torque wrench		
		Reference	Size		Reference		Reference		Nm
SC.. 09 T3 40..	32 mm	DVF3992 (Non drilled)	M 3.5	2.4-3 N.m	TX215PLUS	15 IP	TDX 215PLUS	15 IP	3.0
SC.. 09 T3 40..	40 - 63 mm	DVF4506 (Drilled)	M 3.5	2.4-3 N.m	TX215PLUS	15 IP	TDX 215PLUS	15 IP	3.0
SC.. 12 T3 60..	32 - 40 mm	DVF3992 (Non drilled)	M 3.5	2.4-3 N.m	TX215PLUS	15 IP	TDX 215PLUS	15 IP	3.0
SC.. 12 T3 60..	50 - 80 mm	DVF4506 (Drilled)	M 3.5	2.4-3 N.m	TX215PLUS	15 IP	TDX 215PLUS	15 IP	3.0

AEROFINISH

Finishing and semi-finishing face milling cutter with SideLok™ technology

Insert program,

SCKR... EN-11

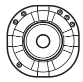


Reference	Dimensions (mm)					Grade													
	d	s	l	r	b_s	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX05	KX20	KX2	N
SCKR 09 T3 40 EN-11	9.525	3.97	4.00	4	1.5	-	-	-	-	-	✓	-	-	-	-	-	-	-	-
SCKR 12 T3 60 EN-11	12.7	3.97	6.00	5.8	1.1	-	-	-	-	-	✓	-	-	-	-	-	-	-	-

✓Article which can be ordered.

Ordering example : SCKR 09 T3 40 EN-11

Top form geometry

Top form geometry	Application	Max chip thickness H max (mm)	P Steel	M Stainless steel	K Cast iron	N Non-ferrous aluminum	S Super alloys	H Hardened materials	Insert
 11	Semi-finishing / Finishing	0.08	5020	5020	5020		**5020**		

MILLING

AEROFINISH

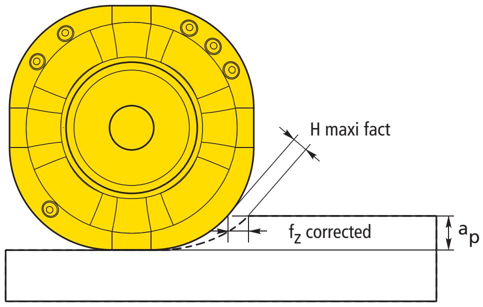
Milling cutter characteristics

Cutting data for the Titanium TA6V

Reference	Feed per tooth f_z (mm) corrections according on a_p		a_p (mm)								
	Corner radius	H max fact	0.3	0.5	0.7	0.8	1	1.5	2	4	6
SCKR 09 T3 40 EN-11	4	0.08	0.21	0.17	0.15	0.13	0.12	0.10	0.09	0.08	-
SCKR 12 T3 60 EN-11	5.8	0.08	0.26	0.20	0.17	0.16	0.14	0.12	0.11	0.08	0.08

Starting values are shown, cutting data must be optimized depending on: material, tool overhang, coolant conditions etc…

Example	
Insert	SCKR 12 T3 60EN-11
H max (mm)	0.08
a_p (mm)	2
f_z (mm)	0.11



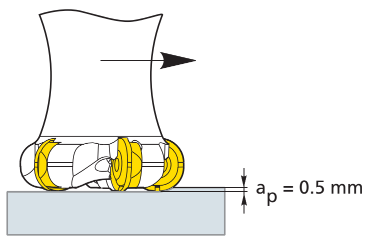
Feed (f_Z) correction factors - Examples

Facemilling - finishing in TA6V

For finishing face milling (ap < 1 mm) there is no need to reduce the fz at high width of cut ae > 50% of Dc

Face milling, finishing	
Material	TA6V
Hardeness	895 Mpa
Tool	AF09 050R08 A22A045
Diameter	50
Number of teeth	8
Insert	SCKR 09 T3 40EN-11
Grade	5020
a_e (mm)	50
a_p (mm)	0.5 (face milling, finishing)
v_c (m/min)	50
H max (mm)	0.08
f_z corrected (radius)	0.20 (depend on corner radius)
f_z corrected a_e	0.20 (depend on a_e = 0.20 x 1)
n (rev/min)	318
v_f (mm/min)	508

a_e	Feed per tooth f_z (mm) corrected according a_e and D_c for finishing				
	$D_c = 32$	$D_c = 40$	$D_c = 50$	$D_c = 63$	$D_c = 80$
2.5	1.92	2.09	2.39	2.56	2.91
5	1.4	1.52	1.72	1.85	2.07
10	1.09	1.16	1.28	1.37	1.52
16	1	1.01	1.08	1.15	1.23
20	1	1	1.03	1.07	1.16
25	1	1	1	1.02	1.06
32	1	1	1	1	1.01
40	-	1	1	1	1
50	-	-	1	1	1
63	-	-	-	1	1
80	-	-	-	-	1



AEROFINISH

Milling cutter characteristics

Facemilling - Ramping - Shouldering in TA6V

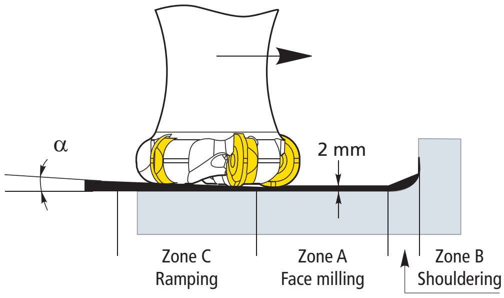
For surface finishing (ap > 1mm) (zone A) and shoulders (zone B), it is necessary to choose the fz by the standard method depend on deth of cut ap and width of cut ae. For all types of the machining with ramping (zone C) recommended fz values to be reduced in 2 times.

Face milling general	
Material	TA6V
Hardeness	895 Mpa
Tool	AF09 050R08 A22A045
Diameter	50
Number of teeth	8
Insert	SCKR 09 T3 40EN-11
Grade	5020
a_e (mm)	40
a_p (mm)	2 (face milling)
v_c (m/min)	50
H max (mm)	0.08
f_z corrected (radius)	0.11 (depend on corner radiu)
f_z corrected a_e	0.088 (depend on a_e = 0.11 x 0.8)
n (rev/min)	318
v_f (mm/min)	223

a_e	Feed per tooth f_z (mm) corrected according a_e and D_c for general machining				
	$D_c = 32$	$D_c = 40$	$D_c = 50$	$D_c = 63$	$D_c = 80$
2.5	1.92	2.09	2.39	2.56	2.91
5	1.4	1.52	1.72	1.85	2.07
10	1.09	1.16	1.28	1.37	1.52
16	1	1.01	1.08	1.15	1.23
20	0.95	1	1.03	1.07	1.16
25	0.8	0.95	1	1.02	1.06
32	0.5	0.8	0.95	1	1.01
40	-	0.5	0.8	0.95	1
50	-	-	0.5	0.8	0.95
63	-	-	-	0.5	0.8
80	-	-	-	-	0.5

Nota : Do not use for plunging

Reduce the cutting data accordingly in case of work with long overhang.

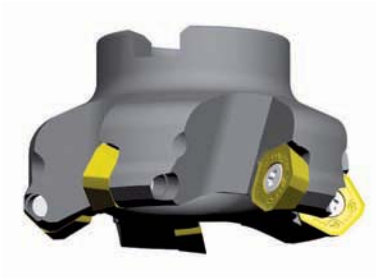


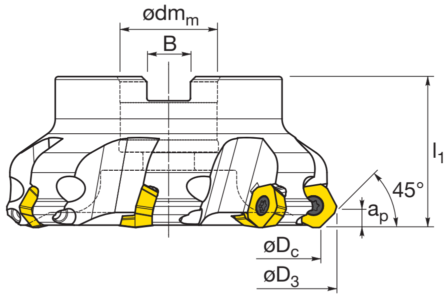
MILLING

PENTA 45

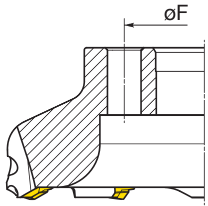
Face milling cutter 45° with positive pentagonal inserts

Cutter program, PC09





Arbor mounting



Reference	Dimensions (mm)							Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg
	D_c	D_3	Max. a_p	dm_m	l_1	B	F						
PC09 050R04 A22X040	50.00	60.80	4.50	22.00	40.00	10.40	-	4	PD.. 09 05 AE…	4	No [1]	19000	0.308
PC09 063R05 A22X040	63.00	73.80	4.50	22.00	40.00	10.40	-	5	PD.. 09 05 AE…	5	No [1]	16000	0.411
PC09 080R06 A27X050	80.00	90.90	4.50	27.00	50.00	12.40	-	6	PD.. 09 05 AE…	6	No [1]	14000	0.953
PC09 100R07 A32X050	100.00	110.90	4.50	32.00	50.00	14.40	-	7	PD.. 09 05 AE…	7	No [1]	12000	1.589
PC09 125R07 A40X063	125.00	135.90	4.50	40.00	63.00	16.40	-	7	PD.. 09 05 AE…	7	No [1]	10000	3.063
PC09 160R09 A40X063	160.00	170.90	4.50	40.00	63.00	16.40	66.70	9	PD.. 09 05 AE…	9	No	8500	4.200

[1] Optional coolant screw can be ordered separately

Spare parts

Insert style	Diameter D_c	Insert screw			Screw driver	
		Reference	Size	Torque	Reference	Torx
PD.. 09 05 AE…	50 - 160 mm	DVF 2097	M 5.0	5.0 N.m	DMP 3662	20 IP

Optional spare parts

Insert style	Diameter D_c	Coolant screw
		Reference
PD.. 09 05 AE…	50 mm	DVZ 3523
PD.. 09 05 AE…	63 mm	DVZ 3523
PD.. 09 05 AE…	80 mm	DVZ 3535
PD.. 09 05 AE…	100 mm	DVZ 3536
PD.. 09 05 AE…	125 mm	DVZ 3537
PD.. 09 05 AE…	160 mm	-

PENTA 45

Face milling cutter 45° with positive pentagonal inserts

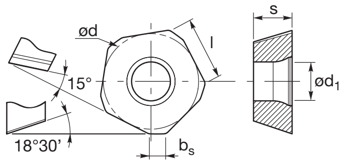
Insert program


PDKT... AE ER-41


PDMT... AE SR-81

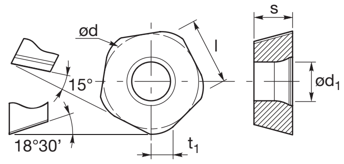

PDMW... AE SR-91

Utility inserts




PDKT... AE SR-HF

High feed inserts



Reference	Dimensions (mm)							Grades													
	d	s	d_1	l	r	b_s	t_1	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX05	KX20	KX2	N
Utility inserts																					
PDKT 09 05 AE ER-41	13.50	5.47	5.5	9.00	-	2.00	-	-	-	-	✓	-	✓	-	✓	✓	-	-	-	-	-
PDMT 09 05 AE SR-81	13.50	5.47	5.5	9.00	-	2.00	-	-	✓	-	-	-	✓	-	✓	✓	✓	-	-	-	-
PDMW 09 05 AE SR-91	13.50	5.47	5.5	9.00	-	2.00	-	-	-	✓	-	-	-	-	✓	-	-	-	-	-	-
High feed inserts																					
PDKT 09 05 AE SR-HF	13.50	5.47	5.5	9.00	-	-	3.00 [1]	-	-	-	✓	-	-	-	✓	✓	-	-	-	-	-

[1] To be used in High Feed machining with Max. $a_p = 1.0$ mm

✓Article which can be ordered

Ordering example: PDKT 09 05 AE ER-41 5020

Cutting conditions

Grade	Feed per tooth (mm)	P Steel				M Stainless steel			K Cast iron				N Non-ferrous aluminum				S Super alloys			H Hardened materials			
		Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
1120	v_{c1}	338	306	238	154	-	-	-	259	238	206	177	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.10	0.10	0.10	0.10	-	-	-	0.10	0.10	0.10	0.10	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	170	160	120	90	-	-	-	195	165	115	90	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.35	0.35	0.35	0.35	-	-	-	0.35	0.35	0.35	0.35	-	-	-	-	-	-	-	-	-	-	-
1130	v_{c1}	-	-	-	-	-	-	-	209	190	160	133	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	-	-	-	-	-	-	-	0.10	0.10	0.10	0.10	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	-	-	-	-	-	-	-	130	110	55	10	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	-	-	-	-	-	-	-	0.35	0.35	0.35	0.35	-	-	-	-	-	-	-	-	-	-	-
2003	v_{c1}	-	-	-	240	272	230	172	264	244	214	194	-	-	-	-	90	80	60	92	112	92	92
	f_{z1}	-	-	-	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	-	-	-	-	0.10	0.10	0.10	0.10	0.10	0.10	0.10
	v_{c2}	-	-	-	210	253	200	153	226	206	176	156	-	-	-	-	80	70	55	73	93	73	73
	f_{z2}	-	-	-	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	-	-	-	-	0.15	0.15	0.15	0.25	0.25	0.25	0.25
5020	v_{c1}	318	286	218	134	201	185	132	244	223	191	162	970	530	430	540	60	50	45	35	40	35	30
	f_{z1}	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
	v_{c2}	150	140	100	70	140	135	100	180	150	100	60	730	170	280	360	30	20	30	20	25	20	15
	f_{z2}	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
5050	v_{c1}	241	212	148	85	126	83	71	-	-	-	-	-	-	-	-	48	38	30	-	-	-	-
	f_{z1}	0.10	0.10	0.10	0.10	0.10	0.10	0.10	-	-	-	-	-	-	-	-	0.10	0.10	0.10	-	-	-	-
	v_{c2}	150	130	80	35	80	60	55	-	-	-	-	-	-	-	-	25	15	15	-	-	-	-
	f_{z2}	0.35	0.35	0.35	0.35	0.35	0.35	0.35	-	-	-	-	-	-	-	-	0.35	0.35	0.25	-	-	-	-
8030	v_{c1}	-	-	-	-	174	141	106	-	-	-	-	-	-	-	-	62	52	42	-	-	-	-
	f_{z1}	-	-	-	-	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	-	-	-	-	142	120	102	-	-	-	-	-	-	-	-	50	40	37	-	-	-	-
	f_{z2}	-	-	-	-	0.2	0.2	0.2	-	-	-	-	-	-	-	-	0.2	0.2	0.2	-	-	-	-
5135	v_{c1}	254	230	158	91	130	100	80	-	-	-	-	-	-	-	-	53	43	35	-	-	-	-
	f_{z1}	0.10	0.10	0.10	0.10	0.10	0.10	0.10	-	-	-	-	-	-	-	-	0.10	0.10	0.10	-	-	-	-
	v_{c2}	186	170	117	60	100	60	70	-	-	-	-	-	-	-	-	39	29	30	-	-	-	-
	f_{z2}	0.25	0.25	0.25	0.25	0.15	0.15	0.15	-	-	-	-	-	-	-	-	0.25	0.25	0.15	-	-	-	-

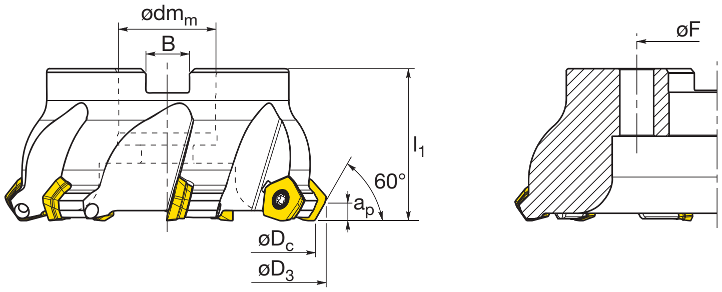
The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

MILLING

PENTA 60

Face milling cutter 60° with positive pentagonal inserts

Cutter program, PS 09



Arbor mounting

Reference	Dimensions (mm)							Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg
	D_c	D_3	Max. a_p	dm_m	l_1	B	F						
PS-09/040-03-ALC16-040-R	40.00	46.80	5.50	16.00	40.00	8.40	-	3	PD.. 09 05 DE…	3	Yes	22000	0.182
PS-09/050-04-AL22-040-R	50.00	58.80	5.50	22.00	40.00	10.40	-	4	PD.. 09 05 DE…	4	No [1]	19000	0.255
PS-09/063-05-AL22-040-R	63.00	71.80	5.50	22.00	40.00	10.40	-	5	PD.. 09 05 DE…	5	No [1]	16000	0.342
PS-09/080-06-AL27-050-R	80.00	88.80	5.50	27.00	50.00	12.40	-	6	PD.. 09 05 DE…	6	No [1]	14000	0.807
PS-09/100-07-AL32-050-R	100.00	108.90	5.50	32.00	50.00	14.40	-	7	PD.. 09 05 DE…	7	No [1]	12000	1.541
PS-09/125-08-AL40-063-R	125.00	133.90	5.50	40.00	63.00	16.40	-	8	PD.. 09 05 DE…	8	No [1]	10000	2.776
PS-09/160-10-AL40-063-R	160.00	168.90	5.50	40.00	63.00	16.40	66.70	10	PD.. 09 05 DE…	10	No	8500	4.511

[1] Optional coolant screw can be ordered separately

Spare parts

Insert style	Diameter D_c	Insert Screw			Screw driver		Special mounting screw
		Reference	Size		Reference		Reference
PD.. 09 05 DE…	40 mm	DVF 2097	M 5.0	5.0 N.m	DMP 3662	20 IP	DVZ 1715
PD.. 09 05 DE…	50 - 160 mm	DVF 2097	M 5.0	5.0 N.m	DMP 3662	20 IP	-

Optional spare parts

Insert style	Diameter D_c	Coolant screw
		Reference
PD.. 09 05 DE…	40 mm	-
PD.. 09 05 DE…	50 mm	DVZ 3523
PD.. 09 05 DE…	63 mm	DVZ 3523
PD.. 09 05 DE…	80 mm	DVZ 3535
PD.. 09 05 DE…	100 mm	DVZ 3536
PD.. 09 05 DE…	125 mm	DVZ 3537
PD.. 09 05 DE…	160 mm	-

PENTA 60

Face milling cutter 60° with positive pentagonal inserts

Insert program

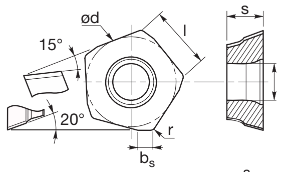
PDKT... DE E/FR-11

PDKT... DE ER-41

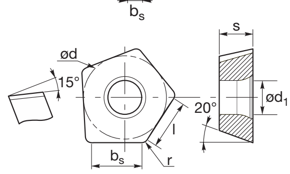
PDMT... DE SR-81

PDHX... DE FR

Utility inserts



Wiper inserts



Reference	Dimensions (mm)							Grades													
	d	s	d_1	l	r	b_s	t_1	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX05	KX20	KX2	N
Utility inserts																					
PDKT 09 05 DE ER-11	13.50	5.47	5.5	9.00	-	2.30	-	-	-	-	✓	-	✓	-	-	-	-	-	-	-	-
PDKT 09 05 DE FR-11	13.50	5.47	5.5	9.00	-	2.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	✓
PDKT 09 05 DE ER-41	13.50	5.47	5.5	9.00	-	2.30	-	-	✓	-	✓	-	✓	✓	✓	✓	✓	-	-	-	-
PDMT 09 05 DE SR-81	13.50	5.47	5.5	9.00	-	2.30	-	-	✓	-	✓	-	✓	✓	✓	✓	✓	-	-	-	-
Wiper inserts																					
PDHX 09 05 DE FR	13.50	5.47	5.5	9.00	1.0	8.20	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-

✓Article which can be ordered

Ordering example: PDKT 09 05 DE ER-41 5020

Cutting conditions

Grade	Feed per tooth (mm)	P Steel				M Stainless steel			K Cast iron				N Non-ferrous aluminum				S Super alloys			H Hardened materials			
		Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
1120	v_{c1}	338	306	238	154	-	-	-	259	238	206	177	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.10	0.10	0.10	0.10	-	-	-	0.10	0.10	0.10	0.10	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	170	160	120	90	-	-	-	195	165	115	90	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.35	0.35	0.35	0.35	-	-	-	0.35	0.35	0.35	0.35	-	-	-	-	-	-	-	-	-	-	-
1130	v_{c1}	-	-	-	-	-	-	-	209	190	160	133	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	-	-	-	-	-	-	-	0.10	0.10	0.10	0.10	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	-	-	-	-	-	-	-	161	142	97	59	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	-	-	-	-	-	-	-	0.25	0.25	0.25	0.25	-	-	-	-	-	-	-	-	-	-	-
2003	v_{c1}	-	-	-	250	279	240	179	277	257	227	207	-	-	-	-	100	90	65	99	119	99	99
	f_{z1}	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	-	-	-	190	240	180	140	200	180	150	130	-	-	-	-	60	50	45	60	80	60	60
	f_{z2}	-	-	-	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	-	-	-	-	0.25	0.25	0.25	0.35	0.35	0.35	0.35
5020	v_{c1}	351	316	241	147	213	195	139	257	238	209	182	1050	650	480	600	70	60	50	40	45	40	35
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	150	140	100	70	140	135	100	180	150	100	60	730	170	280	360	30	20	30	20	25	20	15
	f_{z2}	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
5040	v_{c1}	288	256	188	104	160	140	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.10	0.10	0.10	0.10	0.10	0.10	0.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	120	110	70	40	70	35	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.35	0.35	0.35	0.35	0.25	0.25	0.25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5050	v_{c1}	241	212	148	85	126	83	71	-	-	-	-	-	-	-	-	48	38	30	-	-	-	-
	f_{z1}	0.10	0.10	0.10	0.10	0.10	0.10	0.10	-	-	-	-	-	-	-	-	0.10	0.10	0.10	-	-	-	-
	v_{c2}	150	130	80	35	80	60	55	-	-	-	-	-	-	-	-	25	15	15	-	-	-	-
	f_{z2}	0.35	0.35	0.35	0.35	0.35	0.35	0.35	-	-	-	-	-	-	-	-	0.35	0.35	0.25	-	-	-	-
8030	v_{c1}	-	-	-	-	170	139	105	-	-	-	-	-	-	-	-	59	49	40	-	-	-	-
	f_{z1}	-	-	-	-	0.1	0.1	0.1	-	-	-	-	-	-	-	-	0.1	0.1	0.1	-	-	-	-
	v_{c2}	-	-	-	-	110	97	77	-	-	-	-	-	-	-	-	27	18	22	-	-	-	-
	f_{z2}	-	-	-	-	0.35	0.35	0.35	-	-	-	-	-	-	-	-	0.35	0.35	0.25	-	-	-	-
5135	v_{c1}	254	230	158	91	130	100	80	-	-	-	-	-	-	-	-	53	43	35	-	-	-	-
	f_{z1}	0.10	0.10	0.10	0.10	0.10	0.10	0.10	-	-	-	-	-	-	-	-	0.10	0.10	0.10	-	-	-	-
	v_{c2}	163	150	104	58	70	35	60	-	-	-	-	-	-	-	-	32	25	25	-	-	-	-
	f_{z2}	0.30	0.30	0.30	0.30	0.20	0.20	0.20	-	-	-	-	-	-	-	-	0.30	0.30	0.20	-	-	-	-
N	v_{c1}	-	-	-	-	-	-	-	147	121	92	82	940	520	505	530	46	40	35	-	-	-	-
	f_{z1}	-	-	-	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-
	v_{c2}	-	-	-	-	-	-	-	126	103	79	73	840	470	430	480	43	37	33	-	-	-	-
	f_{z2}	-	-	-	-	-	-	-	0.12	0.12	0.12	0.12	0.08	0.08	0.08	0.08	0.08	0.08	0.08	-	-	-	-

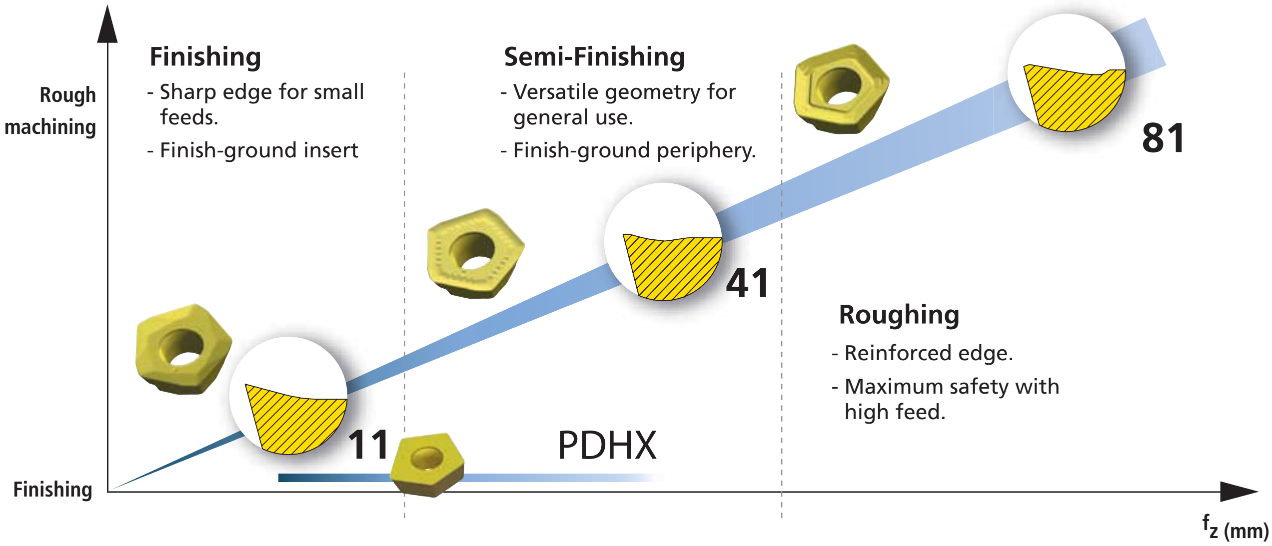
The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

MILLING

PENTA 60

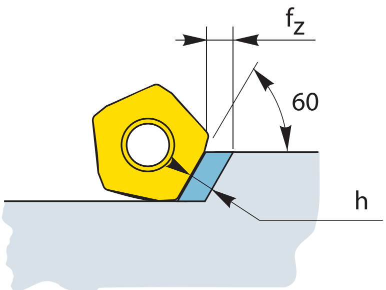
Milling cutter characteristics

Use of inserts depending on geometry



Entry / Approach angle Kr 60°

f_z =Tooth feed



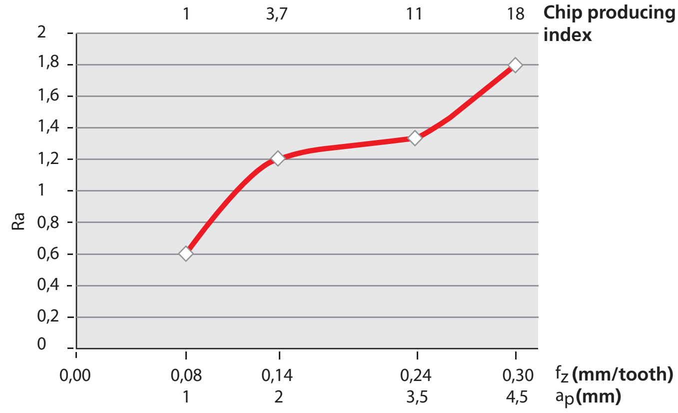
Ex : calculation of f_z to get an actual chip thickness of 0,1 mm

$$f_z = \frac{h}{\sin 60°} = \frac{0{,}1}{0{,}866} = 0{,}115 \text{ mm}$$

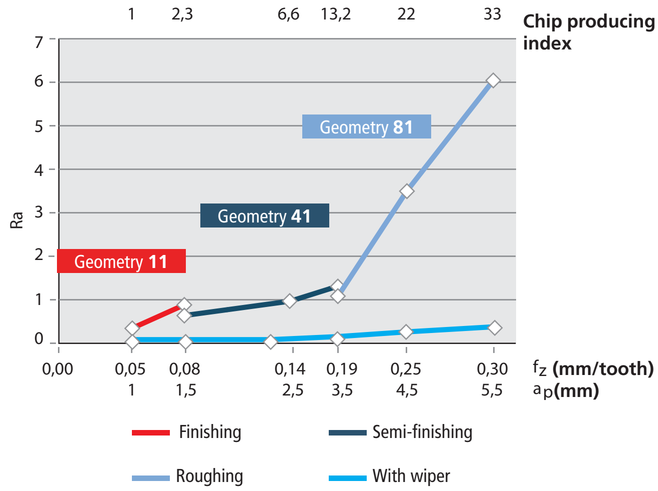
PENTA 60
Milling cutter characteristics

Examples of machining and surface finish

PENTA Ø63 PS-09/063-05-AL22-040-R
Roughness value Ra for a finishing pass
Material = AU4G
Inserts = PDKT 09 05 DEFR-11 H15TF
v_c = 700 m/min
a_e = 39 mm
External coolant



PENTA Ø63 PS-09/063-05-AL22-040-R
Material = 35NCD16
Inserts = PDMT 09 05...81 / PDKT 09 05...41 / PDKT 09 05...11
Wiper insert = PDHX 09 05 DE FR
v_c = 150 m/min
a_e = 50,4 mm
External coolant

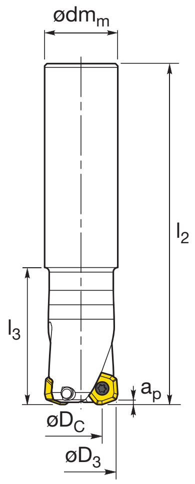


MILLING

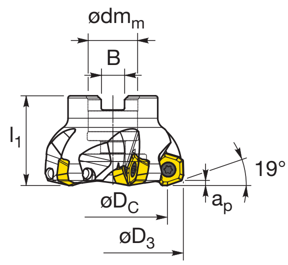
PENTA HIGH FEED

High Feed face milling cutter with positive pentagonal inserts

Cutter program, PF 09



Cylindrical shank



Arbor mounting

Reference	Dimensions (mm)								Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg
	D_c	D_3	Max. a_p	dm_m	l_1	l_2	l_3	B						
Cylindrical shank														
PF-09/032-02-QC32-250-R	18.60	32.00	2.00	32.00	-	250.00	60.00	-	2	PD.. 09 05 ZE…	2	No	26000	1.421
PF-09/040-03-QC32-250-R	25.80	40.00	2.00	32.00	-	250.00	60.00	-	3	PD.. 09 05 ZE…	3	No	22000	1.500
Arbor normal pitch														
PF-09/042-03-ALC16-040-R	27.80	42.00	2.00	16.00	40.00	-	-	8.40	3	PD.. 09 05 ZE…	3	Yes	21000	0.180
PF-09/050-04-AL22-040-R	35.60	50.00	2.00	22.00	40.00	-	-	10.40	4	PD.. 09 05 ZE…	4	No [1]	19000	0.236
PF-09/052-04-AL22-040-R	37.60	52.00	2.00	22.00	40.00	-	-	10.40	4	PD.. 09 05 ZE…	4	No [1]	18000	0.248
PF-09/063-05-AL22-040-R	48.60	63.00	2.00	22.00	40.00	-	-	10.40	5	PD.. 09 05 ZE…	5	No [1]	16000	0.325
PF-09/066-06-AL22-040-R	51.60	66.00	2.00	22.00	40.00	-	-	10.40	6	PD.. 09 05 ZE…	6	No [1]	16000	0.331
Arbor coarse pitch														
PF-09/050-03-AL22-040-R	35.60	50.00	2.00	22.00	40.00	-	-	10.40	3	PD.. 09 05 ZE…	3	No [1]	19000	0.248
PF-09/063-04-AL22-040-R	48.60	63.00	2.00	22.00	40.00	-	-	10.40	4	PD.. 09 05 ZE…	4	No [1]	16000	0.315
PF-09/080-05-AL27-050-R	65.60	80.00	2.00	27.00	50.00	-	-	12.40	5	PD.. 09 05 ZE…	5	No [1]	14000	0.818
PF-09/100-06-AL32-050-R	85.60	100.00	2.00	32.00	50.00	-	-	14.40	6	PD.. 09 05 ZE…	6	No [1]	12000	1.441

[1] Optional coolant screw can be ordered separately

Spare parts

Insert style	Diameter D_3	Insert screw			Screw driver		Special mounting screw
		Reference	Size	Torque	Reference		Reference
PD.. 09 05 ZE…	32 - 40 mm	DVF 3608	M 5.0	5.0 N.m	DMP 3662	20 IP	-
PD.. 09 05 ZE…	42 mm	DVF 3608	M 5.0	5.0 N.m	DMP 3662	20 IP	DVZ 1715
PD.. 09 05 ZE…	50 - 100 mm	DVF 3608	M 5.0	5.0 N.m	DMP 3662	20 IP	-

Optional spare parts

Insert style	Diameter D_3	Coolant screw
		Reference
PD.. 09 05 ZE…	42 mm	-
PD.. 09 05 ZE…	50 - 52 mm	DVZ 3523
PD.. 09 05 ZE…	63 - 66 mm	DVZ 3523
PD.. 09 05 ZE…	80 mm	DVZ 3535
PD.. 09 05 ZE…	100 mm	DVZ 3536

PENTA HIGH FEED

High Feed face milling cutter with positive pentagonal inserts

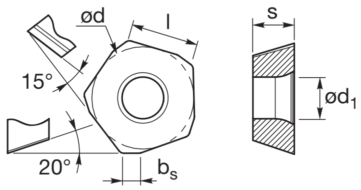
Insert program


PDKX... ZE ER-41


PDMX... ZE ER-51


PDMX... ZE SER-81

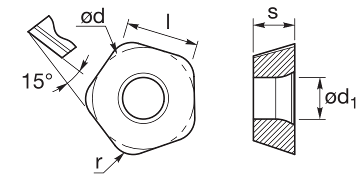
Utility inserts




PDKT... 30 ER-41


PDMW... 30 SR-91

Inserts with radius



Reference	Dimensions (mm)							Grades													
	d	s	d_1	l	r	b_s	t_1	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX05	KX20	KX2	N
Utility inserts																					
PDKX 09 05 ZE ER-41	13.50	5.47	5.5	9.00	-	2.00	-	-	✓	-	✓	-	-	-	✓	✓	-	-	-	-	-
PDMX 09 05 ZE ER-51	13.50	5.47	5.5	9.00	-	2.00	-	-	-	-	✓	-	✓	-	✓	✓	-	-	-	-	-
PDMX 09 05 ZE SR-81	13.50	5.47	5.5	9.00	-	2.00	-	-	-	-	✓	-	✓	✓	✓	-	-	-	-	-	-
Inserts with radius																					
PDKT 09 05 30 ER-41	13.50	5.47	5.5	9.00	3.0	-	-	-	-	-	✓	-	✓	-	✓	✓	-	-	-	-	-
PDMW 09 05 30 SR-91	13.50	5.47	5.5	9.00	3.0	-	-	-	-	✓	-	-	-	-	✓	-	✓	-	-	-	-

✓Article which can be ordered

Ordering example: PDMX 09 05 ZE ER-51 5020

Cutting conditions

Grade	Feed per tooth (mm)	P Steel				M Stainless steel			K Cast iron				N Non-ferrous aluminum				S Super alloys			H Hardened materials			
		Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
1120	v_{c1}	324	295	228	149	-	-	-	254	232	199	169	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.50	0.50	0.50	0.50	-	-	-	0.50	0.50	0.50	0.50	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	163	151	115	103	-	-	-	166	144	106	76	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	2.00	2.00	2.00	1.50	-	-	-	2.00	2.00	2.00	2.00	-	-	-	-	-	-	-	-	-	-	-
1130	v_{c1}	-	-	-	-	-	-	-	193	174	139	109	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	-	-	-	-	-	-	-	0.50	0.50	0.50	0.50	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	-	-	-	-	-	-	-	165	145	101	64	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	-	-	-	-	-	-	-	2.00	2.00	2.00	2.00	-	-	-	-	-	-	-	-	-	-	-
2003	v_{c1}	-	-	-	236	270	226	170	259	239	209	189	-	-	-	-	86	76	58	90	110	90	90
	f_{z1}	-	-	-	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	-	-	-	-	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	v_{c2}	-	-	-	200	246	190	146	170	151	130	114	-	-	-	-	50	40	40	66	86	66	66
	f_{z2}	-	-	-	1.50	1.50	1.50	1.50	2.00	2.00	2.00	2.00	-	-	-	-	1.20	1.20	1.20	1.20	1.20	1.20	1.20
5020	v_{c1}	304	275	208	129	196	181	130	239	217	184	154	938	482	410	516	56	46	43	33	38	33	28
	f_{z1}	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	v_{c2}	147	135	99	83	152	145	106	154	132	94	64	810	290	330	420	40	30	35	25	30	25	20
	f_{z2}	2.00	2.00	2.00	1.50	1.50	1.50	1.50	2.00	2.00	2.00	2.00	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
5040	v_{c1}	274	245	178	99	148	126	96	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.50	0.50	0.50	0.50	0.50	0.50	0.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	123	111	75	53	40	20	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	2.00	2.00	2.00	1.50	1.50	1.50	1.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5050	v_{c1}	234	206	142	81	123	81	70	-	-	-	-	-	-	-	-	46	36	28	-	-	-	-
	f_{z1}	0.50	0.50	0.50	0.50	0.50	0.50	0.50	-	-	-	-	-	-	-	-	0.50	0.50	0.50	-	-	-	-
	v_{c2}	134	117	75	45	89	65	58	-	-	-	-	-	-	-	-	39	29	20	-	-	-	-
	f_{z2}	2.00	2.00	2.00	1.50	1.50	1.50	1.50	-	-	-	-	-	-	-	-	1.20	1.20	1.20	-	-	-	-
8030	v_{c1}	-	-	-	-	164	131	100	-	-	-	-	-	-	-	-	51	41	35	-	-	-	-
	f_{z1}	-	-	-	-	0.5	0.5	0.5	-	-	-	-	-	-	-	-	0.5	0.5	0.5	-	-	-	-
	v_{c2}	-	-	-	-	120	105	82	-	-	-	-	-	-	-	-	40	30	28	-	-	-	-
	f_{z2}	-	-	-	-	2	2	2	-	-	-	-	-	-	-	-	1.2	1.2	1.2	-	-	-	-
5135	v_{c1}	245	222	152	88	118	84	76	-	-	-	-	-	-	-	-	51	41	33	-	-	-	-
	f_{z1}	0.50	0.50	0.50	0.50	0.50	0.50	0.50	-	-	-	-	-	-	-	-	0.50	0.50	0.50	-	-	-	-
	v_{c2}	130	120	83	58	70	20	60	-	-	-	-	-	-	-	-	44	34	25	-	-	-	-
	f_{z2}	2.00	2.00	2.00	1.50	1.20	1.20	1.20	-	-	-	-	-	-	-	-	1.20	1.20	1.20	-	-	-	-

The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

MILLING

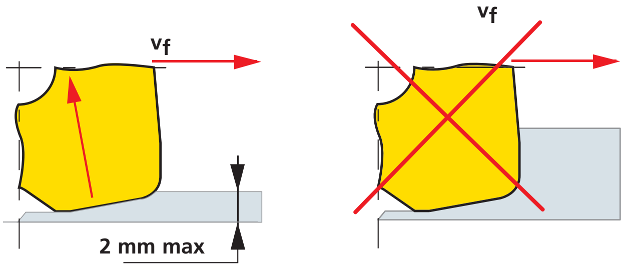
PENTA HIGH FEED

Milling cutter characteristics

Use for high feed facing

The cutter characteristic angles are designed to direct the cutting forces (R) mainly up the spindle thus allowing high machining feed with low cutting depth. It is essential to maintain a cutting depth of 2mm max.

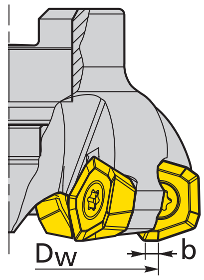
High-Feed use



For a good surface finish

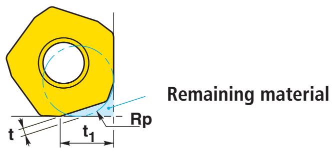
In finishing, the best surface finish is obtained without exceeding the value of b = 2mm for a f_n feed and a maximum profiling pitch (cut width) $a_e \leq D_W$.

Diameter D	32	40	42	50	52	63	66	80	100
Effective diameter D_W (mm	18,4	25,5	27,5	35,3	37,3	48,2	51,2	65,3	85,3



Programming – Remaining material

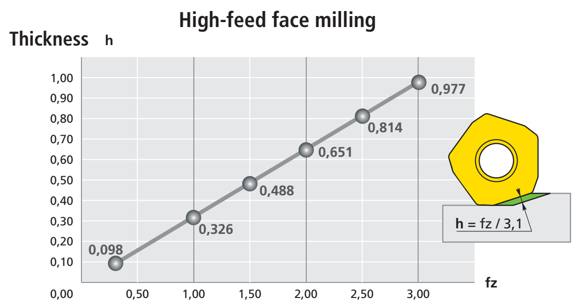
Programming radius



Ø	Rp	t	t1
32	4,5	1,1	6,8
40-100	4,5	1,1	7,3

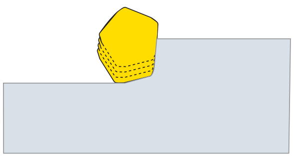
The insert radius is different from the radius to program (Rp)

Actual chip thickness



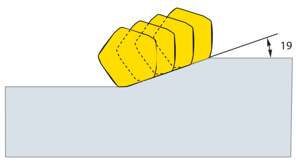
Approach of vertical faces

1st machining strategy with vertical faces



Reduce f_z feed to 0,5 max. when approaching a vertical face in order to avoid vibrations and insert flaking.

2nd machining strategy with no vertical face



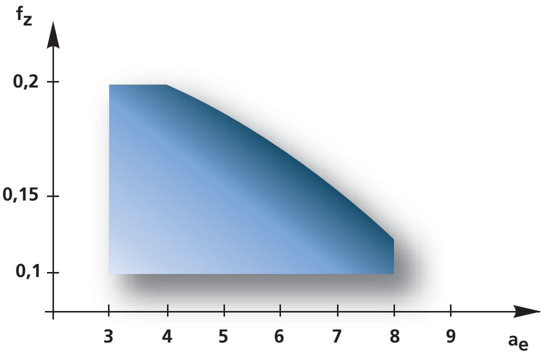
To maintain "High Feed" without creating vertical faces, apply a 19° slope.

PENTA HIGH FEED

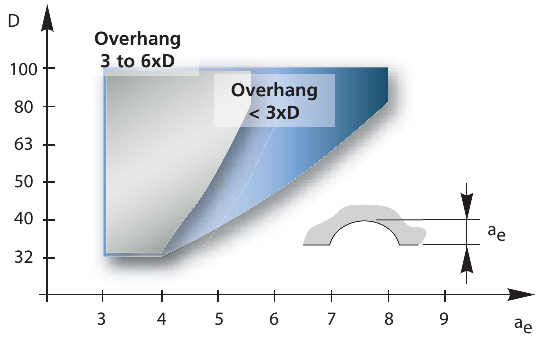
Milling cutter characteristics

Machining strategy in plunging

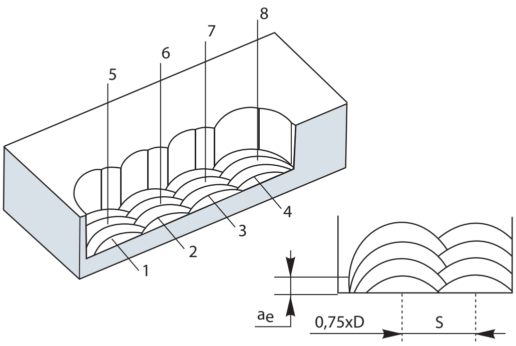
f_z value depending on infeed a_e



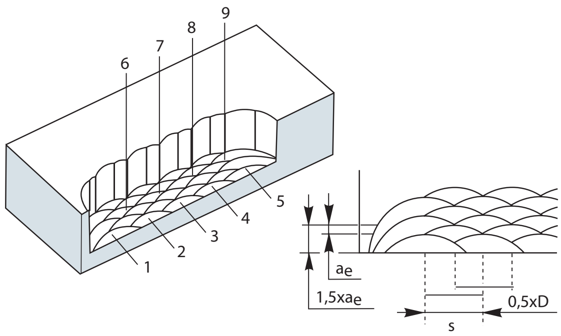
a_e infeed depending on overhang



Cutter with overrun L ≤ 3xD

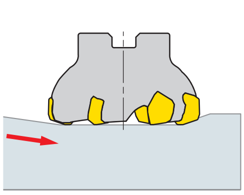


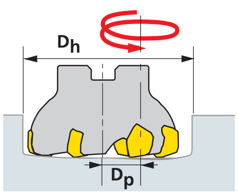
Cutter with overrun L ≥ 3xD

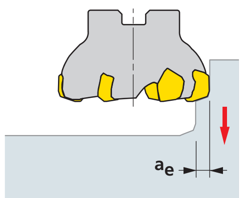


Use

Ramping	Helical interpolation	Plunging







Diameter	Cutting depth	Ramping		Helical interpolation (mm)				Plunging (1)
D (mm)	a_p max. (mm)	Angle α	L (mm)	D_h min.	D_p min.	D_h max.	D_p max.	a_e max. (mm)
32	2	0°	-	-	-	-	-	4
40	2	0° to 8°	14,2	63,5	23,5	77,7	37,7	4
42	2	0° to 8°	14,2	67,5	25,5	81,7	39,7	5
50	2	0° to 8°	14,2	83,3	33,3	97,7	47,7	6
52	2	0° to 8°	14,2	87,3	35,3	101,7	49,7	6
63	2	0° to 7°	16,2	109,2	46,2	123,7	60,7	7
66	2	0° to 6°	19,0	115,2	49,2	129,7	63,7	7
80	2	0° to 5°	22,8	143,3	63,3	157,7	77,7	8
100	2	0° to 3°	38,1	183,3	83,3	197,7	97,7	8

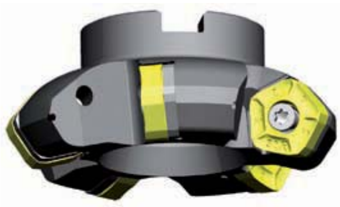
(1) Reduce from 50 to 80% the cutting conditions for plunging in accordance with a_e

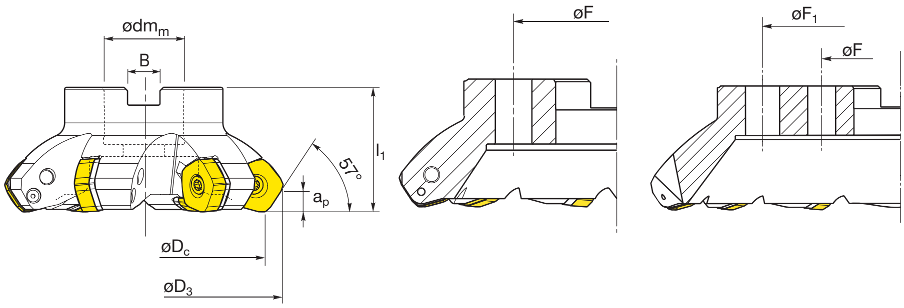
MILLING

PENTA HEAVY DUTY

Heavy Duty face milling cutter with negative pentagonal inserts

Cutter program, V560





Arbor mounting

Reference	Dimensions (mm)								Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg
	D_c	D_3	Max. a_p	dm_m	l_1	B	F	F_1						
Arbor Mounting - Right hand														
V560A 13 M100 32 05R	100.00	115.80	10.00	32.00	50.00	14.40	-	-	5	PN.. 13 08 DN...	5	No	6400	1.193
V560A 13 M125 40 06R	125.00	140.80	10.00	40.00	63.00	16.40	-	-	6	PN.. 13 08 DN...	6	No	5500	2.279
V560A 13 M160 40 08R	160.00	175.80	10.00	40.00	63.00	16.40	66.70	-	8	PN.. 13 08 DN...	8	No	5000	3.195
V560A 13 M200 60 10R	200.00	215.80	10.00	60.00	63.00	25.70	101.60	-	10	PN.. 13 08 DN...	10	No	4400	6.679
V560A 13 M250 60 12R	250.00	265.80	10.00	60.00	63.00	25.70	101.60	-	12	PN.. 13 08 DN...	12	No	3900	12.488
V560A 13 M315 60 14R	315.00	330.80	10.00	60.00	80.00	25.70	101.60	177.80	14	PN.. 13 08 DN...	14	No	3500	20.645
Arbor Mounting - Left hand (on request)														
M560A 13 M100 32 05L	100.00	115.80	10.00	32.00	50.00	14.40	-	-	5	PN.. 13 08 DN...	5	No	6400	1.193
M560A 13 M125 40 06L	125.00	140.80	10.00	40.00	63.00	16.40	-	-	6	PN.. 13 08 DN...	6	No	5500	2.279
M560A 13 M160 40 08L	160.00	175.80	10.00	40.00	63.00	16.40	66.70	-	8	PN.. 13 08 DN...	8	No	5000	3.195
M560A 13 M200 60 10L	200.00	215.80	10.00	60.00	63.00	25.70	101.60	-	10	PN.. 13 08 DN...	10	No	4400	6.679
M560A 13 M250 60 12L	250.00	265.80	10.00	60.00	63.00	25.70	101.60	-	12	PN.. 13 08 DN...	12	No	3900	12.488
M560A 13 M315 60 14L	315.00	330.80	10.00	60.00	80.00	25.70	101.60	177.80	14	PN.. 13 08 DN...	14	No	3500	20.645

Spare parts

Insert style	Diameter D_c	Insert Screw			Screw driver		Shim seat	Shim screw	Screw driver [1]
		Reference	Size		Reference		Reference	Reference	Reference
PN.. 13 08 DN...	100 - 315 mm	DVZ 3642	M 8.0	16.0 N.m	DMP 3460	30 IP	DAN 4585	DVF 2259	TX 215PLUS

[1] Shim screw Torx Plus driver must be ordered separately

Optional spare parts

Insert style	Diameter D_c	Coolant screw
		Reference
PN.. 13 08 DN...	100 mm	DVZ 3536
PN.. 13 08 DN...	125 mm	DVZ 3537
PN.. 13 08 DN...	160 - 315 mm	-

MILLING

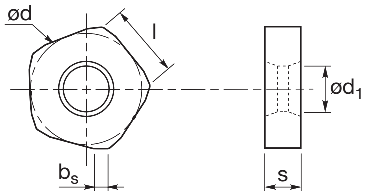
PENTA HEAVY DUTY

Heavy Duty face milling cutter with negative pentagonal inserts

Insert program

PNMU...-52

PNMU...-92



Reference	Dimensions (mm)							Grades													
	d	s	d_1	l	r	b_s	t_1	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX05	KX20	KX2	N
PNMU 13 08 DN SL-52	24.40	7.94	10.00	13.00	-	3.00	-	✓	-	-	-	-	✓	-	✓	-	✓	-	-	-	-
PNMU 13 08 DN SN-92	24.40	7.94	10.00	13.00	-	3.00	-	-	-	-	-	-	-	-	✓	-	✓	✓	-	-	-
PNMU 13 08 DN SR-52	24.40	7.94	10.00	13.00	-	3.00	-	✓	-	-	-	-	✓	✓	✓	✓	✓	-	-	-	-

✓Article which can be ordered

Ordering example: PNMU 13 08 DN SR-52 5020

Cutting conditions

Grade	Feed per tooth (mm)	P Steel				M Stainless steel			K Cast iron				N Non-ferrous aluminum				S Super alloys			H Hardened materials			
		Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
1020	v_{c1}	227	209	157	106	-	-	-	216	189	146	111	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.30	0.30	0.30	0.30	-	-	-	0.30	0.30	0.30	0.30	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	136	125	94	90	-	-	-	142	123	90	63	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.70	0.70	0.70	0.50	-	-	-	0.70	0.70	0.70	0.70	-	-	-	-	-	-	-	-	-	-	-
5020	v_{c1}	217	199	147	96	164	155	113	206	179	136	101	730	170	280	360	30	20	30	20	25	20	15
	f_{z1}	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
	v_{c2}	105	98	70	69	140	135	100	126	105	70	42	650	50	230	300	20	10	25	15	20	15	10
	f_{z2}	0.70	0.70	0.70	0.50	0.50	0.50	0.50	0.70	0.70	0.70	0.70	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
5040	v_{c1}	187	169	117	66	70	35	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.30	0.30	0.30	0.30	0.30	0.30	0.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	84	77	49	47	49	25	49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.70	0.70	0.70	0.50	0.50	0.50	0.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5050	v_{c1}	186	163	107	55	99	69	61	-	-	-	-	-	-	-	-	34	24	15	-	-	-	-
	f_{z1}	0.30	0.30	0.30	0.30	0.30	0.30	0.30	-	-	-	-	-	-	-	-	0.30	0.30	0.30	-	-	-	-
	v_{c2}	105	102	56	45	69	48	43	-	-	-	-	-	-	-	-	30	20	10	-	-	-	-
	f_{z2}	0.70	0.70	0.70	0.50	0.50	0.50	0.50	-	-	-	-	-	-	-	-	0.50	0.50	0.50	-	-	-	-
8030	v_{c1}	-	-	-	-	131	112	87	-	-	-	-	-	-	-	-	32	22	20	-	-	-	-
	f_{z1}	-	-	-	-	0.3	0.3	0.3	-	-	-	-	-	-	-	-	0.3	0.3	0.3	-	-	-	-
	v_{c2}	-	-	-	-	104	86	71	-	-	-	-	-	-	-	-	25	15	12	-	-	-	-
	f_{z2}	-	-	-	-	0.7	0.7	0.7	-	-	-	-	-	-	-	-	0.5	0.5	0.5	-	-	-	-
5135	v_{c1}	186	170	117	66	70	20	60	-	-	-	-	-	-	-	-	39	29	20	-	-	-	-
	f_{z1}	0.30	0.30	0.30	0.30	0.30	0.30	0.30	-	-	-	-	-	-	-	-	0.30	0.30	0.30	-	-	-	-
	v_{c2}	98	91	63	58	49	14	42	-	-	-	-	-	-	-	-	35	25	15	-	-	-	-
	f_{z2}	0.70	0.70	0.70	0.50	0.50	0.50	0.50	-	-	-	-	-	-	-	-	0.50	0.50	0.50	-	-	-	-
KX20	v_{c1}	-	-	-	-	-	-	-	211	184	141	106	-	-	-	185	37	42	36	-	-	-	-
	f_{z1}	-	-	-	-	-	-	-	0.30	0.30	0.30	0.30	-	-	-	0.30	0.30	0.30	0.30	-	-	-	-
	v_{c2}	-	-	-	-	-	-	-	130	109	74	46	-	-	-	120	27	37	32	-	-	-	-
	f_{z2}	-	-	-	-	-	-	-	0.70	0.70	0.70	0.70	-	-	-	0.50	0.50	0.50	0.50	-	-	-	-

The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

PENTA HEAVY DUTY

Milling cutter characteristics

Test reports

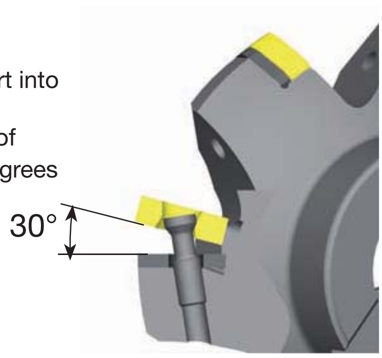
Skin removal	V560 Solution
Diameter D_c (mm)	250
Number of Teeth	12
Insert reference	PNMU 13 08 DN SR-52 5020
V_c (m/min)	98 (N= 125 rpm)
V_f (mm/min)	600 (f_z= 0.4 mm)
a_p	5
a_e	95% D_c
Material	55NiCrMoV7 (1500 Mpa)
Material volume (cm^3/min)	690

Turbine blade	V560 Solution
Diameter Dc (mm)	100
Number of Teeth	5
Insert reference	PNMU 13 08 DN SR-52 5040
Vc (m/min)	140
Vf (mm/min)	1500 (f_z= 0.66 mm)
ap	8
ae	50
Material	Stainless Steel - 316L type
Material volume (cm3/min)	600

Permanent resident screw in the insert pocket

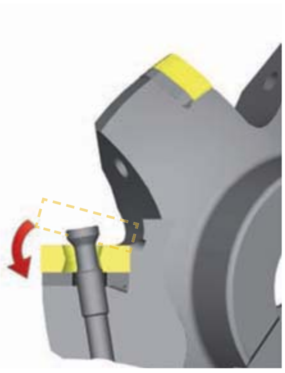
1

Set the insert into the pocket at an angle of about 30 degrees



2

Rotate the insert down flat against the shim seat to its final position in the cutter pocket



3

Tighten three revolutions

4

Torque specification: 16-17 N.m (11-12 ft-lbs)*

* For information

SPECIAL SOLUTION
BACK-SAF

A FLEXIBLE, QUICKER AND SAFER TOOL

COOLANT ACTUATED BACK SPOT FACING TOOL

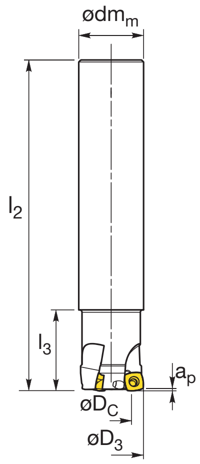
Safety

Cutting Tool Solutions

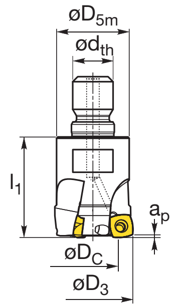
TETRA HIGH FEED

High Feed milling cutter with positive four edged inserts

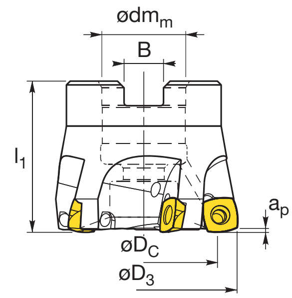
Cutter program, MH09



Cylindrical shank



Threaded modular heads



Arbor mounting

Reference	Dimensions (mm)										Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg	Ramping angle α
	D_c	D_3	Max. a_p	dm_m D_{5m}	d_{th}	l_1	l_2	l_3	A [1]	B							
Cylindrical shank																	
MH09 025R02 C25A160	13.2	25	1	25	-		160	35	-	-	2	SD.. 09 03..	2	Yes	8800	0.530	6
MH09 032R03 C32A200	20.2	32	1	32	-		200	40	-	-	3	SD.. 09 03..	3	Yes	8000	1.100	3.5
Threaded modular heads																	
MH09 025R02 P12A036	13.2	25	1	20.8	M12	36	-	-	17	-	2	SD.. 09 03..	2	Yes	8800	0.100	6
MH09 032R03 P16A040	20.2	32	1	28.8	M16	40	-	-	24	-	3	SD.. 09 03..	3	Yes	8000	0.182	3.5
MH09 035R03 P16A040	23.2	35	1	28.8	M16	40	-	-	24	-	3	SD.. 09 03..	3	Yes	7600	0.199	3
Arbor mounting																	
MH09 040R04 A16A040	28.2	40	1	16	-	40	-	-	-	8.4	4	SD.. 09 03..	4	Yes	7200	0.191	2.5
MH09 042R04 A16A040	30.2	42	1	16	-	40	-	-	-	8.4	4	SD.. 09 03..	4	Yes	7000	0.212	2
MH09 050R05 A22A040	38.2	50	1	22	-	40	-	-	-	10.4	5	SD.. 09 03..	5	Yes	6400	0.300	1.5
MH09 052R05 A22A040	40.2	52	1	22	-	40	-	-	-	10.4	5	SD.. 09 03..	5	Yes	6300	0.326	1.25

[1] Size of the wrench to be used for modular heads is given by dimension A

Spare parts

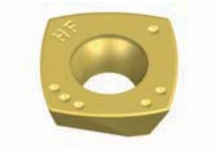
Insert style	Diameter D_3	Insert screw			Screw driver	
		Reference	Size	Torque	Reference	Torx
SD.. 09 03..	25-52	DVF 0981	M3.5	2.4 N.m	TX210PLUS	10IP

MILLING

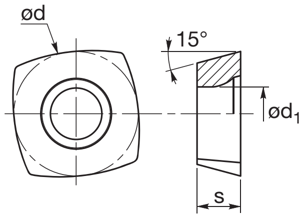
TETRA HIGH FEED

High Feed milling cutter with positive four edged inserts

Insert program



SDKW 09 03 TR-HF

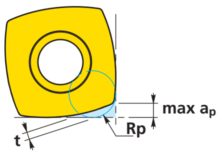


Reference	Dimensions (mm)					Grades												
	d	s	d_1	Max. ap	t_1	1020	1120	1130	2003	5007	5020	5040	5050	5135	KX20	KX2	N	SY3
SDKW 09 03 TR-HF	9.2	3.18	3.8	1	-	-	-	✓	-	-	✓	-	-	-	-	-	-	-

✓Article which can be ordered

Ordering example: SDKW 09 03 TR-HF 1130

Programming radius



Rp	t	Max. ap
2	0.55	1

The insert radius is different from the radius to program (Rp)

Cutting conditions

		P Steel				M Stainless steel			K Cast iron				N Non-ferrous aluminum				S Super alloys			H Hardened materials			
Grade	Feed per tooth (mm)	Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
1130	v_{c1}	245	221	157	91	-	-	-	193	174	139	109	-	-	-	-	-	-	-	35	40	35	30
	f_{z1}	0.50	0.50	0.50	0.50	-	-	-	0.50	0.50	0.50	0.50	-	-	-	-	-	-	-	0.50	0.50	0.50	0.50
	v_{c2}	158	148	106	83	-	-	-	165	145	101	64	-	-	-	-	-	-	-	27	33	27	22
	f_{z2}	2.00	2.00	2.00	2.00	-	-	-	2.00	2.00	2.00	2.00	-	-	-	-	-	-	-	0.80	1.00	0.80	0.80
5020	v_{c1}	304	275	208	129	196	181	130	239	217	184	154	-	-	-	-	56	46	43	33	38	33	28
	f_{z1}	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	-	-	-	-	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	v_{c2}	147	135	99	83	152	145	106	154	132	94	64	-	-	-	-	40	30	35	25	30	25	20
	f_{z2}	2.00	2.00	2.00	2.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00	-	-	-	-	1.00	1.00	1.00	0.80	1.00	0.80	0.80

The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

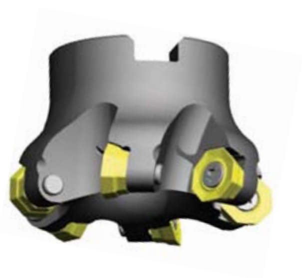
MILLING

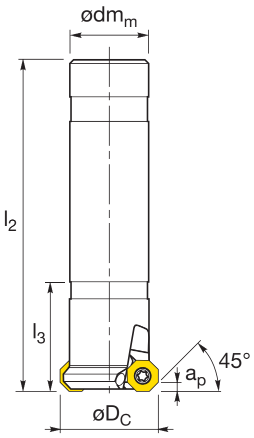
MILLING

QUADRI-SAF

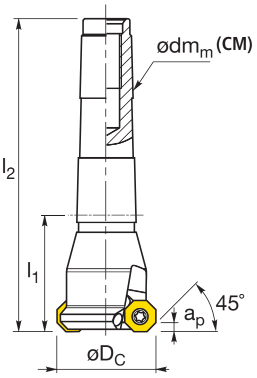
Multi-purpose face milling cutter with positive octagonal, square and round inserts

Cutter program, OC 12

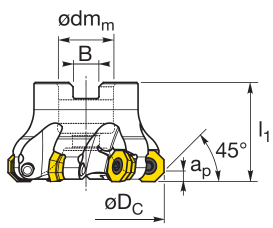




Cylindrical shank



Morse taper



Arbor mounting

Reference	Dimensions (mm)									Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg
	D_c	D_3	Max. a_p SD.. inserts	dm_m	l_1	l_2	l_3	B	F						
Cylindrical Shank															
OC-12/032-03-QCC-5-R	32.00	-	10.00	25.00	-	126.00	45.00	-	-	3	OD/RD/SD.. 12 05..	3	Yes	14000	0.413
OC-12/040-03-QCC-5-R	40.00	-	10.00	32.00	-	148.00	45.00	-	-	3	OD/RD/SD.. 12 05..	3	Yes	14000	0.837
Morse taper															
OC-12/032-03-CM3-5-R	32.00	-	10.00	CM3	45.00	126.00	-	-	-	3	OD/RD/SD.. 12 05..	3	No	11000	0.527
Arbor normal pitch															
OC-12/040-03-ALC-R	40.00	-	10.00	16.00	40.00	-	-	8.40	-	3	OD/RD/SD.. 12 05..	3	Yes	11000	0.161
OC-12/050-04-ALC-R	50.00	-	10.00	22.00	40.00	-	-	10.40	-	4	OD/RD/SD.. 12 05..	4	Yes	9800	0.252
OC-12/063-05-ALC-R	63.00	-	10.00	22.00	40.00	-	-	10.40	-	5	OD/RD/SD.. 12 05..	5	Yes	8000	0.372
OC-12/080-06-ALC-R	80.00	-	10.00	27.00	50.00	-	-	12.40	-	6	OD/RD/SD.. 12 05..	6	Yes	6500	0.583
OC-12/100-07-ALC-R	100.00	-	10.00	32.00	50.00	-	-	14.40	-	7	OD/RD/SD.. 12 05..	7	Yes	5500	0.929
OC-12/125-08-ALC-R	125.00	-	10.00	40.00	63.00	-	-	16.40	-	8	OD/RD/SD.. 12 05..	8	Yes	4500	2.210
Arbor coarse pitch															
OC-12/063-04-AL-R	63.00	-	10.00	22.00	40.00	-	-	10.40	-	4	OD/RD/SD.. 12 05..	4	No [1]	8000	0.376
OC-12/080-04-AL-R	80.00	-	10.00	27.00	50.00	-	-	12.40	-	4	OD/RD/SD.. 12 05..	4	No [1]	6500	0.655
OC-12/100-05-AL-R	100.00	-	10.00	32.00	50.00	-	-	14.40	-	5	OD/RD/SD.. 12 05..	5	No [1]	5500	1.066
OC-12/160-10-AL-R	160.00	-	10.00	40.00	63.00	-	-	16.40	66.70	10	OD/RD/SD.. 12 05..	10	No	3500	3.997
Arbor fine pitch															
OC-12/050-05-ALC-R	50.00	-	10.00	22.00	40.00	-	-	10.40	-	5	OD/RD/SD.. 12 05..	5	Yes	9800	0.235
OC-12/063-06-ALC-R	63.00	-	10.00	22.00	40.00	-	-	10.40	-	6	OD/RD/SD.. 12 05..	6	Yes	8000	0.327
OC-12/080-08-ALC-R	80.00	-	10.00	27.00	50.00	-	-	12.40	-	8	OD/RD/SD.. 12 05..	8	Yes	6500	0.673
OC-12/100-10-ALC-R	100.00	-	10.00	32.00	50.00	-	-	14.40	-	10	OD/RD/SD.. 12 05..	10	Yes	5500	1.011
OC-12/125-12-ALC-R	125.00	-	10.00	40.00	63.00	-	-	16.40	-	12	OD/RD/SD.. 12 05..	12	Yes	4500	2.500

[1] Optional coolant screw can be ordered separately

Spare parts

Insert style	Diameter D_c	Insert Screw			Screw driver		Special arbor mounting screw
		Reference	Size		Reference		Reference
OD/RD/SD.. 12 05..	32 mm	DVF 2097	M 5.0	5.0 N.m	DMP 3662	20 IP	-
OD/RD/SD.. 12 05..	40 mm	DVF 2097	M 5.0	5.0 N.m	DMP 3662	20 IP	DVZ 1715
OD/RD/SD.. 12 05..	50 - 160 mm	DVF 2097	M 5.0	5.0 N.m	DMP 3662	20 IP	-

Optional spare parts - Arbor coarse pitch

Insert style	Diameter D_c	Coolant screw
		Reference
OD/RD/SD.. 12 05..	50 - 63 mm	DVZ 3523
OD/RD/SD.. 12 05..	80 mm	DVZ 3535
OD/RD/SD.. 12 05..	100 mm	DVZ 3536
OD/RD/SD.. 12 05..	125 mm	DVZ 3537

QUADRI-SAF

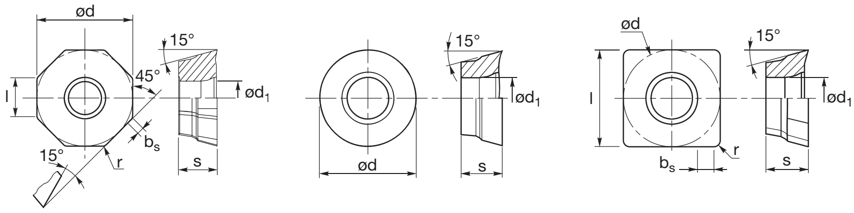
Multi-purpose face milling cutter with positive octagonal, square and round inserts

Insert program

ODKT... FR-11

ODKT... SR-41

ODMT... SN-81



Reference	Dimensions (mm)							Grades													
	d	s	d_1	l	r	b_s	ch	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX05	KX20	KX2	N
Octagonal inserts																					
ODKT 12 05 AD FR-11	12.70	5.56	5.5	5.26	-	1.00	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
ODKT 12 05 AD SR-41	12.70	5.56	5.5	5.26	-	1.00	-	✓	-	-	✓	-	✓	✓	✓	✓	✓	-	-	-	-
ODMT 12 05 AD SR-41	12.70	5.56	5.5	5.26	-	1.00	-	-	-	-	-	-	-	✓	✓	✓	✓	-	-	-	-
ODMT 12 05 08 SN-81	12.70	5.56	5.5	5.26	0.8	-	-	-	-	-	-	-	✓	-	✓	✓	✓	-	-	-	-
Round inserts																					
RDGT 12 05 00 FN-11	12.70	5.56	5.5	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
RDGT 12 05 00 SN F8-41	12.70	5.56	5.5	-	-	-	-	-	-	-	✓	-	✓	-	✓	✓	-	-	-	-	-
RDMT 12 05 00 SN F8-81	12.70	5.56	5.5	-	-	-	-	-	-	-	-	-	✓	-	✓	-	✓	-	-	-	-
Square inserts																					
SDKT 12 05 PD FR-11	12.70	5.56	5.5	12.70	0.8	2.30	-	-	-	-	✓	-	-	-	-	-	-	✓	-	-	-
SDKT 12 05 AE SN-41	12.70	5.56	5.5	12.70	-	-	1.7 x 45°	-	-	-	-	-	✓	✓	✓	-	✓	-	✓	-	-
SDKT 12 05 PD SR-41	12.70	5.56	5.5	12.70	0.8	2.30	-	-	-	-	-	-	✓	✓	✓	-	✓	-	-	-	-
SDMT 12 05 08 EN-21	12.70	5.56	5.5	12.70	0.8	-	-	-	-	-	✓	-	✓	✓	✓	-	✓	✓	-	-	-
SDMT 12 05 AE EN-21	12.70	5.56	5.5	12.70	-	-	1.7 x 45°	-	-	-	-	-	-	✓	✓	-	✓	-	✓	-	-
SDMT 12 05 08 SN-41	12.70	5.56	5.5	12.70	0.8	-	-	-	-	-	-	-	-	✓	✓	-	-	-	-	-	-
SDMT 12 05 08 SN-81	12.70	5.56	5.5	12.70	0.8	-	-	✓	-	-	-	-	✓	✓	✓	-	✓	-	-	-	-
SDMT 12 05 AE SN-81	12.70	5.56	5.5	12.70	-	-	1.7 x 45°	-	-	-	-	-	✓	✓	✓	-	✓	-	✓	-	-

✓Article which can be ordered

Ordering example: ODKT 12 05 AD SR-41 5020

Cutting conditions

Grade	Feed per tooth (mm)	P Steel				M Stainless steel			K Cast iron				N Non-ferrous aluminum				S Super alloys			H Hardened materials			
		Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
1020	v_{c1}	361	326	251	157	-	-	-	267	248	219	192	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	-	-	-	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	261	238	181	119	-	-	-	229	204	165	131	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.20	0.20	0.20	0.20	-	-	-	0.20	0.20	0.20	0.20	-	-	-	-	-	-	-	-	-	-	-
2003	v_{c1}	-	-	-	250	279	240	179	277	257	227	207	-	-	-	-	100	90	65	99	119	99	99
	f_{z1}	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	-	-	-	220	259	210	159	239	219	189	169	-	-	-	-	90	80	60	79	99	79	79
	f_{z2}	-	-	-	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	-	-	-	-	0.10	0.10	0.10	0.20	0.20	0.20	0.20
5020	v_{c1}	351	316	241	147	213	195	139	257	238	209	182	1050	650	480	600	70	60	50	40	45	40	35
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	251	228	171	109	176	165	119	219	194	155	121	970	530	430	540	60	50	45	35	40	35	30
	f_{z2}	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
5040	v_{c1}	321	286	211	117	190	175	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	221	198	141	79	160	140	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.20	0.20	0.20	0.20	0.10	0.10	0.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5050	v_{c1}	259	229	161	95	136	88	74	-	-	-	-	-	-	-	-	53	43	35	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	205	179	121	65	108	74	65	-	-	-	-	-	-	-	-	48	38	30	-	-	-	-
	f_{z2}	0.20	0.20	0.20	0.20	0.20	0.20	0.20	-	-	-	-	-	-	-	-	0.20	0.20	0.10	-	-	-	-
8030	v_{c1}	-	-	-	-	174	141	106	-	-	-	-	-	-	-	-	62	52	42	-	-	-	-
	f_{z1}	-	-	-	-	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	-	-	-	-	142	120	102	-	-	-	-	-	-	-	-	50	40	37	-	-	-	-
	f_{z2}	-	-	-	-	0.2	0.2	0.2	-	-	-	-	-	-	-	-	0.2	0.2	0.2	-	-	-	-
5135	v_{c1}	277	250	171	99	160	140	90	-	-	-	-	-	-	-	-	58	48	40	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	209	190	131	75	130	100	80	-	-	-	-	-	-	-	-	44	34	35	-	-	-	-
	f_{z2}	0.20	0.20	0.20	0.20	0.10	0.10	0.10	-	-	-	-	-	-	-	-	0.20	0.20	0.10	-	-	-	-
KX20	v_{c1}	-	-	-	-	-	-	-	262	243	214	187	-	-	-	445	77	62	52	-	-	-	-
	f_{z1}	-	-	-	-	-	-	-	0.05	0.05	0.05	0.05	-	-	-	0.05	0.05	0.05	0.05	-	-	-	-
	v_{c2}	-	-	-	-	-	-	-	224	199	160	126	-	-	-	380	67	57	48	-	-	-	-
	f_{z2}	-	-	-	-	-	-	-	0.20	0.20	0.20	0.20	-	-	-	0.10	0.10	0.10	0.10	-	-	-	-

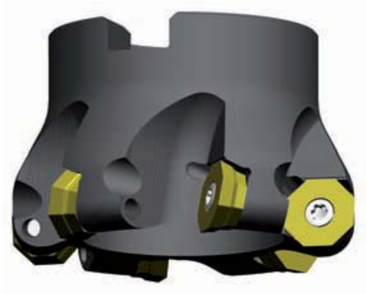
The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

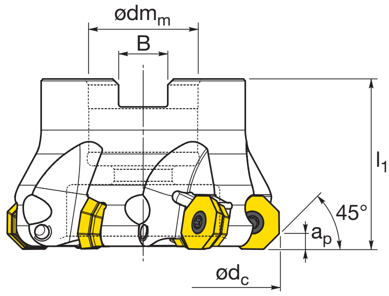
MILLING

QUADRI-SAF

Multi-purpose face milling cutter with positive octagonal, square and round inserts

Cutter program, OC 15





Arbor mounting

Reference	Dimensions (mm)							Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg
	D_c	D_3	Max. a_p SD.. Inserts	dm_m	l_1	B	F						
OC-15/063-05-ASC-R	63.00	-	12.00	27.00	50.00	12.40	-	5	OD/RD/SD.. 15 06..	5	Yes	8000	0.502
OC-15/080-06-ASC-R	80.00	-	12.00	32.00	50.00	14.40	-	6	OD/RD/SD.. 15 06..	6	Yes	6500	0.691
OC-15/100-07-ASC-R	100.00	-	12.00	40.00	63.00	16.40	-	7	OD/RD/SD.. 15 06..	7	Yes	5500	1.546

[1] Optional coolant screw can be ordered separately

Spare parts

Insert style	Diameter D_c	Insert Screw			Screw driver	
		Reference	Size	Torque	Reference	Torx
OD/RD/SD.. 15 06..	63 - 100 mm	DVF 2097	M 5.0	5.0 N.m	DMP 3662	20 IP

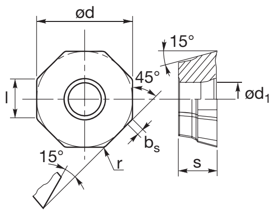
QUADRI-SAF

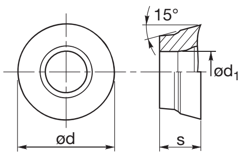
Multi-purpose face milling cutter with positive octagonal, square and round inserts

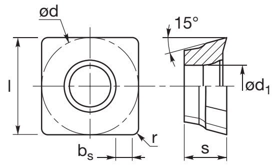
Insert program

ODKT... SR-41

ODMT... SN-81







Reference	Dimensions (mm)							Grades													
	d	s	d_1	l	r	b_s	ch	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX05	KX20	KX2	N
Octagonal inserts																					
ODKT 15 06 AD SR-41	15.87	6.35	5.5	6.58	-	1.30	-	-	-	-	✓	-	-	-	✓	-	✓	-	-	-	-
ODMT 15 06 08 SN-81	15.87	6.35	5.5	6.58	0.8	-	-	-	-	-	-	-	-	-	✓	-	✓	-	-	-	-
Round inserts																					
RDMT 15 06 00 SN-81	15.87	6.35	5.5	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-
Square inserts																					
SDMT 15 06 08 EN-21	15.87	6.35	5.5	15.87	0.8	-	-	-	-	-	-	-	✓	-	✓	-	✓	-	-	-	-
SDMT 15 06 08 SN-81	15.87	6.35	5.5	15.87	0.8	-	-	-	✓	-	-	-	✓	✓	✓	-	✓	-	-	-	-
SDMT 15 06 AE SN-81	15.87	6.35	5.5	15.87	-	-	1.8 x 45°	-	-	-	-	-	-	✓	✓	-	✓	-	-	-	-

✓Article which can be ordered

Ordering example: ODKT 15 06 AD SR-41 2003

Cutting conditions

Grade	Feed per tooth (mm)	P Steel				M Stainless steel			K Cast iron				N Non-ferrous aluminum				S Super alloys			H Hardened materials			
		Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
1120	v_{c1}	371	336	261	167	-	-	-	272	253	224	197	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	-	-	-	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	170	160	191	90	-	-	-	195	165	115	75	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.35	0.35	0.35	0.35	-	-	-	0.35	0.35	0.35	0.35	-	-	-	-	-	-	-	-	-	-	-
2003	v_{c1}	-	-	-	250	279	240	179	277	257	227	207	-	-	-	-	100	90	65	99	119	99	99
	f_{z1}	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	-	-	-	220	259	210	159	239	219	189	169	-	-	-	-	80	70	55	60	80	60	60
	f_{z2}	-	-	-	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	-	-	-	-	0.15	0.15	0.15	0.35	0.35	0.35	0.35
5020	v_{c1}	351	316	241	147	213	195	139	257	238	209	182	1050	650	480	600	70	60	50	40	45	40	35
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	150	140	100	70	140	135	100	180	150	100	60	890	410	380	480	60	50	45	30	35	30	25
	f_{z2}	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
5040	v_{c1}	321	286	211	117	190	175	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	120	110	70	40	130	105	90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.35	0.35	0.35	0.35	0.15	0.15	0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5050	v_{c1}	259	229	161	95	136	88	74	-	-	-	-	-	-	-	-	53	43	35	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	150	130	80	35	80	60	55	-	-	-	-	-	-	-	-	44	34	25	-	-	-	-
	f_{z2}	0.35	0.35	0.35	0.35	0.35	0.35	0.35	-	-	-	-	-	-	-	-	0.15	0.15	0.15	-	-	-	-
5135	v_{c1}	277	250	171	99	160	140	90	-	-	-	-	-	-	-	-	58	48	40	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	140	130	90	50	100	60	70	-	-	-	-	-	-	-	-	49	39	30	-	-	-	-
	f_{z2}	0.35	0.35	0.35	0.35	0.15	0.15	0.15	-	-	-	-	-	-	-	-	0.15	0.15	0.15	-	-	-	-

The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

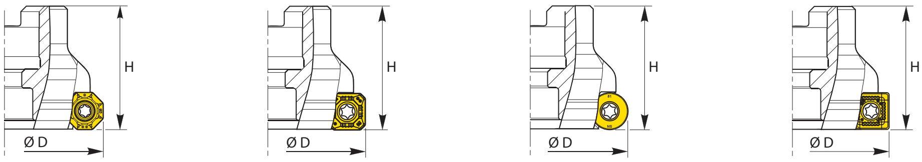
MILLING

QUADRI SAF

Milling cutter characteristics

Diameter D and height H

Diameter D is identical for the four insert shapes. – Height H is identical for the 4 insert shapes.

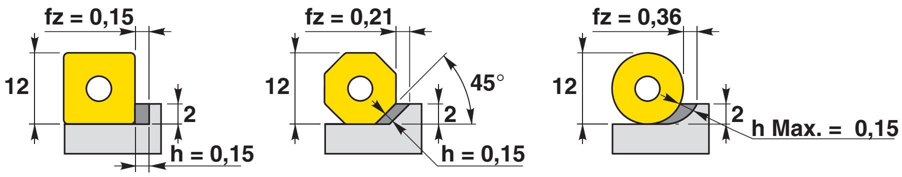


Operating safety

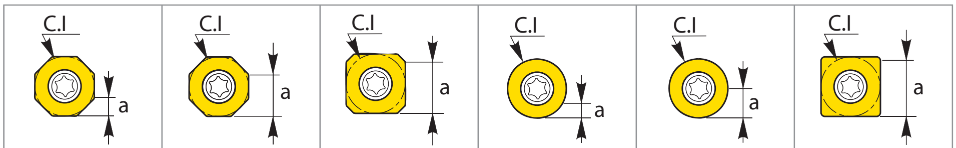
The inserts are thick (5.56 for 12mm inserts and 6.35 for 15mm inserts) making them very robust and ensuring better heat dissipation and hence longer life.

Chip thickness depending on the insert shape

Calculation of "h" (Max.) actual chip thickness



Cutting depth – Number of edges



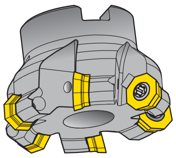
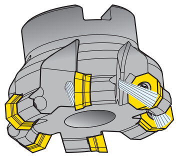
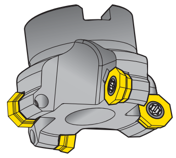
Cutting depth	C.I 12	3	7	9	3	6	10
	C.I 15	4	9	11	4	8	12
Number of edges per insert		8	4	4	6	4	4

QUADRI SAF

Milling cutter characteristics

Cutter pitch

To meet the various needs related to the variety of materials, part shapes and types of work to be performed, some QUADRI-SAF cutters are available in Close pitch, Normal pitch and Large pitch with or without coolant.

		
Close pitch	**Normal pitch**	**Large pitch**
- High number of teeth - Wide chip flow area - Interrupted cut	- Typical use	- Reduced number of teeth - Less absorbed power - Slotting - Machining of stainless steels - Machining of aluminium alloys

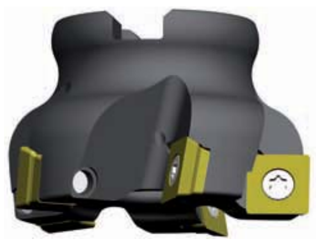
Usage limits

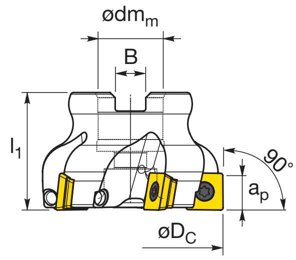
Ramping is not recommended
IMPORTANT : The small size of chip pockets in Ø 32 cutters with 3 teeth prohibits slotting and requires:
- to limit the cutting depth to 3 mm.
- to limit tooth feed to 0,15 mm.
- infeed equal to 80% of the diameter.

QUADRI SP

Precision face milling cutter 90° with positive square inserts

Cutter program, SP12





Arbor mounting

Reference	Dimensions (mm)							Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg
	D_c	D_3	Max. a_p	dm_m	l_1	B	F						
SP12 050R04 A22A040	50.00	-	10.00	22.00	40.00	10.40	-	4	SD.. 12 05..	4	Yes	9800	0.236
SP12 063R05 A22A040	63.00	-	10.00	22.00	40.00	10.40	-	5	SD.. 12 05..	5	Yes	8000	0.345
SP12 080R06 A27A050	80.00	-	10.00	27.00	50.00	12.40	-	6	SD.. 12 05..	6	Yes	6500	0.779
SP12 100R07 A32A050	100.00	-	10.00	32.00	50.00	14.40	-	7	SD.. 12 05..	7	Yes	5500	1.438

Spare parts

Insert style	Diameter D_c	Insert Screw			Screw driver	
		Reference	Size	Torque	Reference	Torx
SD.. 12 05..	50 - 100 mm	DVF 2097	M 5.0	5.0 N.m	DMP 3662	20 IP

QUADRI SP

Precision face milling cutter 90° with positive square inserts

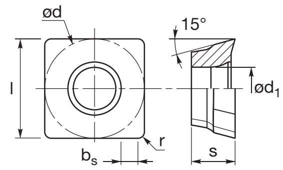
Insert program

SDKT... FR-11

SDMT... EN-21

SDKT... SR-41
SDMT... SN-41

SDMT... SN-81



Reference	Dimensions (mm)							Grades													
	d	s	d_1	l	r	b_s	t_1	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX05	KX20	KX2	N
SDKT 12 05 PD FR-11	12.70	5.56	5.5	12.70	-	2.30	-	-	-	-	✓	-	-	-	-	-	-	✓	-	-	-
SDKT 12 05 PD SR-41	12.70	5.56	5.5	12.70	-	2.30	-	-	-	-	-	-	✓	✓	✓	-	✓	-	-	-	-
SDMT 12 05 08 EN-21	12.70	5.56	5.5	12.70	0.8	-	-	-	-	-	✓	-	✓	✓	✓	-	✓	✓	-	-	-
SDMT 12 05 08 SN-41	12.70	5.56	5.5	12.70	0.8	-	-	-	-	-	-	-	-	✓	✓	-	-	-	-	-	-
SDMT 12 05 08 SN-81	12.70	5.56	5.5	12.70	0.8	-	-	✓	-	-	-	-	✓	✓	✓	-	✓	-	-	-	-

✓Article which can be ordered

Ordering example: SDKT 12 05 PD SR-41 5020

Cutting conditions

Grade	Feed per tooth (mm)	P Steel				M Stainless steel			K Cast iron				N Non-ferrous aluminum				S Super alloys			H Hardened materials			
		Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
1020	v_{c1}	361	326	251	157	-	-	-	267	248	219	192	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	-	-	-	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	261	238	181	119	-	-	-	229	204	165	131	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.20	0.20	0.20	0.20	-	-	-	0.20	0.20	0.20	0.20	-	-	-	-	-	-	-	-	-	-	-
2003	v_{c1}	-	-	-	250	279	240	179	277	257	227	207	-	-	-	-	100	90	65	99	119	99	99
	f_{z1}	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	-	-	-	220	259	210	159	239	219	189	169	-	-	-	-	70	60	50	79	99	79	79
	f_{z2}	-	-	-	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	-	-	-	-	0.10	0.10	0.10	0.20	0.20	0.20	0.20
5020	v_{c1}	351	316	241	147	213	195	139	257	238	209	182	1050	650	480	600	70	60	50	40	45	40	35
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	251	228	171	109	176	165	119	219	194	155	121	970	530	430	540	60	50	45	35	40	35	30
	f_{z2}	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
5040	v_{c1}	321	286	211	117	190	175	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	221	198	141	79	160	140	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.20	0.20	0.20	0.20	0.10	0.10	0.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5050	v_{c1}	259	229	161	95	136	88	74	-	-	-	-	-	-	-	-	53	43	35	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	205	179	121	65	108	74	65	-	-	-	-	-	-	-	-	48	38	30	-	-	-	-
	f_{z2}	0.20	0.20	0.20	0.20	0.20	0.20	0.20	-	-	-	-	-	-	-	-	0.20	0.20	0.10	-	-	-	-
5135	v_{c1}	277	250	171	99	160	140	90	-	-	-	-	-	-	-	-	58	48	40	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	209	190	131	75	130	100	80	-	-	-	-	-	-	-	-	44	34	35	-	-	-	-
	f_{z2}	0.20	0.20	0.20	0.20	0.10	0.10	0.10	-	-	-	-	-	-	-	-	0.20	0.20	0.10	-	-	-	-
KX20	v_{c1}	-	-	-	-	-	-	-	262	243	214	187	-	-	-	445	77	62	52	-	-	-	-
	f_{z1}	-	-	-	-	-	-	-	0.05	0.05	0.05	0.05	-	-	-	0.05	0.05	0.05	0.05	-	-	-	-
	v_{c2}	-	-	-	-	-	-	-	224	199	160	126	-	-	-	380	67	57	48	-	-	-	-
	f_{z2}	-	-	-	-	-	-	-	0.20	0.20	0.20	0.20	-	-	-	0.10	0.10	0.10	0.10	-	-	-	-

The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

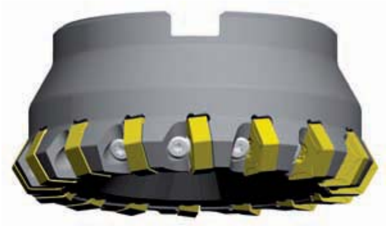
MILLING

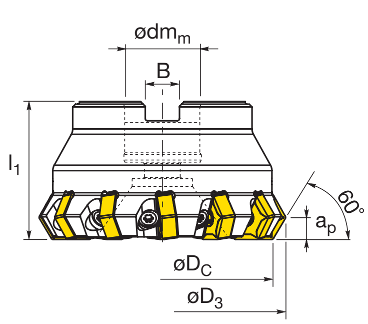
MILLING

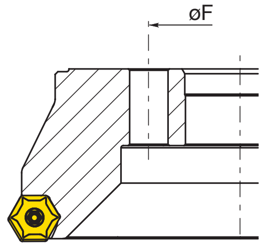
FORCE-SAF

Face milling cutter 60° for cast iron machining with negative hexagonal inserts and SideLok™ technology

Cutter program, V760







Arbor mounting

Reference	Dimensions (mm)							Z	Insert style	Nb of inserts	Wiper insert possible	Coolant channels	Max. RPM	kg
	D_c	D_3	Max. a_p	dm_m	l_1	B	F							
Arbor coarse pitch														
V760A 09 M080 27 08R	80.00	89.40	6.00	27.00	50.00	12.40	-	8	HN.. 09 05..	8	2	No [1]	11500	1.310
V760A 09 M100 32 10R	100.00	109.40	6.00	32.00	50.00	14.40	-	10	HN.. 09 05..	10	2	No [1]	10000	2.070
V760A 09 M125 40 12R	125.00	134.40	6.00	40.00	63.00	16.40	-	12	HN.. 09 05..	12	2	No [1]	8800	3.835
V760A 09 M160 40 16R	160.00	169.40	6.00	40.00	63.00	16.40	66.70	16	HN.. 09 05..	16	3	No	7600	5.816
V760A 09 M200 60 20R	200.00	209.40	6.00	60.00	63.00	25.70	101.60	20	HN.. 09 05..	20	4	No	6700	9.117
V760A 09 M250 60 24R	250.00	259.40	6.00	60.00	63.00	25.70	101.60	24	HN.. 09 05..	24	4	No	6000	12.280
Arbor fine pitch														
V760A 09 M080 27 12R	80.00	89.40	6.00	27.00	50.00	12.40	-	12	HN.. 09 05..	12	2	No [1]	11500	1.221
V760A 09 M100 32 16R	100.00	109.40	6.00	32.00	50.00	14.40	-	16	HN.. 09 05..	16	2	No [1]	10000	1.964
V760A 09 M125 40 20R	125.00	134.40	6.00	40.00	63.00	16.40	-	20	HN.. 09 05..	20	2	No [1]	8800	3.647
V760A 09 M160 40 24R	160.00	169.40	6.00	40.00	63.00	16.40	66.70	24	HN.. 09 05..	24	3	No	7600	5.654
V760A 09 M200 60 32R	200.00	209.40	6.00	60.00	63.00	25.70	101.60	32	HN.. 09 05..	32	4	No	6700	8.885
V760A 09 M250 60 40R	250.00	259.40	6.00	60.00	63.00	25.70	101.60	40	HN.. 09 05..	40	4	No	6000	11.976

[1] Optional coolant screw can be ordered separately

Spare parts

Insert style	Diameter D_c	Insert screw			Screw driver		Torque wrench		
		Reference	Size		Reference		Reference		Nm
HN.. 09 05..	80 - 250 mm	DVF 4207	M 4.0	3.0 N.m	TX 215PLUS	15 IP	TDX 215PLUS	15 IP	3.0

Optional spare parts

Insert style	Diameter D_c	Coolant screw
		Reference
HN.. 09 05..	80 mm	DVZ 3535
HN.. 09 05..	100 mm	DVZ 3536
HN.. 09 05..	125 mm	DVZ 3537
HN.. 09 05..	160 - 250 mm	-

FORCE-SAF

Face milling cutter 60° for cast iron machining with negative hexagonal inserts and SideLok™ technology

Insert program

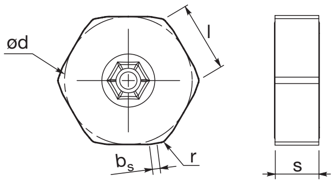
HNEF... W1 FN-11

HNEF... EN-41

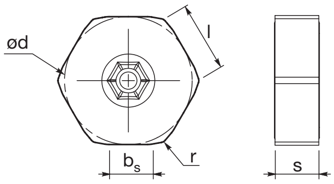
HNEF... SN-81

HNEF... W1 ZZ L/R

Utility inserts



Wiper inserts



Reference	Dimensions (mm)							Grades													
	d	s	d_1	l	r	b_s	t_1	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX05	KX20	KX2	N
Utility inserts																					
HNEF 09 05 04 W1 FN-11	16.20	5.64	-	9.40	0.4	1.6	-	✓	✓	✓	-	-	-	-	-	-	-	-	-	-	-
HNEF 09 05 08 EN-41	16.20	5.64	-	9.40	0.8	-	-	✓	✓	✓	-	-	-	-	-	-	-	-	-	-	-
HNMF 09 05 16 SN-81	16.20	5.64	-	9.40	1.6	-	-	✓	✓	✓	-	-	-	-	-	-	-	-	-	-	-
Wiper Inserts																					
HNEF 09 05 08 W1 ZZ L	16.26	5.64	-	9.38	0.8	5.0	-	✓	✓	✓	-	-	-	-	-	-	-	-	-	-	-
HNEF 09 05 08 W1 ZZ R	16.26	5.64	-	9.38	0.8	5.0	-	✓	✓	✓	-	-	-	-	-	-	-	-	-	-	-

✓Article which can be ordered

Ordering example: HNEF 09 05 08 EN-41 1120

Cutting conditions

Grade	Feed per tooth (mm)	P Steel				M Stainless steel			K Cast iron				N Non-ferrous aluminum				S Super alloys			H Hardened materials			
		Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
1020	v_{c1}	361	326	251	157	-	-	-	267	248	219	192	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	-	-	-	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	261	238	181	119	-	-	-	229	204	165	131	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.20	0.20	0.20	0.20	-	-	-	0.20	0.20	0.20	0.20	-	-	-	-	-	-	-	-	-	-	-
1120	v_{c1}	371	336	261	167	-	-	-	272	253	224	197	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	-	-	-	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	271	248	191	129	-	-	-	234	209	170	136	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.20	0.20	0.20	0.20	-	-	-	0.20	0.20	0.20	0.20	-	-	-	-	-	-	-	-	-	-	-
1130	v_{c1}	-	-	-	-	-	-	-	224	206	181	158	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	-	-	-	-	-	-	-	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	-	-	-	-	-	-	-	177	158	118	84	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	-	-	-	-	-	-	-	0.20	0.20	0.20	0.20	-	-	-	-	-	-	-	-	-	-	-

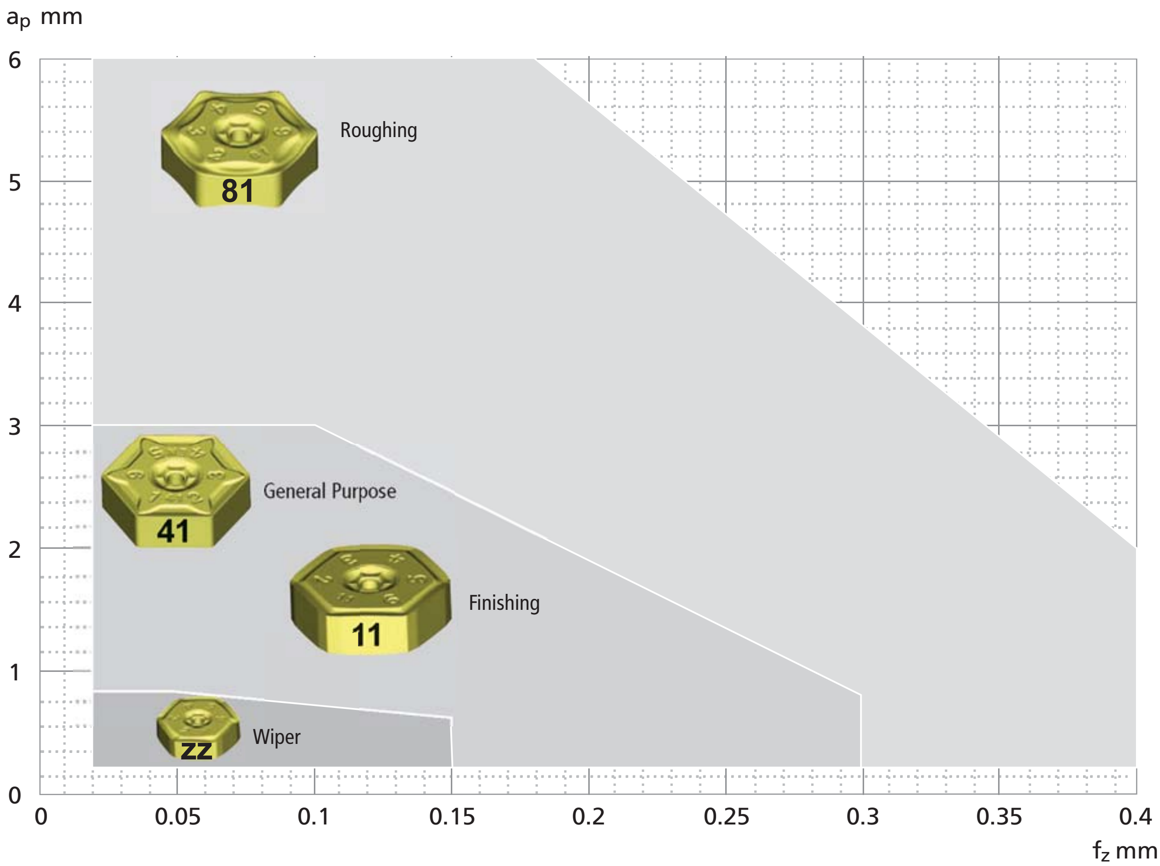
The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

MILLING

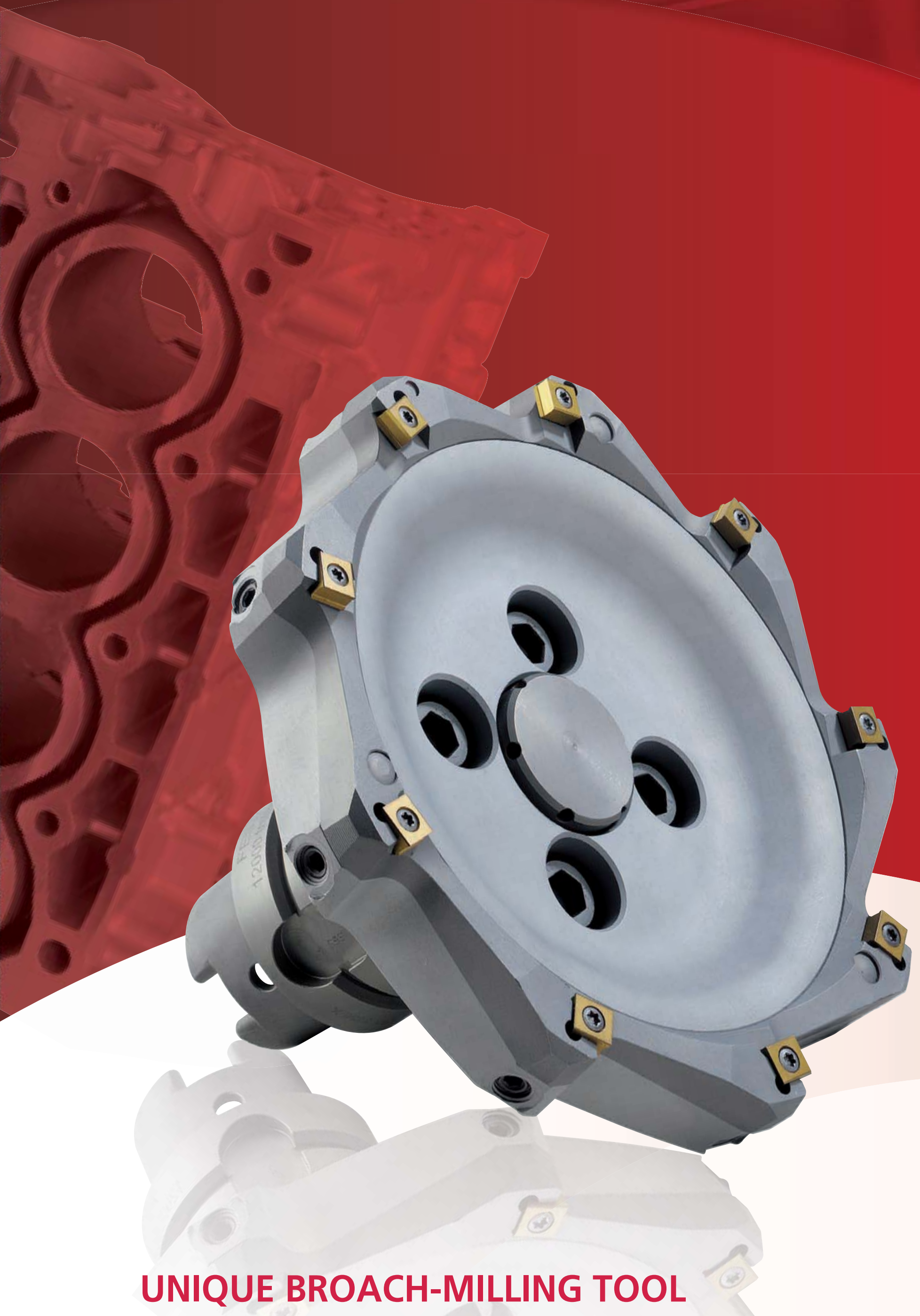
FORCE-SAF

Milling cutter characteristics

Feed rate



SPECIAL SOLUTION
BF CUTTER



UNIQUE BROACH-MILLING TOOL

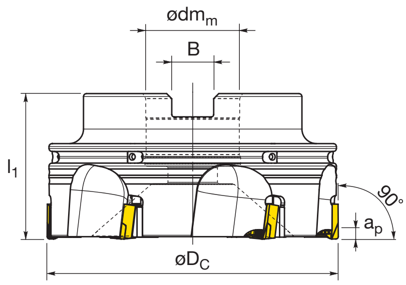
AN OUTSTANDING SURFACE FINISH
QUALITY AND NO BURRS

Safety
Cutting Tool Solutions

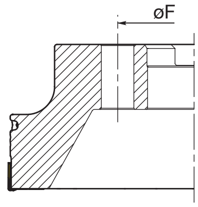
FLASH-SAF

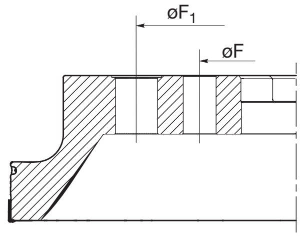
Face and shoulder milling cutter 90° for high speed machining of aluminiumwith PCD & CBN inserts

Cutter program, V650



Arbor mounting





Reference	Dimensions (mm)								Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg
	D_c	D_3	Max. a_p	dm_m	l_1	B	F	F_1						
Arbor coarse pitch														
V650A 12 M050 22 04R	50.00	-	10.00	22.00	40.00	10.40	-	-	4	XOEN 12 T3…	4	No	35000	0.314
V650A 12 M063 22 05R	63.00	-	10.00	22.00	40.00	10.40	-	-	5	XOEN 12 T3…	5	No	31000	0.487
V650A 12 M080 27 06R	80.00	-	10.00	27.00	50.00	12.40	-	-	6	XOEN 12 T3…	6	No	28000	0.937
V650A 12 M100 32 06R	100.00	-	10.00	32.00	50.00	14.40	-	-	6	XOEN 12 T3…	6	No	25000	1.684
V650A 12 M125 40 08R	125.00	-	10.00	40.00	63.00	16.40	-	-	8	XOEN 12 T3…	8	No	22000	2.536
V650A 12 M160 40 10R	160.00	-	10.00	40.00	63.00	16.40	66.70	-	10	XOEN 12 T3…	10	No	20000	4.225
V650A 12 M200 60 12R	200.00	-	10.00	60.00	63.00	25.70	101.60	-	12	XOEN 12 T3…	12	No	17000	6.596
V650A 12 M250 60 16R	250.00	-	10.00	60.00	63.00	25.70	101.60	-	16	XOEN 12 T3…	16	No	15000	9.262
V650A 12 M315 60 20R	315.00	-	10.00	60.00	80.00	25.70	101.60	177.80	20	XOEN 12 T3…	20	No	14000	17.656
Arbor fine pitch														
V650A 12 M050 22 06R	50.00	-	10.00	22.00	40.00	10.40	-	-	6	XOEN 12 T3…	6	No	35000	0.321
V650A 12 M063 22 07R	63.00	-	10.00	22.00	40.00	10.40	-	-	7	XOEN 12 T3…	7	No	31000	0.523
V650A 12 M080 27 09R	80.00	-	10.00	27.00	50.00	12.40	-	-	9	XOEN 12 T3…	9	No	28000	0.978
V650A 12 M100 32 12R	100.00	-	10.00	32.00	50.00	14.40	-	-	12	XOEN 12 T3…	12	No	25000	1.735
V650A 12 M125 40 15R	125.00	-	10.00	40.00	63.00	16.40	-	-	15	XOEN 12 T3…	15	No	22000	2.639
V650A 12 M160 40 18R	160.00	-	10.00	40.00	63.00	16.40	66.70	-	18	XOEN 12 T3…	18	No	20000	4.383
V650A 12 M200 60 24R	200.00	-	10.00	60.00	63.00	25.70	101.60	-	24	XOEN 12 T3…	24	No	17000	6.741
V650A 12 M250 60 30R	250.00	-	10.00	60.00	63.00	25.70	101.60	-	30	XOEN 12 T3…	30	No	15000	9.514
V650A 12 M315 60 36R	315.00	-	10.00	60.00	80.00	25.70	101.60	177.80	36	XOEN 12 T3…	36	No	14000	17.922

Spare parts

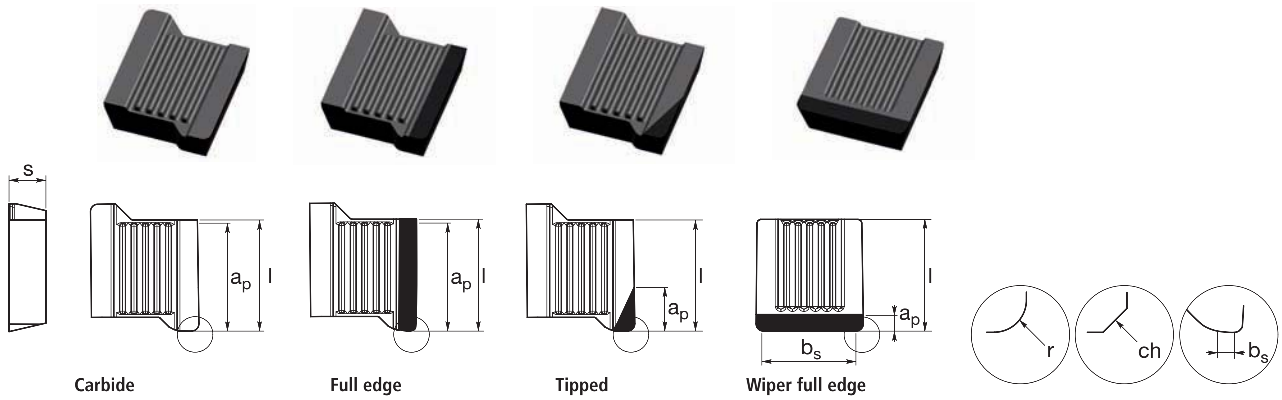
Insert style	Diameter D_c	Protection wedge	Adjustment screw	Clamping screw		Wrench
		Reference	Reference	Reference	N.m	Reference
XOEN 12 T3…	50 - 315 mm	DCP 4211	DVZ 4213	DVD 4212	1.8 to 2.8 N.m	174.1-870

MILLING

FLASH-SAF

Face and shoulder milling cutter 90° for high speed machining of aluminiumwith PCD & CBN inserts

Insert program



Carbide Fig. 1 | Full edge Fig. 2 | Tipped Fig. 3 | Wiper full edge Fig. 4

Reference	Fig.	Dimensions (mm)							Grades		
		L/N/R	l	s	r	ch	b_s	Max. a_p	N	D720 (PCD)	B125 (CBN)
Carbide											
XOEN 12 T3 04 RC	1	R	12	4	0.4	-	1.6	10.00	✓	-	-
XOEN 12 T3 08 RC	1	R	12	4	0.8	-	1.2	10.00	✓	-	-
Tipped - Full edge											
XOEN 12 T3 08 RH	2	R	12.00	4.00	0.8	-	1.00	10.00	-	✓	-
XOEN 12 T3 AZ 08 RH	2	R	12.00	4.00	-	0.8 x 45°	1.00	10.00	-	✓	-
Tipped - Right hand											
XOEN 12 T3 04 RF	3	R	12.00	4.00	0.4	-	(angle 5°)	3.30	-	✓	-
XOEN 12 T3 08 RE	3	R	12.00	4.00	0.8	-	1.26	3.30	-	-	✓
XOEN 12 T3 08 RF	3	R	12.00	4.00	0.8	-	1.20	3.30	-	✓	-
XOEN 12 T3 AZ 08 RF	3	R	12.00	4.00	-	0.8 x 45°	1.20	3.30	-	✓	-
Tipped - Left hand											
XOEN 12 T3 04 LF	3	L	12.00	4.00	0.4	-	(angle 5°)	3.30	-	✓ 1)	-
XOEN 12 T3 08 LF	3	L	12.00	4.00	0.8	-	1.20	3.30	-	✓ 1)	-
Tipped - Wiper full edge											
XOEN 12 T3 04 ZZ NH	4	N	12.00	4.00	0.4	-	10.80	0.76	-	✓	-
XOEN 12 T3 08 ZZ NH	4	N	12.00	4.00	0.8	-	10.10	0.76	-	✓	-
XOEN 12 T3 AZZ 08 NH	4	N	12.00	4.00	-	0.8 x 45°	10.00	0.76	-	✓	-
XOEN 12 T3 08 ZZ NHE	4	N	12.00	4.00	0.8	-	10.00	0.76	-	-	✓

1) On request

Ordering example: XOEN 12 T3 08 RF D720

Cutting conditions

		P Steel				M Stainless steel			K Cast iron				N Non-ferrous aluminum				S Super alloys			H Hardened materials			
Grade	Feed per tooth (mm)	Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
N	v_{c1}	-	-	-	-	-	-	-	142	117	89	80	900	500	475	510	-	-	-	-	-	-	-
	f_{z1}	-	-	-	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-
	v_{c2}	-	-	-	-	-	-	-	126	103	79	73	820	460	415	470	-	-	-	-	-	-	-
	f_{z2}	-	-	-	-	-	-	-	0.12	0.12	0.12	0.12	0.09	0.09	0.09	0.09	-	-	-	-	-	-	-
B125 (CBN)	v_{c1}	-	-	-	-	-	-	-	1000	800	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	-	-	-	-	-	-	-	0.10	0.10	-	-	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	-	-	-	-	-	-	-	800	650	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	-	-	-	-	-	-	-	0.20	0.20	-	-	-	-	-	-	-	-	-	-	-	-	-
D720 (PCD)	v_{c1}	-	-	-	-	-	-	-	-	-	-	420 1)	4442	3425	1083	2483	-	-	-	-	-	-	-
	f_{z1}	-	-	-	-	-	-	-	-	-	-	0.10 1)	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-
	v_{c2}	-	-	-	-	-	-	-	-	-	-	250 1)	2867	2300	633	1733	-	-	-	-	-	-	-
	f_{z2}	-	-	-	-	-	-	-	-	-	-	0.30 1)	0.20	0.20	0.20	0.20	-	-	-	-	-	-	-

1) Starting values to be used to machine Bi-Metal

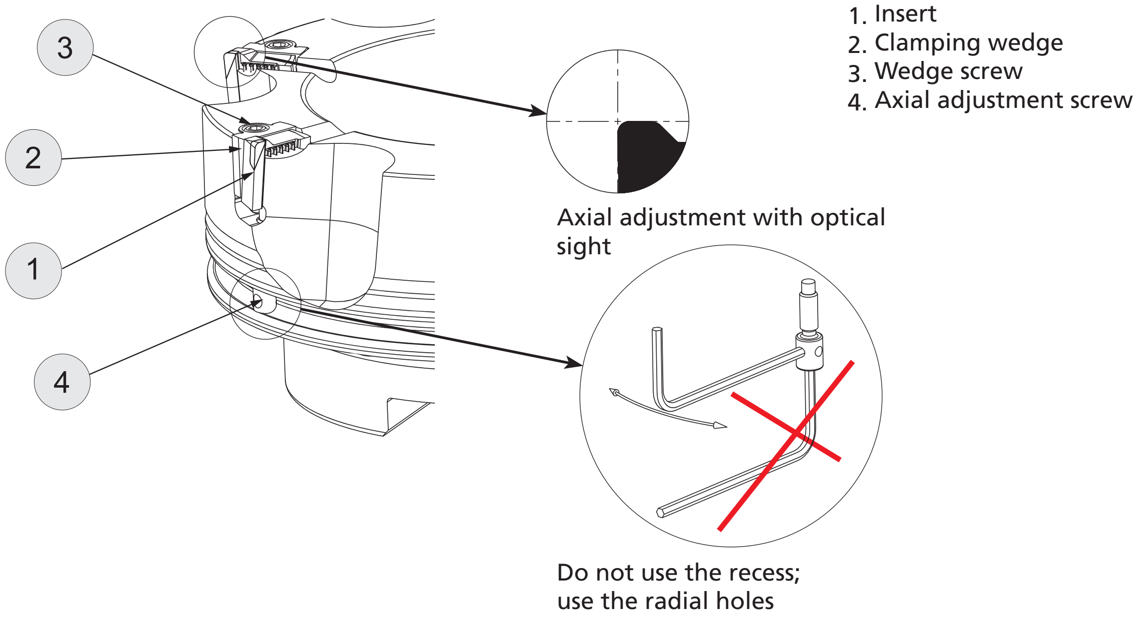
The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

MILLING

FLASH-SAF

Milling cutter characteristics

Adjustment of inserts to dimensions of use by the customer



Test equipment:

- Optical presetter.

Adjustment operation:

1 - Reception of milling cutter and first adjustment.

1.1 - Unscrew the axial adjustment screws (4) and the wedge screws (3).
1.2 - Clean the housings to remove any impurity.
1.3 - Position the inserts (1) in their housing.
1.4 - Pre-tighten the inserts (1) by tightening the wedge screw slightly (3).
1.5 - Approach the required cutting height (0.1 mm below) by screwing the axial adjustment screw (4) with the radial holes.
1.6 - Attach the inserts (1) by tightening the wedge screw (3) to a final torque of 2 N.m.
1.7 - Adjust all the inserts (1) to the final height by screwing the axial adjustment screw (4).

2 - Replacement of inserts

2.1 - Unscrew the axial adjustment screw (4) by half a turn using the radial holes before removing the insert (1) to be replaced to allow the adjustment of the new insert.
2.2 - Unscrew the wedge screw (3) by a few turns and remove the insert (1) to be replaced.
2.3 - Replace the insert (1) and repeat operations 1.2 to 1.7.

MILLING

FLASH-SAF

Milling cutter characteristics

Applications

Main Application Areas
Aluminum castings, high and low silicon content
Dura and extruded aluminum
Magnesium alloys
Zinc alloys
Brass, bronze and other copper alloys
Pure soft metals

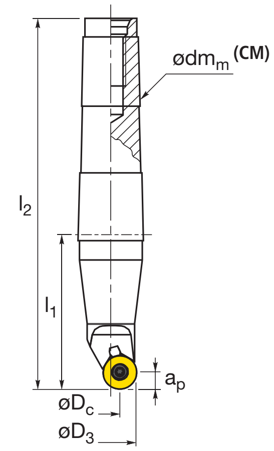
Secondary Application Areas
Bi-metal materials aluminum - cast iron and steel
Hardened steel and cast iron (finishing with CBN)
Graphite
Plastics (nylon, Teflon, polypropylene)
Composite plastics with glass and carbon fibers
Wood and fiber board
Biological materials

Industry Applications	
Automotive	Engine block , heads, transmission housing and components
Aerospace	Frame and body parts
Mechanical Engineering	Any machining of aluminum, brass, copper and non-ferrous materials
Electrical and Electronic	Housings, frames and radiators
Metallurgical	Aluminum blanks, copper electrodes and other electrolytic materials

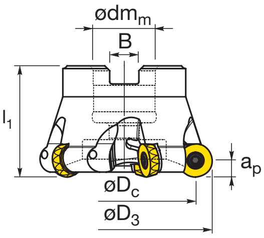
RD-SAF

Face milling and profiling cutter with positive round inserts

Cutter program, RD 12, RD 16, RD 20



Morse taper



Arbor mounting

Reference	Dimensions (mm)									Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg
	D_c	D_3	Max. a_p	dm_m	l_1	l_2	l_3	B	F						
Morse taper															
RD-12/032-03-CM3-080	20.00	32.00	6.00	CM3	80.00	160.70	-	-	-	3	RC.. 12 04..	3	No	9200	0.400
RD-20/050-03-CM4-055	30.00	50.00	10.00	CM4	55.00	157.20	-	-	-	3	RC.. 20 06..	3	No	10700	0.720
Arbor mounting															
RD-12/040-03-AL16-040	28.00	40.00	6.00	16.00	40.00	-	-	8.40	-	3	RC.. 12 04..	3	No	14800	0.160
RD-12/050-04-AL22-040	38.00	50.00	6.00	22.00	40.00	-	-	10.40	-	4	RC.. 12 04..	4	No [1]	13200	0.260
RD-12/063-05-AL22-040	51.00	63.00	6.00	22.00	40.00	-	-	10.40	-	5	RC.. 12 04..	5	No [1]	11800	0.350
RD-12/080-05-AL27-050	68.00	80.00	6.00	27.00	50.00	-	-	12.40	-	5	RC.. 12 04..	5	No [1]	10400	0.890
RD-12/100-06-AL32-050	88.00	100.00	6.00	32.00	50.00	-	-	14.40	-	6	RC.. 12 04..	6	No [1]	9300	1.550
RD-16/063-04-AL22-050	47.00	63.00	8.00	22.00	50.00	-	-	10.40	-	4	RC.. 16 06..	4	No [1]	9700	0.470
RD-16/080-05-AL27-050	64.00	80.00	8.00	27.00	50.00	-	-	12.40	-	5	RC.. 16 06..	5	No [1]	8600	0.730
RD-16/100-06-AL32-050	84.00	100.00	8.00	32.00	50.00	-	-	14.40	-	6	RC.. 16 06..	6	No [1]	7700	1.050
RD-20/080-04-AL27-050	60.00	80.00	10.00	27.00	50.00	-	-	12.40	-	4	RC.. 20 06..	4	No [1]	8500	0.640
RD-20/100-05-AL32-050	80.00	100.00	10.00	32.00	50.00	-	-	14.40	-	5	RC.. 20 06..	5	No [1]	7600	0.960

[1] Optional coolant screw can be ordered separately

Spare parts

Insert style	Diameter D_3	Insert screw			Screw driver		Torque wrench			Special mounting screw
		Reference	Size		Reference		Reference		Nm	Reference
RC.. 12 04..	32 mm	5513 020-32	M 3.5	3.0 N.m	DMP 3125	15 IP	TDX 215PLUS	15 IP	3.0	-
RC.. 12 04..	40 mm	5513 020-32	M 3.5	3.0 N.m	DMP 3125	15 IP	TDX 215PLUS	15 IP	3.0	DVZ 1715
RC.. 12 04..	50 - 100 mm	5513 020-32	M 3.5	3.0 N.m	DMP 3125	15 IP	TDX 215PLUS	15 IP	3.0	-
RC.. 16 06..	63 - 100 mm	5513 020-55	M 5.0	5.0 N.m	DMP 3662	20 IP	-	-	-	-
RC.. 20 06..	50 - 100 mm	5513 020-31	M 6.0	7.5 N.m	DMP 3139	25 IP	-	-	-	-

Optional spare parts

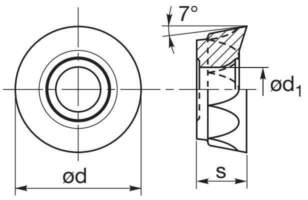
Insert style	Diameter D_3	Coolant screw
		Reference
RC.. 12 04..	40 mm	-
RC.. 12 04..	50 - 63 mm	DVZ 3523
RC.. 12 04..	80 mm	DVZ 3535
RC.. 12 04..	100 mm	DVZ 3536
RC.. 16 06..	63 mm	DVZ 3523
RC.. 16 06..	80 mm	DVZ 3535
RC.. 16 06..	100 mm	DVZ 3536
RC.. 20 06..	80 mm	DVZ 3535
RC.. 20 06..	100 mm	DVZ 3536

RD-SAF

Face milling and profiling cutter with positive round inserts

Insert program

RCMT... -21 RCMT... -61 RCMT... -91 RCMT... F8-33



Reference	Dimensions (mm)							Grades													
	d	s	d_1	l	r	b_s	t_1	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX05	KX20	KX2	N
RCMT 12 04 M0 EN F-21	12.00	4.76	4.4	-	-	-	-	-	-	-	✓	-	✓	-	-	✓	✓	-	✓	-	-
RCMT 12 04 M0 SN F-61	12.00	4.76	4.4	-	-	-	-	-	-	-	-	-	✓	✓	✓	-	✓	-	-	-	-
RCMT 12 04 M0 EN F-91	12.00	4.76	4.4	-	-	-	-	-	-	-	-	-	✓	-	-	-	✓	-	-	-	-
RCMT 12 04 M0 SN F-91	12.00	4.76	4.4	-	-	-	-	-	-	-	-	-	-	✓	✓	-	-	-	-	-	-
RCMT 16 06 M0 EN F8-21	16.00	6.35	5.5	-	-	-	-	-	-	-	✓	-	-	-	-	✓	-	-	-	-	-
RCMT 16 06 M0 SN F8-61	16.00	6.35	5.5	-	-	-	-	-	-	-	-	-	✓	-	-	-	✓	-	-	-	-
RCMT 16 06 M0 SN F8-91	16.00	6.35	5.5	-	-	-	-	-	-	-	-	-	-	✓	✓	-	-	-	-	-	-
RCMT 20 06 M0 SN F8-33	20.00	6.35	6.5	-	-	-	-	-	-	-	✓	-	-	✓	-	-	-	-	-	-	-
RCMT 20 06 M0 SN F8-61	20.00	6.35	6.5	-	-	-	-	-	-	-	-	-	✓	-	-	-	✓	-	-	-	-
RCMT 20 06 M0 SN F8-91	20.00	6.35	6.5	-	-	-	-	-	-	-	-	-	-	✓	✓	-	-	-	-	-	-

✓Article which can be ordered

Ordering example: RCMT 12 04 M0 EN F-21 5020

Cutting conditions

		P Steel				M Stainless steel			K Cast iron				N Non-ferrous aluminum				S Super alloys			H Hardened materials			
Grade	Feed per tooth (mm)	Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
1020	v_{c1}	371	336	261	167	-	-	-	267	248	219	192	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	-	-	-	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	237	219	167	116	-	-	-	216	189	146	111	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.25	0.25	0.25	0.25	-	-	-	0.25	0.25	0.25	0.25	-	-	-	-	-	-	-	-	-	-	-
2003	v_{c1}	-	-	-	250	279	240	179	277	257	227	207	-	-	-	-	100	90	65	99	119	99	99
	f_{z1}	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	-	-	-	200	246	190	146	213	193	163	143	-	-	-	-	70	60	50	66	86	66	66
	f_{z2}	-	-	-	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	-	-	-	-	0.20	0.20	0.20	0.30	0.30	0.30	0.30
5020	v_{c1}	351	316	241	147	213	195	139	257	238	209	182	1050	650	480	600	70	60	50	40	45	40	35
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	184	169	124	83	152	145	106	193	165	118	80	810	290	330	420	40	30	35	25	30	25	20
	f_{z2}	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
5040	v_{c1}	321	286	211	117	190	175	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	154	139	94	53	100	70	80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.30	0.30	0.30	0.30	0.20	0.20	0.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5050	v_{c1}	270	211	141	78	136	88	74	-	-	-	-	-	-	-	-	53	43	25	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	168	146	94	45	89	65	58	-	-	-	-	-	-	-	-	30	20	20	-	-	-	-
	f_{z2}	0.30	0.30	0.30	0.30	0.30	0.30	0.30	-	-	-	-	-	-	-	-	0.30	0.30	0.20	-	-	-	-
8030	v_{c1}	-	-	-	-	174	141	106	-	-	-	-	-	-	-	-	62	52	42	-	-	-	-
	f_{z1}	-	-	-	-	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	-	-	-	-	142	120	102	-	-	-	-	-	-	-	-	50	40	37	-	-	-	-
	f_{z2}	-	-	-	-	0.2	0.2	0.2	-	-	-	-	-	-	-	-	0.2	0.2	0.2	-	-	-	-
5135	v_{c1}	286	246	168	99	160	140	90	-	-	-	-	-	-	-	-	58	48	40	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	64	49	95	58	70	20	60	-	-	-	-	-	-	-	-	44	34	25	-	-	-	-
	f_{z2}	0.30	0.30	0.30	0.30	0.20	0.20	0.20	-	-	-	-	-	-	-	-	0.30	0.30	0.20	-	-	-	-

The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

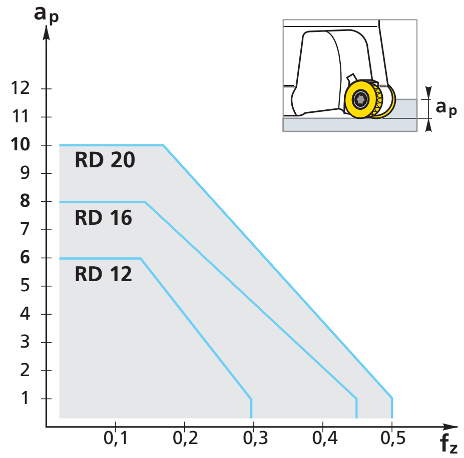
MILLING

RD-SAF

Milling cutter characteristics

Cutting conditions

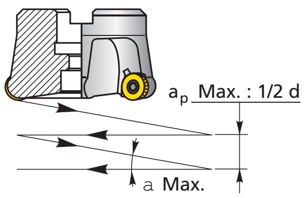
The RD-SAF cutter range with round inserts are designed for rough machining of hard steel and cast irons for use with moulds and press tools as a whole
Therefore, these cutters are particularly suitable for modern C.N.C machines making complex shapes by continuous interpolation in 3 axis.
The robustness of these cutters, together with tough cutting edge ensure safe operation in rough machining of moulds and dies. The cutting depth may be as much as 6, 8 or 10 mm, i.e. the value of the insert radius (1/2 d).
Single-piece cutters with diameters from 16 to 125 mm can be used for facing, slotting or pocketing.
Cutters with diameters from 160 to 315 mm in the cartridge version are only recommended for surfacing.



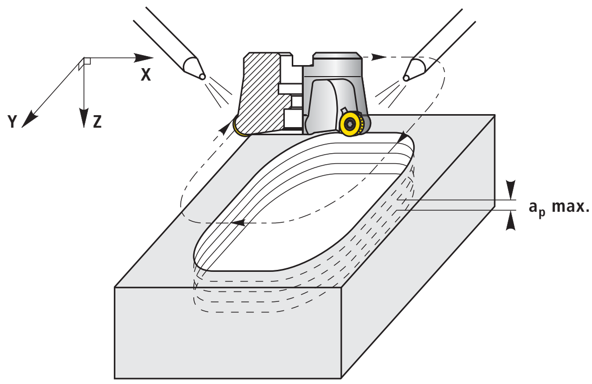
Cutting depth a_p / Tooth feed f_z

MILLING

Milling in pockets



Ø D	α Max.		
	RD-12	RD-16	RD-20
25	10°	–	12°
32	12°	–	–
40	9°	–	–
50	7°	10°	12°
63	5°	7°	–
80	3°	5°	7°
100	2°	4°	5°



a_p Max. (mm)	RD-12	RD-16	RD-20
	3,5	5	6

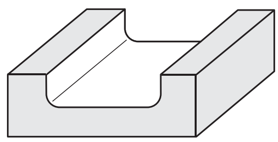
These values must be reduced by 50% for single-tooth cutters.

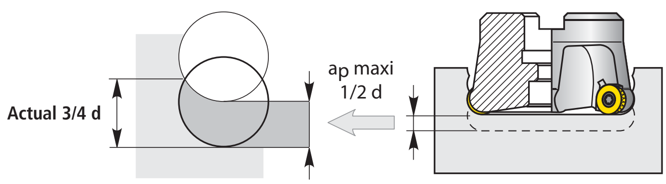
Chip evacuation

Coolant pressure, preferably along two different directions as close as possible to the inserts.

Slotting

In slotting, when the cutting depth reached the insert radius (1/2 d), the cutting height on the sides of the slot is equal to 3/4 of d.



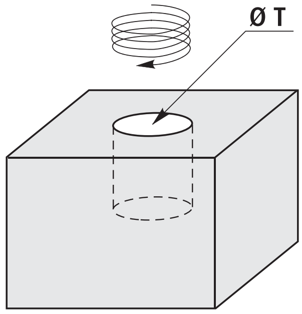


RD-SAF

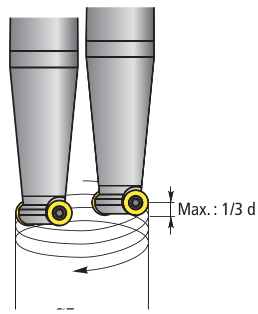
Milling cutter characteristics

Drilling with helical cycle

RD-SAF cutters are designed to allow drilling in solid material or the enlargement of holes by helical interpolation within the limits shown on the sketches below.



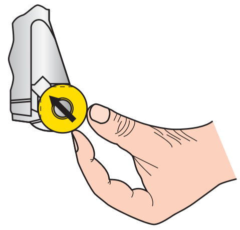
	Ø T max.
Without pilot hole	2 D
With pilot hole	Ø of pilot hole + 2 D



Assembly instructions for inserts with facets

Before tightening the screw, make sure that :

1 - the insert facets are in contact with the 11° slopes of the cutter housing.
2 - the insert lower face is in contact with the cutter housing seat.



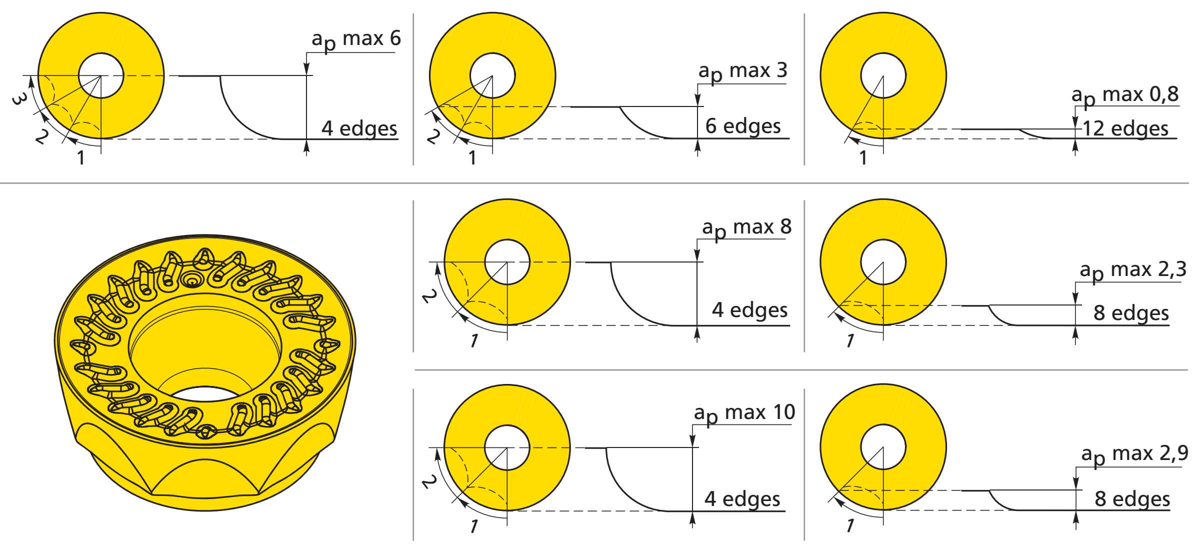
Number of cutting edges

Inserts with facets around the periphery enable precise indexing depending on the cutting depth and maximum use of the cutting edge. The facets make it possible to both locate the insert correctly in its housing and to prevent it from turning or getting loose when working in ramping or axial penetration.

RCMT 12
12 facets

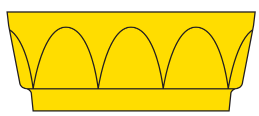
RCMT 16
8 facets

RCMT 20
8 facets



Safety

The inserts thickness make them very robust while allowing better heat dissipation and hence longer insert life.

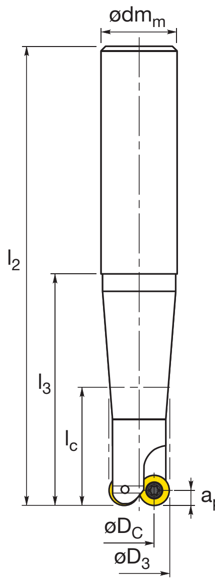


Insert thickness	
d	s
12	4,76
16	6,35
20	6,35

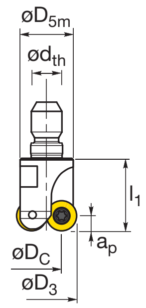
TORO-SAF

Face milling and profiling cutter with positive round inserts

Cutter program, TR 05, TR 07, TR 08



Cylindrical shank



Threaded modular heads

Reference	Dimensions (mm)											Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg
	D_c	D_3	Max. a_p	dm_m D_{5m}	d_{th}	l_1	l_2	l_3	l_c	A [1]	B						
Long cylindrical shank																	
TR-05/010-02-QC16-160	5.00	10.00	2.50	16.00	-	-	160.00	60.00	23.00	-	-	2	RD.. 05 01..	2	No	24700	0.203
TR-07/012-02-QC16-160	5.00	12.00	3.50	16.00	-	-	160.00	60.00	27.00	-	-	2	RD.. 07 T1..	2	No	24700	0.210
TR-07/015-02-QC20-200	8.00	15.00	3.50	20.00	-	-	200.00	80.00	34.00	-	-	2	RD.. 07 T1..	2	No	24700	0.430
TR-07/020-03-QC25-250	13.00	20.00	3.50	25.00	-	-	250.00	80.00	44.00	-	-	3	RD.. 07 02..	3	No	24700	0.835
TR-08/016-02-QC20-200	8.00	16.00	4.00	20.00	-	-	200.00	60.00	36.00	-	-	2	RD.. 08 T2..	2	No	24700	0.413
Undersized cylindrical shank																	
TR-07/015-02-QC14-160	8.00	15.00	3.50	14.00	-	-	160.00	19.00	-	-	-	2	RD.. 07 02..	2	No	24700	0.185
Threaded modular heads																	
TR07 012R02 P08X025	5.00	12.00	3.50	11.00	M8	25.00	-	-	-	10 [1]	-	2	RD.. 07 T1..	2	No	- [3]	0.009
TR07 015R03 P08X025	13.00	20.00	3.50	18.00	M8	25.00	-	-	-	10 [1]	-	4	RD.. 07 T1..	4	No	- [3]	0.047
TR07 016R03 P08X025	18.00	25.00	3.50	23.00	M8	25.00	-	-	-	10 [1,2]	-	5	RD.. 07 T1..	5	No	- [3]	0.098
TR08 020R03 P10A030	8.00	16.00	4.00	14.00	M10	30.00	-	-	-	14 [1,2]	-	2	RD.. 08 T2..	2	No	- [3]	0.019

[1] Size of the wrench to be used for modular heads is given by dimension A
[2] Use a narrow flat wrench
[3] Max. RPM values are not given for modular heads as they are always used with long extensions

Spare parts

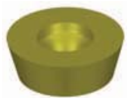
Insert style	Diameter D_3	Insert screw			Screw driver		Torque wrench		
		Reference	Size		Reference		Reference		Nm
RD.. 05 01..	10 mm	5513 020-40	M 2.0	0.6 N.m	PT-8000	6 IP	TDX 206PLUS	6 IP	0.6
RD.. 07 T1..	12 - 25 mm	5513 020-41	M 2.2	0.9 N.m	PT-8001	7 IP	TDX 207PLUS	7 IP	0.9
RD.. 07 02..	15 mm	DVF 3658	M 2.5	1.2 N.m	PT-8006	8 IP	TDX 208PLUS	8 IP	1.2
RD.. 08 T2..	16 mm	DVF 2910	M 2.5	1.2 N.m	PT-8006	8 IP	TDX 208PLUS	8 IP	1.2

MILLING

TORO-SAF

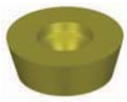
Face milling and profiling cutter with positive round inserts

Insert program

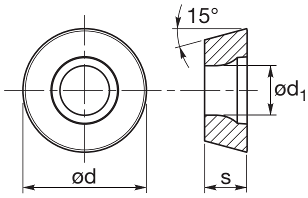


RDHW... -91

RDMT... -61



RDMW... EN



Reference	Dimensions (mm)							Grades													
	d	s	d_1	l	r	b_s	t_1	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX05	KX20	KX2	N
RD.. 0501.. inserts																					
RDHW 05 01 M0 EN-91	5.00	1.50	2.2	-	-	-	-	-	-	-	✓	-	✓	-	✓	✓	-	-	-	-	-
RD.. 07T1.. inserts																					
RDHW 07 T1 M0 EN-91	7.00	1.99	2.8	-	-	-	-	-	-	-	✓	-	-	-	✓	✓	-	-	-	-	-
RDMT 07 T1 M0 SN-61	7.00	1.99	2.8	-	-	-	-	-	-	-	-	-	-	✓	✓	-	-	-	-	-	-
RDMW 07 T1 M0 EN	7.00	1.99	2.8	-	-	-	-	-	-	-	✓	-	✓	-	✓	-	-	-	-	-	-
RD.. 0702.. inserts																					
RDHW 07 02 M0 EN-91	7.00	2.38	2.5	-	-	-	-	-	-	-	✓	-	✓	-	✓	✓	-	-	-	-	-
RDMT 07 02 M0 SN-61	7.00	2.38	2.5	-	-	-	-	-	-	-	-	-	-	✓	✓	-	-	-	-	-	-
RDMW 07 02 M0 EN	7.00	2.38	2.5	-	-	-	-	-	-	-	✓	-	✓	✓	✓	-	-	-	-	-	-
RD.. 08T2.. inserts																					
RDHW 08 T2 M0 EN-91	8.00	2.78	2.8	-	-	-	-	-	-	-	✓	-	-	-	✓	✓	-	-	-	-	-
RDMT 08 T2 M0 SN-61	8.00	2.78	2.8	-	-	-	-	-	-	-	-	-	-	✓	✓	-	-	-	-	-	-
RDMW 08 T2 M0 EN	8.00	2.78	2.8	-	-	-	-	-	-	-	-	-	✓	-	✓	-	-	-	-	-	-

✓Article which can be ordered

Ordering example: RDHW 05 01 M0 EN-91 5020

Cutting conditions

		P Steel				M Stainless steel			K Cast iron				N Non-ferrous aluminum				S Super alloys			H Hardened materials			
Grade	Feed per tooth (mm)	Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
2003	v_{c1}	-	-	-	250	279	240	179	277	257	227	207	-	-	-	-	100	90	65	99	119	99	99
	f_{z1}	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	-	-	-	220	259	210	159	239	219	189	169	-	-	-	-	90	80	60	79	99	79	79
	f_{z2}	-	-	-	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	-	-	-	-	0.10	0.10	0.10	0.20	0.20	0.20	0.20
5020	v_{c1}	351	316	241	147	213	195	139	257	238	209	182	1050	650	480	600	70	60	50	40	45	40	35
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	251	228	171	109	176	165	119	219	194	155	121	970	530	430	540	60	50	45	35	40	35	30
	f_{z2}	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
5040	v_{c1}	321	286	211	117	190	175	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	221	198	141	79	160	140	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.20	0.20	0.20	0.20	0.10	0.10	0.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5050	v_{c1}	259	229	161	95	136	88	74	-	-	-	-	-	-	-	-	53	43	35	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	205	179	121	65	108	74	65	-	-	-	-	-	-	-	-	39	29	30	-	-	-	-
	f_{z2}	0.20	0.20	0.20	0.20	0.20	0.20	0.20	-	-	-	-	-	-	-	-	0.20	0.20	0.10	-	-	-	-
8030	v_{c1}	-	-	-	-	174	141	106	-	-	-	-	-	-	-	-	62	52	42	-	-	-	-
	f_{z1}	-	-	-	-	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	-	-	-	-	142	120	102	-	-	-	-	-	-	-	-	50	40	37	-	-	-	-
	f_{z2}	-	-	-	-	0.2	0.2	0.2	-	-	-	-	-	-	-	-	0.2	0.2	0.2	-	-	-	-

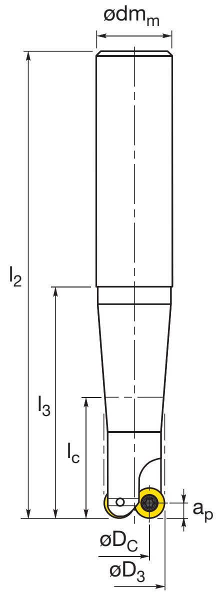
The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

MILLING

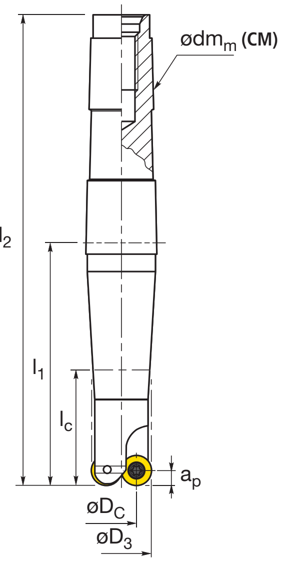
TORO-SAF

Face milling and profiling cutter with positive round inserts

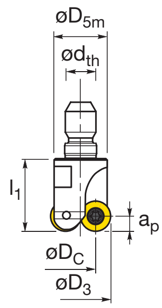
Cutter program, TR 10



Cylindrical shank



Morse taper



Threaded modular heads

Reference	Dimensions (mm)											Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg
	D_c	D_3	Max. a_p	dm_m D_{5m}	d_{th}	l_1	l_2	l_3	l_c	A [1]	B						
Long cylindrical shank																	
TR-10/020-02-QC20-200	10.00	20.00	5.00	20.00	-	-	200.00	40.00	-	-	-	2	RD.. 10 03..	2	No	24700	0.450
TR-10/020-02-QC25-250	10.00	20.00	5.00	25.00	-	-	250.00	80.00	44.00	-	-	2	RD.. 10 03..	2	No	20000	0.850
TR-10/025-02-QC32-250	15.00	25.00	5.00	32.00	-	-	250.00	80.00	40.00	-	-	2	RD.. 10 03..	2	No	20000	1.360
TR-10/025-03-QC25-200	15.00	25.00	5.00	25.00	-	-	200.00	60.00	-	-	-	3	RD.. 10 03..	3	No	20000	0.700
TR-10/032-03-QC32-250	22.00	32.00	5.00	32.00	-	-	250.00	60.00	-	-	-	3	RD.. 10 03..	3	No	20000	1.460
Undersized cylindrical shank																	
TR-10/020-02-QC19-200	10.00	20.00	5.00	19.00	-	-	200.00	34.00	-	-	-	2	RD.. 10 03..	2	No	24700	0.415
Morse taper																	
TR-10/020-02-CM3-080	10.00	20.00	5.00	CM3	-	80.00	161.00	-	48.00	-	-	2	RD.. 10 03..	2	No	25000	0.360
TR-10/025-02-CM3-080	15.00	25.00	5.00	CM3	-	80.00	161.00	-	79.00	-	-	2	RD.. 10 03..	2	No	25000	0.420
Threaded modular heads																	
TR10 020R03 P08X025	10.00	20.00	5.00	18.00	M10	30.00	-	-	-	14[1]	-	2	RD.. 10 03..	2	No	-[3]	0.040
TR10 025R03 P08X025	15.00	25.00	5.00	23.00	M12	35.00	-	-	-	17 [1] [2]	-	3	RD.. 10 03..	3	No	-[3]	0.084
TR10 032R03 P08X025	22.00	32.00	5.00	29.00	M112	45.00	-	-	-	17 [1]	-	3	RD.. 10 03..	3	No	-[3]	0.208
TR10 040R03 P10A030	32.00	42.00	5.00	40.00	M16	45.00	-	-	-	24 [1]	-	5	RD.. 10 03..	5	No	-[3]	0.295

[1] Size of the wrench to be used for modular heads is given by dimension A
[2] Use a narrow flat wrench
[3] Max. RPM values are not given for modular heads as they are always used with long extensions

Spare parts

Insert style	Diameter D_3	Insert screw			Screw driver		Torque wrench		
		Reference	Size		Reference		Reference		Nm
RD.. 10 03..	20 - 42 mm	DVF 3503	M 3.5	3.0 N.m	DMP 3125	15 IP	TDX 215PLUS	15 IP	3.0

TORO-SAF

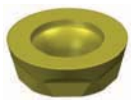
Face milling and profiling cutter with positive round inserts

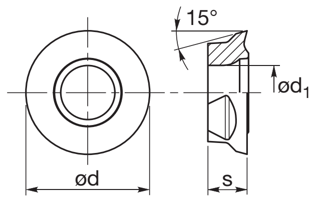
Insert program


RDGT... F6-11


RDHW... F6-91


RDMT... F6-61


RDMW... F6



Reference	d	s	d_1	l	r	b_s	t_1	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX05	KX20	KX2	N
	Dimensions (mm)							Grades													
RD.. 1003.. inserts																					
RDGT 10 03 M0 EN F6-11	10.00	3.18	4.4	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-
RDHW 10 03 M0 EN F6-91	10.00	3.18	4.4	-	-	-	-	-	-	-	✓	-	✓	-	✓	✓	-	-	-	-	-
RDMT 10 03 M0 SN F6-61	10.00	3.18	4.4	-	-	-	-	-	-	-	-	-	-	✓	✓	-	-	-	-	-	-
RDMW 10 03 M0 SN F6	10.00	3.18	4.4	-	-	-	-	-	-	-	✓	-	✓	✓	✓	-	-	-	-	-	-

✓Article which can be ordered

Ordering example: RDHW 10 03 M0 EN F6-91 5020

Cutting conditions

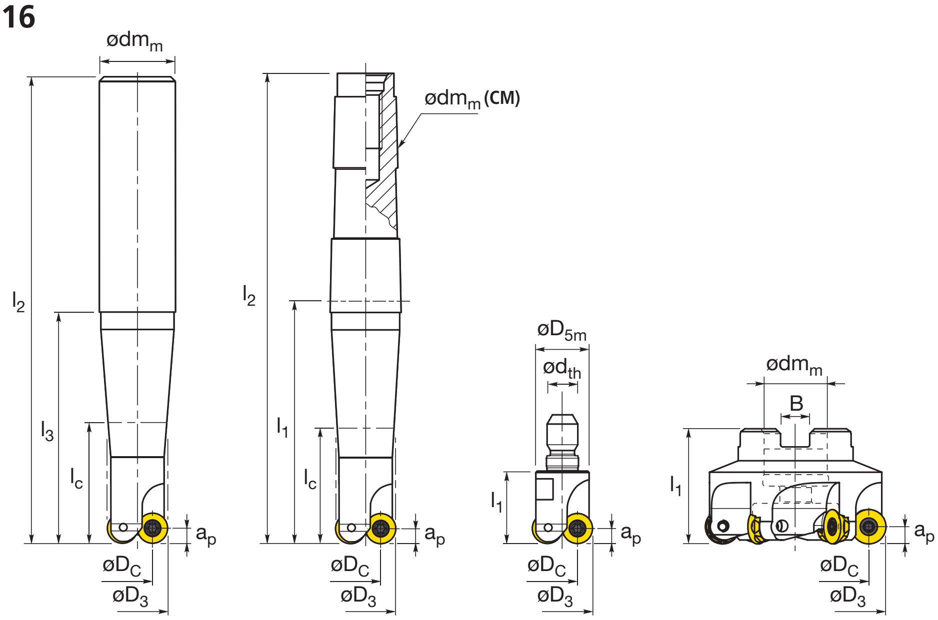
Grade	Feed per tooth (mm)	P Steel: Free machining and low carbon (120-170 HB)	P Steel: Medium and high carbon (180-220 HB)	P Steel: Alloy and easy to machine tool steels (200-240 HB)	P Steel: Tool and die steels (220-260 HB)	M Stainless steel: Ferritic and martensitic (180-240 HB)	M Stainless steel: Austenitic (140-180 HB)	M Stainless steel: Ph and duplex (220-260 HB)	K Cast iron: Gray cast iron (180-220 HB)	K Cast iron: Gray cast iron (220-260 HB)	K Cast iron: Ductile iron (180-220 HB)	K Cast iron: Ductile iron (220-260 HB)	N Non-ferrous aluminum: Aluminum < 7% Si (<100 HB)	N Non-ferrous aluminum: Aluminum 7% - 12% Si (<100 HB)	N Non-ferrous aluminum: Aluminum > 12% Si (<130 HB)	N Non-ferrous aluminum: Non-ferrous (<100 HB)	S Super alloys: Iron based alloys (200-300 HB)	S Super alloys: Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	S Super alloys: Titanium alloys 6AL-V4 (110-450 HB)	H Hardened materials: Case hardened carbon steels (50Rc - 62Rc)	H Hardened materials: Case hardened alloy steels (40Rc - 50Rc)	H Hardened materials: Hardened tools steels (45Rc - 62Rc)	H Hardened materials: Hardened irons (400 BHN)
2003	v_{c1}	-	-	-	244	275	234	175	269	249	219	199	-	-	-	-	94	84	62	95	115	95	95
	f_{z1}	-	-	-	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	-	-	-	-	0.08	0.08	0.08	0.08	0.08	0.08	0.08
	v_{c2}	-	-	-	210	253	200	153	226	206	176	156	-	-	-	-	80	70	55	73	93	73	73
	f_{z2}	-	-	-	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	-	-	-	-	0.15	0.15	0.15	0.25	0.25	0.25	0.25
5020	v_{c1}	331	298	227	139	206	189	135	249	229	198	170	1002	578	450	564	64	54	47	37	42	37	42
	f_{z1}	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
	v_{c2}	217	199	147	96	164	155	113	206	179	136	101	890	410	380	480	50	40	40	30	35	30	25
	f_{z2}	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
5040	v_{c1}	301	268	197	109	172	154	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.08	0.08	0.08	0.08	0.08	0.08	0.08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	187	169	117	66	130	105	90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.25	0.25	0.25	0.25	0.15	0.15	0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5050	v_{c1}	248	219	153	89	130	85	72	-	-	-	-	-	-	-	-	50	40	32	-	-	-	-
	f_{z1}	0.08	0.08	0.08	0.08	0.08	0.08	0.08	-	-	-	-	-	-	-	-	0.08	0.08	0.08	-	-	-	-
	v_{c2}	186	163	107	55	99	69	61	-	-	-	-	-	-	-	-	34	24	25	-	-	-	-
	f_{z2}	0.25	0.25	0.25	0.25	0.25	0.25	0.25	-	-	-	-	-	-	-	-	0.25	0.25	0.15	-	-	-	-
8030	v_{c1}	-	-	-	-	174	141	106	-	-	-	-	-	-	-	-	62	52	42	-	-	-	-
	f_{z1}	-	-	-	-	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	-	-	-	-	131	112	87	-	-	-	-	-	-	-	-	42	32	31	-	-	-	-
	f_{z2}	-	-	-	-	0.25	0.25	0.25	-	-	-	-	-	-	-	-	0.25	0.25	0.15	-	-	-	-

The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

TORO-SAF

Face milling and profiling cutter with positive round inserts

Cutter program, TR 12, TR 16



Cylindrical shank | Morse taper | Threaded modular heads | Arbor mounting

Reference	D_c	D_3	Max. a_p	dm_m / D_{5m}	d_{th}	l_1	l_2	l_3	l_c	A [2]	B	Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg
Long cylindrical shank																	
TR-12/025-02-QC25-250	13.00	25.00	6.00	25.00	-	-	250.00	60.00	-	-	-	2	RD.. 12 T3..	2	No	24000	0.890
TR-12/025-02-QC32-250	13.00	25.00	6.00	32.00	-	-	250.00	80.00	40.00	-	-	2	RD.. 12 T3..	2	No	24000	1.358
TR-12/032-03-QC25-250	20.00	32.00	6.00	25.00	-	-	250.00	60.00	-	-	-	3	RD.. 12 T3..	3	No	24000	0.950
TR-12/032-03-QC32-250	20.00	32.00	6.00	32.00	-	-	250.00	60.00	-	-	-	3	RD.. 12 T3..	3	No	18000	1.430
Undersized cylindrical shank																	
TR-12/025-02-QC24-250	13.00	25.00	6.00	24.00	-	-	250.00	54.00	-	-	-	2	RD.. 12 T3..	2	No	24000	0.830
Morse taper																	
TR-12/032-03-CM4-080	20.00	32.00	6.00	CM4	-	80.00	182.00	-	79.00	-	-	3	RD.. 12 T3..	3	No	18000	0.785
Threaded modular heads																	
TR12 032R03 P16A045	20.00	32.00	6.00	29.00	M16	45.00	-	-	-	24 [2]	-	2	RD.. 12 T3..	2	No	- [3]	0.210
TR12 040R04 P16A045	20.00	32.00	6.00	29.00	M16	45.00	-	-	-	24 [2]	-	3	RD.. 12 T3..	3	No	- [3]	0.195
Arbor mounting																	
TR-12/040-04-AL16-040	28.00	40.00	6.00	16.00	-	40.00	-	-	-	-	8.40	4	RD.. 12 T3..	4	No	21400	0.173
TR-12/050-04-AL22-040	38.00	50.00	6.00	22.00	-	40.00	-	-	-	-	10.40	4	RD.. 12 T3..	4	No [1]	18900	0.271
TR-12/050-05-AL22-040	38.00	50.00	6.00	22.00	-	40.00	-	-	-	-	10.40	5	RD.. 12 T3..	5	No [1]	18900	0.255
TR-12/052-04-AL22-040	40.00	52.00	6.00	22.00	-	40.00	-	-	-	-	10.40	4	RD.. 12 T3..	4	No [1]	18500	0.296
TR-12/052-05-AL22-040	40.00	52.00	6.00	22.00	-	40.00	-	-	-	-	10.40	5	RD.. 12 T3..	5	No [1]	18500	0.280
TR 12/052-05ALC22-040 P4	40.00	52.00	6.00	22.00	-	40.00	-	-	-	-	10.40	5	RD.. 12 T3..	5	Yes	18500	0.250
TR-12/063-06-AL22-040	51.00	63.00	6.00	22.00	-	40.00	-	-	-	-	10.40	6	RD.. 12 T3..	6	No [1]	16300	0.390
TR-12/066-06-AL27-050	54.00	66.00	6.00	27.00	-	50.00	-	-	-	-	12.40	6	RD.. 12 T3..	6	No [1]	15700	0.530
TR-16/052-04-AL22-050	36.00	52.00	8.00	22.00	-	50.00	-	-	-	-	10.40	4	RD.. 16 04..	4	No [1]	18500	0.323
TR-16/063-05-AL27-050	47.00	63.00	8.00	27.00	-	50.00	-	-	-	-	12.40	5	RD.. 16 04..	5	No [1]	16300	0.593
TR-16/080-06-AL27-050	64.00	80.00	8.00	27.00	-	50.00	-	-	-	-	12.40	6	RD.. 16 04..	6	No [1]	13700	0.835
TR-16/100-07-AL32-050	84.00	100.00	8.00	32.00	-	50.00	-	-	-	-	14.40	7	RD.. 16 04..	7	No [1]	12100	1.516

[1] Optional coolant screw can be ordered separately
[2] Size of the wrench to be used for modular heads is given by dimension A
[3] Max. RPM values are not given for modular heads as they are always used with long extensions

Spare parts

Insert style	Diameter D_3	Insert screw			Screw driver		Torque wrench			Special mounting screw
		Reference	Size		Reference		Reference		Nm	Reference
RD.. 12 T3..	25 - 32 mm	DVF 3504	M 3.5	3.0 N.m	DMP 3125	15 IP	TDX 215PLUS	15 IP	3.0	-
RD.. 12 T3..	40 mm	DVF 3504	M 3.5	3.0 N.m	DMP 3125	15 IP	TDX 215PLUS	15 IP	3.0	DVZ 1715
RD.. 12 T3..	50 - 66 mm	DVF 3504	M 3.5	3.0 N.m	DMP 3125	15 IP	TDX 215PLUS	15 IP	3.0	28300
RD.. 16 04..	52 - 100 mm	DVF 3020	M 5.0	5.0 N.m	DMP 3662	20 IP	-	-	-	-

Optional spare parts

Insert style	Diameter D_3	Coolant screw Reference
RD.. 12 T3..	40 mm	-
RD.. 12 T3..	50 - 66 mm	DVZ 3523
RD.. 16 04..	52 - 63 mm	DVZ 3523
RD.. 16 04..	80 mm	DVZ 3535
RD.. 16 04..	100 mm	DVZ 3536

TORO-SAF

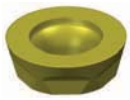
Face milling and profiling cutter with positive round inserts

Insert program

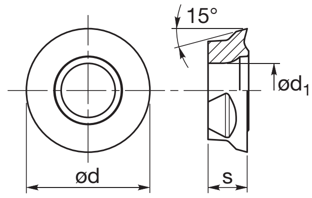
RDGT... F6-11

RDHW... F6-91

RDMT... F6-61



RDMW... F6



Reference	Dimensions (mm)							Grades													
	d	s	d_1	l	r	b_s	t_1	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX05	KX20	KX2	N
RD.. 12T3.. inserts																					
RDGT 12 T3 M0 EN F6-11	12.00	3.97	4.4	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-
RDHW 12 T3 M0 EN F6-91	12.00	3.97	4.4	-	-	-	-	-	-	-	✓	-	✓	-	✓	✓	-	-	-	-	-
RDMT 12 T3 M0 SN F6-61	12.00	3.97	4.4	-	-	-	-	-	-	-	-	-	✓	✓	✓	-	-	-	-	-	-
RDMW 12 T3 M0 SN F6	12.00	3.97	4.4	-	-	-	-	-	-	-	✓	-	✓	✓	✓	-	-	-	-	-	-
RD.. 1604.. inserts																					
RDMT 16 04 M0 SN F6-61	16.00	4.76	5.7	-	-	-	-	-	-	-	-	-	-	✓	✓	-	-	-	-	-	-
RDMW 16 04 M0 SN F6	16.00	4.76	5.7	-	-	-	-	-	-	-	✓	-	✓	✓	✓	-	-	-	-	-	-

✓Article which can be ordered

Ordering example: RDHW 12 T3 M0 EN F6-91 5020

Cutting conditions

Grade	Feed per tooth (mm)	P Steel				M Stainless steel			K Cast iron				N Non-ferrous aluminum				S Super alloys			H Hardened materials			
		Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
2003	v_{c1}	-	-	-	244	275	234	175	269	249	219	199	-	-	-	-	94	84	62	95	115	95	95
	f_{z1}	-	-	-	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	-	-	-	-	0.08	0.08	0.08	0.08	0.08	0.08	0.08
	v_{c2}	-	-	-	190	240	180	140	200	180	150	130	-	-	-	-	70	60	50	60	80	60	60
	f_{z2}	-	-	-	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	-	-	-	-	0.20	0.20	0.20	0.35	0.35	0.35	0.35
5020	v_{c1}	331	298	227	139	206	189	135	249	229	198	170	1002	578	450	564	64	54	47	37	42	37	32
	f_{z1}	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
	v_{c2}	150	140	100	70	140	135	100	180	150	100	60	810	290	330	420	40	30	35	25	30	25	20
	f_{z2}	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
5040	v_{c1}	301	268	197	109	172	154	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.08	0.08	0.08	0.08	0.08	0.08	0.08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	120	110	70	40	100	70	80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.35	0.35	0.35	0.35	0.20	0.20	0.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5050	v_{c1}	248	219	153	89	130	85	72	-	-	-	-	-	-	-	-	50	40	32	-	-	-	-
	f_{z1}	0.08	0.08	0.08	0.08	0.08	0.08	0.08	-	-	-	-	-	-	-	-	0.08	0.08	0.08	-	-	-	-
	v_{c2}	150	130	80	35	80	60	55	-	-	-	-	-	-	-	-	25	15	20	-	-	-	-
	f_{z2}	0.35	0.35	0.35	0.35	0.35	0.35	0.35	-	-	-	-	-	-	-	-	0.35	0.35	0.20	-	-	-	-
8030	v_{c1}	-	-	-	-	170	139	105	-	-	-	-	-	-	-	-	59	49	40	-	-	-	-
	f_{z1}	-	-	-	-	0.1	0.1	0.1	-	-	-	-	-	-	-	-	0.1	0.1	0.1	-	-	-	-
	v_{c2}	-	-	-	-	110	97	77	-	-	-	-	-	-	-	-	27	18	22	-	-	-	-
	f_{z2}	-	-	-	-	0.35	0.35	0.35	-	-	-	-	-	-	-	-	0.35	0.35	0.25	-	-	-	-

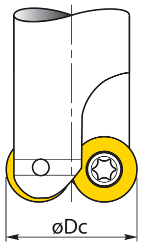
The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

MILLING

TORO-SAF

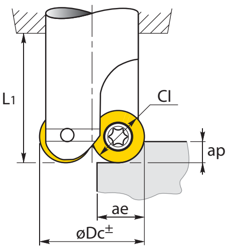
Milling cutter characteristics

Tolerances on cutting diameter of shank type milling cutters



Insert	Geometry 91 class H	Geometry 11 class G	Without geometry class M Geometry 61 class M
RD . . 05 . . M0 . .	Dc +0 / -0,12	-	-
RD . . 07 . . M0 . .	Dc +0 / -0,12	Dc +0 / -0,14	Dc +0,04 / -0,18
RD . . 08 . . M0 . .	Dc +0 / -0,12	Dc +0 / -0,14	Dc +0,04 / -0,18
RD . . 10 . . M0 . .	Dc +0 / -0,12	Dc +0 / -0,14	Dc +0,04 / -0,18
RD . . 12 . . M0 . .	Dc +0 / -0,12	Dc +0 / -0,14	Dc +0,08 / -0,22
RD . . 16 . . M0 . .	-	-	Dc +0,16 / -0,28

Tooth feed f_z (mm)



	ap (mm)											
CI	0,3	0,5	0,7	0,8	1	1,2	2	3	4	5	6	8
05	0,1	0,08										
		0,16	0,13	0,11	0,1	0,08	0,07					
07	0,17	0,13	0,11									
			0,22	0,21	0,19	0,17	0,13	0,11				
08	0,21	0,16	0,14	0,13								
				0,25	0,23	0,21	0,16	0,13	0,11			
10	0,29	0,22	0,19	0,18	0,16							
					0,32	0,29	0,22	0,18	0,16	0,14		
12	0,38	0,29	0,25	0,23	0,21	0,19						
					0,42	0,38	0,29	0,24	0,21	0,19	0,17	
16	0,44	0,34	0,29	0,27	0,24	0,22	0,18					
					0,51	0,47	0,37	0,3	0,28	0,26	0,25	0,25

NOTE : fz values are given for a maximum L_1 dimension = 3 x Dc. For a bigger L_1 dimension, the parameters shall be adapted to the conditions of use.

Finishing; a_e up to 25% of cutting diameter Dc

Roughing; a_e 20 - 100% of cutting diameter Dc

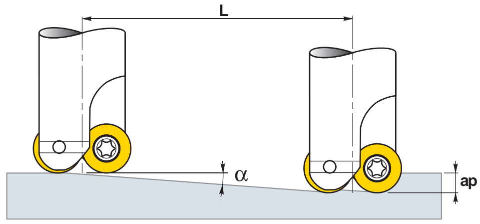
MILLING

TORO-SAF

Milling cutter characteristics

Ramping angle α

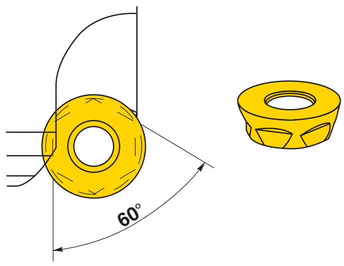
Formula :
a_p max = Cl/2
L min = a_p/TAN(α)



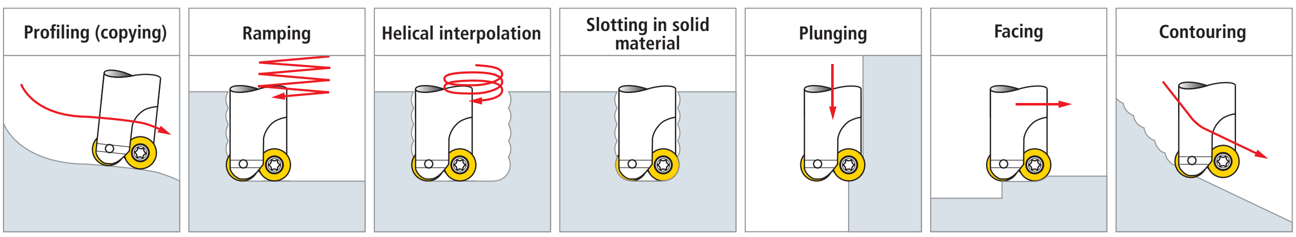
	Dc (mm)													
Cl	10	12	15	16	20	25	32	40	50	52	63	66	80	100
05	21°													
07		20°	35°		15°									
08				34°										
10					39°	17°	10°							
12						44°	19°	11°	8°		5°			
16							47°			12°		8°	6°	4°

Insert indexing

10-16mm diameter Inserts are provided with an indexing system at 60° (6 facets) making the identification of worn edges easier and securing the insert during machining.



Use

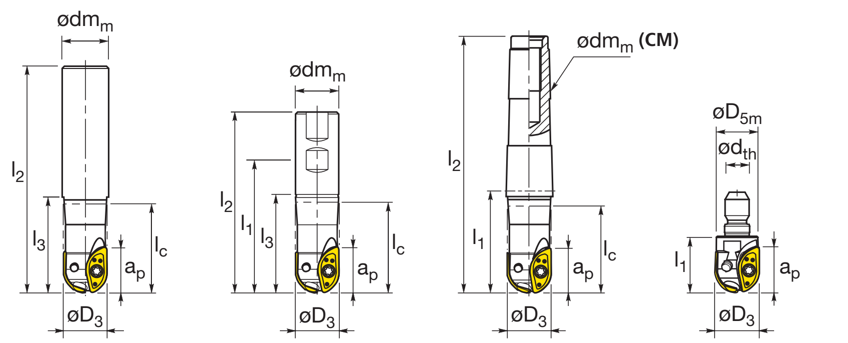


MILLING

SR-SAF

Ball nose roughing endmill

Cutter program, SR 10-20



Long cylindrical shank | Weldon shank | Morse taper | Threaded modular head

Reference	Dimensions (mm)										Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg
	D_c	D_3	Max. a_p	dm_m D_{5m}	d_{th}	l_1	l_2	l_3	l_c	A 2)						
Long cylindrical shank																
SR 10/02-QC16-160	-	10.00	8.90	16.00	-	-	160.00	50.00	22.30	-	2	ZP 10 00..	2	No	35800	0.210
SR 12/02-QC20-200	-	12.00	10.70	20.00	-	-	200.00	44.80	22.00	-	2	ZP 12 00..	2	No	21000	0.431
SR 16/02-QCC20-200	-	16.00	14.40	20.00	-	-	200.00	44.50	29.40	-	2	ZP 16 00..	2	Yes	20000	0.434
SR 20/02-QCC20-250	-	20.00	17.90	20.00	-	-	250.00	50.00	-	-	2	ZP 20 00..	2	Yes	24000	0.854
SR 20/02-QCC25-200	-	20.00	17.90	25.00	-	-	200.00	54.40	36.10	-	2	ZP 20 00..	2	Yes	24000	0.654
SR 20/02-QCC32-250	-	20.00	17.90	32.00	-	-	250.00	55.70	34.50	-	2	ZP 20 00..	2	Yes	24000	1.397
Weldon shank																
SR 12/02-QW20-040	-	12.00	10.70	20.00	-	66.50	91.00	40.00	21.50	-	2	ZP 12 00..	2	No	21000	0.155
SR 12/02-QW20-060	-	12.00	10.70	20.00	-	86.50	111.00	60.00	23.80	-	2	ZP 12 00..	2	No	21000	0.185
SR 16/02-QWC20-040	-	16.00	14.40	20.00	-	66.50	91.00	40.00	28.30	-	2	ZP 16 00..	2	Yes	20000	0.164
SR 16/02-QWC20-060	-	16.00	14.40	20.00	-	86.50	111.00	60.00	32.90	-	2	ZP 16 00..	2	Yes	20000	0.199
SR 20/02-QWC25-050	-	20.00	17.90	25.00	-	75.50	107.00	50.00	35.10	-	2	ZP 20 00..	2	Yes	24000	0.294
SR 20/02-QWC25-070	-	20.00	17.90	25.00	-	95.50	127.00	70.00	39.50	-	2	ZP 20 00..	2	Yes	24000	0.350
Morse taper																
SR 10/02-CM2-050	-	10.00	8.90	CM2	-	50.00	114.00	-	21.90	-	2	ZP 10 00..	2	No	21000	0.120
SR 12/02-CM2-040	-	12.00	10.70	CM2	-	40.00	104.00	-	22.50	-	2	ZP 12 00..	2	No	21000	0.111
SR 12/02-CM2-060	-	12.00	10.70	CM2	-	60.00	124.00	-	25.80	-	2	ZP 12 00..	2	No	21000	0.135
SR 12/02-CM2-090	-	12.00	10.70	CM2	-	90.00	154.00	-	25.80	-	2	ZP 12 00..	2	No	21000	0.185
SR 16/02-CM2-040	-	16.00	14.40	CM2	-	40.00	104.00	-	31.30	-	2	ZP 16 00..	2	No	20000	0.115
SR 16/02-CM2-060	-	16.00	14.40	CM2	-	60.00	124.00	-	42.20	-	2	ZP 16 00..	2	No	20000	0.145
SR 16/02-CM2-090	-	16.00	14.40	CM2	-	90.00	154.00	-	75.90	-	2	ZP 1600..	2	No	20000	0.186
SR 20/02-CM2-070	-	20.00	17.90	CM2	-	70.00	134.00	-	42.50	-	2	ZP 20 00..	2	No	24000	0.179
SR 20/02-CM3-050	-	20.00	17.90	CM3	-	50.00	131.00	-	36.60	-	2	ZP 20 00..	2	No	24000	0.273
SR 20/02-CM3-070	-	20.00	17.90	CM3	-	70.00	151.00	-	-	-	2	ZP 20 00..	2	No	24000	0.325
SR 20/02-CM3-100	-	20.00	17.90	CM3	-	100.00	181.00	-	77.40	-	2	ZP 20 00..	2	No	24000	0.387
Threaded modular heads																
SR10 010R02 P08X025	-	10.00	8.90	11.00	M8	25.00	-	-	15.90	10	2	ZP 10 00..	2	No	- 1)	0.011
SR12 010R02 P08X025	-	12.00	10.70	11.00	M8	25.00	-	-	-	10	2	ZP 12 00..	2	No	- 1)	0.008
SR16 010R02 P08X025	-	16.00	14.40	14.00	M8	25.00	-	-	-	10 3)	2	ZP 16 00..	2	No	- 1)	0.020
SR20 010R02 P08X025	-	20.00	17.90	18.00	M10	30.00	-	-	-	14	2	ZP 20 00..	2	Yes	- 1)	0.040

1) Max. RPM values are not given for modular heads as they are always used with long extensions
2) Size of the wrench to be used for modular heads is given by dimension A
3) Use a narrow flat wrench

Spare parts

Insert style	Diameter D_3	Insert screw			Screw driver		Torque wrench		
		Reference	Size		Reference		Reference		Nm
ZP 10 00..	10 mm	5513 020-28	M 2.0	0.6 N.m	PT-8000	6 IP	TDX 206PLUS	6 IP	0.6
ZP 12 00..	12 mm	5513 020-36	M 2.5	1.2 N.m	PT-8006	8 IP	TDX 208PLUS	8 IP	1.2
ZP 16 00..	16 mm	5513 020-35	M 2.5	1.2 N.m	PT-8006	8 IP	TDX 208PLUS	8 IP	1.2
ZP 20 00..	20 mm	416.1-833	M 3.5	2.0 N.m	PT-8007	10 IP	TDX 210PLUS	10 IP	2.0

SR-SAF

Ball nose roughing endmill

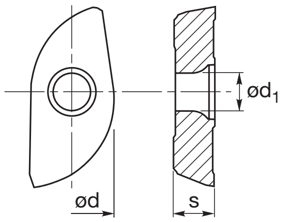
Insert program

ZP... ER-11

ZP... ER-31

ZP... ER-51

ZP... ER-71



Reference	Dimensions (mm)							Grades													
	d	s	d_1	l	r	b_s	t_1	1020	1120	1130	2003	5007	5020	5040	8030	5050	5135	KX05	KX20	KX2	N
ZP 10 00 ER-31	10.00	1.70	2.2	-	-	-	-	-	-	-	✓	-	-	✓	-	✓	-	-	-	-	-
ZP 12 00 ER-31	12.00	2.38	2.9	-	-	-	-	-	-	-	✓	-	-	✓	-	✓	-	-	-	-	-
ZP 12 00 ER-51	12.00	2.38	2.9	-	-	-	-	-	-	-	-	-	✓	✓	✓	-	-	-	-	-	-
ZP 16 00 ER-31	16.00	3.18	2.9	-	-	-	-	-	-	-	✓	-	-	✓	-	-	-	-	-	-	-
ZP 16 00 ER-51	16.00	3.18	2.9	-	-	-	-	-	-	-	-	-	✓	✓	✓	-	-	-	-	-	-
ZP 16 00 ER-71	16.00	3.18	2.9	-	-	-	-	✓	-	-	-	-	-	✓	-	✓	✓	-	-	-	-
ZP 20 00 ER-11	20.00	3.97	4.0	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
ZP 20 00 ER-31	20.00	3.97	4.0	-	-	-	-	-	-	-	✓	-	-	✓	-	-	-	-	-	-	-
ZP 20 00 ER-51	20.00	3.97	4.0	-	-	-	-	-	-	-	-	-	✓	✓	✓	-	-	-	-	-	-
ZP 20 00 ER-71	20.00	3.97	4.0	-	-	-	-	✓	-	-	-	-	-	✓	-	✓	✓	-	-	-	-

✓Article which can be ordered

Ordering example: ZP 16 00 ER-51 5020

Cutting conditions

		P Steel				M Stainless steel			K Cast iron				N Non-ferrous aluminum				S Super alloys			H Hardened materials			
Grade	Feed per tooth (mm)	Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
1020	v_{c1}	328	296	228	144	-	-	-	254	233	201	172	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.10	0.10	0.10	0.10	-	-	-	0.10	0.10	0.10	0.10	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	160	150	110	80	-	-	-	190	160	110	70	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.35	0.35	0.35	0.35	-	-	-	0.35	0.35	0.35	0.35	-	-	-	-	-	-	-	-	-	-	-
2003	v_{c1}	-	-	-	250	279	240	179	277	257	227	207	-	-	-	-	100	90	65	99	119	99	99
	f_{z1}	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	-	-	-	220	259	210	159	239	219	189	169	-	-	-	-	90	80	60	79	99	79	79
	f_{z2}	-	-	-	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	-	-	-	-	0.10	0.10	0.10	0.20	0.20	0.20	0.20
5020	v_{c1}	351	316	241	147	213	195	139	257	238	209	182	-	-	-	-	70	60	50	40	45	40	35
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	150	140	100	70	140	135	100	180	150	100	60	-	-	-	-	30	20	30	20	25	20	15
	f_{z2}	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	-	-	-	-	0.25	0.25	0.25	0.25	0.25	0.25	0.25
5040	v_{c1}	321	286	211	117	190	175	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	221	198	141	79	160	140	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.20	0.20	0.20	0.20	0.10	0.10	0.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5050	v_{c1}	259	229	161	95	136	88	74	-	-	-	-	-	-	-	-	53	43	35	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	186	163	107	55	99	69	61	-	-	-	-	-	-	-	-	34	24	25	-	-	-	-
	f_{z2}	0.25	0.25	0.25	0.25	0.25	0.25	0.25	-	-	-	-	-	-	-	-	0.25	0.25	0.15	-	-	-	-
8030	v_{c1}	-	-	-	-	174	141	106	-	-	-	-	-	-	-	-	62	52	42	-	-	-	-
	f_{z1}	-	-	-	-	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	-	-	-	-	131	112	87	-	-	-	-	-	-	-	-	42	32	31	-	-	-	-
	f_{z2}	-	-	-	-	0.25	0.25	0.25	-	-	-	-	-	-	-	-	0.25	0.25	0.15	-	-	-	-
5135	v_{c1}	254	230	158	91	130	100	80	-	-	-	-	-	-	-	-	53	43	35	-	-	-	-
	f_{z1}	0.10	0.10	0.10	0.10	0.10	0.10	0.10	-	-	-	-	-	-	-	-	0.10	0.10	0.10	-	-	-	-
	v_{c2}	140	130	90	50	40	20	50	-	-	-	-	-	-	-	-	30	20	20	-	-	-	-
	f_{z2}	0.35	0.35	0.35	0.35	0.25	0.25	0.25	-	-	-	-	-	-	-	-	0.35	0.35	0.25	-	-	-	-

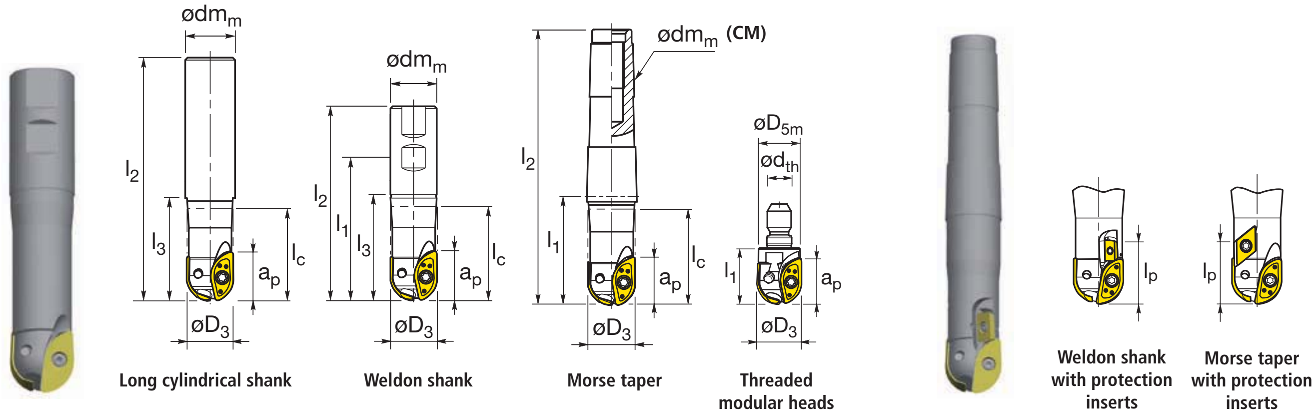
The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

MILLING

SR-SAF

Ball nose roughing endmill

Cutter program, SR 25-50



Reference	Dimensions (mm)											Z	Insert style	Nb of inserts	Shank protection insert	Nb of inserts	Coolant channels	Max. RPM	kg
	D_c	D_3	Max. a_p	dm_m D_{5m}	d_{th}	l_1	l_2	l_3	l_c	l_p	A [2]								
Long cylindrical shank																			
SR 25/02-QCC25-250	-	25.00	22.30	25.00	-	-	250.00	60.00	-	-	-	2	ZP 25 00..	2	-	-	Yes	24000	1.289
SR 25/02-QCC32-250	-	25.00	22.30	32.00	-	-	250.00	64.70	43.00	-	-	2	ZP 25 00..	2	-	-	Yes	24000	1.289
SR 32/02-QCC32-250	-	32.00	28.60	32.00	-	-	250.00	70.30	-	-	-	2	ZP 32 00..	2	-	-	Yes	18500	1.374
Weldon shank																			
SR 25/02-QWC25-060	-	25.00	22.30	25.00	-	85.50	117.00	60.00	-	-	-	2	ZP 25 00..	2	-	-	Yes	24000	0.346
SR 25/02-QWC25-080	-	25.00	22.30	25.00	-	105.50	137.00	80.00	-	-	-	2	ZP 25 00..	2	-	-	Yes	24000	0.414
SR 32/02-QWC32-070	-	32.00	28.60	32.00	-	95.50	131.00	70.00	-	-	-	2	ZP 32 00..	2	-	-	Yes	18500	0.616
SR 32/02-QWC32-100	-	32.00	28.60	32.00	-	125.50	161.00	100.00	-	-	-	2	ZP 32 00..	2	-	-	Yes	18500	0.790
SR 40/02-QWC32-070	-	40.00	35.70	32.00	-	95.50	131.00	70.00	-	-	-	2	ZP 40 00..	2	-	-	Yes	8000	0.720
SR 40/02-QWC40-100	-	40.00	35.70	40.00	-	131.50	171.00	100.00	-	-	-	2	ZP 40 00..	2	-	-	Yes	8000	1.330
SR 50/02-QWC50-100	-	50.00	44.70	50.00	-	136.50	181.00	100.00	-	-	-	2	ZP 50 00..	2 [4]	-	-	Yes	7000	2.132
Morse taper																			
SR 25/02-CM3-080	-	25.00	22.30	CM3	-	80.00	161.00	-	-	-	-	2	ZP 25 00..	2	-	-	No	24000	0.386
SR 25/02-CM4-110	-	25.00	22.30	CM4	-	110.00	212.50	-	92.70	-	-	2	ZP 25 00..	2	-	-	No	24000	0.760
SR 32/02-CM4-100	-	32.00	28.60	CM4	-	100.00	202.50	-	-	-	-	2	ZP 32 00..	2	-	-	No	18500	0.825
SR 32/02-CM4-150	-	32.00	28.60	CM4	-	150.00	252.50	-	-	-	-	2	ZP 32 00..	2	-	-	No	18500	1.100
SR 50/02-CM5-100	-	50.00	44.70	CM5	-	100.00	229.50	-	-	-	-	2	ZP 50 00..	2 [4]	-	-	No	7000	2.000
Threaded modular heads																			
SR25 010R02 P08X025	-	25.00	22.30	23.00	M12	35.00	-	-	-	-	17 [3]	2	ZP 25 00..	2	-	-	Yes	- [1]	0.070
SR32 010R02 P08X025	-	32.00	28.60	29.00	M16	45.00	-	-	-	-	24	2	ZP 32 00..	2	-	-	Yes	- [1]	0.150
Weldon shank with protection inserts																			
SR 30/03-QWC32-070	-	30.00	26.80	32.00	-	95.50	131.00	70.00	60.10	42.80	-	2	ZP 30 00..	2	APMW 16 04..	1	Yes	19500	0.210
SR 30/03-QWC32-100	-	30.00	26.80	32.00	-	125.50	161.00	100.00	90.10	42.80	-	2	ZP 30 00..	2	APMW 16 04..	1	Yes	19500	0.341
SR 40/04-QWC40-150	-	40.00	35.70	40.00	-	181.50	221.00	150.00	-	65.00	-	2	ZP 40 00..	2	APMW 16 04..	2	Yes	8000	1.700
SR 50/06-QWC50-150	-	50.00	44.70	50.00	-	186.50	231.00	150.00	-	103.00	-	2	ZP 50 00..	2 [4]	APMW 16 04..	4	Yes	7000	2.650
Morse taper with protection inserts																			
SR 25/03-CM4-110	-	25.00	22.30	M4	-	110.00	212.50	-	60.60	34.30	-	2	ZP 25 00..	2	DCMW 11 T3..	1	No	18500	0.760
SR 32/03-CM4-100	-	32.00	28.60	M4	-	100.00	202.50	-	-	43.20	-	2	ZP 32 00..	2	APMW 16 04..	1	No	18500	0.820
SR 32/04-CM4-100	-	32.00	28.60	M4	-	100.00	202.50	-	-	57.70	-	2	ZP 32 00..	2	APMW 16 04..	2	No	18500	0.805
SR 40/04-CM5-150	-	40.00	35.70	M5	-	150.00	279.50	-	108.00	65.00	-	2	ZP 40 00..	2	APMW 16 04..	2	No	8000	2.260

[1] Max. RPM values are not given for modular heads as they are always used with long extensions
[2] Size of the wrench to be used for modular heads is given by dimension A
[3] Use a narrow flat wrench
[4] Requires two shim seats DAN 2391, supplied with cutter.

Spare parts

Insert style	Diameter D_3	Insert screw			Screw driver		Torque wrench			Insert shim seat	Shim screw
		Reference	Size		Reference		Reference	Nm	Nm	Reference	Reference
ZP 25 00..	25 mm	416.1-834	M 4.0	3.0 N.m	DMP 3125	15 IP	TDX 215PLUS	15 IP	3.0	-	-
ZP 30 00..	30 mm	5513 020-07	M 5.0	5.0 N.m	DMP 3662	20 IP	-	-	-	-	-
ZP 32 00..	32 mm	28349	M 5.0	5.0 N.m	DMP 2099	T20	-	-	-	-	-
ZP 40 00..	40 mm	5513 020-31	M 6.0	7.5 N.m	DMP 3139	25 IP	-	-	-	-	-
ZP 50 00..	50 mm	DVF 2447	M 8.0	18.0 N.m	DMP 3460	T30	-	-	-	DAN 2391	5513 020-09
APMW 16 04..	30 - 50 mm	5513 020-09	M 3.5	3.0 N.m	DMP 3125	15 IP	TDX 215PLUS	15 IP	3.0	-	-
DCMW 11 T3..	25 mm	416.1-833	M 3.5	2.0 N.m	PT-8007	10 IP	TDX 210PLUS	10 IP	2.0	-	-

MILLING

SR-SAF

Ball nose roughing endmill

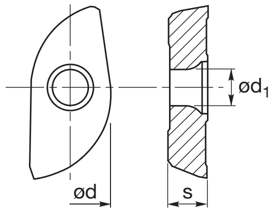
Insert program

ZP... ER-11

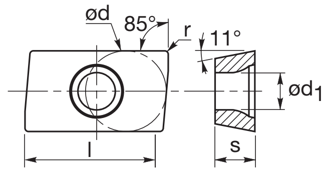
ZP... ER-31

ZP... ER-51

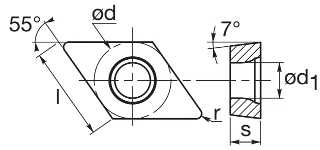
ZP... ER-71



ZP...



APMW...



DCMT...

Reference	Dimensions (mm)							Grades													
	d	s	d_1	l	r	b_s	t_1	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX05	KX20	KX2	N
ZP 25 00 ER-31	25.00	4.76	4.7	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
ZP 25 00 ER-51	25.00	4.76	4.7	-	-	-	-	-	-	-	-	-	✓	✓	-	✓	-	-	-	-	-
ZP 25 00 ER-71	25.00	4.76	4.7	-	-	-	-	✓	-	-	-	-	-	✓	✓	-	✓	-	-	-	-
ZP 30 00 ER-51	30.00	6.35	5.9	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-
ZP 32 00 ER-11	32.00	6.35	5.9	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
ZP 32 00 ER-31	32.00	6.35	5.9	-	-	-	-	-	-	-	✓	-	-	✓	-	-	-	-	-	-	-
ZP 32 00 ER-51	32.00	6.35	5.9	-	-	-	-	-	-	-	-	-	✓	✓	-	✓	-	-	-	-	-
ZP 32 00 ER-71	32.00	6.35	5.9	-	-	-	-	✓	-	-	-	-	-	✓	✓	-	✓	-	-	-	-
ZP 40 00 ER-71	40.00	7.94	7.0	-	-	-	-	-	-	-	-	-	-	✓	✓	-		-	-	-	-
ZP 50 00 ER-11	50.00	7.94	9.6	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
ZP 50 00 ER-71	50.00	7.94	9.6	-	-	-	-	-	-	-	-	-	-	✓	✓	✓	-	-	-	-	-
Protection inserts																					
APMW 16 04 PD TR	9.52	4.76	4.4	16.45	0.8	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-
DCMT 11 T3 04-PF4 [1)]	9.52	3.97	4.4	11.60	0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[1)] See turning section for grade choice

✓Article which can be ordered

Ordering example: ZP 25 00 ER-51 5020

Cutting conditions

Grade	Feed per tooth (mm)	P Steel: Free machining and low carbon (120-170 HB)	P Steel: Medium and high carbon (180-220 HB)	P Steel: Alloy and easy to machine tool steels (200-240 HB)	P Steel: Tool and die steels (220-260 HB)	M Stainless steel: Ferritic and martensitic (180-240 HB)	M Stainless steel: Austenitic (140-180 HB)	M Stainless steel: Ph and duplex (220-260 HB)	K Cast iron: Gray cast iron (180-220 HB)	K Cast iron: Gray cast iron (220-260 HB)	K Cast iron: Ductile iron (180-220 HB)	K Cast iron: Ductile iron (220-260 HB)	N Non-ferrous aluminum: Aluminum < 7% Si (<100 HB)	N Non-ferrous aluminum: Aluminum 7% - 12% Si (<100 HB)	N Non-ferrous aluminum: Aluminum > 12% Si (<130 HB)	N Non-ferrous aluminum: Non-ferrous (<100 HB)	S Super alloys: Iron based alloys (200-300 HB)	S Super alloys: Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	S Super alloys: Titanium alloys 6AL-V4 (110-450 HB)	H Hardened materials: Case hardened carbon steels (50Rc - 62Rc)	H Hardened materials: Case hardened alloy steels (40Rc - 50Rc)	H Hardened materials: Hardened tools steels (45Rc - 62Rc)	H Hardened materials: Hardened irons (400 BHN)
1020	v_{c1}	328	296	228	144	-	-	-	254	233	201	172	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.10	0.10	0.10	0.10	-	-	-	0.10	0.10	0.10	0.10	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	160	150	110	80	-	-	-	190	160	110	70	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.35	0.35	0.35	0.35	-	-	-	0.35	0.35	0.35	0.35	-	-	-	-	-	-	-	-	-	-	-
2003	v_{c1}	-	-	-	250	279	240	179	277	257	227	207	-	-	-	-	100	90	65	99	119	99	99
	f_{z1}	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	-	-	-	220	259	210	159	239	219	189	169	-	-	-	-	90	80	60	79	99	79	79
	f_{z2}	-	-	-	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	-	-	-	-	0.10	0.10	0.10	0.20	0.20	0.20	0.20
5020	v_{c1}	351	316	241	147	213	195	139	257	238	209	182	-	-	-	-	70	60	50	40	45	40	35
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	150	140	100	70	140	135	100	180	150	100	60	-	-	-	-	30	20	30	20	25	20	15
	f_{z2}	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	-	-	-	-	0.25	0.25	0.25	0.25	0.25	0.25	0.25
5040	v_{c1}	321	286	211	117	190	175	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	221	198	141	79	160	140	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.20	0.20	0.20	0.20	0.10	0.10	0.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5050	v_{c1}	259	229	161	95	136	88	74	-	-	-	-	-	-	-	-	53	43	35	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	186	163	107	55	99	69	61	-	-	-	-	-	-	-	-	34	24	25	-	-	-	-
	f_{z2}	0.25	0.25	0.25	0.25	0.25	0.25	0.25	-	-	-	-	-	-	-	-	0.25	0.25	0.15	-	-	-	-
8030	v_{c1}	-	-	-	-	174	141	106	-	-	-	-	-	-	-	-	62	52	42	-	-	-	-
	f_{z1}	-	-	-	-	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	-	-	-	-	131	112	87	-	-	-	-	-	-	-	-	42	32	31	-	-	-	-
	f_{z2}	-	-	-	-	0.08	0.08	0.08	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
5135	v_{c1}	254	230	158	91	130	100	80	-	-	-	-	-	-	-	-	53	43	35	-	-	-	-
	f_{z1}	0.10	0.10	0.10	0.10	0.10	0.10	0.10	-	-	-	-	-	-	-	-	0.10	0.10	0.10	-	-	-	-
	v_{c2}	140	130	90	50	40	20	50	-	-	-	-	-	-	-	-	30	20	20	-	-	-	-
	f_{z2}	0.35	0.35	0.35	0.35	0.25	0.25	0.25	-	-	-	-	-	-	-	-	0.35	0.35	0.25	-	-	-	-

The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

MILLING

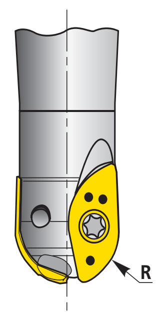
SR SAF

Milling cutter characteristics

Machining tolerances

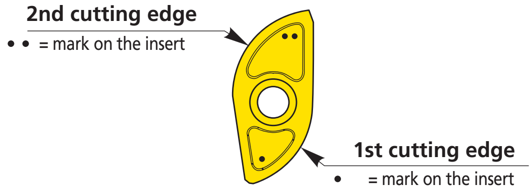
The cutting diameter of cutters fitted with **finish inserts** is always equal to or less than the nominal diameter.

Nominal diameter ØD	Radius R	Geometry **71** Roughing Difficult machining	Geometry **51** Light roughing Multi-purpose insert	Geometry **31** Finishing Accurate dimensions	Geometry **11** Semi-Finishing Light alloys
10	5	-	-	5 $^{+0,03}_{-0,12}$	-
12	6	-	6 $^{+0,04}_{-0,13}$	6 $^{0}_{-0,09}$	6 $^{+0,01}_{-0,1}$
16	8	8 $^{+0,03}_{-0,12}$	8 $^{+0,04}_{-0,13}$	8 $^{0}_{-0,09}$	8 $^{+0,01}_{-0,1}$
20	10	10 $^{+0,03}_{-0,12}$	10 $^{+0,04}_{-0,13}$	10 $^{0}_{-0,09}$	10 $^{+0,01}_{-0,1}$
25	12,5	12,5 $^{+0,06}_{-0,15}$	12,5 $^{+0,04}_{-0,13}$	12,5 $^{0}_{-0,09}$	12,5 $^{+0,01}_{-0,1}$
30	15	-	15 $^{+0,08}_{-0,16}$	-	-
32	16	16 $^{+0,10}_{-0,18}$	16 $^{+0,08}_{-0,16}$	16 $^{0}_{-0,09}$	16 $^{+0,01}_{-0,1}$
40	20	20 $^{+0,18}_{-0,25}$	20 $^{+0,18}_{-0,25}$	-	20 $^{+0,09}_{-0,17}$
50	25	25 $^{+0,22}_{-0,30}$	-	-	25 $^{+0,13}_{-0,22}$



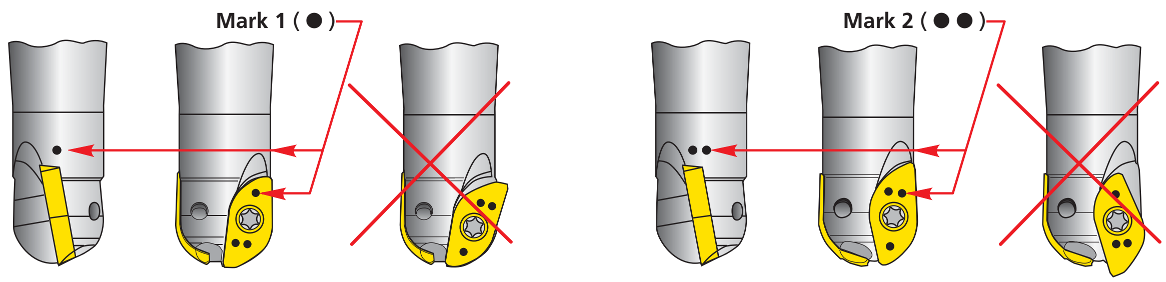
Number of cutting edges

Each cutter only uses one type of insert with two cutting edges on the hemispherical part.



Assembly of inserts

For correct assembly, the marks on the cutter body should match those on the insert (● with ●) and (●● with ●●)

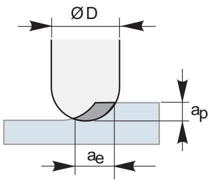
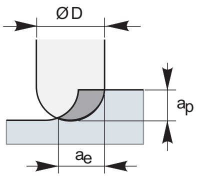
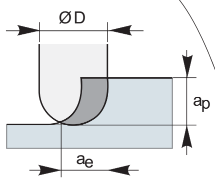
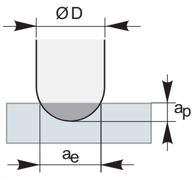
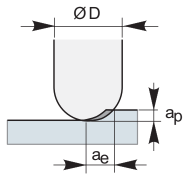


MILLING

SR SAF
Milling cutter characteristics

Cutting conditions

Machining type

A	B	C	E	Finition
				
0,1 D ap < 0,2 D ae max = 0,15 D	0,2 D ap < 0,4 D ae max = 0,2 D	0,4 D ap < 0,8 D ae max = 0,15 D	ap = 0,3 D ae max = 0,9 D	ap = 0,3 to 0,9 mm ae max = 0,1 to 0,3 mm

Maximum rotation speed: reduce by 50% for long L_1 sections (= 8 x Ø)

Table 1 - Cutting parameters, starting values

Material		Roughing					Finishing	
		V_C (in m/min)	f_Z (in mm)				V_C (in m/min)	f_Z (in mm)
			A	B	C	E		F
P Steel	Steel HB 150	230-280	0,3-0,4	0,17-0,35	0,15-0,3	0,1-0,2	-	-
P Steel	Steel 150 <HB 200	220-250	0,3-0,4	0,17-0,35	0,15-0,3	0,1-0,2	-	-
P Steel	Steel 200 < HB 230	200-220	0,3-0,4	0,17-0,35	0,2-0,25	0,1-0,2	-	-
P Steel	Tool steel 230 < HB 300	150-200	0,3-0,4	0,2-0,3	0,1-0,2	0,1-0,2	400-550	0,1-0,3
P Steel	Hardened steel 300 < HB 400	110-150	0,3-0,4	0,2-0,3	0,1-0,2	0,1-0,2	300-400	0,1-0,3
M Stainless steel	Stainless steel	90-120	0,3-0,4	0,2-0,3	0,1-0,2	0,1-0,2	-	-
K Cast iron	Cast iron HB = 140	180-200	0,4-0,5	0,3-0,4	0,1-0,3	0,1-0,3	500-550	0,1-0,3
N Non ferrous	Graphite	350-400	0,5-0,6	0,3-0,4	0,1-0,3	0,1-0,3	850-1000	0,05-0,1
S Super alloys	Titanium alloy	50-60	0,2-0,3	0,1-0,2	0,1-0,2	0,1-0,2	-	-
S Super alloys	Inconel Heat resistant alloys	30-40	0,2-0,3	0,1-0,2	0,1-0,2	0,1-0,2	-	-

Table 2 - Correction factors of f_Z and V_C depending on the cutter diameter and the type of machining

Machining type	V_C correction	Ø D (in mm) 10-12	16	20	25	30-32	40	50
A	1	0,45	0,7	1	1	1,1	1,2	1,3
B	1	0,25	0,45	0,6	0,8	1	1,1	1,2
C	0,8	0,2	0,3	0,5	0,7	0,8	0,9	1
E	1	0,2	0,3	0,5	0,7	0,8	0,9	1
F	1	1	1	1	1	1	-	-
		f_Z correction						

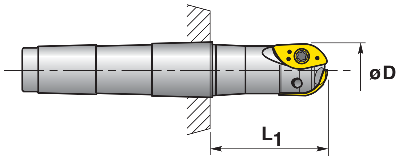
MILLING

SR SAF

Milling cutter characteristics

Cutting conditions (continued)

Table 3 - Correction factors according to the tool length



Tool projection	1 D ≤ L1 ≤ 2,9 D	3 D ≤ L1 ≤ 3,5 D	3,6 D ≤ L1 ≤ 4 D	4,1 D ≤ L1 ≤ 4,6 D	4,6 D < L1
Correction factor of Vc	1	0,9	0,8	0,7	0,5

Example 1

Rough machining of a mould made of 40CMD8 hardened steel (1400 MPa), tool projection (L_1 = 110 mm) with a milling cutter of 32 mm diameter.

a_p = 14 mm
a_e = 4 mm

Therefore, machining type: "C"

Basic values Table 1	v_c and f_z correction Table 2	Correction depending on overhang Table 3	Result
v_c = 350 m/min	v_{c1} = 350 m/min	v_{c2} = 0,5 x 350 = 175 m/min	v_{c2} = 175 m/min
f_z = 0,2 mm/tooth	f_{z1} = 0,2 mm/tooth		f_{z1} = 0,2 mm/tooth

Example 2

Finish machining of a mould made of 40CMD8 hardened steel (1400 MPa), tool projection (L_1 = 110 mm) with a milling cutter of 20 mm diameter.

a_p = 0,5 mm
a_e = 0,2 mm

Therefore, machining type: "F"

Basic values Table 1	v_c and f_z correction Table 2	Correction depending on overhang Table 3	Result
v_c = 350 m/min	v_{c1} = 350 m/min	v_{c2} = 0,5 x 350 = 175 m/min	v_{c2} = 175 m/min
f_z = 0,2 mm/tooth	f_{z1} = 0,2 mm/tooth		f_{z1} = 0,2 mm/tooth

SR SAF

Milling cutter characteristics

Cutting geometry

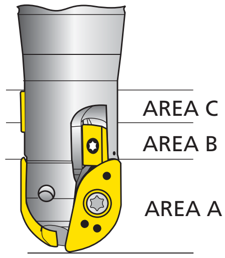
Cutter may be fitted with any of the following geometries: 71, 51, 31 or 11
Geometry 71 is designed for rough milling with large chip output and under severe conditions.
It allows plunging in solid material at a depth equal to the cutter radius; feed must be interrupted by stops to break the chips into pieces.
Geometry 51 can be used in most machining applications; it is a multi-purpose and very versatile geometry.
Geometry 31, finishing, is more specifically designed for conventional milling.
Geometry 11 is intended for machining aluminium or finishing sticky materials.

Specific characteristics of protective inserts

APMW 16 04 PD TR inserts main function is to protect the cutter body particulary when climb milling in deep cavities.
When in use, the feed must not exceed 0,2 mm/revolution.

WARNING ! The cutter is fitted with :

2 ZP in area A	2 teeth	→
1 AP in area B	1 tooth only	→
1 AP in area C	1 tooth only	→

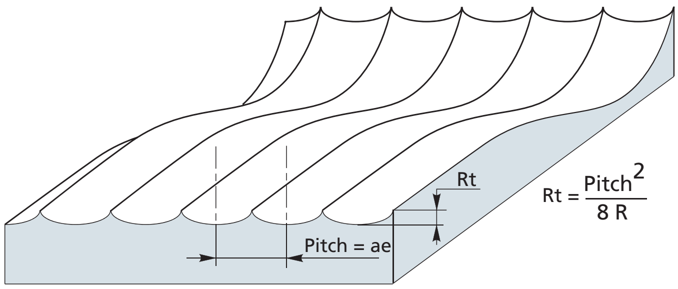


Recommendations for use

Machining with large tool overhang

To avoid vibrations due to bending with long tools, it is recommended to reduce cutting speed by 30 to 50%.

ROUGHNESS Rt :



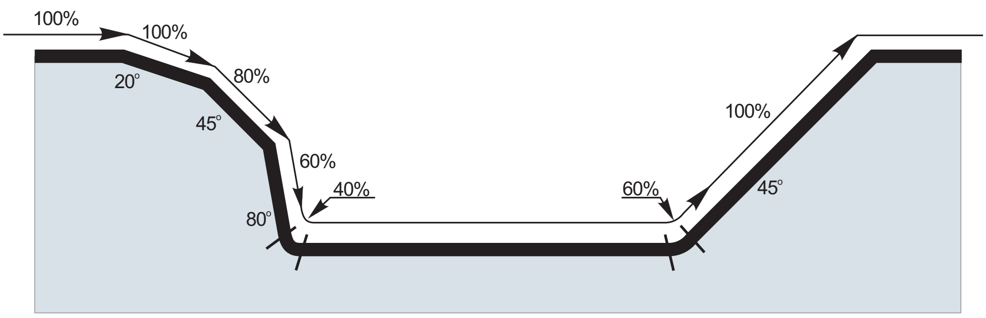
$$Rt = \frac{Pitch^2}{8\,R}$$

Rt value depending on the step over

Cutter diameter ØD	10			12			16			20			25			32			40			50		
Pitch = ae	0,7	1,0	1,5	1,0	1,5	2,0	1,0	2,0	3,0	2,0	3,0	4,0	3,0	4,0	5,0	3,0	4,0	5,0	4,0	6,0	8,0	4,0	6,0	8,0
Rt	0,01	0,02	0,03	0,02	0,05	0,08	0,02	0,06	0,14	0,05	0,11	0,20	0,09	0,16	0,25	0,07	0,13	0,20	0,10	0,23	0,40	0,08	0,18	0,32

Table feed correction depending on the machined profile

According to the machining configuration, we recommend to modify the table feed as shown below.



SR SAF
Milling cutter characteristics

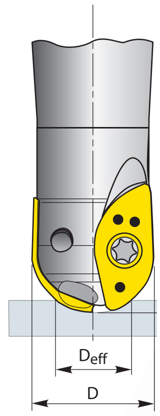
Effective cutting diameter

End milling

$$D\ eff = 2\sqrt{a_p\,(D - a_p)}$$

$$V_c = \frac{\pi .\ D\ eff.\ n}{1000}$$

vc =	Cutting speed (in m/min)
n =	Number of revolutions (in rpm)
D =	Cutter diameter (in mm)
D eff =	Effective cutting diameter (in mm)
a_p =	Cutting depth (in mm)



Calculation of effective diameter (Ø D eff) according to a_p

	a_p																
Ø D	**1,0**	**2,0**	**3,0**	**4,0**	**5,0**	**6,0**	**7,0**	**8,0**	**9,0**	**10,0**	**11,0**	**12,0**	**13,0**	**14,0**	**15,0**	**16,0**	**17,0**
10	6,0	8,0	9,2	9,8	10,0	-	-	-	-	-	-	-	-	-	-	-	-
12	6,6	8,9	10,4	11,3	11,8	12,0	-	-	-	-	-	-	-	-	-	-	-
16	7,7	10,6	12,5	13,9	14,8	15,5	15,9	16,0	-	-	-	-	-	-	-	-	-
20	8,7	12,0	14,3	16,0	17,3	18,3	19,1	19,6	19,9	20,0	-	-	-	-	-	-	-
25	9,8	13,6	16,2	18,3	20,0	21,4	22,4	23,3	24,0	24,5	24,8	25,0	-	-	-	-	-
30	10,8	15,0	18,0	20,4	22,4	24,0	25,4	26,5	27,5	28,3	28,9	29,4	29,7	29,9	30,0	-	-
32	11,1	15,5	18,7	21,2	23,2	25,0	26,5	27,7	28,8	29,7	30,4	31,0	31,4	31,7	31,9	32,0	-
40	12,5	17,4	21,1	24,0	26,5	28,6	30,4	32,0	33,4	34,6	35,7	36,7	37,5	38,2	38,7	39,2	39,5
50	14,0	19,6	23,7	27,1	30,0	32,5	34,7	36,7	38,4	40,0	41,4	42,7	43,9	44,9	45,8	46,6	47,4

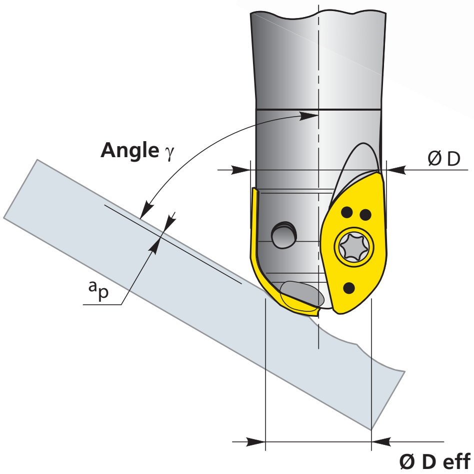
Example: With a 20 mm diameter milling cutter, cutting depth a_p = 3,0 mm, D eff (effective diameter) is 14,3 mm.

Milling on inclined face

The effective diameter will vary with :
- the inclined face angle
- cutting depth

Typically, it will be between :
- minimum effective diameter = Ø D x cos

Angle γ
- maximum effective diameter = Ø D



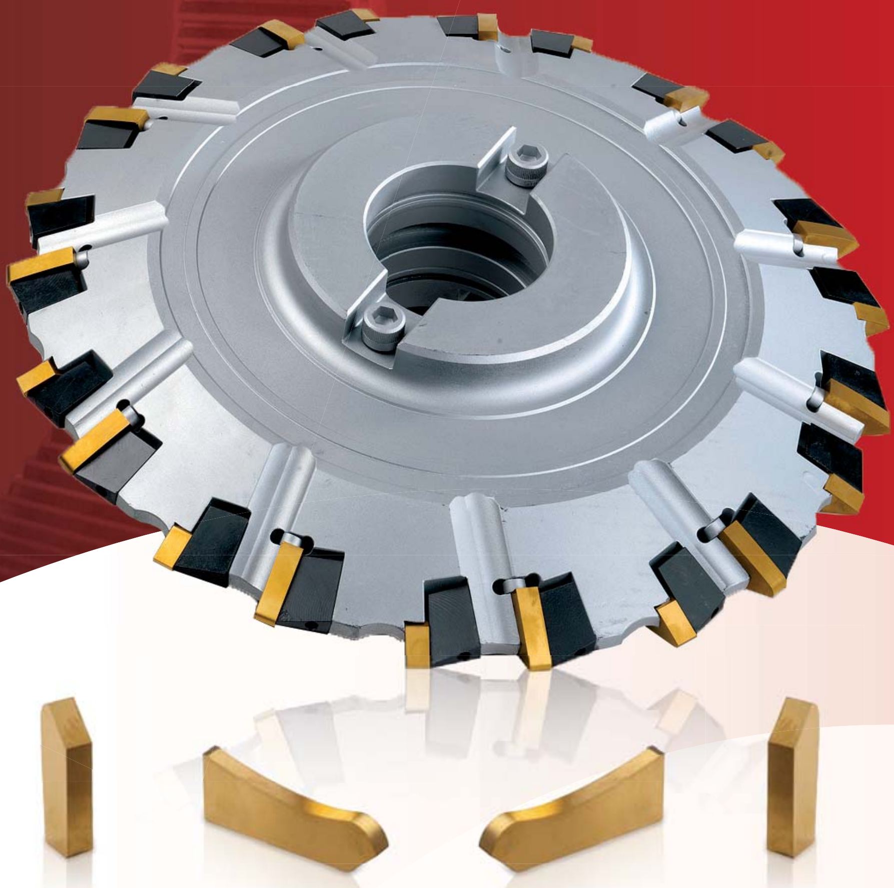
Ø D eff approximately = Ø D x cos Angle γ

Chip evacuation

If safety conditions allow, it is recommended that the coolant is blown towards the cut to facilitate chip evacuation. Soluble oil lubrication must be abundant and powerful to prevent thermal shocks.

MILLING

SPECIAL SOLUTION
GEAR-SAF



GEAR UP FOR PROFITABILITY

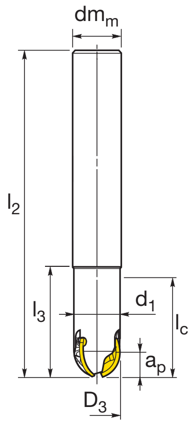
LARGE RANGE OF GEAR PROFILES
WITH THE SAME CUTTER

Safety
Cutting Tool Solutions

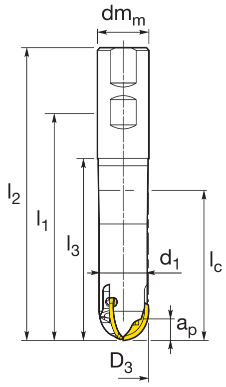
SM-SAF

Ball nose high productivity endmill with SideLok™ technology

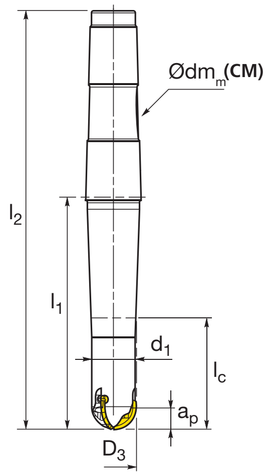
Cutter program, SM 16-32



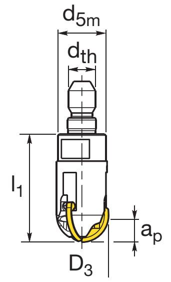
Long cylindrical shank



Weldon shank



Morse taper



Threaded modular heads

Reference	Dimensions (mm)											Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg
	D_c	D_3	d_1	Max. a_p	dm_m d_{5m}	d_{th}	l_1	l_2	l_3	l_c	α						
Long cylindrical shank (1)																	
SM16 016R03 C16X200	-	16.00	14,85	8	16.00	-	-	200.00 (1)	50.00	-	-	3	XPB 16..	3	No	20000	0.290
SM16 016R03 C20X200	-	16.00	14,85	8	20.00	-	-	200.00 (1)	50.00	42.20	14°30	3	XPB 16..	3	No	20000	0.430
SM20 020R03 C20X200	-	20.00	18.70	10.00	20.00	-	-	200.00 (1)	50.00	-	-	3	XPB 20..	3	No	20000	0.450
SM20 020R03 C25X250	-	20.00	18.70	10.00	25.00	-	-	250.00 (1)	60.00	43.90	9°20	3	XPB 20..	3	No	20000	0.845
SM25 025R03 C25X250	-	25.00	23.25	12.50	25.00	-	-	250.00 (1)	60.00	-	-	3	XPB 25..	3	No	20000	0.880
SM32 032R03 C32X250	-	32.00	30.00	16.00	32.00	-	-	250.00 (1)	80.00	-	-	3	XPB 32..	3	No	15000	1.420
Weldon shank																	
SM16 016R03 W20X086	-	16.00	14,85	8.00	20.00	-	86.50	111.00	60.00	44.40	7°30	3	XPB 16..	3	No	20000	0.200
SM20 020R03 W25X096	-	20.00	18.70	10.00	25.00	-	95.50	127.00	70.00	46.30	5°50	3	XPB 20..	3	No	20000	0.359
SM25 025R03 W25X106	-	25.00	23.25	12.50	25.00	-	105.50	137.00	80.00	-	-	3	XPB 25..	3	No	20000	0.439
Morse taper																	
SM20 020R03 MK3X080	-	20.00	18.70	10.00	CM3	-	80.00	160.70	-	65.00	7°10	3	XPB 20..	3	No	20000	0.350
SM25 025R03 MK4X100	-	25.00	23.25	12.50	CM4	-	100.00	202.20	-	83.50	14°00	3	XPB 25..	3	No	20000	0.740
SM32 032R03 MK4X120	-	32.00	30.00	16.00	CM4	-	120.00	222.20	-	-	-	3	XPB 32..	3	No	15000	0.995
Threaded modular heads																	
SM16 016R03 P08X035	-	16.00	15.00	8.00	15.00	M8	35.00	52.50	-	-	-	3	XPB 16..	3	No	- (2)	0.040
SM16 016R03 P10X035	-	16.00	15.50	8.00	15.40	M10	35.00	54.50	-	-	-	3	XPB 16..	3	No	- (2)	0.050
SM20 020R03 P10X040	-	20.00	18.70	10.00	17.80	M10	40.00	59.50	-	-	-	3	XPB 20..	3	No	- (2)	0.070
SM25 025R03 P12X045	-	25.00	23.25	12.50	20.80	M12	45.00	67.00	-	-	-	3	XPB 25..	3	No	- (2)	0.114
SM32 032R03 P16X055	-	32.00	30.00	16.00	28.80	M16	55.00	79.00	-	-	-	3	XPB 32..	3	No	- (2)	0.240

(1) Shank length to shorten by your good offices if needed.

(2) Max. RPM values are not given for modular heads as they are always used with long extensions.

Spare parts

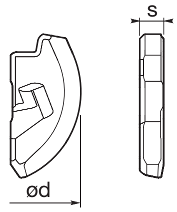
Insert style	Diameter D_3	Insert screw			Screw driver		Torque wrench		
		Reference	Size		Reference		Reference		Nm
XPB 16..	16 mm	DVF 4762	M 3.0	1.2 N.m	TX 209PLUS	9 IP	TDX 209PLUS	9 IP	1.4
XPB 20..	20 mm	DVF 3992	M 3.5	3.0 N.m	TX 215PLUS	15 IP	TDX 215PLUS	15 IP	3.0
XPB 25..	25 mm	DVF 3993	M 4.0	3.0 N.m	TX 215PLUS	15 IP	TDX 215PLUS	15 IP	3.0
XPB 32..	32 mm	DVF 3994	M 5.0	5.0 N.m	TX 220PLUS	20 IP	-	-	-

SM-SAF

Ball nose high productivity endmill with SideLok™ technology

Insert program

XPB... ER-41



Reference	Dimensions (mm)							Grades													
	d	s	d_1	l	r	b_s	t_1	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX05	KX20	KX2	N
XPB 16 ER-41	-	-	-	-	-	-	-	-	-	-	✓	-	✓	-	✓	-	-	-	-	-	-
XPB 20 ER-41	20.00	2.50	-	-	-	-	-	-	-	-	✓	-	✓	✓	✓	-	-	-	-	-	-
XPB 25 ER-41	25.00	3.17	-	-	-	-	-	-	-	-	✓	-	✓	✓	✓	-	-	-	-	-	-
XPB 32 ER-41	32.00	4.00	-	-	-	-	-	-	-	-	✓	-	✓	✓	✓	-	-	-	-	-	-

✓Article which can be ordered

Ordering example: XPB 16 ER-41 2003

Top form geometry

Top form geometry	Application	P Steel	M Stainless steel	K Cast iron	N Non-ferrous aluminum	S Super alloys	H Hardened materials
 ER-41	Semi-Finishing	2003 **5020** 5040 **5050**	**2003** **5020** 5050	 **5020** 5040 5050		**2003** **5020** 5050	**2003** 5020 5040 5050

Cutting conditions

		P Steels				M Stainless steels			K Cast irons				N Aluminum - Non-ferrous				S Super alloys			H Hardened materials			
Grade	Feed per tooth (mm)	Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
2003	v_{c1}	-	-	-	250	279	240	179	277	257	227	207	-	-	-	-	100	90	65	99	119	99	99
	f_{z1}	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	-	-	-	220	259	210	159	239	219	189	169	-	-	-	-	90	80	60	79	99	79	79
	f_{z2}	-	-	-	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	-	-	-	-	0.10	0.10	0.10	0.20	0.20	0.20	0.20
5020	v_{c1}	351	316	241	147	213	195	139	257	238	209	182	-	-	-	-	70	60	50	40	45	40	35
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	150	140	100	70	140	135	100	180	150	100	60	-	-	-	-	30	20	30	20	25	20	15
	f_{z2}	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	-	-	-	-	0.25	0.25	0.25	0.25	0.25	0.25	0.25
5040	v_{c1}	321	286	211	117	190	175	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	221	198	141	79	160	140	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.20	0.20	0.20	0.20	0.10	0.10	0.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5050	v_{c1}	259	229	161	95	136	88	74	-	-	-	-	-	-	-	-	53	43	35	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	186	163	107	55	99	69	61	-	-	-	-	-	-	-	-	34	24	25	-	-	-	-
	f_{z2}	0.25	0.25	0.25	0.25	0.25	0.25	0.25	-	-	-	-	-	-	-	-	0.25	0.25	0.15	-	-	-	-

The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

MILLING

SM-SAF

Milling cutter characteristics

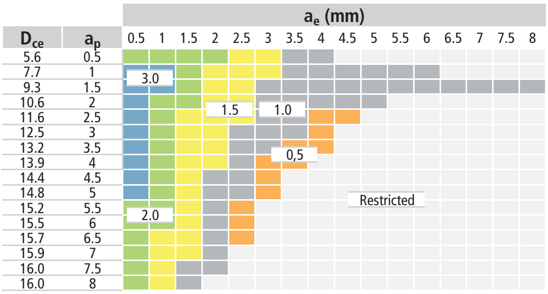
Feed calculation

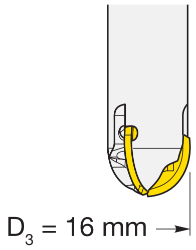
$f_z = h_{max} \cdot k_a \cdot k_{L1}$

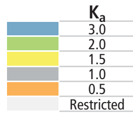
Recommended chip thickness values h_{max} for feed calculations

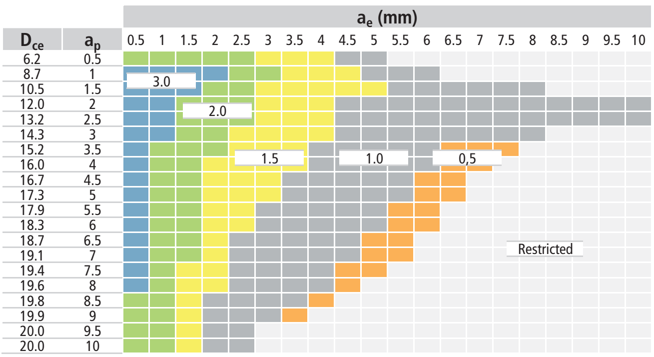
Family	Cutter	Reference	P	M	K	N	S	H
			Maximum chip thickness = h_{max} (mm)					
SM-SAF	SM	XPB 16 ER-41	0.05-0.1	0.05-0.08	0.06-0.12	-	0.03-0.05	0.03-0.05
SM-SAF	SM	XPB 20 ER-41	0.07-0.12	0.07-0.1	0.09-0.15	-	0.05-0.07	0.05-0.07
SM-SAF	SM	XPB 25 ER-41	0.07-0.12	0.07-0.1	0.09-0.15	-	0.05-0.07	0.05-0.07
SM-SAF	SM	XPB 32 ER-41	0.1-0.18	0.1-0.16	0.1-0.2	-	0.06-0.09	0.06-0.09

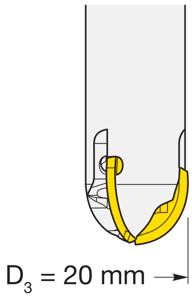
Feed correction factors k_a related to a_p and a_e

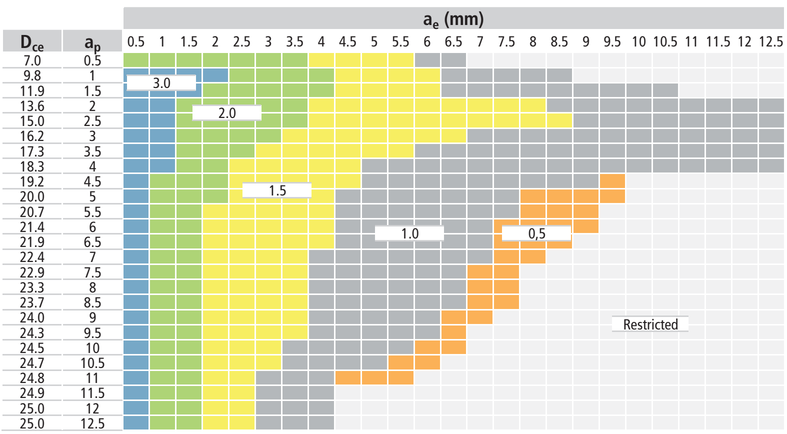


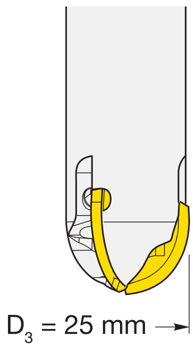












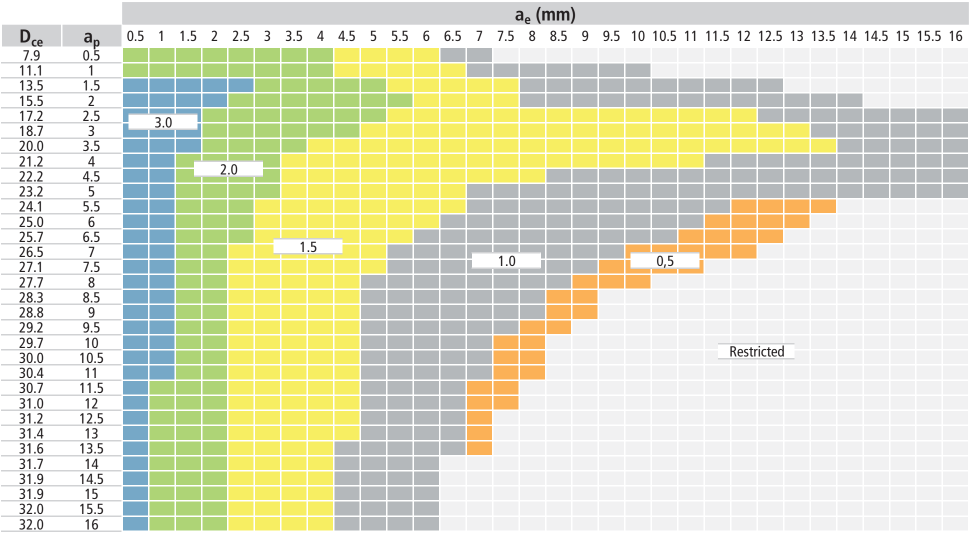
D_{ce} = Effective cutting diameter

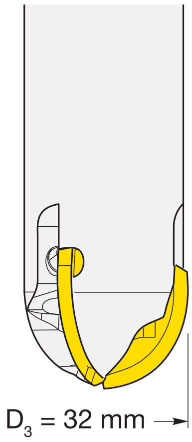
MILLING

SM-SAF

Milling cutter characteristics

Feed correction factors k_a related to a_p and a_e (continued)





Feed correction factor k_{L1} related to overhang

L_1 (mm)	k_{L1}
$1 \times D_3 \leq L1 \leq 3 \times D_3$	1
$3.1 \times D_3 \leq L1 \leq 4 \times D_3$	0.9
$4.1 \times D_3 \leq L1 \leq 6 \times D_3$	0.7
$6 \times D_3 \leq L1$	0.5

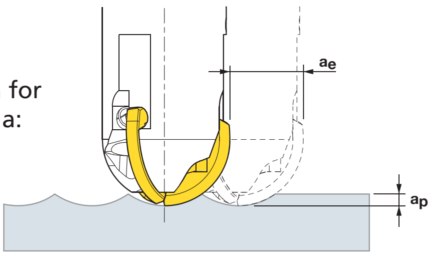
Technical data

$$n = \frac{1000\ v_c}{\pi \cdot D_{ce}} \qquad V_f = 3 \cdot f_z \cdot n$$

Effective cutting diameter (D_{ce})

For straight cutter position D_{ce} value can be taken for specific D_3 and a_p from k_a diagrams, or use formula:

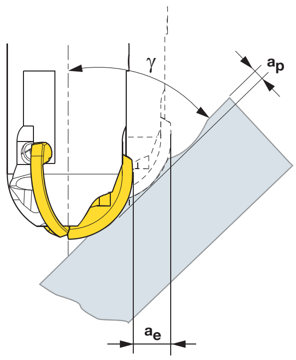
$$D_{ce} = \sqrt{D_3^2 - (D_3 - 2a_p)^2}$$



For inclinated cutter position use formula:

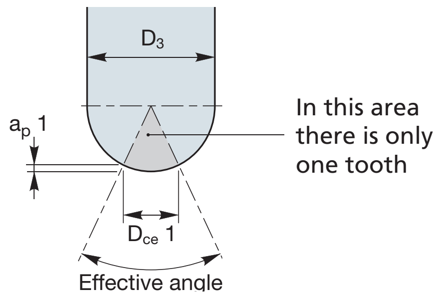
$$D_{ce} = \sqrt{D_3^2 - (D_3 - 2a_p)^2} \cdot \sin\gamma + (D_3 - 2a_p) \cdot \cos\gamma$$

For inclinated cutter position D_{ce} calculeted by formula to be used to find feed correction factors in diagrams k_a.



One effective tooth area

D_3 (mm)	Effective angle	D_{ce} 1 (mm)	a_p 1 (mm)
16	41°	5.568	0.51
20	37°	6.314	0.52
25	37°	7.901	0.65
32	37°	10.122	0.83



MILLING

SM-SAF

Milling cutter characteristics

Insert assembly

Insert assembly and setting it back on its supports

❶ Loosen the screw by a few turns only (five to six turns)

❹ Assemble the insert Slide the insert in the direction shown

❷ Remove the insert Slide the insert in the direction shown

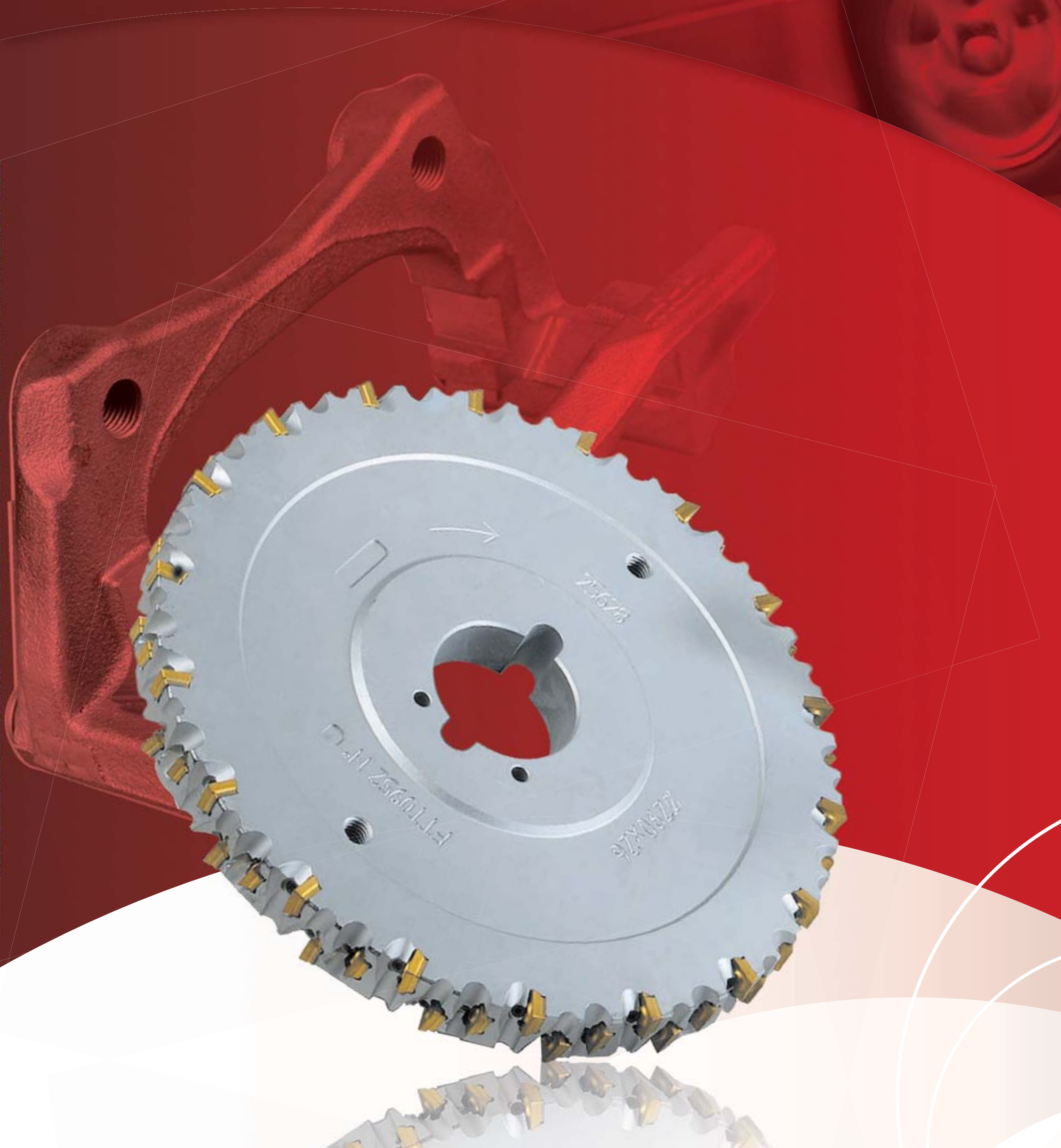
❺ Screw tightening

❸ Blowing and cleaning of the insert housing

Machining example

	Unit	Safety
Tool		SM32 032R03 C32X250
Insert		XPB 32 ER-41 5020
Cutting edges per insert		1
Material		FGS450
Number of parts to produce		1000
Cutting data		
Cutting diameter= Ø	mm	21.16
Number of teeth= z		3
Cutting speed= v_c	m/min	266
Revolutions per minute= n	rpm	4003
Cutting depth= a_p	mm	4
Cutting width= a_e	mm	3.5
Tooth feed= f_z	mm/tooth	0.5
Feed per revolution= f_n	mm/rev	1.5
Table feed= v_f	mm/min	6005
Chip production rate= Q	cm^3/min	84
Machining time per workpiece	min	13.33

SPECIAL SOLUTION
THREE CUTS MILLING DISC



SLOTTING YOUR PATH

HIGH INSERTS DENSITY THANKS
TO SIDELOK™ SYSTEM

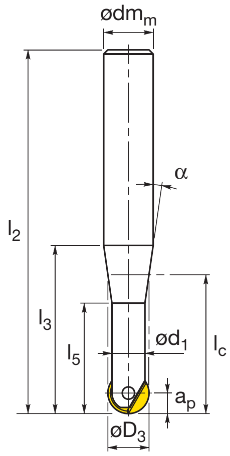
Safety

Cutting Tool Solutions

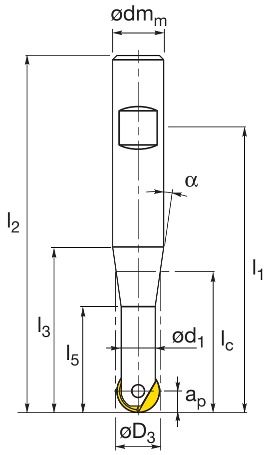
ARAF

Ball nose finishing endmill

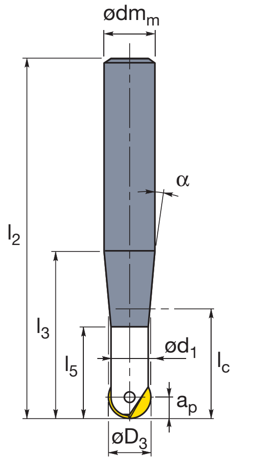
Cutter program, PPH 06-10



Cylindrical shank



Weldon shank



Carbide shank

Reference	Dimensions (mm)													Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg
	D_c	D_3	d_1	Max. a_p	dm_m D_{5m}	d_{th}	l_1	l_2	l_3	l_c	l_5	α	A [1]						
Cylindrical shank with $dm_m > D_3$																			
PPH-06/02-QC10-070	-	6.00	5.50	1.00	10.00	-	-	70.00	30.00	14.60	12.50	6°40	-	2	PPH..06..	1	No	30000	0.032
PPH-06/02-QC10-085	-	6.00	5.50	1.00	10.00	-	-	85.00	45.00	17.00	12.50	3°10	-	2	PPH..06..	1	No	21000	0.038
PPH-06/02-QC10-110	-	6.00	5.50	1.00	10.00	-	-	110.00	60.00	18.20	12.50	2°30	-	2	PPH..06..	1	No	13500	0.050
PPH-08/02-QC10-130	-	8.00	6.50	1.20	10.00	-	-	130.00	30.00	28.10	14.00	3°00	-	2	PPH..08..	1	No	-	0.069
PPH-08/02-QC12-092	-	8.00	6.50	1.20	12.00	-	-	92.00	35.00	23.10	19.00	9°30	-	2	PPH..08..	1	No	40000	0.062
PPH-08/02-QC12-110	-	8.00	6.50	1.20	12.00	-	-	110.00	53.00	41.50	33.50	5°00	-	2	PPH..08..	1	No	33600	0.066
PPH-08/02-QC12-132	-	8.00	6.50	1.20	12.00	-	-	132.00	75.00	41.80	19.00	1°45	-	2	PPH..08..	1	No	16800	0.077
PPH-10/02-QC12-092	-	10.00	8.00	1.50	12.00	-	-	95.00	38.00	30.00	22.40	7°00	-	2	PPH..10..	1	No	40000	0.066
PPH-10/02-QC12-110	-	10.00	8.00	1.50	12.00	-	-	110.00	53.00	51.90	38.70	3°45	-	2	PPH..10..	1	No	40000	0.070
PPH-10/02-QC12-132	-	10.00	8.00	1.50	12.00	-	-	132.00	75.00	73.60	21.80	1°00	-	2	PPH..10..	1	No	20300	0.083
Cylindrical shank with dm_m=D3																			
PPH-10/02-QC10-145	-	10.00	8.00	1.50	10.00	-	-	145.00	38.00	-	-	-	-	2	PPH..10..	1	No	-	0.078
Weldon shank																			
PPH-08/02-QW12-035	-	8.00	6.50	1.20	12.00	-	70.00	92.00	35.00	23.10	19.00	9°30	-	2	PPH..08..	1	No	40000	0.061
PPH-08/02-QW12-053	-	8.00	6.50	1.20	12.00	-	88.00	110.00	53.00	41.50	33.50	5°00	-	2	PPH..08..	1	No	33600	0.065
PPH-08/02-QW12-075	-	8.00	6.50	1.20	12.00	-	110.00	132.00	75.00	41.80	19.00	1°45	-	2	PPH..08..	1	No	16800	0.077
PPH-10/02-QW12-035	-	10.00	8.00	1.50	12.00	-	73.00	95.00	38.00	30.00	22.40	7°00	-	2	PPH..10..	1	No	40000	0.065
PPH-10/02-QW12-053	-	10.00	8.00	1.50	12.00	-	88.00	110.00	53.00	51.90	38.70	3°45	-	2	PPH..10..	1	No	40000	0.069
Carbide shank with $dm_m > D_3$																			
PPH-06/02-QC10-132HSCW	-	6.00	5.50	1.00	10.00	-	-	132.00	19.10	18.00	-	-	-	2	PPH..06..	2	No	-	0.147
PPH-08/02-QC12-092HSCW	-	8.00	6.50	1.20	12.00	-	-	92.00	35.00	24.00	19.15	9°00	-	2	PPH..08..	2	No	40000	0.124
PPH-08/02-QC12-110HSCW	-	8.00	6.50	1.20	12.00	-	-	110.00	53.00	30.10	19.00	4°00	-	2	PPH..08..	2	No	40000	0.143
PPH-08/02-QC12-132HSCW	-	8.00	6.50	1.20	12.00	-	-	132.00	75.00	37.10	19.00	2°30	-	2	PPH..08..	2	No	23400	0.166
PPH-10/02-QC12-092HSCW	-	10.00	8.00	1.50	12.00	-	-	95.00	38.10	30.90	21.90	6°30	-	2	PPH..10..	2	No	40000	0.132
PPH-10/02-QC12-110HSCW	-	10.00	8.00	1.50	12.00	-	-	110.00	53.10	41.40	21.80	3°00	-	2	PPH..10..	2	No	40000	0.151
PPH-10/02-QC12-132HSCW	-	10.00	8.00	1.50	12.00	-	-	132.00	75.10	51.10	21.80	2°00	-	2	PPH..10..	2	No	23400	0.178
Carbide shank with $dm_m = D_3$																			
PPH-06/02-QC06-110HSCW	-	6.00	5.50	1.00	6.00	-	-	110.00	16.00	-	-	-	-	2	PPH..06..	1	No	-	0.147
PPH-08/02-QC08-130HSCW	-	8.00	6.50	1.20	8.00	-	-	130.00	20.00	-	-	-	-	2	PPH..08..	1	No	-	0.095
PPH-10/02-QC10-140HSCW	-	10.00	8.00	1.50	10.00	-	-	140.00	25.00	-	-	-	-	2	PPH..10..	1	No	-	0.158

[1] Size of the wrench to be used for modular heads is given by dimension A

[2] Max. RPM values are not given for modular heads as they are always used with long extensions

Spare parts

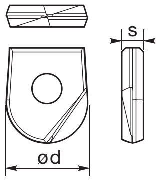
Insert style	Diameter D_3	Insert screw			Screw driver		Torque wrench		
		Reference	Size		Reference		Reference		Nm
PPH..06..	6 mm	DVF 3228	M 2.2	0.6 N.m	TX 206PLUS	6 IP	TDX 206PLUS	6 IP	0.6
PPH..08..	8 mm	DVF 6240	M 2.5	1.0 N.m	TX 207PLUS	7 IP	TDX 207PLUS	7 IP	0.9
PPH..10..	10 mm	DVF 3429	M 3.0	1.2 N.m	TX 208PLUS	8 IP	TDX 208PLUS	8 IP	1.2

MILLING

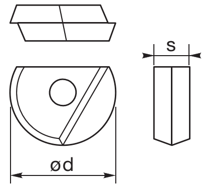
ARAF
Ball nose finishing endmill

Insert program

PPH... -CL1

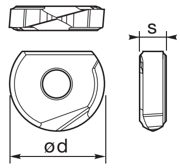


Ø6 mm

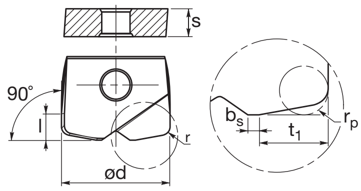


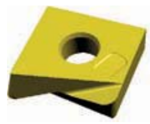
Ø8 - Ø10 mm

PPHE... -SM1

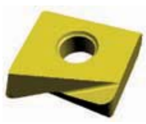


PPHF... -CE1

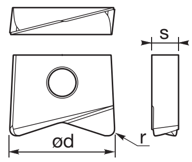




PPHT... -A1



PPHT... -A2



Reference	Dimensions (mm)							Grades													
	d	s	r	l	b_s	r_p 1)	t_1	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX05	KX20	KX2	N
PPH inserts																					
PPH 0600-CL1	6.00	1.60	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPH 0800-CL1	8.00	2.40	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPH 1000-CL1	10.00	2.60	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPH 0800-CL4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-
PPH 1000-CL4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-
PPHE inserts																					
PPHE 1000-SM1	10.00	2.60	-	-	-	-	-	-	-	-	-	✓	-	-	✓	-	-	-	-	-	-
PPHF inserts																					
PPHF 0800 04-CE1	8.00	2.40	0.60	2.00	0.40	1.00	2.60	-	-	-	✓	-	-	-	✓	-	-	-	-	-	-
PPHF 1000 05-CE1	10.00	2.60	0.80	2.60	0.50	1.20	3.20	-	-	-	✓	-	-	-	✓	-	-	-	-	-	-
PPHT… - A1 inserts																					
PPHT 0800 05-A1	8.00	2.40	0.50	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-
PPHT 1000 08-A1	10.00	2.60	0.80	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-
PPHT… - A2 inserts																					
PPHT 0800 03-A2	8.00	2.40	0.30	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPHT 0800 04-A2	8.00	2.40	0.40	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPHT 0800 05-A2	8.00	2.40	0.50	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPHT 0800 08-A2	8.00	2.40	0.80	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPHT 0800 10-A2	8.00	2.40	1.00	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPHT 1000 05-A2	10.00	2.60	0.50	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPHT 1000 08-A2	10.00	2.60	0.80	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPHT 1000 10-A2	10.00	2.60	1.00	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPHT 1000 15-A2	10.00	2.60	1.50	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-

1) r_p = Radius for programing ✓Article which can be ordered Ordering example: PPH 1000-CL1 2003

Cutting conditions

Grade	Feed per tooth (mm)	P Steel				M Stainless steel			K Cast iron				N Non-ferrous aluminum				S Super alloys			H Hardened materials			
		Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
2003	v_{c1}	-	-	-	250	279	240	179	277	257	227	207	-	-	-	-	100	90	65	99	119	99	99
	f_{z1}	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	-	-	-	220	259	210	159	239	219	189	169	-	-	-	-	90	80	60	79	99	79	79
	f_{z2}	-	-	-	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	-	-	-	-	0.10	0.10	0.10	0.20	0.20	0.20	0.20
5007	v_{c1}	416	374	291	211	247	216	169	-	-	-	-	1164	779	531	656	85	75	60	50	55	50	50
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	313	279	221	160	209	188	149	-	-	-	-	937	489	428	526	55	45	45	35	40	35	35
	f_{z2}	0.20	0.20	0.20	0.20	0.20	0.20	0.20	-	-	-	-	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
5050	v_{c1}	259	229	161	95	136	88	74	-	-	-	-	-	-	-	-	53	43	35	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	186	163	107	55	99	69	61	-	-	-	-	-	-	-	-	34	24	25	-	-	-	-
	f_{z2}	0.25	0.25	0.25	0.25	0.25	0.25	0.25	-	-	-	-	-	-	-	-	0.25	0.25	0.15	-	-	-	-
KX05	v_{c1}	416	374	291	211	247	216	169	-	-	-	-	1164	779	531	656	85	75	60	50	55	50	50
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	313	279	221	160	209	188	149	-	-	-	-	937	489	428	526	55	45	45	35	40	35	35
	f_{z2}	0.20	0.20	0.20	0.20	0.20	0.20	0.20	-	-	-	-	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20

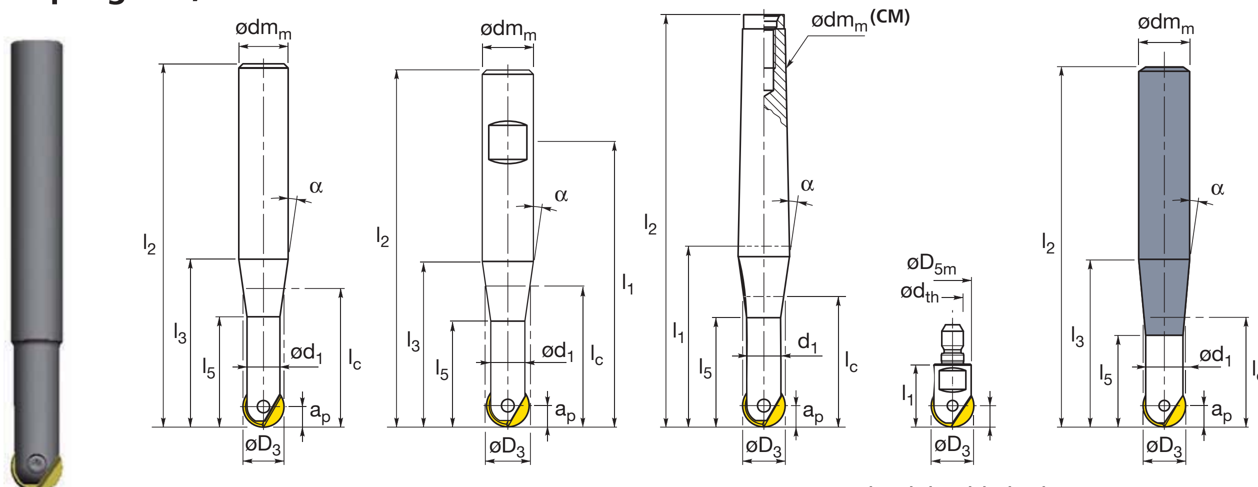
The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

MILLING

ARAF

Ball nose finishing endmill

Cutter program, PPH 12-16



Reference	Dimensions (mm)													Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg
	D_c	D_3	d_1	Max. a_p	dm_m D_{5m}	d_{th}	l_1	l_2	l_3	l_c	l_5	α	A 1)						
Cylindrical shank with $dm_m > D_3$																			
PPH-12/02-QC16-145	-	12.00	10.00	1.80	16.00	-	-	145.00	85.00	63.30	22.50	1°20	-	2	PPH..12..	1	No	19800	0.154
PPH-14/02-QC16-092	-	14.00	12.00	2.20	16.00	-	-	92.00	32.00	-	-	-	-	2	PPH..14..	1	No	36000	0.142
PPH-14/02-QC16-123	-	14.00	12.00	2.20	16.00	-	-	123.00	63.00	-	-	-	-	2	PPH..14..	1	No	36000	0.115
PPH-16/02-QC20-166	-	16.00	14.00	2.40	20.00	-	-	166.00	100.00	75.50	29.50	1°10	-	2	PPH..16..	1	No	20000	0.291
Cylindrical shank with $dm_m = D_3$																			
PPH-12/02-QC12-083	-	12.00	10.00	1.80	12.00	-	-	83.00	26.00	-	-	-	-	2	PPH..12..	1	No	40000	0.062
PPH-12/02-QC12-110	-	12.00	10.00	1.80	12.00	-	-	110.00	53.00	-	-	-	-	2	PPH..12..	1	No	40000	0.078
PPH-12/02-QC12-145	-	12.00	10.00	1.80	12.00	-	-	145.00	45.00	-	-	-	-	2	PPH..12..	1	No		0.111
PPH-16/02-QC16-092	-	16.00	14.00	2.40	16.00	-	-	92.00	32.00	-	-	-	-	2	PPH..16..	1	No	36000	0.122
PPH-16/02-QC16-123	-	16.00	14.00	2.40	16.00	-	-	123.00	63.00	-	-	-	-	2	PPH..16..	1	No	36000	0.159
PPH-16/02-QC16-166	-	16.00	14.00	2.40	16.00	-	-	166.00	55.00	-	-	-	-	2	PPH..16..	1	No		0.229
Weldon shank																			
PPH-12/02-QW12-026	-	12.00	10.00	1.80	12.00	-	61.00	83.00	26.00	-	-	-	-	2	PPH..12..	1	No	40000	0.061
PPH-12/02-QW12-053	-	12.00	10.00	1.80	12.00	-	88.00	110.00	53.00	-	-	-	-	2	PPH..12..	1	No	40000	0.078
PPH-12/02-QW16-085	-	12.00	10.00	1.80	16.00	-	121.50	145.00	85.00	63.30	22.50	1°20	-	2	PPH..12..	1	No	19800	0.153
PPH-16/02-QW16-063	-	16.00	14.00	2.40	16.00	-	99.50	123.00	63.00	-	-	-	-	2	PPH..16..	1	No	36000	0.158
PPH-16/02-QW20-100	-	16.00	14.00	2.40	20.00	-	141.50	166.00	100.00	75.50	29.50	1°10	-	2	PPH..16..	1	No	20000	0.289
Morse taper																			
PPH-12/02-CM2-053	-	12.00	10.00	1.80	CM2	-	58.00	121.70	-	51.00	-	-	-	2	PPH..12..	1	No	40000	0.114
PPH-16/02-CM2-063	-	16.00	14.00	2.40	CM2	-	68.00	131.70	-	62.70	-	-	-	2	PPH..16..	1	No	36000	0.161
PPH-16/02-CM2-100	-	16.00	14.00	2.40	CM2	-	105.00	168.70	-	85.16	28.50	1°00	-	2	PPH..16..	1	No	20000	0.211
Threaded modular heads																			
PPH-12/02-025-P08	-	12.00	10.00	1.80	11.00	M8	25.00	-	-	-	-	-	10	2	PPH..12..	1	No	- 2)	0.016
PPH-16/02-025-P08	-	16.00	14.00	2.40	14.00	M8	25.00	-	-	-	-	-	10	2	PPH..16..	1	No	- 2)	0.034
PPH-16/02-025-P10	-	16.00	14.00	2.40	14.00	M10	30.00	-	-	-	-	-	14	2	PPH..16..	1	No	- 2)	0.034
Carbide shank with $dm_m > D_3$																			
PPH-12/02-QC16-145HSCW	-	12.00	10.00	1.80	16.00	-	-	145.00	85.00	65.60	21.50	1°20	-	2	PPH..12..	1	No	21000	0.306
PPH-16/02-QC20-166HSCW	-	16.00	14.00	2.40	20.00	-	-	166.00	100.00	87.20	28.50	1°00	-	2	PPH..16..	1	No	25500	0.570
Carbide shank with $dm_m = D_3$																			
PPH-12/02-QC12-083HSCW	-	12.00	10.00	1.80	12.00	-	-	83.00	26.00	-	-	-	-	2	PPH..12..	1	No	40000	0.123
PPH-12/02-QC12-110HSCW	-	12.00	10.00	1.80	12.00	-	-	110.00	53.00	-	-	-	-	2	PPH..12..	1	No	40000	0.153
PPH-16/02-QC16-092HSCW	-	16.00	14.00	2.40	16.00	-	-	92.00	32.00	-	-	-	-	2	PPH..16..	1	No	43000	0.234
PPH-16/02-QC16-123HSCW	-	16.00	14.00	2.40	16.00	-	-	123.00	63.00	-	-	-	-	2	PPH..16..	1	No	43000	0.306

1) Size of the wrench to be used for modular heads is given by dimension A

2) Max. RPM values are not given for modular heads as they are always used with long extensions

Spare parts

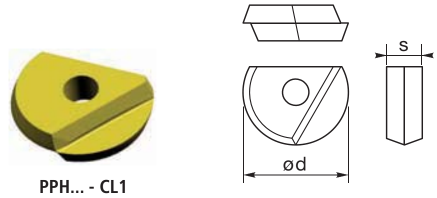
Insert style	Diameter D_3	Insert screw			Screw driver		Torque wrench		
		Reference	Size		Reference		Reference		Nm
PPH..12..	12 mm	DVF 3430	M 3.5	2.0 N.m	TX 210PLUS	10 IP	TDX 210PLUS	10 IP	2.0
PPH..14..	14 mm	DVF 6243	M 4.0	3.0 N.m	TX 215	T15	-	-	-
PPH..16..	16 mm	DVF 3431	M 4.0	3.0 N.m	TX 215PLUS	15 IP	TDX 215PLUS	15 IP	3.0

MILLING

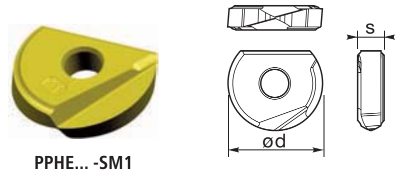
ARAF

Ball nose finishing endmill

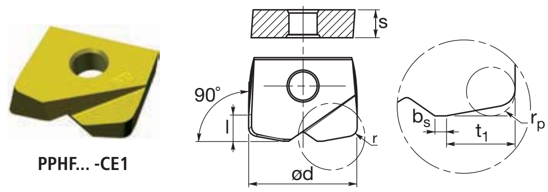
Insert program



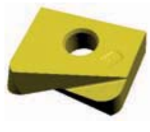
PPH... - CL1



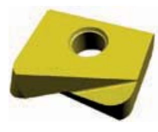
PPHE... -SM1



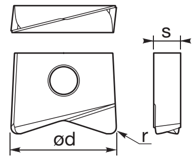
PPHF... -CE1



PPHT...-A1



PPHT...-A2



Reference	Dimensions (mm)							Grades													
	d	s	r	l	b_s	r_p [1)]	t_1	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX05	KX20	KX2	N
PPH inserts																					
PPH 1200-CL1	12.00	3.00	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPH 1400-CL1	14.00	3.50	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPH 1600-CL1	16.00	4.00	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPH 1200-CL4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-
PPH 1400-CL4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-
PPH 1600-CL4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-
PPHE inserts																					
PPHE 1200-SM1	12.00	3.00	-	-	-	-	-	-	-	-	-	✓	-	-	✓	-	-	-	-	-	-
PPHE 1600-SM1	16.00	4.00	-	-	-	-	-	-	-	-	-	✓	-	-	✓	-	-	-	-	-	-
PPHF inserts																					
PPHF 1200 06-CE1	12.00	3.00	1.00	3.00	0.60	1.50	3.90	-	-	-	✓	-	-	-	✓	-	-	-	-	-	-
PPHF 1600 08-CE1	16.00	4.00	1.30	3.80	0.80	2.00	5.20	-	-	-	✓	-	-	-	✓	-	-	-	-	-	-
PPHT… - A1 inserts																					
PPHT 1200 10-A1	12.00	3.00	1.00	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-
PPHT 1200 20-A1	12.00	3.00	2.00	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-
PPHT 1600 10-A1	16.00	4.00	1.00	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-
PPHT 1600 13-A1	16.00	4.00	1.30	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-
PPHT 1600 20-A1	16.00	4.00	2.00	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-
PPHT 1600 30-A1	16.00	4.00	3.00	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-
PPHT… - A2 inserts																					
PPHT 1200 05-A2	12.00	3.00	0.50	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPHT 1200 10-A2	12.00	3.00	1.00	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPHT 1200 15-A2	12.00	3.00	1.50	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPHT 1200 20-A2	12.00	3.00	2.00	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPHT 1600 10-A2	16.00	4.00	1.00	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPHT 1600 13-A2	16.00	4.00	1.30	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPHT 1600 20-A2	16.00	4.00	2.00	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPHT 1600 30-A2	16.00	4.00	3.00	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-

[1)] r_p = Radius for programing ✓Article which can be ordered Ordering example: PPH 1600-CL1 2003

Cutting conditions

Grade	Feed per tooth (mm)	P Steel				M Stainless steel			K Cast iron				N Non-ferrous aluminum				S Super alloys			H Hardened materials			
		Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
2003	v_{c1}	-	-	-	250	279	240	179	277	257	227	207	-	-	-	-	100	90	65	99	119	99	99
	f_{z1}	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	-	-	-	220	259	210	159	239	219	189	169	-	-	-	-	90	80	60	79	99	79	79
	f_{z2}	-	-	-	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	-	-	-	-	0.10	0.10	0.10	0.20	0.20	0.20	0.20
5007	v_{c1}	416	374	291	211	247	216	169	-	-	-	-	1164	779	531	656	85	75	60	50	55	50	50
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	313	279	221	160	209	188	149	-	-	-	-	937	489	428	526	55	45	45	35	40	35	35
	f_{z2}	0.20	0.20	0.20	0.20	0.20	0.20	0.20	-	-	-	-	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
5050	v_{c1}	259	229	161	95	136	88	74	-	-	-	-	-	-	-	-	53	43	35	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	186	163	107	55	99	69	61	-	-	-	-	-	-	-	-	34	24	25	-	-	-	-
	f_{z2}	0.25	0.25	0.25	0.25	0.25	0.25	0.25	-	-	-	-	-	-	-	-	0.25	0.25	0.15	-	-	-	-
KX05	v_{c1}	416	374	291	211	247	216	169	-	-	-	-	1164	779	531	656	85	75	60	50	55	50	50
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	313	279	221	160	209	188	149	-	-	-	-	937	489	428	526	55	45	45	35	40	35	35
	f_{z2}	0.20	0.20	0.20	0.20	0.20	0.20	0.20	-	-	-	-	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20

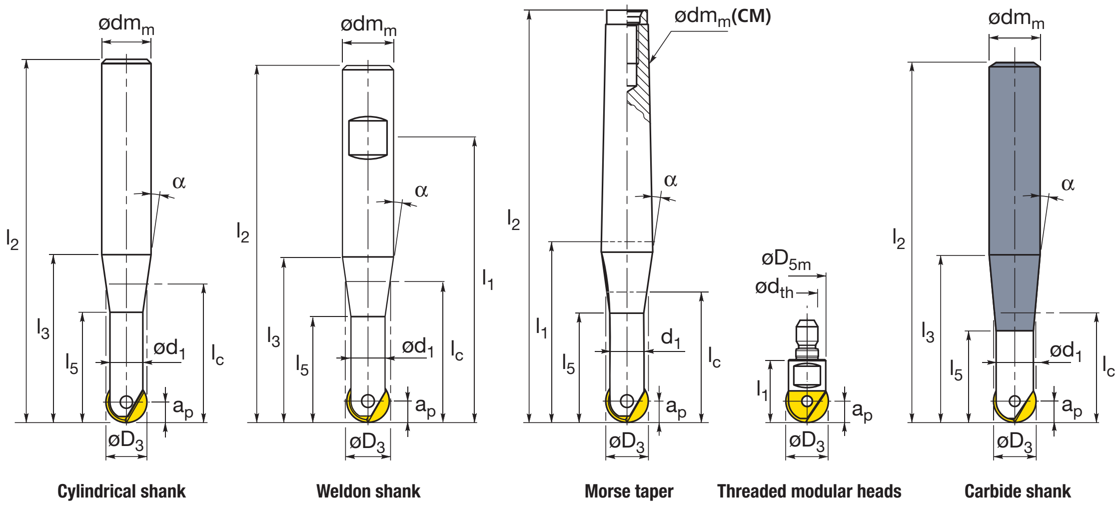
The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

MILLING

ARAF

Ball nose finishing endmill

Cutter program, PPH 20-32



Reference	Dimensions (mm)													Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg
	D_c	D_3	d_1	Max. a_p	dm_m D_{5m}	d_{th}	l_1	l_2	l_3	l_c	l_5	α	A [1]						
Cylindrical shank with $dm_m > D_3$																			
PPH-20/02-QC25-191	-	20.00	17.00	3.00	25.00	-	-	191.00	115.00	82.20	35.00	1°45	-	2	PPH..20..	1	No	18400	0.521
PPH-25/02-QC32-215	-	25.00	21.00	3.70	32.00	-	-	215.00	135.00	97.00	42.50	2°00	-	2	PPH..25..	1	No	16500	0.918
Cylindrical shank with $dm_m = D_3$																			
PPH-20/02-QC20-104	-	20.00	17.00	3.00	20.00	-	-	104.00	38.00	-	-	-	-	2	PPH..20..	1	No	40000	0.209
PPH-20/02-QC20-141	-	20.00	17.00	3.00	20.00	-	-	141.00	75.00	-	-	-	-	2	PPH..20..	1	No	40000	0.276
PPH-20/02-QC20-191	-	20.00	17.00	3.00	20.00	-	-	191.00	65.00	-	-	-	-	2	PPH..20..	1	No		0.405
PPH-25/02-QC25-121	-	25.00	21.00	3.70	25.00	-	-	121.00	45.00	-	-	-	-	2	PPH..25..	1	No	40000	0.376
PPH-25/02-QC25-166	-	25.00	21.00	3.70	25.00	-	-	166.00	90.00	-	-	-	-	2	PPH..25..	1	No	37100	0.497
PPH-32/02-QC32-133	-	32.00	26.00	4.50	32.00	-	-	134.00	54.00	-	-	-	-	2	PPH..32..	1	No	32500	0.654
PPH-32/02-QC32-186	-	32.00	26.00	4.50	32.00	-	-	187.00	107.00	-	-	-	-	2	PPH..32..	1	No	32500	0.873
PPH-32/02-QC32-240	-	32.00	26.00	4.50	32.00	-	-	240.00	160.00	-	54.00	1°00	-	2	PPH..32..	1	No	14500	1.170
Weldon shank																			
PPH-20/02-QW20-075	-	20.00	17.00	3.00	20.00	-	116.50	141.00	75.00	-	-	-	-	2	PPH..20..	1	No	40000	0.273
Morse taper																			
PPH-20/02-CM3-115	-	20.00	17.00	3.00	CM3	-	120.00	200.70	-	75.00	34.00	2°00	-	2	PPH..20..	1	No	18400	0.442
Threaded modular heads																			
PPH-20/02-030-P10	-	20.00	17.00	3.00	18.00	M10	30.00	-	-	-	-	-	14	2	PPH..20..	1	No	- [2]	0.040
PPH-25/02-035-P12	-	25.00	21.00	3.70	23.00	M12	35.00	-	-	-	-	-	17	2	PPH..25..	1	No	- [2]	0.100
Carbide shank with $dm_m > D_3$																			
PPH-20/02-QC25-191HSCW	-	20.00	17.00	3.00	25.00	-	-	191.00	115.00	75.60	35.00	2°00	-	2	PPH..20..	1	No	18500	1.035
Carbide shank with $dm_m = D_3$																			
PPH-20/02-QC20-104HSCW	-	20.00	17.00	3.00	20.00	-	-	104.00	38.00	-	-	-	-	2	PPH..20..	1	No	40000	0.390
PPH-20/02-QC20-141HSCW	-	20.00	17.00	3.00	20.00	-	-	141.00	75.00	-	-	-	-	2	PPH..20..	1	No	40000	0.523

[1] Size of the wrench to be used for modular heads is given by dimension A
[2] Max. RPM values are not given for modular heads as they are always used with long extensions

Spare parts

Insert style	Diameter D_3	Insert screw			Screw driver	
		Reference	Size	Torque	Reference	Torx
PPH..20..	20 mm	DVF 3432	M 5.0	5.0 N.m	TX 220PLUS	20 IP
PPH..25..	25 mm	DVF 3433	M 6.0	7.5 N.m	DMP 3139	25 IP
PPH..32..	32 mm	DVF 3434	M 8.0	26.0 N.m	DMP 3441	40 IP

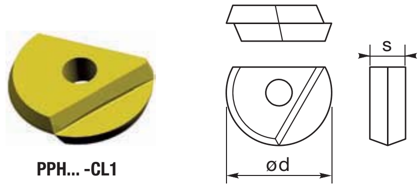
Note : 40 Ø body need to be order in special. For insert Ø 30 use the body Ø 32.
Assembling instruction for PPHE & PPHT : Mark on the screw side.

MILLING

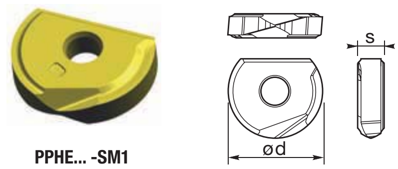
ARAF

Ball nose finishing endmill

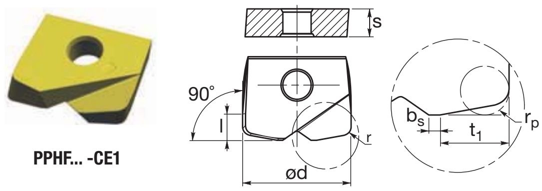
Insert program



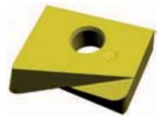
PPH... -CL1



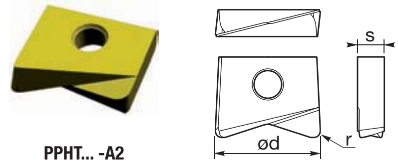
PPHE... -SM1



PPHF... -CE1



PPHT... -A1



PPHT... -A2

Reference	Dimensions (mm)							Grades													
	d	s	r	l	b_s	r_p [1)]	t_1	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX05	KX20	KX2	N
PPH inserts																					
PPH 2000-CL1	20.00	5.00	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPH 2500-CL1	25.00	6.00	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPH 3000-CL1	30.00	7.00	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPH 3200-CL1	32.00	7.00	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPH 4000-CL1	40.00	8.00	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPH 2000-CL4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-
PPH 2500-CL4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-
PPH 3000-CL4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-
PPH 3200-CL4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-
PPH 4000-CL4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-
PPHE inserts																					
PPHE 2000-SM1	20.00	5.00	-	-	-	-	-	-	-	-	-	✓	-	-	✓	-	-	-	-	-	-
PPHE 2500-SM1	25.00	6.00	-	-	-	-	-	-	-	-	-	✓	-	-	✓	-	-	-	-	-	-
PPHF inserts																					
PPHF 2000 10-CE1	20.00	5.00	1.60	4.70	1.00	2.50	6.40	-	-	-	✓	-	-	-	✓	-	-	-	-	-	-
PPHF 2500 12-CE1	25.00	6.00	1.90	6.20	1.20	3.00	7.90	-	-	-	✓	-	-	-	✓	-	-	-	-	-	-
PPHT… - A1 inserts																					
PPHT 2000 10-A1	20.00	5.00	1.00	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-
PPHT 2000 16-A1	20.00	5.00	1.60	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-
PPHT… - A2 inserts																					
PPHT 2000 10-A2	20.00	5.00	1.00	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPHT 2000 16-A2	20.00	5.00	1.60	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPHT 2000 30-A2	20.00	5.00	3.00	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPHT 2000 40-A2	20.00	5.00	4.00	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
PPHT 2500 20-A2	25.00	6.00	2.00	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-

[1)] r_p = Radius for programing ✓Article which can be ordered Ordering example: PPH 2000-CL1 2003

Cutting conditions

Grade	Feed per tooth (mm)	P Steel				M Stainless steel			K Cast iron				N Non-ferrous aluminum				S Super alloys			H Hardened materials			
		Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
2003	v_{c1}	-	-	-	250	279	240	179	277	257	227	207	-	-	-	-	100	90	65	99	119	99	99
	f_{z1}	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	-	-	-	220	259	210	159	239	219	189	169	-	-	-	-	90	80	60	79	99	79	79
	f_{z2}	-	-	-	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	-	-	-	-	0.10	0.10	0.10	0.20	0.20	0.20	0.20
5007	v_{c1}	416	374	291	211	247	216	169	-	-	-	-	1164	779	531	656	85	75	60	50	55	50	50
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	313	279	221	160	209	188	149	-	-	-	-	937	489	428	526	55	45	45	35	40	35	35
	f_{z2}	0.20	0.20	0.20	0.20	0.20	0.20	0.20	-	-	-	-	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
5050	v_{c1}	259	229	161	95	136	88	74	-	-	-	-	-	-	-	-	53	43	35	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	186	163	107	55	99	69	61	-	-	-	-	-	-	-	-	34	24	25	-	-	-	-
	f_{z2}	0.25	0.25	0.25	0.25	0.25	0.25	0.25	-	-	-	-	-	-	-	-	0.25	0.25	0.15	-	-	-	-
KX05	v_{c1}	416	374	291	211	247	216	169	-	-	-	-	1164	779	531	656	85	75	60	50	55	50	50
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	313	279	221	160	209	188	149	-	-	-	-	937	489	428	526	55	45	45	35	40	35	35
	f_{z2}	0.20	0.20	0.20	0.20	0.20	0.20	0.20	-	-	-	-	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20

The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

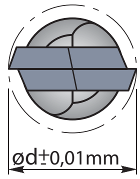
MILLING

ARAF

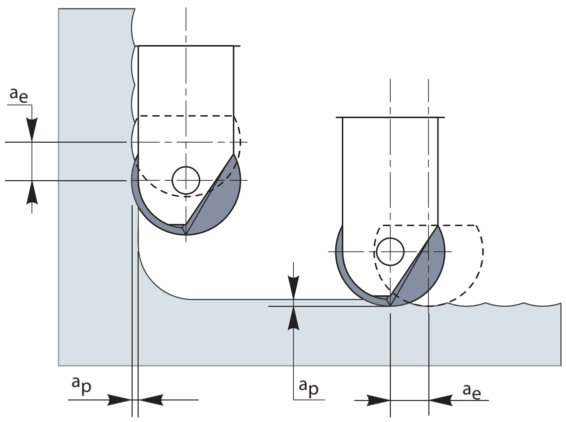
Milling cutter characteristics

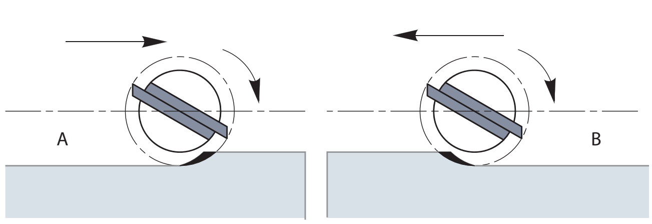
PPH is intended for finish cutting operations in 3D copying on CNC.
PPH consists of a tool holder and a replaceable single-piece carbide insert Ø ± 0,01 mm.
PPH is suitable for finishing mock-ups, models, stamping tools, casting, plastic, glass, rubber moulds, etc.

Carbide grade for all materials (resin, light and copper alloys, ductile cast irons, chromium cast iron, graphite, tool steel, mould steel, stainless steel, heat resistant steel, titanium, inconel, etc.



Recommendations for use





Preferably choose working direction **A** (climb milling)

Chip thickness "a_p" and step over "a_e"

PPH is a finishing tool.
It is recommended not to exceed the a_p and a_e values given in the table.

	P	M	K	N	S	H
Cutting depth ap or ae	0.05 to 0.07 x D	0.05 x D	0.07 to 0.1 x D	0.05 to 0.07 x D	0.03 x D	0.03 x D

Cutting speed

For side milling inserts, the actual Ø to be used to determine the rotation speed is Ø D eff actually engaged. The table next page show the Ø values to be used in relation to a_p infeed.

$$n = \frac{1000 \cdot Vc}{\pi \cdot D\,eff}$$

$$D\,eff = 2\sqrt{a_p\,(D - a_p)}$$

$$V_c = \frac{\pi \cdot D\,eff \cdot n}{1000}$$

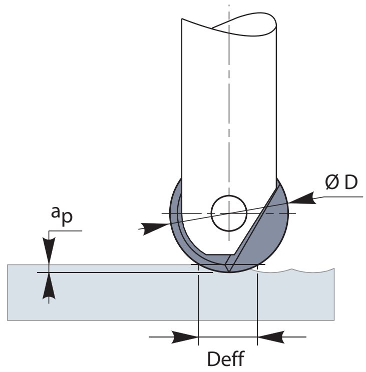
vc =	Cutting speed (in m/min)
n =	Number of revolutions (in rpm)
D =	Cutter diameter (in mm)
D eff =	Effective cutting diameter (in mm)
a_p =	Cutting depth (in mm)

ARAF

Milling cutter characteristics

Effective diameter depending on cutter infeed

End milling



Calculation of effective cutting diameter (Ø D eff) depending on ap

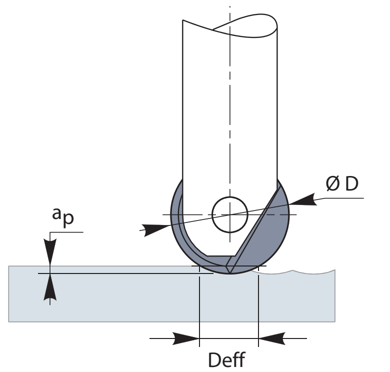
Ø D	ap 0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1	1,5	2	2,5	3	3,5	4	5	6	7
6	1,5	2,2	2,6	3,0	3,3	3,6	3,9	4,1	4,3	4,5	5,2	5,7	5,9	6,0	-	-	-	-	-
8	1,8	2,5	3,0	3,5	3,9	4,2	4,5	4,8	5,1	5,3	6,2	6,9	7,4	7,7	-	-	-	-	-
10	2,0	2,8	3,4	3,9	4,4	4,7	5,1	5,4	5,7	6,0	7,1	8,0	8,7	9,2	9,5	-	-	-	-
12	2,2	3,1	3,7	4,3	4,8	5,2	5,6	6,0	6,3	6,6	7,9	8,9	9,7	10,4	10,9	11,3	11,8	-	-
14	2,4	3,3	4,1	4,7	5,2	5,7	6,1	6,5	6,9	7,2	8,7	9,8	10,7	11,5	12,1	12,6	13,4	13,9	-
16	2,5	3,6	4,3	5,0	5,6	6,1	6,5	7,0	7,4	7,7	9,3	10,6	11,6	12,5	13,2	13,9	14,8	15,5	15,9
20	2,8	4,0	4,9	5,6	6,2	6,8	7,4	7,8	8,3	8,7	10,5	12,0	13,2	14,3	15,2	16,0	17,3	18,3	19,1
25	-	4,5	5,4	6,3	7,0	7,7	8,2	8,8	9,3	9,8	11,9	13,6	15,0	16,2	17,3	18,3	20,0	21,4	22,4
30	-	-	6,0	6,9	7,7	8,4	9,1	9,7	10,2	10,8	13,1	15,0	16,6	18,0	19,3	20,4	22,4	24,0	25,4
32	-	-	-	7,1	7,9	8,7	9,4	10,0	10,6	11,1	13,5	15,5	17,2	18,7	20,0	21,2	23,2	25,0	26,5

Example : With a 12 mm diameter cutter, cutting depth ap = 0,4 mm, D eff is 4,3 mm.

Milling on inclined face

Effective diameter will depend on :
- inclined face angle γ
- Cutting depth

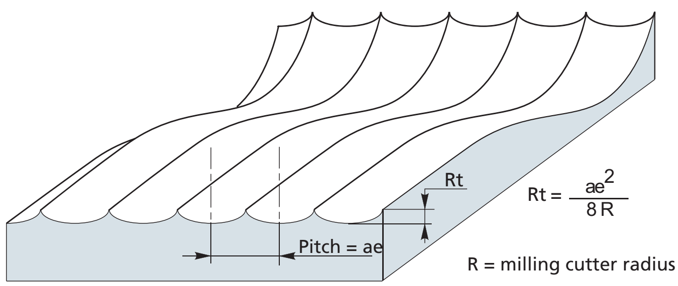
Typically, it will be between :
- minimum effective diameter = Ø D x cos γ
- maximum effective diameter = Ø D



D eff. approximately = Ø D x cos γ

Roughness

Value of Rt is dependant upon step over



Cutter diameter ØD	06			08			10			12			16			20			25			32		
Pitch = ae	0,7	1,0	1,5	0,7	1,0	1,5	0,7	1,0	1,5	1,0	1,5	2,0	1,0	2,0	3,0	2,0	3,0	4,0	3,0	4,0	5,0	3,0	4,0	5,0
Rt	0,02	0,04	0,09	0,01	0,03	0,07	0,01	0,02	0,05	0,02	0,05	0,08	0,02	0,06	0,14	0,05	0,11	0,20	0,09	0,16	0,25	0,07	0,13	0,20

ARAF

Milling cutter characteristics

Feed correction factor

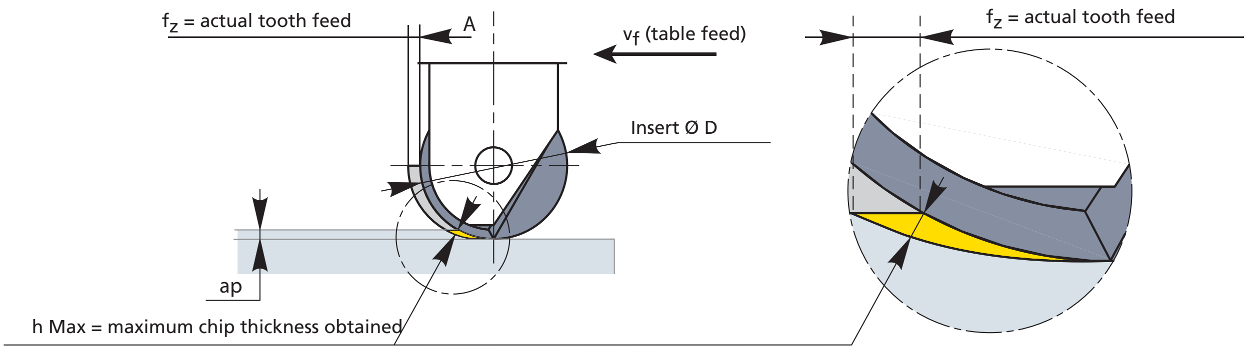


Table of feed correction factors fz

ap = Cutting depth — Ø D = insert Ø

Ø D	ap 0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1	1,5	2	2,5	3	3,5	4	5	6	7
6	3,9	2,8	2,3	2,0	1,8	1,7	1,6	1,5	1,4	1,3	1,2	1,1	1,0	1,0	-	-	-	-	-
8	4,5	3,2	2,6	2,3	2,1	1,9	1,8	1,7	1,6	1,5	1,3	1,2	1,1	1,0	1,0	1,0	-	-	-
10	5,0	3,6	2,9	2,6	2,3	2,1	2,0	1,8	1,7	1,7	1,4	1,3	1,2	1,1	1,0	1,0	1,0	-	-
12	5,5	3,9	3,2	2,8	2,5	2,3	2,1	2,0	1,9	1,8	1,5	1,3	1,2	1,2	1,1	1,1	1,0	1,0	-
14	5,9	4,2	3,5	3,0	2,7	2,5	2,3	2,2	2,0	1,9	1,6	1,4	1,3	1,2	1,2	1,1	1,0	1,0	1,0
16	6,3	4,5	3,7	3,2	2,9	2,6	2,4	2,3	2,2	2,1	1,7	1,5	1,4	1,3	1,2	1,2	1,1	1,0	1,0
20	7,1	5,0	4,1	3,6	3,2	2,9	2,7	2,6	2,4	2,3	1,9	1,7	1,5	1,4	1,3	1,3	1,2	1,1	1,0
25	-	5,6	4,6	4,0	3,6	3,3	3,0	2,8	2,7	2,6	2,1	1,8	1,7	1,5	1,4	1,4	1,3	1,2	1,1
30	-	-	5,0	4,4	3,9	3,6	3,3	3,1	2,9	2,8	2,3	2,0	1,8	1,7	1,6	1,5	1,3	1,3	1,2
32	-	-	-	4,5	4,0	3,7	3,4	3,2	3,0	2,9	2,4	2,1	1,9	1,7	1,6	1,5	1,4	1,3	1,2

Example :
Cutter : PPH-20/02-QC20-104
Insert : PPH-2000-CL3 Ø20

ap = 1mm
Chip thickness required = 0,2 mm (h Max)
Actual tooth feed to be used = 0,46 mm = 0,2 x 2,3 correction factor (f_Z)

Advantages of insert

- Diameter guaranteed to ± 0,01, cut guaranteed at centre.
- Geometry of machined shape complied with.
- Cutting quality of PPH insert over its entire periphery and at end.

Example of finish machining

Milling cutter PPH-16/02-QC16-123HSCW	
Material =	Stainless steel "X19 CrNi 17 02" (AISI 431)
Hardness =	1000 MPa
Tool =	PPH-16/02-QC16-123HSCW Ø16
Insert =	PPH-1600-CL1
Grade =	2003
Lubrication =	emulsion
Cutting speed (v_c) =	110 m/min
Revolutions per minute (n) =	8 000 rpm
Feed (v_f) =	1 600 mm/min
Cutting depth (a_p) =	0,3 mm
Pitch (a_e) =	0,3 mm
Effective diameter (Ø eff) =	4,34 mm

Tool life improved by +25% on application

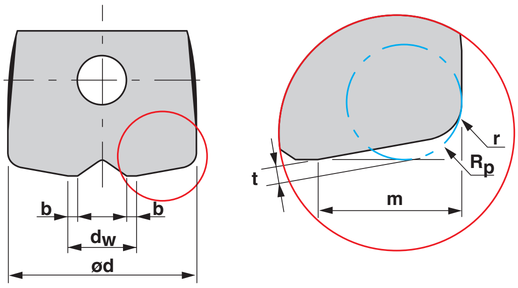
MILLING

ARAF

Milling cutter characteristics

Programming – remaining material

Insert radius "r" is different from the radius to be programmed "R_p".



Dimensions (mm)				
d	r	R_p	m	t
08	0,6	1	2,6	0,3
10	0,8	1,2	3,2	0,4
12	1,0	1,5	3,9	0,4
16	1,3	2	5,2	0,6
20	1,6	2,5	6,4	0,7
25	1,9	3	7,9	0,9

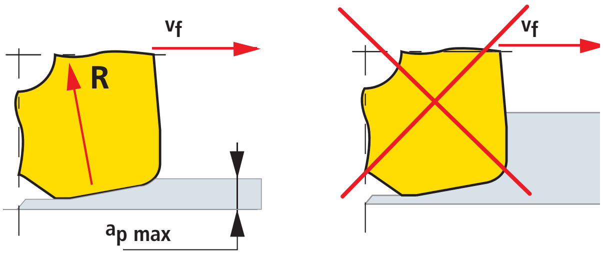
General precautions and machining limits

For good surface finish

In finishing operations, best surface finish is obtained when feed does not exceed value b per cutter revolution.

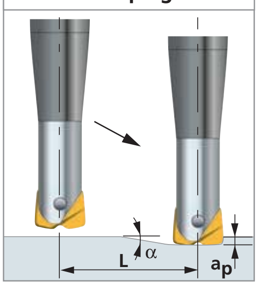
High Feed use

The cutter characteristic angles are designed to direct the cutting forces mainly to the spindle and thus allow high cutting feed under low cutting depth. Therefore, maximum cutting depth specific to each diameter must be complied with (see a_p max values in the Table below)

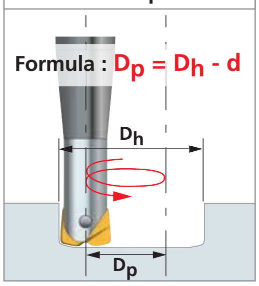


Use

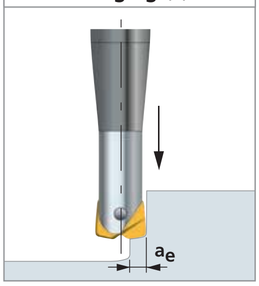
Ramping



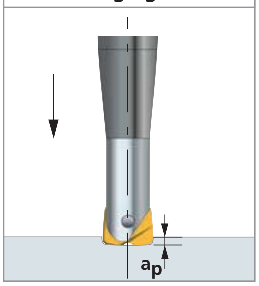
Helical interpolation



Plunging (a)



Plunging (b)



Diameter d (mm)	Effective diameter d_w (mm)	Cutting depth a_p max (mm)	Ramping (1) Angle α	L (mm)	Helical interpolation (1) D_h min / max (mm)	D_p min / max (mm)	Plunging (a) (2) a_e max (mm)	Plunging (b) (2) a_p max (mm)
08	2,8	0,4	8°	2,9	10,4 / 14,7	2,4 / 6,7	2,0	0,4
10	3,5	0,5	8°	3,5	13 / 18,4	3 / 8,4	2,5	0,5
12	4,2	0,6	8°	4,3	15,7 / 22	3,7 / 10	3,0	0,6
16	5,6	0,8	8°	5,7	20,9 / 29,4	4,9 / 13,4	4,0	0,8
20	7,0	1,0	8°	7,1	26,2 / 36,7	6,2 / 16,7	5,0	1,0
25	9,2	1,2	8°	8,5	33 / 46,1	8 / 21,1	6,0	1,2

(1) Reduce cutting data by 30% when working in ramping and helical interpolation.

(2) Reduce cutting data by 50 to 80% when plunging depending on a_e or a_p.

MILLING

CUTTING DATA FOR BALL NOSE INSERTS

ARAF inserts

Reference	Max. a_p	Co	Maximum chip thickness (h_M)					
			P	M	K	N	S	H
PPH 0600-CL1	3.0	3.0	0.03 - 0.05	0.03 - 0.05	0.04 - 0.07	0.05 - 0.10	0.02 - 0.04	0.02 - 0.04
PPH 0800-CL1	4.0	4.0	0.04 - 0.07	0.04 - 0.07	0.05 - 0.10	0.06 - 0.12	0.03 - 0.05	0.03 - 0.05
PPH 1000-CL1	5.0	5.0	0.05 - 0.08	0.05 - 0.08	0.05 - 0.10	0.06 - 0.12	0.04 - 0.06	0.04 - 0.06
PPH 1200-CL1	6.0	6.0	0.05 - 0.08	0.05 - 0.08	0.05 - 0.10	0.06 - 0.12	0.04 - 0.06	0.04 - 0.06
PPH 1400-CL1	7.0	7.0	0.05 - 0.08	0.05 - 0.08	0.05 - 0.10	0.06 - 0.12	0.04 - 0.06	0.04 - 0.06
PPH 1600-CL1	8.0	8.0	0.06 - 0.10	0.06 - 0.10	0.06 - 0.13	0.08 - 0.16	0.04 - 0.07	0.04 - 0.07
PPH 2000-CL1	10.0	10.0	0.06 - 0.10	0.06 - 0.10	0.06 - 0.13	0.08 - 0.16	0.04 - 0.07	0.04 - 0.07
PPH 2500-CL1	12.5	12.5	0.08 - 0.15	0.08 - 0.15	0.08 - 0.17	0.10 - 0.20	0.05 - 0.08	0.05 - 0.08
PPH 3000-CL1	15.0	15.0	0.08 - 0.15	0.08 - 0.15	0.08 - 0.17	0.10 - 0.20	0.05 - 0.08	0.05 - 0.08
PPH 3200-CL1	16.0	16.0	0.08 - 0.15	0.08 - 0.15	0.08 - 0.17	0.10 - 0.20	0.05 - 0.08	0.05 - 0.08
PPH 4000-CL1	20.0	20.0	0.08 - 0.15	0.08 - 0.15	0.08 - 0.17	0.10 - 0.20	0.05 - 0.08	0.05 - 0.08
PPHE 1000-SM1	5.0	5.0	0.05 - 0.09	0.05 - 0.09	0.05 - 0.11	0.07 - 0.13	0.04 - 0.07	0.04 - 0.07
PPHE 1200-SM1	6.0	6.0	0.05 - 0.09	0.05 - 0.09	0.05 - 0.11	0.07 - 0.13	0.04 - 0.07	0.04 - 0.07
PPHE 1600-SM1	8.0	8.0	0.07 - 0.11	0.07 - 0.11	0.07 - 0.14	0.09 - 0.18	0.04 - 0.08	0.04 - 0.08
PPHE 2000-SM1	10.0	10.0	0.07 - 0.11	0.07 - 0.11	0.07 - 0.14	0.09 - 0.18	0.04 - 0.08	0.04 - 0.08
PPHE 2500-SM1	12.5	12.5	0.09 - 0.17	0.09 - 0.17	0.09 - 0.19	0.11 - 0.22	0.05 - 0.09	0.05 - 0.09
PPHF 0800 04-CE1 [1)]	0.4	-	0.20 - 0.40	0.20 - 0.40	0.20 - 0.40	0.20 - 0.40	0.20 - 0.40	-
PPHF 1000 05-CE1 [1)]	0.5	-	0.20 - 0.50	0.20 - 0.40	0.25 - 0.50	0.25 - 0.50	0.20 - 0.40	-
PPHF 1200 06-CE1 [1)]	0.6	-	0.25 - 0.60	0.25 - 0.50	0.30 - 0.60	0.30 - 0.60	0.25 - 0.50	-
PPHF 1600 08-CE1 [1)]	0.8	-	0.35 - 0.80	0.35 - 0.70	0.40 - 0.80	0.40 - 0.80	0.30 - 0.60	-
PPHF 2000 10-CE1 [1)]	1.0	-	0.45 - 1.00	0.45 - 0.90	0.50 - 1.00	0.50 - 1.00	0.40 - 0.80	-
PPHF 2500 12-CE1 [1)]	1.2	-	0.60 - 1.50	0.60 - 1.20	0.75 - 1.50	0.75 - 1.50	0.50 - 1.00	-
PPHT 0800 03-A2	0.3	0.3	0.04 - 0.07	0.04 - 0.07	0.05 - 0.10	0.06 - 0.12	0.03 - 0.05	0.03 - 0.05
PPHT 0800 04-A2	0.4	0.4	0.04 - 0.07	0.04 - 0.07	0.05 - 0.10	0.06 - 0.12	0.03 - 0.05	0.03 - 0.05
PPHT 0800 05-A1	0.5	0.5	0.04 - 0.07	0.04 - 0.07	0.05 - 0.10	0.06 - 0.12	0.03 - 0.05	0.03 - 0.05
PPHT 0800 05-A2	0.5	0.5	0.04 - 0.07	0.04 - 0.07	0.05 - 0.10	0.06 - 0.12	0.03 - 0.05	0.03 - 0.05
PPHT 0800 08-A2	0.8	0.8	0.04 - 0.07	0.04 - 0.07	0.05 - 0.10	0.06 - 0.12	0.03 - 0.05	0.03 - 0.05
PPHT 0800 10-A2	1.0	1.0	0.04 - 0.07	0.04 - 0.07	0.05 - 0.10	0.06 - 0.12	0.03 - 0.05	0.03 - 0.05
PPHT 1000 05-A2	0.5	0.5	0.05 - 0.08	0.05 - 0.08	0.05 - 0.10	0.06 - 0.12	0.04 - 0.06	0.04 - 0.06
PPHT 1000 08-A1	0.8	0.8	0.05 - 0.08	0.05 - 0.08	0.05 - 0.10	0.06 - 0.12	0.04 - 0.06	0.04 - 0.06
PPHT 1000 08-A2	0.8	0.8	0.05 - 0.08	0.05 - 0.08	0.05 - 0.10	0.06 - 0.12	0.04 - 0.06	0.04 - 0.06
PPHT 1000 10-A2	1.0	1.0	0.05 - 0.08	0.05 - 0.08	0.05 - 0.10	0.06 - 0.12	0.04 - 0.06	0.04 - 0.06
PPHT 1000 15-A2	1.5	1.5	0.05 - 0.08	0.05 - 0.08	0.05 - 0.10	0.06 - 0.12	0.04 - 0.06	0.04 - 0.06
PPHT 1200 05-A2	0.5	0.5	0.05 - 0.08	0.05 - 0.08	0.05 - 0.10	0.06 - 0.12	0.04 - 0.06	0.04 - 0.06
PPHT 1200 10-A1	1.0	1.0	0.05 - 0.08	0.05 - 0.08	0.05 - 0.10	0.06 - 0.12	0.04 - 0.06	0.04 - 0.06
PPHT 1200 10-A2	1.0	1.0	0.05 - 0.08	0.05 - 0.08	0.05 - 0.10	0.06 - 0.12	0.04 - 0.06	0.04 - 0.06
PPHT 1200 15-A2	1.5	1.5	0.05 - 0.08	0.05 - 0.08	0.05 - 0.10	0.06 - 0.12	0.04 - 0.06	0.04 - 0.06
PPHT 1200 20-A1	2.0	2.0	0.05 - 0.08	0.05 - 0.08	0.05 - 0.10	0.06 - 0.12	0.04 - 0.06	0.04 - 0.06
PPHT 1200 20-A2	2.0	2.0	0.05 - 0.08	0.05 - 0.08	0.05 - 0.10	0.06 - 0.12	0.04 - 0.06	0.04 - 0.06
PPHT 1600 10-A1	1.0	1.0	0.06 - 0.10	0.06 - 0.10	0.06 - 0.13	0.08 - 0.16	0.04 - 0.07	0.04 - 0.07
PPHT 1600 10-A2	1.0	1.0	0.06 - 0.10	0.06 - 0.10	0.06 - 0.13	0.08 - 0.16	0.04 - 0.07	0.04 - 0.07
PPHT 1600 13-A1	1.3	1.3	0.06 - 0.10	0.06 - 0.10	0.06 - 0.13	0.08 - 0.16	0.04 - 0.07	0.04 - 0.07
PPHT 1600 13-A2	1.3	1.3	0.06 - 0.10	0.06 - 0.10	0.06 - 0.13	0.08 - 0.16	0.04 - 0.07	0.04 - 0.07
PPHT 1600 20-A1	2.0	2.0	0.06 - 0.10	0.06 - 0.10	0.06 - 0.13	0.08 - 0.16	0.04 - 0.07	0.04 - 0.07
PPHT 1600 20-A2	2.0	2.0	0.06 - 0.10	0.06 - 0.10	0.06 - 0.13	0.08 - 0.16	0.04 - 0.07	0.04 - 0.07
PPHT 1600 30-A1	3.0	3.0	0.06 - 0.10	0.06 - 0.10	0.06 - 0.13	0.08 - 0.16	0.04 - 0.07	0.04 - 0.07
PPHT 1600 30-A2	3.0	3.0	0.06 - 0.10	0.06 - 0.10	0.06 - 0.13	0.08 - 0.16	0.04 - 0.07	0.04 - 0.07
PPHT 2000 10-A1	1.0	1.0	0.06 - 0.10	0.06 - 0.10	0.06 - 0.13	0.08 - 0.16	0.04 - 0.07	0.04 - 0.07
PPHT 2000 10-A2	1.0	1.0	0.06 - 0.10	0.06 - 0.10	0.06 - 0.13	0.08 - 0.16	0.04 - 0.07	0.04 - 0.07
PPHT 2000 16-A1	1.6	1.6	0.06 - 0.10	0.06 - 0.10	0.06 - 0.13	0.08 - 0.16	0.04 - 0.07	0.04 - 0.07
PPHT 2000 16-A2	1.6	1.6	0.06 - 0.10	0.06 - 0.10	0.06 - 0.13	0.08 - 0.16	0.04 - 0.07	0.04 - 0.07
PPHT 2000 30-A2	3.0	3.0	0.06 - 0.10	0.06 - 0.10	0.06 - 0.13	0.08 - 0.16	0.04 - 0.07	0.04 - 0.07
PPHT 2000 40-A2	4.0	4.0	0.06 - 0.10	0.06 - 0.10	0.06 - 0.13	0.08 - 0.16	0.04 - 0.07	0.04 - 0.07
PPHT 2500 20-A2	2.0	2.0	0.08 - 0.15	0.08 - 0.15	0.08 - 0.17	0.10 - 0.20	0.05 - 0.08	0.05 - 0.08

[1)] For PPHF inserts $f_z = h_M$

MILLING

CUTTING DATA FOR BALL NOSE INSERTS

SR-SAF inserts

Reference	Max. a_p	Co	Maximum chip thickness (h_M)					
			P	M	K	N	S	H
ZP 10 00 ER-31	8.9	5.0	0.05 - 0.08	0.05 - 0.08	0.05 - 0.10	-	0.04 - 0.06	0.04 - 0.06
ZP 12 00 ER-31	10.7	6.0	0.05 - 0.08	0.05 - 0.08	0.05 - 0.10	-	0.04 - 0.06	0.04 - 0.06
ZP 12 00 ER-51	10.7	6.0	0.06 - 0.10	0.06 - 0.10	0.06 - 0.12	-	-	-
ZP 16 00 ER-31	14.4	8.0	0.06 - 0.10	0.06 - 0.10	0.06 - 0.13	-	0.04 - 0.07	0.04 - 0.07
ZP 16 00 ER-51	14.4	8.0	0.07 - 0.12	0.07 - 0.12	0.07 - 0.15	-	-	-
ZP 16 00 ER-71	14.4	8.0	0.09 - 0.15	0.09 - 0.15	0.09 - 0.19	-	-	-
ZP 20 00 ER-11	17.9	10.0	0.04 - 0.07	0.04 - 0.07	-	-	0.03 - 0.05	0.03 - 0.05
ZP 20 00 ER-31	17.9	10.0	0.06 - 0.10	0.06 - 0.10	0.06 - 0.13	-	0.04 - 0.07	0.04 - 0.07
ZP 20 00 ER-51	17.9	10.0	0.07 - 0.12	0.07 - 0.12	0.07 - 0.15	-	-	-
ZP 20 00 ER-71	17.9	10.0	0.09 - 0.15	0.09 - 0.15	0.09 - 0.19	-	-	-
ZP 25 00 ER-31	22.3	12.5	0.08 - 0.15	0.08 - 0.15	0.08 - 0.17	-	0.05 - 0.08	0.05 - 0.08
ZP 25 00 ER-51	22.3	12.5	0.10 - 0.18	0.10 - 0.18	0.10 - 0.20	-	-	-
ZP 25 00 ER-71	22.3	12.5	0.12 - 0.22	0.12 - 0.22	0.12 - 0.25	-	-	-
ZP 30 00 ER-51	26.8	15.0	0.10 - 0.18	0.10 - 0.18	0.10 - 0.20	-	-	-
ZP 32 00 ER-11	28.6	16.0	0.06 - 0.11	0.06 - 0.11	0.06 - 0.13	-	0.04 - 0.06	0.04 - 0.06
ZP 32 00 ER-31	28.6	16.0	0.08 - 0.15	0.08 - 0.15	0.08 - 0.17	-	0.05 - 0.08	0.05 - 0.08
ZP 32 00 ER-51	28.6	16.0	0.10 - 0.18	0.10 - 0.18	0.10 - 0.20	-	-	-
ZP 32 00 ER-71	28.6	16.0	0.12 - 0.22	0.12 - 0.22	0.12 - 0.25	-	-	-
ZP 40 00 ER-51	35.7	20.0	0.10 - 0.18	0.10 - 0.18	0.10 - 0.20	-	-	-
ZP 40 00 ER-71	35.7	20.0	0.12 - 0.22	0.12 - 0.22	0.12 - 0.25	-	-	-
ZP 50 00 ER-11	44.7	25.0	0.07 - 0.13	0.07 - 0.13	-	-		
ZP 50 00 ER-71	44.7	25.0	0.15 - 0.25	0.15 - 0.25	0.15 - 0.30	-	-	-

SM-SAF inserts

Reference	Max. a_p	Co	Maximum chip thickness (h_M)					
			P	M	K	N	S	H
XPB 20 ER-41	10.0	10.0	0.07 - 0.12	0.07 - 0.1	0.09 - 0.15	-	0.05 - 0.07	0.05 - 0.07
XPB 25 ER-41	12.5	12.5	0.07 - 0.12	0.07 - 0.1	0.09 - 0.15	-	0.05 - 0.07	0.05 - 0.07
XPB 32 ER-41	16.0	16.0	0.07 - 0.12	0.07 - 0.1	0.09 - 0.15	-	0.05 - 0.07	0.05 - 0.07

f_z calculation

$$f_z = \frac{h_M}{\sin\left[\arccos\left(\frac{Co - ap}{Co}\right)\right]}$$

h_M =	Maximum chip thickness (mm)
Co =	Fattore di correzione
a_p =	Cutting depth (mm)

Example	
Tool	PPHT 1200 15-A2
Material	Cast irons
Depth of cut	a_p= 0.5 mm
Maximum chip thickness	h_M= 0.07 mm
Correction factor	Co= 1.5
Result	f_z= 0.094 mm

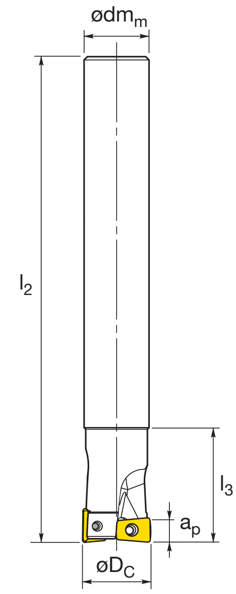
f_z min for $l_1 > 6d$ and difficult-to-machine material
f_z max and a_p max for $l_1 < 3d$ or easy-to-machine material
For $l_1 > 4d$, we recommend to use a WC body.

For PPHF: values are indicated for face milling by steep wall machining decrease to 50% of f_z mini
(ex: facing f_z: 0.2 - 0.4 ; step wall machining: 0.2/2 = 0.1)

PLUNG-SAF

Plung milling cutter

Cutter program, PG 10, PG 13, PG 16



Reference	Dimensions (mm)							Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg
	D_c	D_3	Max. a_p	dm_m	l_1	l_2	l_3						
PG-10/021-02-QC20-160-R	21.00	-	6.00	20.00	-	160.00	35.00	2	PG 10 03..	2	No	11000	0.350
PG-13/026-02-QC25-200-R	26.00	-	8.00	25.00	-	200.00	40.00	2	PG 13 04..	2	No	9000	0.690
PG-16/033-02-QC32-250-R	33.00	-	10.00	32.00	-	250.00	50.00	2	PG 16 04..	2	No	7000	1.420

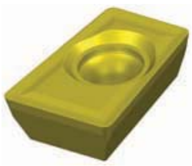
Spare parts

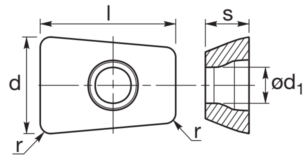
Insert style	Diameter D_c	Insert screw			Screw driver		Torque wrench		
		Reference	Size		Reference		Reference		Nm
PG 10 03..	21 mm	5513 020-36	M 2.5	1.2 N.m	TX 208PLUS	8 IP	TDX 208PLUS	8 IP	1.2
PG 13 04..	26 mm	DVF 0943	M 3.0	1.2 N.m	TX 209PLUS	9 IP	TDX 209PLUS	9 IP	1.4
PG 16 04..	33 mm	5513 020-10	M 3.5	3.0 N.m	TX 215PLUS	15 IP	TDX 215PLUS	15 IP	3.0

PLUNG-SAF

Plung milling cutter

Insert program





Reference	Dimensions (mm)							Grades													
	d	s	d_1	l	r	b_s	t_1	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX20	KX20	KX2	N
PG 10 03 08 N-81	7.50	3.40	2.8	10.50	0.8	-	-	-	-	-	-	-	✓	-	✓	-	-	-	-	-	-
PG 13 04 08 N-81	9.40	4.50	3.4	13.00	0.8	-	-	-	-	-	-	-	✓	-	✓	-	-	-	-	-	-
PG 16 04 08 N-81	11.40	4.76	4.4	16.52	0.8	-	-	-	-	-	-	-	✓	-	✓	-	-	-	-	-	-

✓Article which can be ordered

Ordering example: PG 13 04 08 N-81 5020

Cutting conditions

Grade	Feed per tooth (mm)	P Steel				M Stainless steel			K Cast iron				N Non-ferrous aluminum				S Super alloys			H Hardened materials			
		Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
5020	v_{c1}	365	327	251	152	218	199	141	262	244	217	190	1082	698	500	624	74	64	52	42	47	42	37
	f_{z1}	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	v_{c2}	264	240	180	114	181	169	122	224	200	162	129	938	482	410	516	56	46	43	33	38	33	28
	f_{z2}	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
5050	v_{c1}	267	235	167	99	139	90	76	-	-	-	-	-	-	-	-	55	45	37	-	-	-	-
	f_{z1}	0.03	0.03	0.03	0.03	0.03	0.03	0.03	-	-	-	-	-	-	-	-	0.03	0.03	0.03	-	-	-	-
	v_{c2}	212	186	126	69	112	76	66	-	-	-	-	-	-	-	-	41	31	28	-	-	-	-
	f_{z2}	0.18	0.18	0.18	0.18	0.18	0.18	0.18	-	-	-	-	-	-	-	-	0.18	0.18	0.12	-	-	-	-

The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

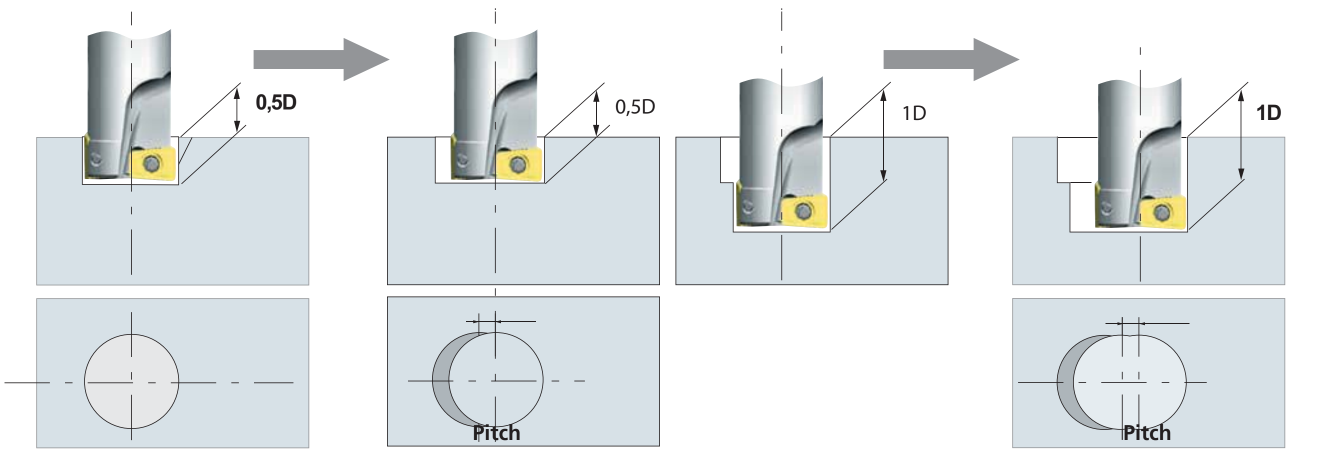
MILLING

PLUNG-SAF

Milling cutter characteristics

Strategy for machining a pocket in plunging

1 Operation **DRILLING**	2 Operation **PLUNGING / DRILLING**	3 Operation **PLUNGING**
- Drilling down to depth 0,5D - Retract to a position in Z axis clear of work piece	- Offset tool up to the pitch value shown - Descend at drilling feed to a depth 0,5D - Retract to a position in Z axis clear of work piece	- Offset tool up to the pitch value shown - Descend at plunging feed to a depth of 1D - Retract to a position in Z axis clear of work piece



Repeat step 3 as many times as necessary.
When the tool is back to the starting point of the first drilling operation, repeat steps 1 to 3 until the required depth is obtained.

Cutter ø (mm)	Drilling Max. depth (mm)	Plunging Max. pitch (mm) B - 0,8 mm
21	10,5	6,7
26	13	8,6
33	16,5	10,6

Chip evacuation

"Open" machining: use of coolant or air blowing.
"Closed" machining pocket type: powerful air blowing only.

Other applications

The plunging and drilling operations can be combined with other applications.
For example, finishing of a pocket by helical contouring also allows machining time saving. PLUNG-SAF cutter provide very good results in slotting or ramping while reducing overhang to L2 length.

Cutter ø (mm)	Slotting Max. a_p (mm)	Ramping Max. angle
21	6	3°
26	8	3°
33	10	3°

Carbide shanks

The use of carbide shanks make it possible to increase overhang by 30 to 40%.

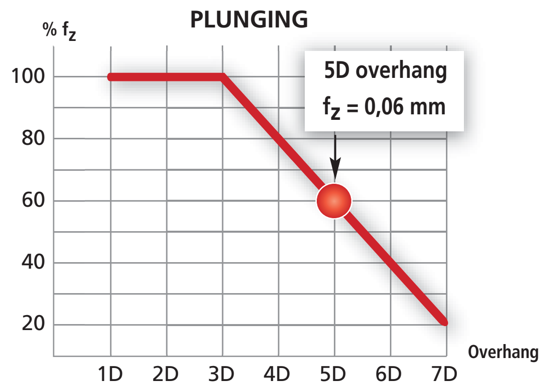
PLUNG-SAF

Milling cutter characteristics

Cutting conditions

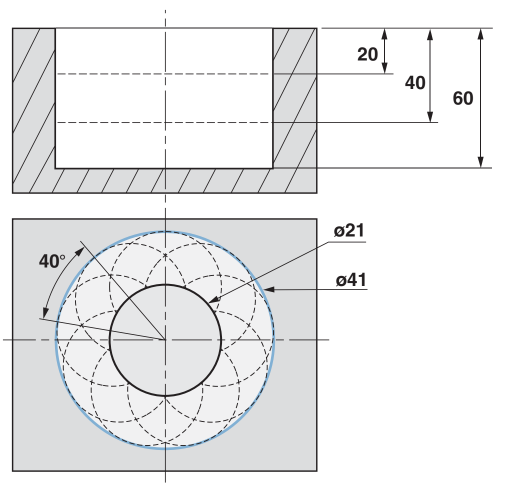
Grade 5020		P Steel		M Stainless steel	K Cast iron	
		(≤ 1000 Mpa)	(> 1000 Mpa)	(≤ 220 HB)	(≤ 450 Mpa)	(> 450 Mpa)
DRILLING 5D overhang	Cutting speed v_c (m/min)	120 - 180	80 - 120	80 - 140	120 - 200	100 - 140
	Tooth feed f_z (mm)	0,05	0,04	0,03 - 0,05	0,08	0,06
PLUNGING 5D overhang	Cutting speed v_c (m/min)	120 - 180	80 - 120	80 - 140	120 - 200	120 - 160
	Tooth feed f_z (mm)	0,03 - 0,12	0,03 - 0,06	0,03 - 0,08	0,08 - 0,18	0,04 - 0,12
CONVENTIONAL MILLING 3D overhang	Cutting speed v_c (m/min)	100 - 180	60 - 120	70 - 140	120 - 200	100 - 180
	Tooth feed f_z (mm)	0,05 - 0,18	0,05 - 0,12	0,05 - 0,12	0,05 - 0,30	0,05 - 0,18

Note :
Cutting speed and f_z values are recommended for use with steel shanks and an overhang of 3 times the cutting diameter. With a higher overhang, f_z values must be reduced as indicated in the diagram opposite.
e.g., f_z will be 0,06 mm with a 5D overhang instead of 0,1 mm with a 3D overhang.
f_z may be increased significantly by selecting a modular cutter and a carbide shank.



Machining example

Milling of a pocket of ø 41mm and 60 mm deep	
Material	40 CMD 8 + S (1300 MPa)
Cutter	PG-10/021-02-QC20-160-R (overhang = 60 mm)
Insert	PG 10 03 08 N-81
Grade	KR 5020



Step 1 Drilling ø21 in the centre, 10 mm deep	
Cutting speed	v_c = 120 m/min
Feed per revolution	f_n = 0,06 mm
Cutting depth	a_p = 10 mm
Infeed	a_e = 21 mm
Interrupt feed every 0,3 mm to break chips	

Step 2 Peripheral plunging, ø 41 mm	
Cutting speed	v_c = 120 m/min
Feed per revolution	f_n = 0,20 mm
Cutting depth	a_p = 20 mm
Infeed	a_e = every 40°

Steps 1 and 2 are repeated 3 times

Step 3 Finishing in contouring of ø 41 mm	
Cutting speed	v_c = 120 m/min
Feed per revolution	f_n = 0,25 mm
Cutting depth	a_p = 20 mm
Infeed	a_e = 5 mm

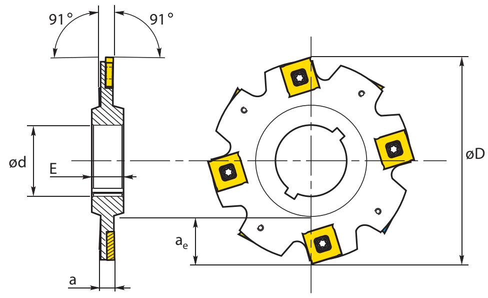
Result

Where 2 tools were necessary to achieve this machining operation, only one PLUNG-SAF milling cutter was used to carry out the 3 operations. Manufacturing time was reduced by over 50%.

RN-SAF

Slotting milling cutter

Cutter program, RN



Reference	Dimensions (mm)						Z	Insert style	Number of inserts	N max.	kg
		D	a_e	a	d	E					
RN 80-05	05	80	17	5	27	12	4	SNBC 12 30 03	8	4500	0.4
RN 100-05	05	100	27	5	27	12	5	SNBC 12 30 03	10	4200	0.7
RN 125-05	05	125	33	5	40	12	6	SNBC 12 30 03	12	3700	1.1
RN 160-05	05	160	45.5	5	40	12	8	SNBC 12 30 03	16	3200	1.8
RN 100-06-M	06	100	27	6	27	12	5	SNBC 12 32 03	10	4700	0.7
RN 125-06-M	06	125	33	6	40	12	6	SNBC 12 32 03	12	4200	1.2
RN 160-06-M	06	160	45.5	6	40	12	8	SNBC 12 32 03	16	3700	1.9
RN 100-08-M	08	100	27	8	27	12	5	SNBC 12 45 03	10	4700	0.8
RN 125-08-M	08	125	33	8	40	12	6	SNBC 12 45 03	12	4200	1.3
RN 160-08-M	08	160	45.5	8	40	12	8	SNBC 12 45 03	16	3700	2.2
RN 200-08-M	08	200	63.5	8	50	12	10	SNBC 12 45 03	20	3400	3.9
RN 100-10-M	10	100	27	10	27	12	5	SNBC 12 54 03	10	4700	0.9
RN 125-10-M	10	125	33	10	40	12	6	SNBC 12 54 03	12	4200	1.5
RN 160-10-M	10	160	45.5	10	40	12	8	SNBC 12 54 03	16	3700	2.5
RN 200-10-M	10	200	63.5	10	50	12	10	SNBC 12 54 03	20	3400	4.3
RN 125-12	12	125	33	12	40	12	6	SNBC 12 65 03	12	3700	1.6
RN 160-12	12	160	45.5	12	40	12	8	SNBC 12 65 03	16	3200	2.7
RN 200-12	12	200	63.5	12	50	12	10	SNBC 12 65 03	20	3000	4.7

Spare parts

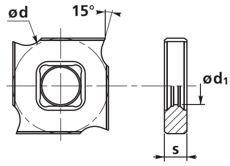
Insert style	Insert screw			Screw driver	
	Reference	Size		Reference	
SNBC 12 30 03	DVF 1217	M3.5	1.2 -1.8 N.m	TX 209	T9
SNBC 12 32 03	DVF 3127	M4	3 - 4.1 N.m	TX 215	T15
SNBC 12 45 03	DVF 3128	M4	3 - 4.1 N.m	TX 215	T15
SNBC 12 54 03	DVF 3129	M4	3 - 4.1 N.m	TX 215	T15
SNBC 12 65 03	DVF 1221	M3.5	1.2 -1.8 N.m	TX 209	T9

Note : The tightening torque values are given for information and adjustment requires the use of a torque screwdriver.

RN-SAF

Slotting milling cutter

Insert program

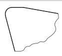
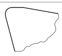


Reference	Dimensions (mm)							Grades													
	d	s	d_1	l	r	b_s	t_1	1020	1120	1130	2003	5007	5020	5040	5050	8030	5135	KX20	KX20	KX2	N
SNBC 12 30 03 SN-H4-T	12.70	3	5	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-
SNBC 12 32 03 SN-H4-T	12.70	3.2	5	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-
SNBC 12 45 03 SN-H4-T	12.70	4.5	5	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-
SNBC 12 54 03 SN-H4-T	12.70	5.4	5	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-
SNBC 12 65 03 SN-H4-T	12.70	6.5	5	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-
SNBC 12 30 03 SN-H5-T	12.70	3	5	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-
SNBC 12 32 03 SN-H5-T	12.70	3.2	5	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-
SNBC 12 45 03 SN-H5-T	12.70	4.5	5	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-
SNBC 12 54 03 SN-H5-T	12.70	5.4	5	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-
SNBC 12 65 03 SN-H5-T	12.70	6.5	5	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-

✓Article which can be ordered

Ordering example: SNBC 12 30 03 SN-H4-T 5040

Top form geometry

Top form geometry	Application	Max chip thickness H max (mm)	P Steel	M Stainless steel	K Cast iron	N Non-ferrous aluminum	S Super alloys	H Hardened materials
 41	Semi-finishing	0.10 - 0.15	5040	5040	**5040**	5040	5040	
 51	Semi-finishing	0.10 - 0.15	5040	5040	**5040**			

Cutting conditions

Grade	Feed per tooth (mm)	P Steel				M Stainless steel			K Cast iron				N Non-ferrous aluminum				S Super alloys			H Hardened materials			
		Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
5040	0,1	290	240	150	220	175	155	140	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	0,2	240	200	120	170	130	110	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	0,3	180	160	100	120	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

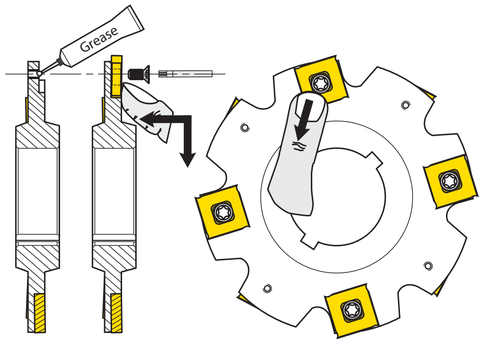
The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

RN-SAF

Milling cutter characteristics

Assembly instructions

The table below gives the tightening torque values and some general information about screws.



Reference	Screw	Overall length mm	Torx end shape	Torque N.m	Inserts
DVF 1217	M3,5	3,75	T9	1,2 to 1,8	SNBC 12 30 ..
DVF 3127	M4	5,2	T15	3 to 4,1	SNBC 12 32 ..
DVF 3128	M4	7	T15	3 to 4,1	SNBC 12 45 ..
DVF 3129	M4	8,7	T15	3 to 4,1	SNBC 12 54 ..
DVF 1221	M3,5	10,75	T9	1,2 to 1,8	SNBC 12 65 ..

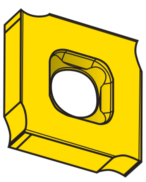
In case of intensive use of RN-SAF cutters, it is recommended to replace insert attachment screws after 40 indexes on the inserts (namely per housing).
Also remember that it is important not to exceed the recommended clamping torque of 1,8 N.m, otherwise the clamp screw life and the cutter life may be seriously affected.

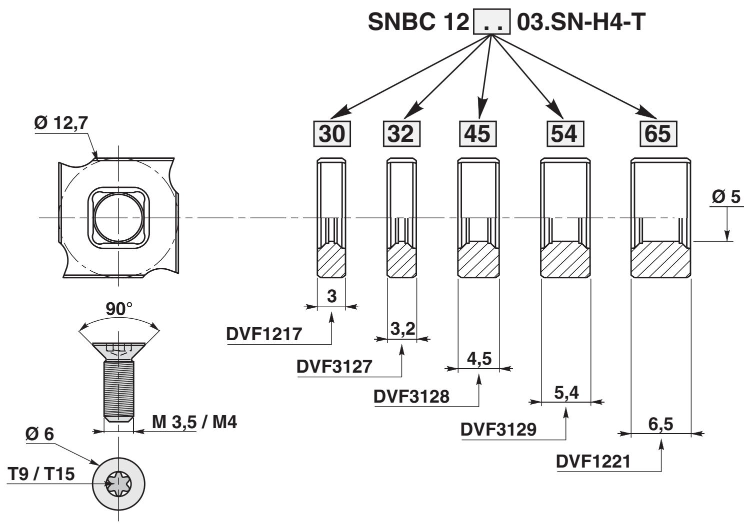
Indexable inserts

Radial cutting angle (resultant)	Ø 80	Ø 100	Ø 125	Ø 160	Ø 200
Inserts installed on cutter	+ 1°	+ 3°	+ 5°	+ 7°	+ 8 °

Inserts thickness

5 inserts to cover the whole range.

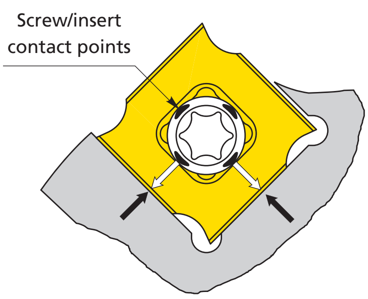




Warning : To each insert thickness corresponds a specific screw. Using the wrong reference can damage the cutter or the machined part.

STOPVIS* : Screw anti-loosening system

* Registered design



Positioning and tightening :

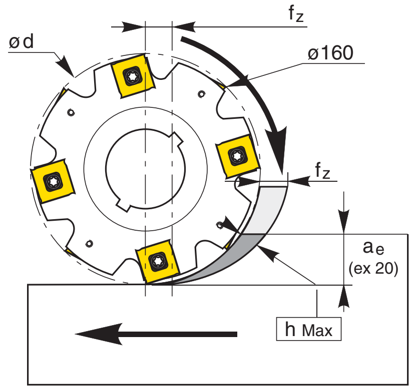
When the insert is assembled, the tightening pressure applied at 4 points causes elastic deformation of the screw head. The resulting limited contact secures the screw (preventing its rotation) and defers seizure which can occur with insert overheating, as well as screw loosening caused by vibrations during machining.
The insert positioning in its housing is identical for all square inserts.
The STOPVIS system also operates when SNBC inserts are installed on other slotting milling cutters. It is not necessary to replace the screws fitted on these milling cutters.
Locking is achieved by the shape of the screw housing on the insert.

RN-SAF

Milling cutter characteristics

Chip thickness and tooth feed

It is recommended that actual chip thickness does not fall below 0,08 mm (h Max).
The sketch opposite and the chart on page 499 will help you correct tooth feed according to the cutter diameter (d) and its infeed in the part (ae). The ratio ae/d should not be less than 0,05 mm. These requirements should be met for correct use of RN-SAF milling cutter in steel. Optimization to higher tooth feeds can be achieved based on various parameters, i.e. : the material to be machined, the machine used, etc.
Reminder : When determining Table feed (vf) the actual number of effective inserts must be taken into account rather than the total number of inserts.
Example : RN 160-12 : has 16 inserts but only 8 effective



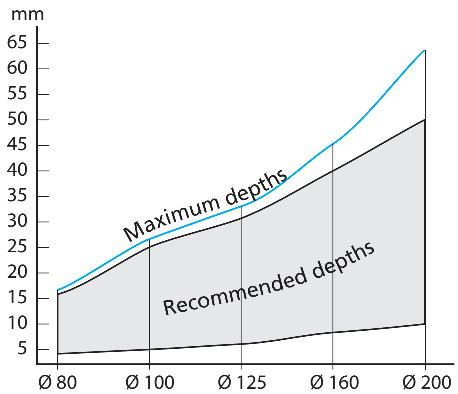
$$h\ Max = 2\,f_z \sqrt{\frac{ae}{D}\left(1-\frac{ae}{D}\right)}$$

Calculation of f_z $$f_z = \frac{h\ Max.}{2\sqrt{\frac{ae}{D}\left(1-\frac{ae}{D}\right)}}$$

Example : h Max required = 0,1

$$f_z = \frac{0,1}{2\sqrt{\frac{20}{160}\left(1-\frac{20}{160}\right)}}$$

f_z to program = 0,15



Slot depth

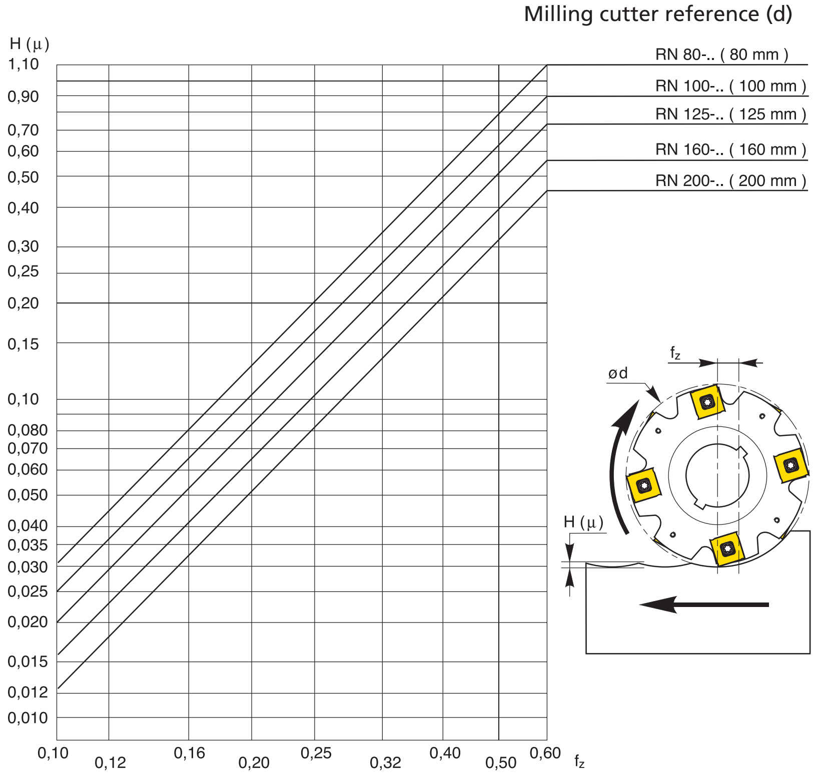
For general use of RN-SAF milling cutters and to obtain the best results safely, it is recommended to slightly reduce the infeed possibilities (ae) of each cutter.
The diagram above shows the recommended slot depths for each cutter (shaded area).

Variation of surface finish

The combined rotation movement of the cutter with the part displacement causes ripples at the slot base.

The chart opposite shows the value (H: expressed in microns) of these ripples which increases with the tooth feed (f_z).

A larger cutter diameter allows, while keeping the same tooth feed, to significantly reduce the ripple value and increase the table speed (vf).



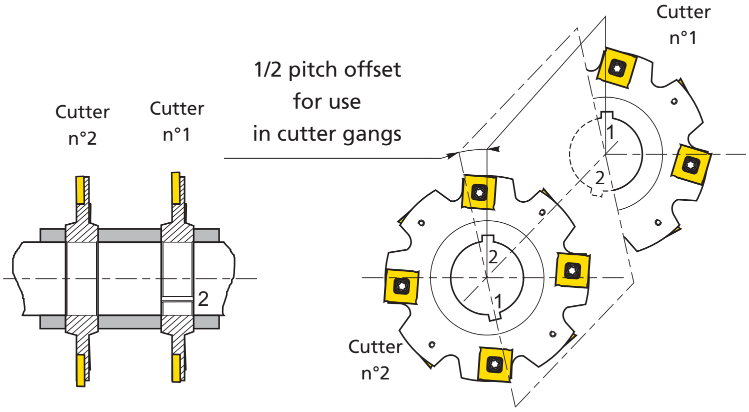
RN-SAF

Milling cutter characteristics

Use in cutter gangs

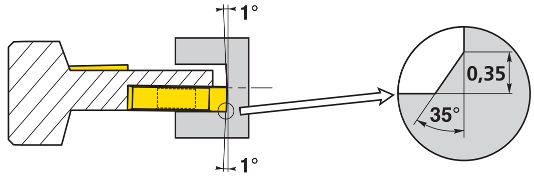
The attachment is designed to facilitate the use of RN-SAF in cutter gangs. Key slots are oriented such that the position of insert during cutting is offset by a value equal to half a pitch.

This arrangement significantly reduces shocks and vibrations during machining. (see diagram)



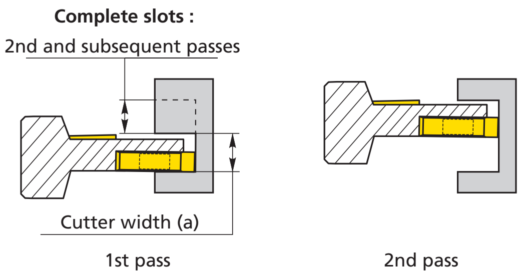
Shape of slot bottom

The way these inserts are arranged on the cutter body gives a V-shape to the slot bottom (1°). In addition the fillet between the bottom and the sides of the slot is achieved by a chamfer as shown on the sketch opposite.

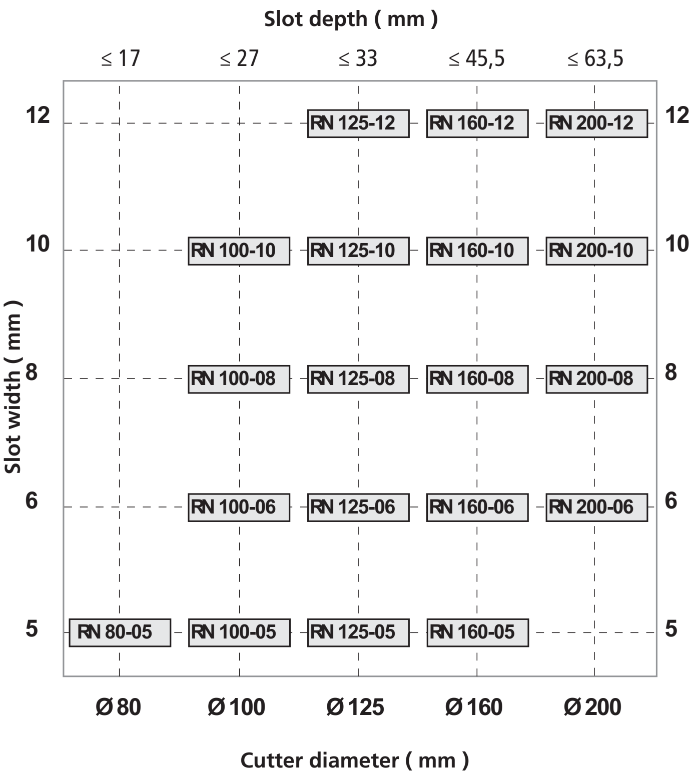


Wide slots and shoulders

When machining wide slots which require several passes, it is essential to select a milling cutter with a width such that the slot can be made in two or more balanced passes.



Cutter selection



Selection criteria	Cutter Ø	
	Large	Small
Milling cutter stiffness	-	+
Milling cutter arbor stiffness	+	-
Response to machine clearances	-	+
Selection of slot depth	+	-
Table speed	+	-
Machining time	+	-
Machining of wider slots or shoulders	-	+
Chip evacuation	-	+
Number of parts between 2 insert edge replacements	+	-
Surface finish	+	-

+ = Good - = Not as good

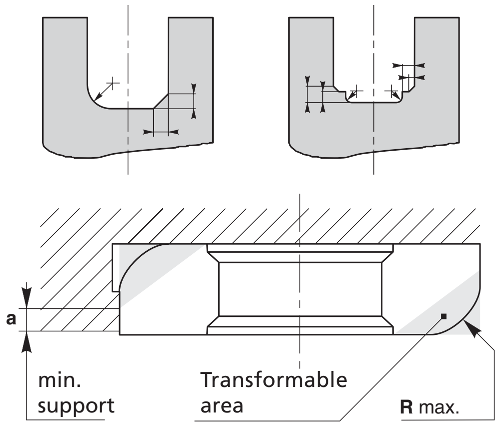
RN-SAF

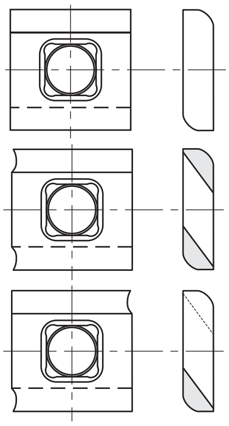
Milling cutter characteristics

Manufacture of special cutters and inserts

Special cutters or inserts can be designed and produced on request. The diagram below show some of the special profiles achieved with RN-SAF cutters.

Example of special profiles :

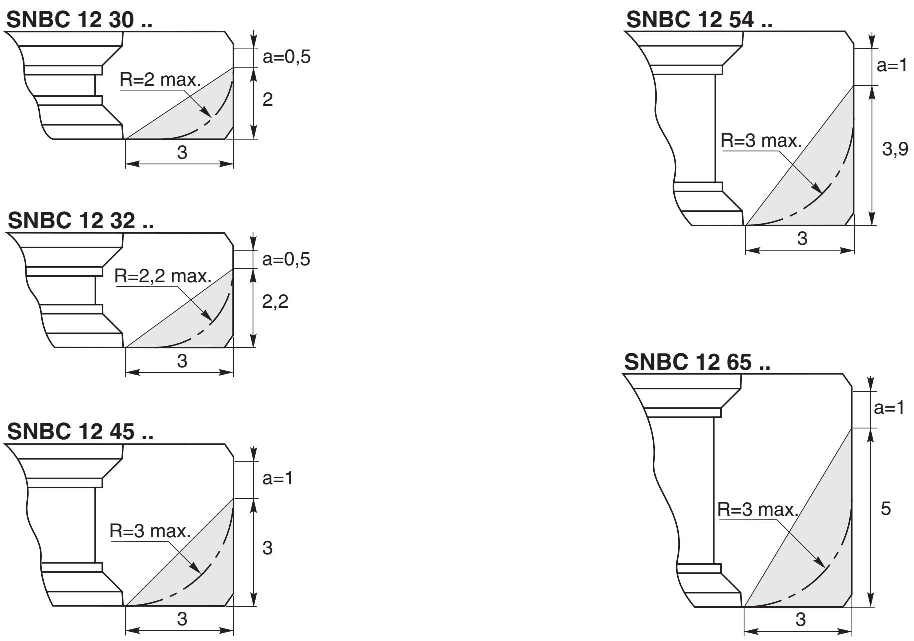




2 R and 2 L
without chip groove

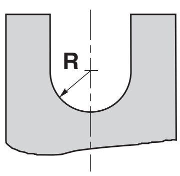
2 R and 2 L
with chip groove

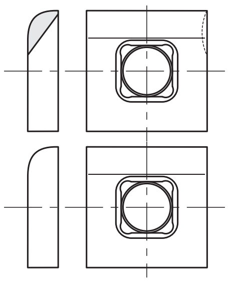
1 R and 1 L
with chip groove



Shaded areas shows the area which can be ground with the special profile. This profile must not go beyond this area, otherwise the cutter operation will not be guaranteed.

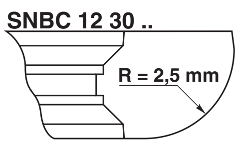
Example of complete radii :

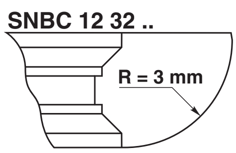




1 R et 1 L
with chip groove

1 R et 1 L
without chip groove



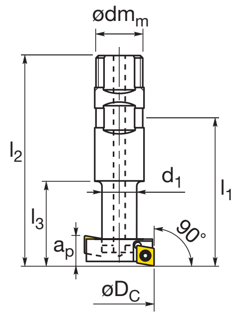


Note : If inserts are modified, do not forget to rework the cutter body as well.

TE-SAF

T-Slot milling cutter

Cutter program, CTM



Reference	Dimensions (mm)								Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg
	D_c	D_3	d_1	Max. a_p	dm_m	l_1	l_2	l_3						
CTM 25-4-K20-CC06	25.00	-	12.00	11.00	20.00	60.00	85.00	34.00	2	CC.. 06 02..	4	Yes	5600	0.143
CTM 32-4-K20-CC08	32.00	-	15.00	14.00	20.00	68.00	93.00	42.00	2	CC.. 08 03..	4	Yes	7200	0.178
CTM 40-4-K25-CC09	40.00	-	20.00	18.00	25.00	83.00	115.00	50.00	2	CC.. 09 T3..	4	Yes	8400	0.377
CTM 50-4-K32-CC12	50.00	-	26.00	22.00	32.00	89.00	125.00	60.00	2	CC.. 12 04..	4	Yes	9000	0.664

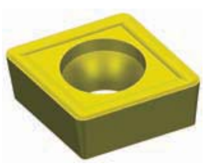
Spare parts

Insert style	Diameter D_c	Insert screw			Screw driver		Torque wrench		
		Reference	Size		Reference		Reference		Nm
CC.. 06 02..	25 mm	5513 020-56	M 2.5	1.2 N.m	PT-8006	8 IP	TDX 208PLUS	8 IP	1.2
CC.. 08 03..	32 mm	TORX-P-M3X8/9	M 3.0	1.2 N.m	PT-8003	9 IP	TDX 209PLUS	9 IP	1.4
CC.. 09 T3..	40 mm	TORX-P-M4X10/15A	M 4.0	3.0 N.m	TX 215PLUS	15 IP	TDX 215PLUS	15 IP	3.0
CC.. 12 04..	50 mm	TORX-P-M5X10/25	M 5.0	6.5 N.m	TX 225PLUS	25 IP	-	-	-

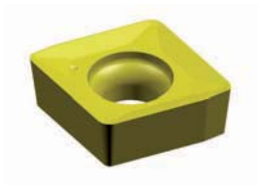
TE-SAF

T-Slot milling cutter

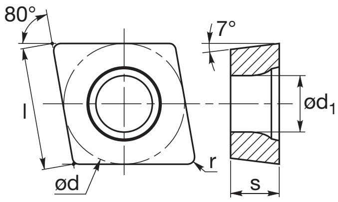
Insert program

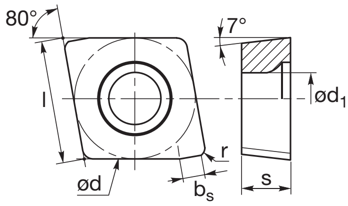


CCMT... FN/SN



CCMT... ER-21





Reference	Dimensions (mm)							Grades												
	d	s	d_1	l	r	b_s	t_1	1020	1120	1130	2003	5007	5020	5040	5050	5135	KX20	KX2	N	SY3
CCMT 06 02 04 SN	6.35	2.38	2.8	6.40	0.4	-	-	-	-	-	-	-	✓	-	✓	-	-	-	-	✓
CCMT 08 03 04 SN	7.94	3.18	3.4	8.10	0.4	-	-	-	-	-	-	-	✓	-	✓	-	-	-	-	✓
CCMT 08 03 08 FN	7.94	3.18	3.4	8.10	0.8	-	-	-	-	-	-	-	-	-	-	-	-	-	✓	-
CCMT 08 03 08 SN	7.94	3.18	3.4	8.10	0.8	-	-	-	-	-	-	-	✓	-	✓	-	-	-	-	✓
CCMT 08 03 PC ER-21	7.94	3.18	3.4	8.10	-	1.5	-	-	-	-	-	-	-	-	-	✓	-	-	-	-
CCMT 09 T3 08 SN	9.52	3.97	4.4	9.70	0.8	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-
CCMT 12 04 08-PM5	12.70	4.76	5.5	12.90	0.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

✓Article which can be ordered

Ordering example: CCMT 08 03 04 SN 5020

Cutting conditions

Grade	Feed per tooth (mm)	P Steel				M Stainless steel			K Cast iron				N Non-ferrous aluminum				S Super alloys			H Hardened materials			
		Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
5020	v_{c1}	351	316	241	147	213	195	139	257	238	209	182	1050	650	480	600	70	60	50	40	45	40	35
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	v_{c2}	304	275	208	129	196	181	130	239	217	184	154	1002	578	450	564	64	54	47	37	42	37	32
	f_{z2}	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
5050	v_{c1}	259	229	161	95	136	88	74	-	-	-	-	-	-	-	-	53	43	35	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	0.05	0.05	0.05	-	-	-	-
	v_{c2}	234	206	142	81	123	81	70	-	-	-	-	-	-	-	-	46	36	32	-	-	-	-
	f_{z2}	0.12	0.12	0.12	0.12	0.12	0.12	0.12	-	-	-	-	-	-	-	-	0.12	0.12	0.08	-	-	-	-
5135	v_{c1}	263	238	163	94	142	116	84	-	-	-	-	-	-	-	-	55	45	37	-	-	-	-
	f_{z1}	0.08	0.08	0.08	0.08	0.08	0.08	0.08	-	-	-	-	-	-	-	-	0.08	0.08	0.08	-	-	-	-
	v_{c2}	231	210	144	83	118	84	76	-	-	-	-	-	-	-	-	49	39	33	-	-	-	-
	f_{z2}	0.15	0.15	0.15	0.15	0.12	0.12	0.12	-	-	-	-	-	-	-	-	0.15	0.15	0.12	-	-	-	-
N	v_{c1}	-	-	-	-	-	-	-	135	111	85	77	840	470	430	480	43	37	33	-	-	-	-
	f_{z1}	-	-	-	-	-	-	-	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	-	-	-	-
	v_{c2}	-	-	-	-	-	-	-	126	103	79	73	800	450	400	460	42	36	32	-	-	-	-
	f_{z2}	-	-	-	-	-	-	-	0.12	0.12	0.12	0.12	0.10	0.10	0.10	0.10	0.10	0.10	0.10	-	-	-	-
SY3	v_{c1}	216	166	126	65	105	80	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z1}	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	v_{c2}	204	154	114	59	102	77	61	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	f_{z2}	0.12	0.12	0.12	0.12	0.08	0.08	0.08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

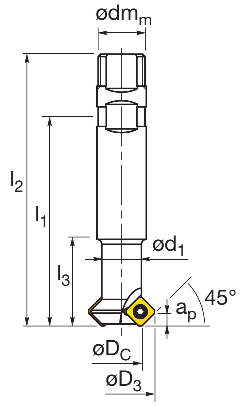
The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

MILLING

GR-SAF

Chamfering cutter 45°

Cutter program, CHM



Reference	Dimensions (mm)								Z	Insert style	Nb of inserts	Coolant channels	Max. RPM	kg
	D_c	D_3	d_1	Max. a_p	dm_m	l_1	l_2	l_3						
CHM 16-2K20-SSD09	16.00	26.20	16.00	5.00	20.00	85.00	110.00	35.00	2	SD.. 09 03 AE..	2	No	12500	0.230
CHM 25-2K25-SSD09	25.00	35.20	22.00	5.00	25.00	98.00	130.00	40.00	2	SD.. 09 03 AE..	2	No	10000	0.460

Spare parts

Insert style	Diameter D_c	Insert screw			Screw driver		Torque wrench		
		Reference	Size		Reference		Reference		Nm
SD.. 09 03 AE..	16 - 25 mm	DVF 0981	M 3.5	2.4 N.m	PT-8007	10 IP	TDX 210PLUS	10 IP	2.0

MILLING

GR-SAF

Chamfering cutter 45°

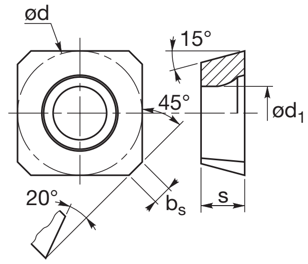
Insert program

SDKW... FN-1R

SDWK... TN-4R

SDKT... EN-41

SDMT... SN-31



Reference	Dimensions (mm)							Grades												
	d	s	d_1	l	r	b_s	t_1	1020	1120	1130	2003	5007	5020	5040	5050	5135	KX20	KX2	N	SY3
SDKW 09 03 AE FN-1R	9.52	3.18	3.8	-	-	1.4	-	-	-	-	-	-	✓	-	-	-	-	-	-	-
SDKW 09 03 AE TN-4R	9.52	3.18	3.8	-	-	1.4	-	-	-	-	-	-	✓	-	-	-	-	-	-	-
SDKT 09 03 AE EN-41	9.52	3.18	3.8	-	-	1.4	-	-	-	-	-	-	-	-	-	✓	-	-	-	-
SDMT 09 03 AE EN-41	9.52	3.18	3.8	-	-	1.4	-	-	-	-	-	-	-	-	-	✓	-	-	-	-
SDMT 09 03 AE SN-31	9.52	3.18	3.8	-	-	1.4	-	-	-	-	-	-	✓	-	-	-	-	-	-	-

✓Article which can be ordered

Ordering example: SDKW 09 03 AE FN-1R 5020

Cutting conditions

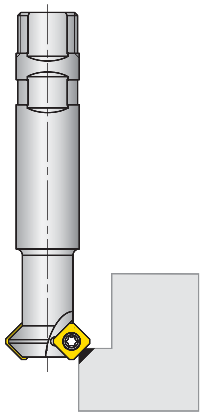
Grade	Feed per tooth (mm)	P Steel				M Stainless steel			K Cast iron				N Non-ferrous aluminum				S Super alloys			H Hardened materials			
		Free machining and low carbon (120-170 HB)	Medium and high carbon (180-220 HB)	Alloy and easy to machine tool steels (200-240 HB)	Tool and die steels (220-260 HB)	Ferritic and martensitic (180-240 HB)	Austenitic (140-180 HB)	Ph and duplex (220-260 HB)	Gray cast iron (180-220 HB)	Gray cast iron (220-260 HB)	Ductile iron (180-220 HB)	Ductile iron (220-260 HB)	Aluminum < 7% Si (<100 HB)	Aluminum 7% - 12% Si (<100 HB)	Aluminum > 12% Si (<130 HB)	Non-ferrous (<100 HB)	Iron based alloys (200-300 HB)	Nickel and cobalt base alloys, hastelloy, inconel, stellite (135-425 HB)	Titanium alloys 6AL-V4 (110-450 HB)	Case hardened carbon steels (50Rc - 62Rc)	Case hardened alloy steels (40Rc - 50Rc)	Hardened tools steels (45Rc - 62Rc)	Hardened irons (400 BHN)
5020	v_{c1}	331	298	227	139	206	189	135	249	229	198	170	1002	578	450	564	64	54	47	37	42	37	32
	f_{z1}	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
	v_{c2}	251	228	171	109	176	165	119	219	194	155	121	890	410	380	480	50	40	40	30	35	30	25
	f_{z2}	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
5135	v_{c1}	263	238	163	94	142	116	84	-	-	-	-	-	-	-	-	55	45	37	-	-	-	-
	f_{z1}	0.08	0.08	0.08	0.08	0.08	0.08	0.08	-	-	-	-	-	-	-	-	0.08	0.08	0.08	-	-	-	-
	v_{c2}	209	190	131	75	100	60	70	-	-	-	-	-	-	-	-	44	34	30	-	-	-	-
	f_{z2}	0.20	0.20	0.20	0.20	0.15	0.15	0.15	-	-	-	-	-	-	-	-	0.20	0.20	0.15	-	-	-	-

The cutting speed (v_c) and the feed per tooth values have to be optimized depending on specific machined material.

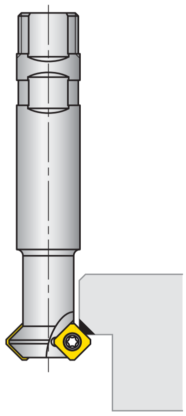
MILLING

GR-SAF
Milling cutter characteristics

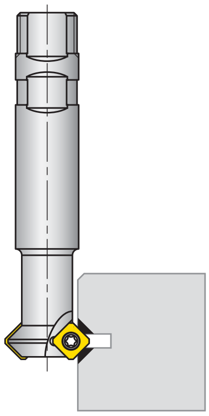
Applications



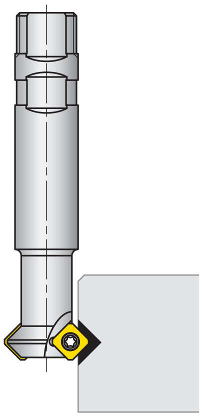
Front chamfer



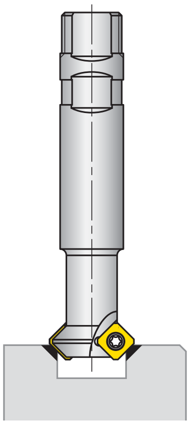
Back chamfer



Front and back chamfer simultaneously



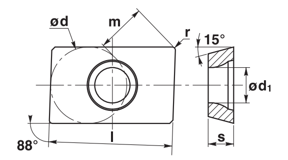
Slotting in solid material



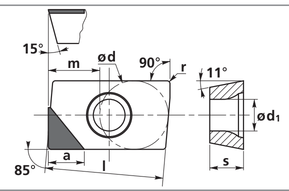
Chamfers on slot

COMPLEMENTARY INSERTS

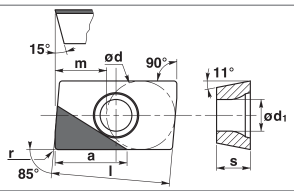
Reference	KX20	5005	5020	5040	5050	8030	5135	H10	H15S	H15TF	KX2	N	S4	SY3	NTB10	D728	PC50	l	d	s	d_1	m	m_1	r
ADMX / ADFX / ADKT... inserts																								
ADMX 15 03 08 ER	-	-	✓	-	-	-	✓	-	-	-	✓	-	-	✓	-	-	-	15	9,525	3,18	4,4	5,75	-	0,8
ADFX 15 03 08 FR-JP	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	15	9,525	3,18	4,4	5,75	-	0,8
ADMX 15 03 08 ER-21	-	-	✓	✓	✓	-	✓	-	-	-	-	-	-	✓	-	-	-	15	9,525	3,18	4,4	5,75	-	0,8
ADKT 15 05 PD ER-71	-	-	✓	✓	-	-	✓	-	-	-	-	-	-	-	-	-	-	15	9,525	5.56	4,4	6.253	-	0,8



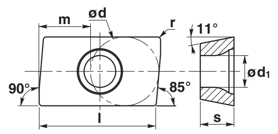
Reference	KX20	5005	5020	5040	5050	8030	5135	H10	H15S	H15TF	KX2	N	S4	SY3	NTB10	D728	PC50	l	d	s	d_1	m	a	r
APEW... inserts																								
APEW 16 04 04 FR-30-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	✓	16.45	9.525	4.76	4.4	7.163	3	0.4
APEW 16 04 WP FR-50-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	✓	16.45	9.525	4.76	4.4	7.183	5	0.4



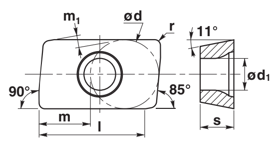
Reference	KX20	5005	5020	5040	5050	8030	5135	H10	H15S	H15TF	KX2	N	S4	SY3	NTB10	D728	PC50	l	d	s	d_1	m	a	r
APEW 16 04 04 T33R-100-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	✓	16.45	9.525	4.76	4.4	7.163	10	0.4



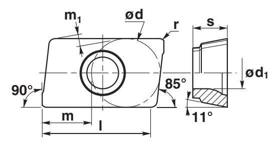
Reference	KX20	5005	5020	5040	5050	8030	5135	H10	H15S	H15TF	KX2	N	S4	SY3	NTB10	D728	PC50	l	d	s	d_1	m	m_1	r
AP... inserts																								
APFW 16 04 PD ER	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16	9,525	4.76	4,4	7.163	-	0,8
APFW 16 04 PD FR	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	16	9,525	4.76	4,4	7.163	-	0,8
APMW 16 04 PD ER	-	-	✓	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	16	9,525	4.76	4,4	7.163	-	0,8
APMW 16 04 PD TR	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	16	9,525	4.76	4,4	7.163	-	0,8
APFT 16 04 PD FR-JP	✓	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	16	9,525	4.76	4,4	7.163	-	0,8
APFT 16 04 PD SR-JP	-	-	✓	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	16	9,525	4.76	4,4	7.163	-	0,8
APMT 16 04 PD FR-JP	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	16	9,525	4.76	4,4	7.163	-	0,8
APMT 16 04 PD SR-JP	✓	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	16	9,525	4.76	4,4	7.163	-	0,8
APMT 16 04 PD ER-21	-	-	✓	✓	-	✓	✓	-	-	-	-	-	-	✓	-	-	-	16	9,525	4.76	4,4	7.163	-	0,8
APMT 16 04 24 ER-21	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	16	9,525	4.76	4,4	7.095	-	2.4
APGT 16 04 PD ER-81	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16	9,525	4.76	4,4	7.163	-	0,8
APMT 16 04 PD SR-81	-	-	✓	✓	✓	✓	✓	-	-	-	-	-	-	-	-	-	-	16	9,525	4.76	4,4	7.163	-	0,8



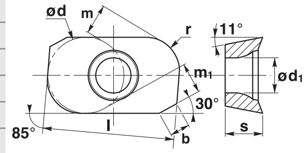
Reference	KX20	5005	5020	5040	5050	8030	5135	H10	H15S	H15TF	KX2	N	S4	SY3	NTB10	D728	PC50	l	d	s	d_1	m	m_1	r
APMT 16 04 PD ER-41	-	-	✓	✓	✓	✓	✓	-	-	-	-	-	-	-	-	-	-	14.8	9.525	4.76	4.7	7.18	1.596	0.8



Reference	KX20	5005	5020	5040	5050	8030	5135	H10	H15S	H15TF	KX2	N	S4	SY3	NTB10	D728	PC50	l	d	s	d_1	m	m_1	r
APMT 16 04 PD ER-71	✓	-	✓	✓	-	✓	✓	-	-	-	-	-	-	-	-	-	-	15.1	9.525	4.76	4.4	7.747	1.596	0.8



Reference	KX20	5005	5020	5040	5050	8030	5135	H10	H15S	H15TF	KX2	N	S4	SY3	NTB10	D728	PC50	l	d	s	d_1	m	m_1	r
APGT 16 04 40 ER-81	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16.45	9.525	4.76	4.4	3.93	3.797	4.0

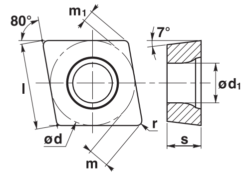


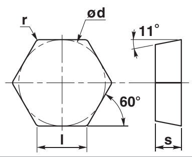
Ordering example: ADMX 15 03 08 ER 5020

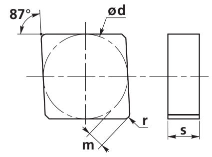
COMPLEMENTARY INSERTS

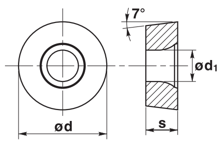
Reference	KX20	5005	5020	5040	5050	8030	5135	H10	H15S	H15TF	KX2	N	S4	SY3	NTB10	D728	PC50	l	d	s	d_1	m	m_1	r
CCMW... inserts																		l	d	s	d_1	m	m_1	r
CCMW 08 03 08 EN	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.1	7.94	3.18	3.4	1.765	0.970	0.8
HPEN... inserts																		l	d	s	d_1	m	m_1	r
HPEN 09 04 08 EN	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	9.15	15.875	4.76	-	-	-	0.8
HPEN 09 04 08 FN	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.15	15.875	4.76	-	-	-	0.8
MNUX... inserts																		l	d	s	d_1	m	m_1	r
MNUX 12 04 08	-	-	-	-	-	-	-	-	✓	-	-	-	-	✓	-	-	-	-	12.7	4.76	-	2.512	-	0.8
MNUX 12 04 08 R-BC	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	12.7	4.76	-	2.512	-	0.8
RCMT / RCMW... inserts																		l	d	s	d_1	m	m_1	r
RCMT 20 06 MO SN-21	-	-	✓	-	-	✓	✓	-	-	-	-	-	-	✓	-	-	-	-	20	6.35	6.5	-	-	-
RCMT 12 04 MO SN-33	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	12	4.76	4.4	-	-	-
RCMT 20 06 MO SN-33	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	20	6.35	6.5	-	-	-
RCMW 20 06 MO	-	-	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	20	6.35	6.5	-	-	-
RCMW 20 06 MO SN	-	-	-	✓	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	20	6.35	6.5	-	-	-
RPMT / RPMW... inserts																		l	d	s	d_1	m	m_1	r
RPMT 12 04 M0-21	✓	-	✓	✓	✓	-	✓	-	-	-	-	-	-	-	-	-	-	-	12	4.76	4.4	-	-	-
RPMW 12 03 MO	-	-	✓	-	-	-	✓	-	-	-	-	-	-	✓	-	-	-	-	12	4.76	4.4	-	-	-
RPMW 12 04 MO	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	4.76	4.4	-	-	-
RPMW 12 04 MO SN	-	-	-	-	-		✓	-	-	-	-	-	-	-	-	-	-	-	12	4.76	4.4	-	-	-
Inserts for ORBI-SAF... milling cutters																		l	d	s	d_1	m	m_1	r
RT 16 06 08 FR-11	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	18.0	9.3	6.40	4.7	9.55	-	0.8
Inserts for CT-SAF... milling cutters																		l	d	s	d_1	m	m_1	r
RT 16 04 30 ERC-31	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.3	9.52	4.76	4.7	6.8	-	3.0
RT 16 04 40 ERC-31	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.9	9.52	4.76	4.4	3.9	-	4.0
SCMT... inserts																		l	d	s	d_1	m	m_1	r
SCMT 09 T3 08-2R	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.52	3.97	4.4	1.644	-	0.8
SCMT 12 04 08-33	-	-	✓	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	12.7	4.76	5.5	2.301	-	0.8
Inserts for CHM... milling cutters																		l	d	s	d_1	m	m_1	r
SDMT 09 03 08 EN-21	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	9.52	3.18	3.8	1.64	-	0.8

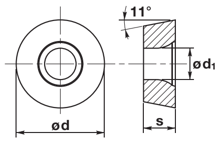
Grades / Dimensions (mm)

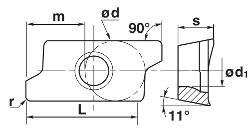


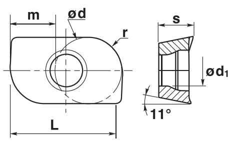


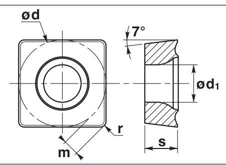


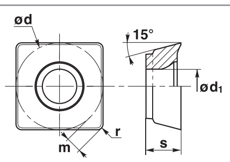










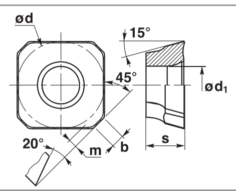


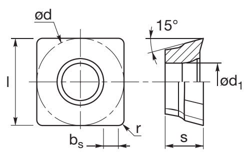
Ordering example: CCMW 08 03 08 EN 5020

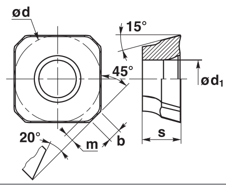
MILLING

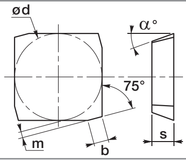
COMPLEMENTARY INSERTS

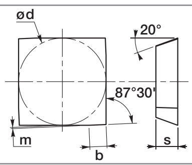
Reference	KX20	5005	5020	5040	5050	8030	5135	H10	H15S	H15TF	KX2	N	S4	SY3	NTB10	D728	PC50	l	d	s	d_1	m	b	r
Inserts for GQ-SAF... milling cutters																		l	d	s	d_1	m	b	r
SDKT 09 T3 AE FN-11	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.916	3.97	3.8	1.219	1.44	-
SDMT 09 T3 AE EN-21	-	-	✓	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	9.95	3.97	3.8	1.225	1.6	-
SDKT 09 T3 AE SN-41	-	-	✓	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	9.95	3.97	3.8	1.225	1.4	-
SDMT 09 T3 AE SN-81	-	-	✓	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	9.95	3.97	3.8	1.225	1.0	-
																		l	d	s	d_1	m	b_s	r
SDMT 09 T3 PD ER-21	-	-	✓	-	-	-	✓	-	-	-	-	✓	-	-	-	-	-	-	9.95	3.97	3.8	1.703	2.3	0.8
SDKT 09 T3 PD SR-41	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.95	3.97	3.8	1.703	2.3	0.8
SDMT 09 T3 PD SR-81	-	-	✓	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	9.95	3.97	3.8	1.703	2.3	0.8
Inserts for QUADRI-SAF... milling cutters																		l	d	s	d_1	m	b	r
SDKT 12 05 AE FN-11	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.67	5.5	5.5	1.42	2.2	-
SDMT 15 06 AE SN-91	-	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	15.875	6.35	5.5	2	2.57	-
SECN... inserts																		l	d	s	d_1	m	α	b
SECN 12 03 EE L	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	12.7	3.18	-	0.8	20°	2.5
SECX... inserts																		l	d	s	d_1	m	b	r
SECX 12 03 FE R	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	12.7	3.18	-	0.147	2.5	-
SEKN / SEKR... inserts																		l	d	s	d_1	m	α	b
SEKN 12 03 AF EN-1R	-	-	✓	-	-	-	✓	-	-	-	-	-	-	✓	-	-	-	-	12.7	3.18	-	1.4	27°	1.8
SEKN 12 03 AF FN-1R	✓	-	✓	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	12.7	3.18	-	1.4	27°	1.8
SEKN 12 03 AF TN-4R	-	-	✓	✓	-	-	✓	-	-	-	-	-	-	✓	✓	-	-	-	12.7	3.18	-	1.4	27°	1.8
SEKN 12 04 AZ EN-1C	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.7	4.76	-	1.63	27°	2
SEKN 12 04 AZ SN-3C	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	12.7	4.76	-	1.63	27°	2
SEKR 12 03 AF EN-41	✓	-	✓	✓	✓	-	✓	-	-	-	-	-	-	-	-	-	-	-	12.7	3.18	-	1.43	25°	1.99
SEKR 12 03 AF SN-41	-	-	✓	✓	✓	-	✓	-	-	-	-	-	-	-	-	-	-	-	12.7	3.18	-	1.43	25°	1.99
SEKR 12 04 AZ EN-41	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	12.7	3.18	-	1.43	25°	1.99
SEKT / SEMT / SEKW... inserts																		l	d	s	d_1	m	b	r
SEKT 14 04 AF EN-41	-	-	✓	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	12.7	4.76	5.5	1.7	2.2	-
SEMT 14 04 AF EN-41	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	12.7	4.76	5.5	1.7	2.2	-
SEMT 14 04 AF EN-21	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	12.7	4.76	5.5	1.7	1.7	-
SEKW 14 04 AF FN-1R	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	4.76	5.5	1.7	2.2	-
SEKW 14 04 AF SN-4R	-	-	✓	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	14	4.76	5.5	1.7	2.2	-
SEKW 14 04 AF TN-4R	-	-	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	14	4.76	5.5	1.7	2.2	-

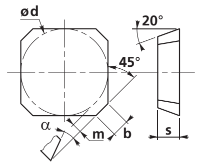


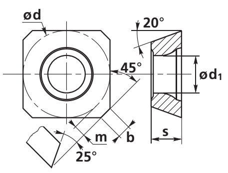












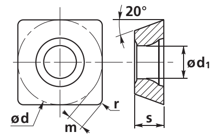
Ordering example: SDKT 09 T3 AE FN-11 KX20

MILLING

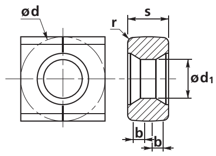
COMPLEMENTARY INSERTS

Grades / Dimensions (mm)

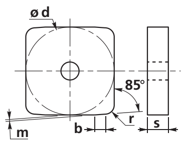
Reference	KX20	5005	5020	5040	5050	8030	5135	H10	H15S	H15TF	KX2	N	S4	SY3	NTB10	D728	PC50	l	d	s	d_1	m	b	r
SEMW... inserts																								
SEMW 14 04 12 TN	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	4.76	5.5	2.402	-	1.2



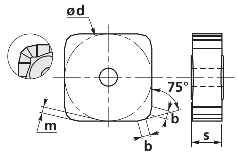
Reference	KX20	5005	5020	5040	5050	8030	5135	H10	H15S	H15TF	KX2	N	S4	SY3	NTB10	D728	PC50	l	d	s	d_1	m	b	r
SNBQ... inserts																								
SNBQ 09 50 WI EN-T	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	5	4.4	-	1.2	0.8



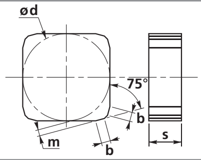
Reference	KX20	5005	5020	5040	5050	8030	5135	H10	H15S	H15TF	KX2	N	S4	SY3	NTB10	D728	PC50	l	d	s	d_1	m	b	r
Inserts for NN85... milling cutters																								
SNHF 12 04 FN EN-11	-	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.7	4.76	-	0.261	2.0	1.2
SNHF 12 04 FN EN-41	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.7	4.76	-	0.261	2.0	1.2



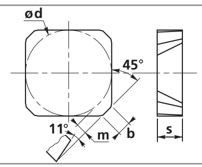
Reference	KX20	5005	5020	5040	5050	8030	5135	H10	H15S	H15TF	KX2	N	S4	SY3	NTB10	D728	PC50	l	d	s	d_1	m	b	r
SNKF... inserts																								
SNKF 12 04 EN EN-51	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.7	4.76	-	0.8	1.3	-



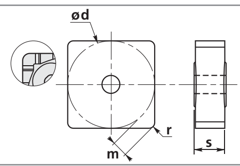
Reference	KX20	5005	5020	5040	5050	8030	5135	H10	H15S	H15TF	KX2	N	S4	SY3	NTB10	D728	PC50	l	d	s	d_1	m	b	r
SNKN... inserts																								
SNKN 12 04 EN	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.7	4.76	-	0.8	1.4	-



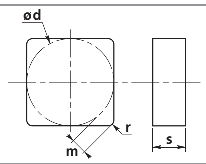
Reference	KX20	5005	5020	5040	5050	8030	5135	H10	H15S	H15TF	KX2	N	S4	SY3	NTB10	D728	PC50	l	d	s	d_1	m	b	r
SNKN 19 05 AP	-	-	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	19.05	5.56	-	2.4	2.4	-



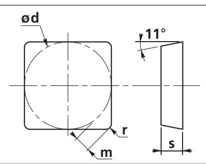
Reference	KX20	5005	5020	5040	5050	8030	5135	H10	H15S	H15TF	KX2	N	S4	SY3	NTB10	D728	PC50	l	d	s	d_1	m	b	r
SNNF... inserts																								
SNNF 12 04 16 EN-51	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.7	4.76	-	1.972	-	1.6



Reference	KX20	5005	5020	5040	5050	8030	5135	H10	H15S	H15TF	KX2	N	S4	SY3	NTB10	D728	PC50	l	d	s	d_1	m	b	r
SNNN... inserts																								
SNNN 12 04 08	-	-	-	-	-	-	-	-	✓	-	-	-	-	✓	-	-	-	-	12.7	4.76	-	2.301	-	0.8



Reference	KX20	5005	5020	5040	5050	8030	5135	H10	H15S	H15TF	KX2	N	S4	SY3	NTB10	D728	PC50	l	d	s	d_1	m	b	r
SPEN / SPNN... inserts																								
SPEN 12 04 08	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.7	4.76	-	2.301	-	0.8
SPNN 09 03 08	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.525	3.18	-	1.644	-	0.8
SPNN 12 03 08	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.7	3.18	-	2.301	-	0.8
SPNN 12 04 08	-	-	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	12.7	4.76	-	2.301	-	0.8

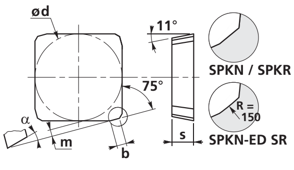


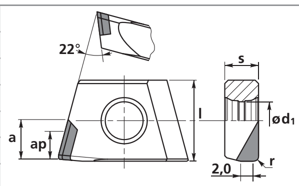
Ordering example: SEMW 14 04 12 TN 5020

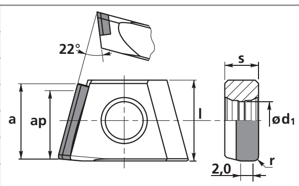
MILLING

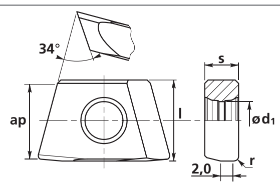
COMPLEMENTARY INSERTS

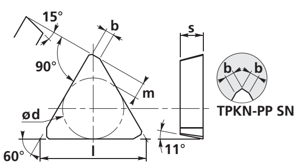
Reference	KX20	5005	5020	5040	5050	8030	5135	H10	H15S	H15TF	KX2	N	S4	SY3	NTB10	D728	PC50	Dimensions (mm)						
SPKN / SPKR... inserts																		l	d	s	d_1	m	α	b
SPKN 12 03 ED FR-1C	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	12.7	3.18	-	0.890	15°	1.4
SPKN 12 03 ED SR-2C	-	-	✓	-	-	-	✓	-	-	-	-	-	-	✓	-	-	-	-	12.7	3.18	-	0.890	15°	1.4
SPKN 12 03 ED SR-3R	-	-	✓	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	12.7	3.18	-	0.890	15°	1.4
SPKN 12 04 EP SR-3R	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.7	4.76	-	0.90	11°	1.4
SPKN 15 04 ED SR-3R	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.875	4.76	-	1.246	15°	1.4
SPKR 12 03 ED ER-41	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	12.7	3.18	-	0.872	15°	1.4
Inserts for GVT-SAF... milling cutters																		l	d	s	d_1	a	a_p	r
TM A 04 W1 F	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	✓	-	12	-	5	5.9	6	4	0.8
																		l	d	s	d_1	a	a_p	r
TM A 10 W2 E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	✓	-	12	-	5	5.9	11.5	10	0.8
																		l	d	s	d_1	a	a_p	r
TM A 12 W1 F	-	-	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	12	-	5	5.9	-	12	0.8
TPKN / TPKR... inserts																		l	d	s	d_1	m	b	r
TPKN 16 03 PD SR-2C	-	-	✓	-	-	-	✓	-	-	-	-	-	-	✓	-	-	-	16.5	9.525	3.18	-	2.45	1.4	-
TPKN 16 03 PD SR-3R	-	-	✓	-	-	-	✓	-	-	-	-	-	-	✓	-	-	-	16.5	9.525	3.18	-	2.45	1.4	-
TPKN 16 03 PP SN-2C	-	-	✓	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16.5	9.525	3.18	-	2.45	1.4	-
TPKN 22 04 PD SR-2C	-	-	-	✓	✓	-	✓	-	-	-	-	-	-	✓	-	-	-	22	12.7	4.76	-	3.55	1.4	-
TPKN 22 04 PD SR-3R	-	-	✓	-	-	-	✓	-	-	-	-	-	✓	-	-	-	-	22	12.7	4.76	-	3.55	1.4	-
TPKR 16 03 PD ER-41	-	-	✓	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	16.5	9.525	3.18	-	2.45	1.09	-
TPKR 22 04 PD ER-41	-	-	✓	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	22	12.7	4.76	-	3.55	1.13	-
TPKR 22 04 PD R	-	-	-	-	-	-	-	✓	-	-	-	-	-	-	-	-	-	22	12.7	4.76	-	3.55	1.4	-
TPUN... inserts																		l	d	s	d_1	m	b	r
TPUN 16 03 08	-	-	✓	-	-	-	✓	-	-	-	-	-	-	✓	-	-	-	16.5	9.525	3.18	-	13.494	0.8	-
TPUN 22 04 12	-	-	-	-	-	-	-	-	-	-	-	-	-	✓	-	-	-	22	12.7	4.76	-	17.859	1.2	-

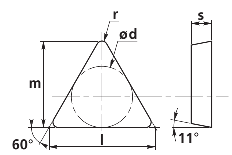








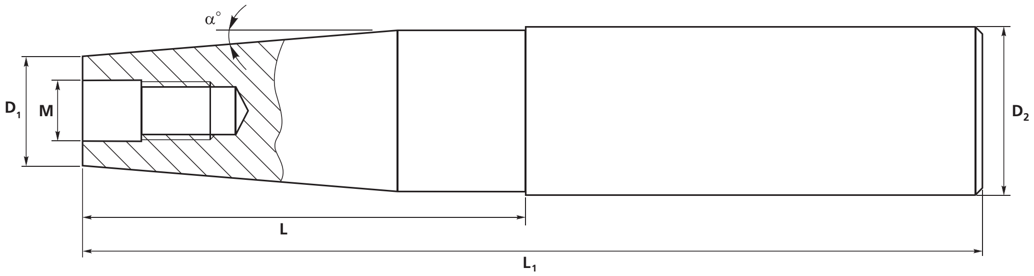




Ordering example: SPKN 12 03 ED FR-1C H15S

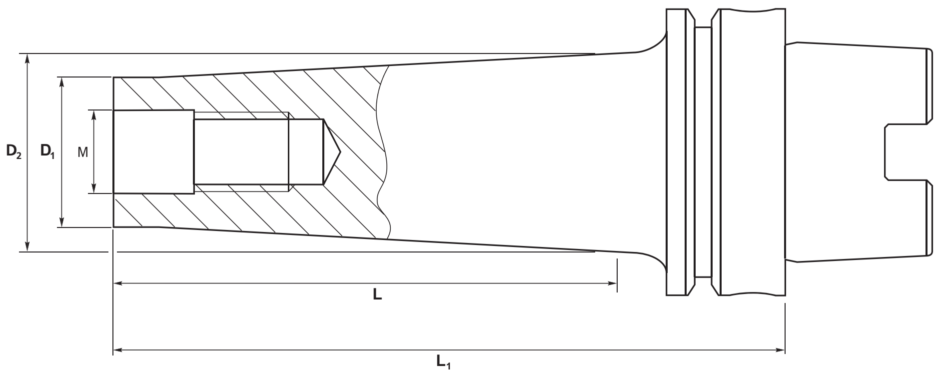
MODULAR SHANKS

Cylindrical Carbide Shank



Reference	M	D_1	D_2	L	L_1	α°
MP08 12A100 C16X148	M8	13.6	16.0	100	148	0.54
MP10 15A100 C20X170	M10	15.4	20.0	120	170	0.96
MP12 21A150 C25X206	M12	21.0	25.0	150	206	0.65

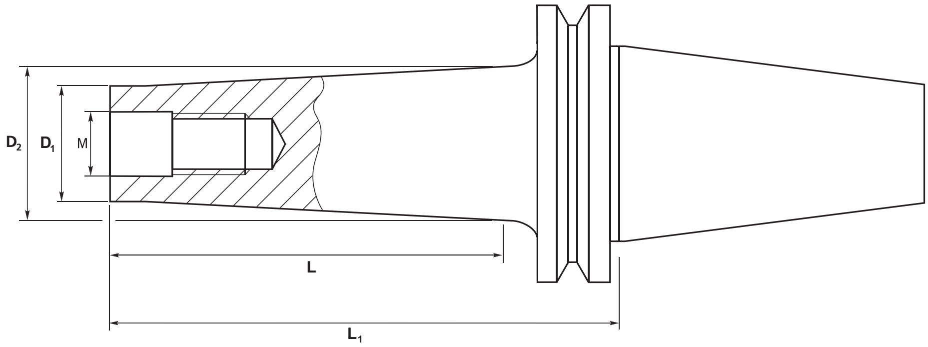
HSK 63A



Reference	M	D_1	D_2	L	L_1
MP08 12A100 HS6X134	M8	12.5	25	100	134
MP10 15A100 HS6X134	M10	15.4	32	100	134
MP10 18A100 HS6X134	M10	18	32	100	134
MP12 21A100 HS6X134	M12	21	36	100	134
MP16 29A050 HS6X084	M16	29	29	50	84
MP16 29A100 HS6X134	M16	29	42	100	132

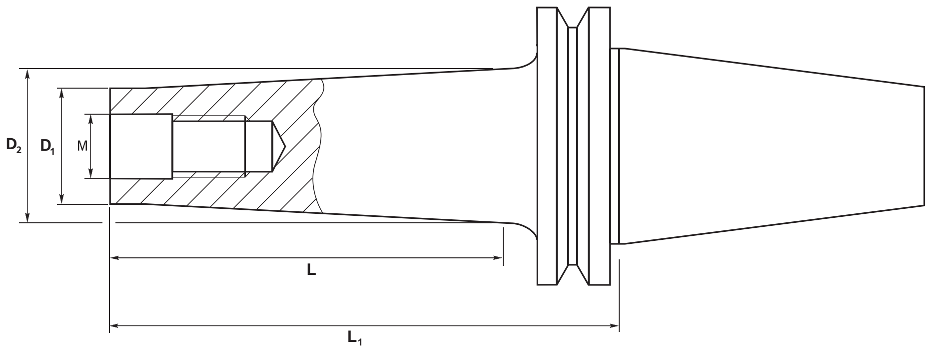
MODULAR SHANKS

ISO40



Reference	M	D_1	D_2	L	L_1
MP08 12A100 IS4X134	M8	12.5	25	100	134.1
MP10 15A100 IS4X134	M10	15.4	32	100	134.1
MP10 18A100 IS4X134	M10	18	32	100	127.1
MP12 21A100 IS4X134	M12	21	36	100	127.1
MP16 29A050 IS4X084	M16	29	29	50	77.1
MP16 29A100 IS4X137	M16	29	42	100	127.1

ISO50

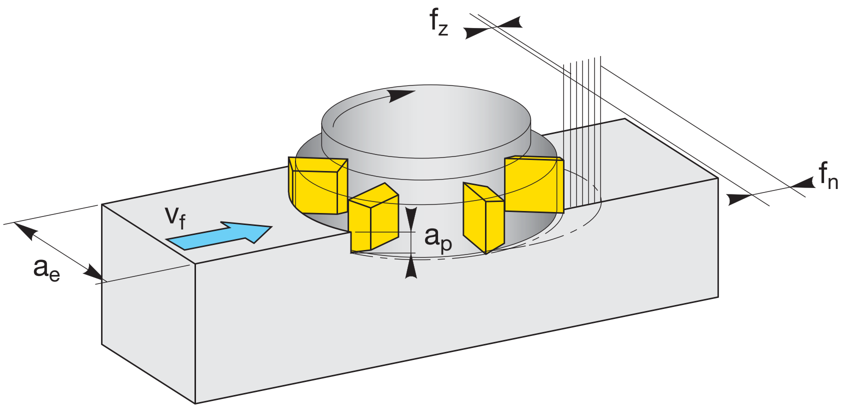


Reference	M	D_1	D_2	L	L_1
MP08 12A100 IS5X137	M8	12.5	25	100	127.1
MP10 15A100 IS5X137	M10	15.4	32	100	127.1
MP10 18A100 IS5X137	M10	18	32	100	127.1
MP12 21A100 IS5X137	M12	21	36	100	137.1
MP16 29A050 IS5X087	M16	29	34	50	87.1
MP16 29A100 IS5X137	M16	29	41	100	137.1

INSERT SCREWS FOR MILLING CUTTERS

Reference	Old reference	Size	Lenght			Screwdriver	Insert	Family
28349	-	M 5.0	13.00	T20	5.0 N.m	DMP 2099	ZP 3200..	SR-SAF
416.1-833	DVF 2394	M 3.5	9.40	10 IP	2.0 N.m	PT-8007	ZP 2000..	SR-SAF
							DCMW 11 T3..	SR-SAF
416.1-834	DVF 2396	M 4.0	11.00	15 IP	3.0 N.m	DMP 3125	RT 16 04..	CT-SAF
							ZP 2500..	SR-SAF
5513 020-02	DVF 3468	M 4.0	8.50	15 IP	3.0 N.m	DMP 3125	RT 16 06..	ORBI-SAF
5513 020-07	DVF 3133	M 5.0	10.85	20 IP	5.0 N.m	DMP 3662	ZP 3000..	SR-SAF
5513 020-09	DVF 0089	M 3.5	8.10	15 IP	3.0 N.m	DMP 3125	APMW 16 04..	SR-SAF
						TX 215PLUS	DAN 2391 (shim)	SR-SAF
5513 020-10	DVF 0088	M 3.5	10.10	15 IP	3.0 N.m	TX 215PLUS	PG 16 04..	PLUNG-SAF
5513 020-19	-	M 2.2	6.40	7 IP	0.8 N.m	PT-8001	WN.. 04 T3..	COMPACT 90
5513 020-27	DVF 1642	M 2.0	4.95	6 IP	0.6 N.m	PT-8000	EN.. 04 02..	COMPACT 90
5513 020-28	DVF 2655	M 2.0	4.25	6 IP	0.6 N.m	PT-8000	RT 07 02..	ORBI-SAF
							ZP 1000..	SR-SAF
5513 020-31	DVF 2193	M 6.0	15.25	25 IP	7.5 N.m	DMP 3139	RC.. 20 06..	RD-SAF
							ZP 4000..	SR-SAF
5513 020-32	-	M 3.5	10.00	15 IP	3.0 N.m	DMP 3125	RC.. 12 04..	RD-SAF
5513 020-35	DVF 3509	M 2.5	7.30	8 IP	1.2 N.m	PT-8006	RT 10 03..	CT-SAF
							RT 10 03/T3..	ORBI-SAF
							ZP 1600..	SR-SAF
5513 020-36	DVF 2564	M 2.5	5.95	8 IP	1.2 N.m	TX 208PLUS	PG 10 03..	PLUNG-SAF
						PT-8006	ZP 1200..	SR-SAF
5513 020-40	DVF 2900	M 2.0	3.50	6 IP	0.6 N.m	PT-8000	RD.. 05 01..	TORO-SAF
5513 020-41	DVF 2833	M 2.2	4.70	7 IP	0.9 N.m	PT-8001	RD.. 07 T1..	TORO-SAF
5513 020-55	-	M 5.0	14.25	20 IP	5.0 N.m	DMP 3662	RC.. 16 06..	RD-SAF
5513 020-56	-	M 2.5	7.00	8 IP	1.2 N.m	PT-8006	CC.. 06 02..	TE-SAF
5513 020-57	-	M 3.0	8.20	9 IP	1.2 N.m	PT-8003	WN.. 06 04..	COMPACT 90
DVF 0943	-	M 3.0	8.50	9 IP	1.2 N.m	PT-8003	RT 13 04..	CT-SAF
							RT 13 04..	ORBI-SAF
						TX 209PLUS	PG 13 04..	PLUNG-SAF
DVF 0981	-	M 3.5	8.00	10 IP	2.0 N.m	PT-8007	SD.. 09 03 AE..	GR-SAF
DVF 2097	-	M 5.0	13.00	20 IP	5.0 N.m	DMP 3662	PD.. 09 05 AE…	PENTA 45
							PD.. 09 05 DE…	PENTA 60
							PD.. 09 05 ZE…	PENTA High Feed
							SD.. 12 05..	QUADRI SP
							OD/RD/SD.. 12 05..	QUADRI-SAF
							OD/RD/SD.. 15 06..	QUADRI-SAF
DVF 2259	-	M 4.0	10.00	15 IP	3.0 N.m	TX 215PLUS	DAN 4585 (shim)	PENTA Heavy Duty
DVF 2447	-	M 8.0	20.00	T30	18.0 N.m	DMP 2514	ZP 5000..	SR-SAF
DVF 2910	-	M 2.5	5.80	8 IP	1.2 N.m	PT-8006	RD.. 08 T2..	TORO-SAF
DVF 3020	-	M 5.0	10.40	20 IP	5.0 N.m	DMP 3662	RD.. 16 04..	TORO-SAF
DVF 3228	-	M 2.2	5.20	6 IP	0.6 N.m	TX 206PLUS	PPH..06..	ARAF
DVF 3429	-	M 3.0	7.80	8 IP	1.2 N.m	TX 208PLUS	PPH..10..	ARAF
DVF 3430	-	M 3.5	9.50	10 IP	2.0 N.m	TX 210PLUS	PPH..12..	ARAF
DVF 3431	-	M 4.0	13.30	15 IP	3.0 N.m	TX 215PLUS	PPH..16..	ARAF
DVF 3432	-	M 5.0	16.20	20 IP	5.0 N.m	TX 220PLUS	PPH..20..	ARAF
DVF 3433	-	M 6.0	20.00	25 IP	7.5 N.m	DMP 3139	PPH..25..	ARAF
DVF 3434	-	M 8.0	25.00	40 IP	26.0 N.m	DMP 3441	PPH..32..	ARAF
DVF 3503	-	M 3.5	6.70	15 IP	3.0 N.m	DMP 3125	RD.. 10 03..	TORO-SAF
DVF 3504	-	M 3.5	8.00	15 IP	3.0 N.m	DMP 3125	RD.. 12 T3..	TORO-SAF
DVF 3658	-	M 2.5	5.00	8 IP	1.2 N.m	PT-8006	RD.. 07 02..	TORO-SAF
DVF 3992	-	M 3.5	12.50	15 IP	3.0 N.m	TX 215PLUS	XPB 20..	SM-SAF
DVF 3993	-	M 4.0	14.00	15 IP	3.0 N.m	TX 215PLUS	XPB 25..	SM-SAF
DVF 3994	-	M 5.0	17.00	20 IP	5.0 N.m	TX 220PLUS	XPB 32..	SM-SAF
DVF 4207	-	M 4.0	16.00	15 IP	3.0 N.m	TX 215PLUS	HN.. 09 05..	FORCE-SAF
DVF 6240	-	M 2.5	6.25	7 IP	1.0 N.m	TX 207PLUS	PPH..08..	ARAF
DVF 6243	-	M 4.0	11.30	T15	3.0 N.m	TX 215	PPH..14..	ARAF
DVZ 3642	-	M 8.0	26.00	30 IP	18.0 N.m	DMP 3460	PN.. 13 08..	PENTA Heavy Duty
TORX-P-M3X8/9	M3 X 8/9	M 3.0	8.20	9 IP	1.2 N.m	PT-8003	CC.. 08 03..	TE-SAF
TORX-P-M4X10/15A	M4 X 10/15	M 4.0	10.00	15 IP	3.0 N.m	TX 215PLUS	CC.. 09 T3..	TE-SAF
TORX-P-M5X10/25	M5 X 10/25	M 5.0	10.00	25 IP	6.5 N.m	TX 225PLUS	CC.. 12 04..	TE-SAF

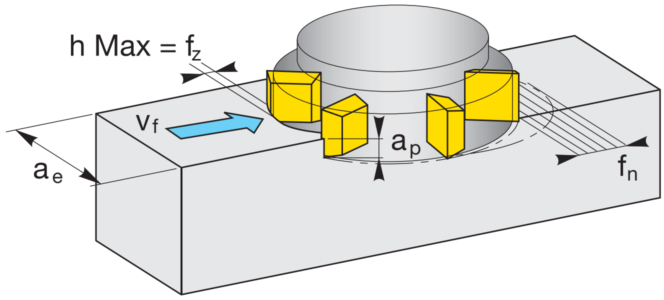
MILLING FORMULAE



Required parameters		Known parameters		Formulae
Cutting speed (m/min)	v_c	Milling cutter diameter (mm) Revolutions per minute	D n	$v_c = \frac{\pi . D . n}{1000}$
Revolutions per minute (rpm)	n	Cutting speed Milling cutter diameter	v_c D	$n = \frac{1000 . v_c}{\pi . D}$
Feed per revolution (mm)	f_n	Table feed Revolutions per minute or Tooth feed Number of teeth	v_f n f_z z	$f_n = \frac{v_f}{n}$ $f_n = z . f_z$
Table feed (mm/min)	v_f	Tooth feed Feed per revolution Revolutions per minute Number of teeth	f_z f_n n z	$v_f = f_z . z . n$ $v_f = f_n . n$
Tooth feed (mm)	f_z	Number of teeth Table feed Revolutions per minute or Number of teeth Feed per revolution	z v_f n z f_n	$f_z = \frac{v_f}{z . n}$ $f_z = \frac{f_n}{z}$
Metal removal rate (cm^3/min)	Q	Table feed Cutting width (infeed) Cutting depth	v_f a_e a_p	$Q = \frac{v_f . a_e . a_p}{1000}$
Milling cutter pitch (mm)	u	Milling cutter diameter Number of teeth	D z	$u = \frac{\pi . D}{z}$

MILLING

CHIP THICKNESS



Reminder of symbols used	
D	Cutter or insert diameter
a_e	Radial cutting depth (infeed)
a_p	Axial cutting depth
f_z	Tooth feed
h Max	Maximum chip thickness
h_m	Mean chip thickness
f_n	Feed per revolution

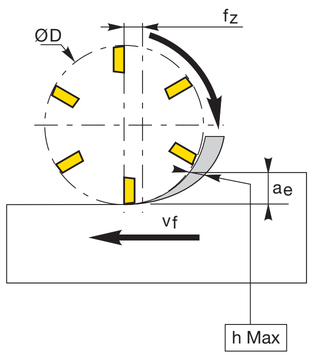
Note : Depending on the type of cutter, consider a_e or a_p

Chip production rate	
Q	Chip production rate (cm^3/min)
V_f	Table feed (mm/min)
a_p	Cutting depth (mm)
a_e	Cutting width (mm)
f_z	Tooth feed (mm)

$$Q = \frac{a_p \cdot a_e \cdot V_f}{1000}$$

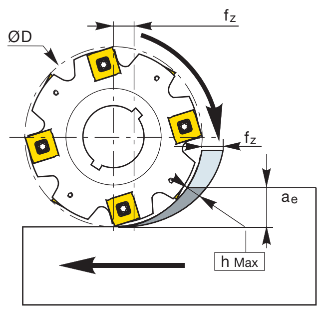
Chip thickness to program

For a 1 or 2 size cutter



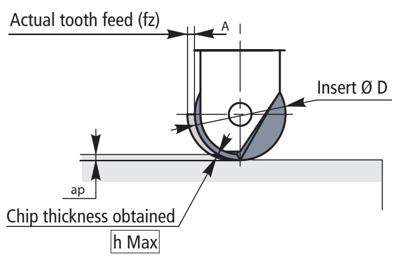
Example :
ØD = 60
a_e = 5
h Max required = 0.12
a_e/D = 0.08

For a 3 size cutter



Example :
ØD = 120
a_e = 10
h Max required = 0.12
a_e/D = 0.08

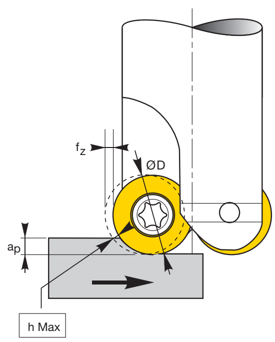
For a ball nose milling cutter



Example :
ØD = 12
a_e = 1
h Max required = 0.12
a_e/D = 0.08

Feed to be programmed based on the table on next page

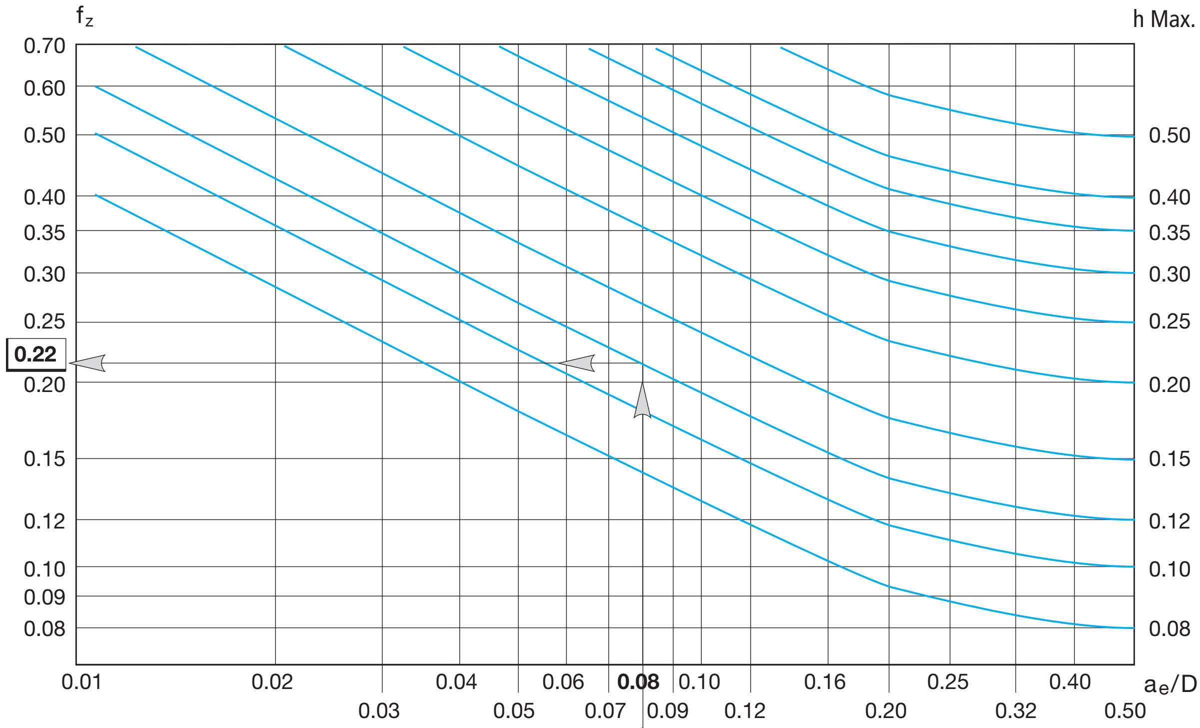
For a round cutter



Example :
ØD = 15
a_e = 1.2
h Max required = 0.12
a_e/D = 0.08

CHIP THICKNESS

Feed multiplicator factor



Example :
Cutter Ø = 120 mm
Number of teeth Z = 4
a_e = 10 mm
v_c = 130 m/min
f_z = 0.22 mm

a_e /D = 0.08 → Chip thickness required : h Max = 0.12 mm → Tooth feed to be programmed : f_z = 0.22

or

a_p /D = 0.08 : Example for hemispherical cutter with round inserts

Number of revolutions per minute : $n = \frac{1000 \times v_c}{\pi \times D}$ = 344 rpm → Table feed : $v_f = f_z \times z \times n$ = 303 mm/min

Chip thickness calculation

Maximum chip thickness

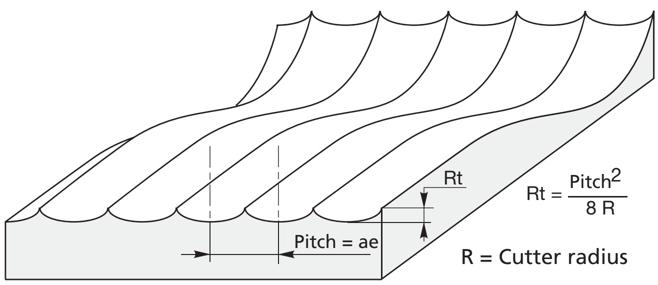
$$h\,Max = 2 f_z \sqrt{\frac{a_e}{D}\left(1 - \frac{a_e}{D}\right)} \qquad f_z = \frac{h\,Max}{2\sqrt{\frac{a_e}{D}\left(1 - \frac{a_e}{D}\right)}}$$

Average chip thickness

$$h_m = f_z \sqrt{\frac{a_e}{D}} \qquad f_z = \frac{h_m}{\sqrt{\frac{a_e}{D}}}$$

Profiling with a hemispherical cutter

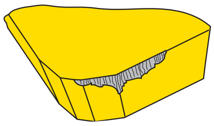
Roughness



Value of Rt as a function of the sweeping pitch

INSERT WEAR MECHANISM

Flank wear



Flank wear gives an indication of the insert life. When it becomes too high, cutting forces increase and the surface finish deteriorates.

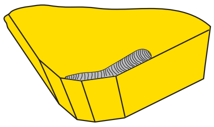
Causes :

- Cutting speed too high
- Feed too low
- Insert wear hardness too low

Solutions :

- Reduce cutting speed
- Increase feed
- Select a harder grade
- Select a coated grade

Crater wear



Crater wear is rare in milling.

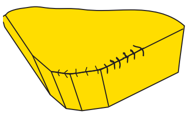
Causes :

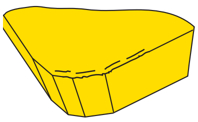
- Cutting speed too high
- Insert wear hardness too low

Solutions :

- Reduce cutting speed
- Select a harder grade
- Select a coated grade

Cracks





Mechanical shocks when the insert comes into contact with the material and variations in cutting forces can cause cracks parallel to the cutting edge. Thermal shocks cause cracks perpendicular to the cutting edge.

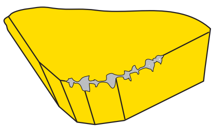
Causes :

- Crack wear caused by temperature variations
- Cracks caused by variation in cutting forces

Solutions :

- Select a tougher grade offering better resistance to thermal shocks
- Select a tougher grade offering better resistance to mechanical shocks

Cutting edges chipping



Small carbide particle separate from the insert, the result is poor surface finish and excessive flank wear.

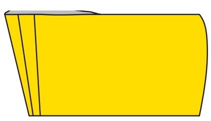
Causes :

- Grade too hard
- Insert geometry too sharp
- Built-up edge

Solutions :

- Select a tougher grade
- Select a geometry with a tougher or reinforced cutting edge
- Increase cutting speed
- Check for vibrations

Built-up edge



If the cutting temperature is too low material builds up on the cutting edge. This results in poor surface finish and separation of the material may cause cutting edge chipping.

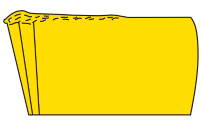
Causes :

- Cutting speed too low
- Negative cutting geometry
- Material too sticky
  Example:
  Stainless steel, aluminum.

Solutions :

- Increase cutting speed
- Select a positive cutting geometry
- Increase cutting speed

Plastic deformation



Collapse or indentation of the cutting edge (due to excessive edge temperature) causing poor surface finish. Flank wear extends finally causing the insert to break.

Causes :

- Cutting temperature too high
- Cutting speed too high
- Cutting forces too high

Solutions :

- Select a harder grade
- Select a coated grade
- Reduce cutting speed.
- Reduce feed

SCREWDRIVERS AND ACCESSORIES

Torx Plus and Torx screwdrivers

	Torx Plus screwdriver		
	Reference	Reference	Reference
6 IP	TX 206PLUS	PT-8000	-
7 IP	TX 207PLUS	PT-8001	-
8 IP	TX 208PLUS	PT-8006	-
9 IP	TX 209PLUS	PT-8003	-
10 IP	TX 210PLUS	PT-8007	-
15 IP	TX 215PLUS	-	DMP 3125
20 IP	TX 220PLUS	-	DMP 3662
25 IP	TX 225PLUS	-	DMP 3139
30 IP	-	-	DMP 3460
40 IP	-	-	DMP 3441

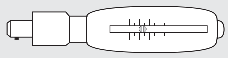
	Torx screwdriver		
	Reference	Reference	Reference
T6	TX 206	-	-
T7	TX 207	-	-
T8	TX 208	-	-
T9	TX 209	-	-
T10	TX 210	-	-
T15	TX 215	-	DMP 2216
T20	TX 220	-	DMP 2099
T25	TX 225	-	DMP 2192
T30	TX 230	-	DMP 2514
T40	TX 240	-	-

Torque screwdrivers

	Torque screwdriver		
Nm	Reference	Nm	ft. lb.
6 IP	TDX 206PLUS	0.6	0.4
7 IP	TDX 207PLUS	0.9	0.7
8 IP	TDX 208PLUS	1.2	0.9
9 IP	TDX 209PLUS	1.4	1.0
10 IP	TDX 210PLUS	2.0	1.5
15 IP	TDX 215PLUS	3.0	2.2

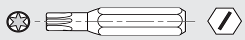
Torque screwdrivers and accessories

Torque screwdriver



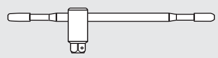
Reference	Torque range
DMT 1242	0.5 - 2.5 Nm
DMT 1243	1.0 - 6.0 Nm

Torx and Torx Plus driver bits



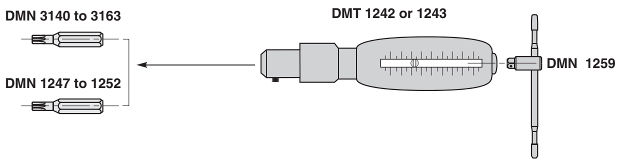
Reference	
DMN 3140	6 IP
DMN 3141	7 IP
DMN 3142	8 IP
DMN 3143	9 IP
DMN 3144	10 IP
DMN 3145	15 IP
DMN 3146	20 IP
DMN 3147	25 IP
DMN 3163	30 IP
DMN 1247	T7
DMN 1248	T8
DMN 1249	T9
DMN 1250	T10
DMN 1251	T15
DMN 1252	T20

Sliding handle



Reference
DMN 1259
-

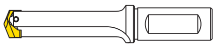
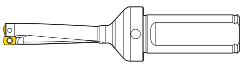
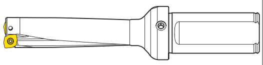
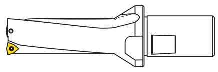
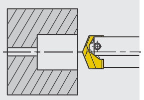
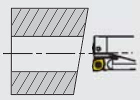
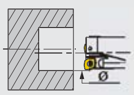
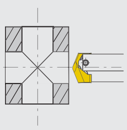
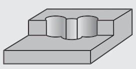
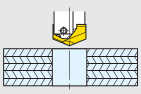
Example of assembly



MILLING

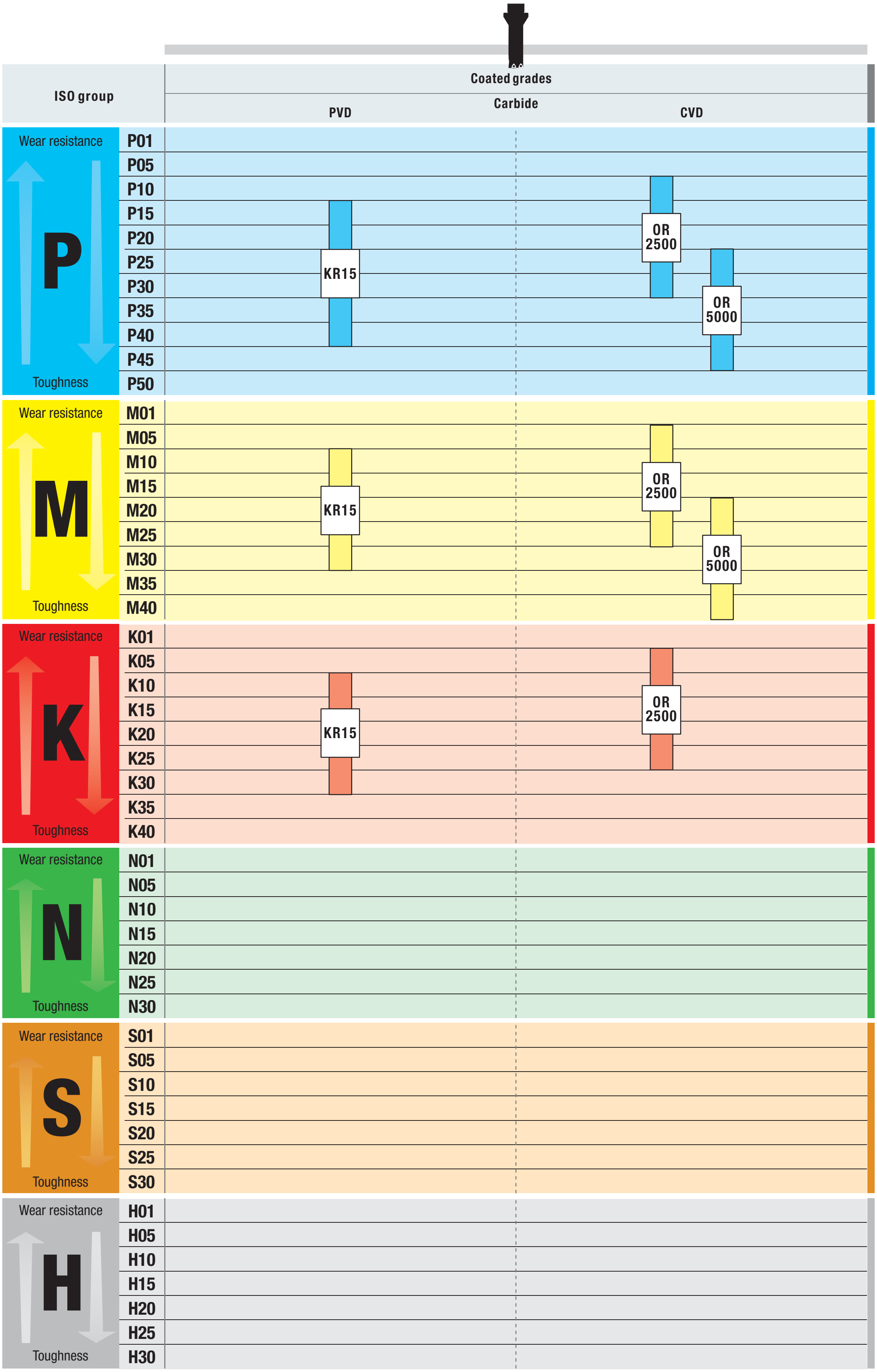
DRILLING

PROGRAM OVERVIEW

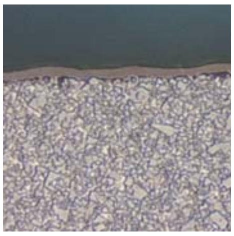
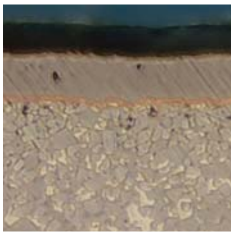
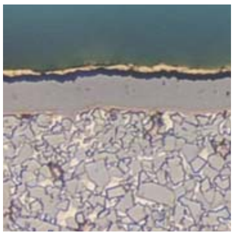
	GY-SAF p. 507	SILVER-DRILL p. 517	SILVER-DRILL p. 518	FY-SAF p. 527
				
Drilling diameter	Ø 12.7 to 35 mm	Ø 12 to 16 mm	Ø 16.5 to 30 mm	Ø 31 to 54 mm
Hole tolerance	Ø : $^{+0,05}_{0}$	2xØ : $^{+0,1}_{-0,3}$ 4xØ : $^{+0,2}_{-0,3}$	2xØ : $^{+0,1}_{-0,3}$ 4xØ : $^{+0,2}_{-0,3}$	2xØ : ±0,2
Drilling depth	3xØ / 5xØ / 8xØ	2xØ / 4xØ	2Ø / 4xØ	3xØ
Materials	P M K	P M K	P M K	P M K
Grades	KR15	KR15 - OR5000	KR15 - OR5000	OR2500 - OR5000 - N
Inserts	GY thickness 4 and 5 mm	LMCT 04	XPMT 06 / 08 / 09	WCMT 06 / 08
Number of teeth	2	1	1	1
Drilling possible with pre-drilled hole 	NO	YES	YES	YES
Drilling on an inclined plane 	NO	YES for depth of 2xØ	YES for depth of 2xØ	YES
Excentration possible with fixed drill 	NO	YES for depth of 2xØ	YES for depth of 2xØ	YES
Drilling perpendi-cular to another hole 	YES if the hole is in the axis	YES	YES	YES
Drilling with interrupted cutting (plunging) 	NO	YES for depth of 2xØ	YES for depth of 2xØ	YES
Drilling of stacked sheet metal 	YES	NO	NO	NO

DRILLING

GRADE TABLE

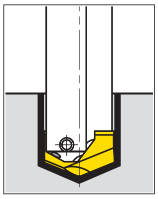

ISO group
Coated grades
Carbide
PVD
CVD
Wear resistance
Toughness
P
P01
P05
P10
P15
P20
P25
P30
P35
P40
P45
P50
KR15
OR 2500
OR 5000
M
M01
M05
M10
M15
M20
M25
M30
M35
M40
KR15
OR 2500
OR 5000
K
K01
K05
K10
K15
K20
K25
K30
K35
K40
KR15
OR 2500
N
N01
N05
N10
N15
N20
N25
N30
S
S01
S05
S10
S15
S20
S25
S30
H
H01
H05
H10
H15
H20
H25
H30

GRADE DESCRIPTION

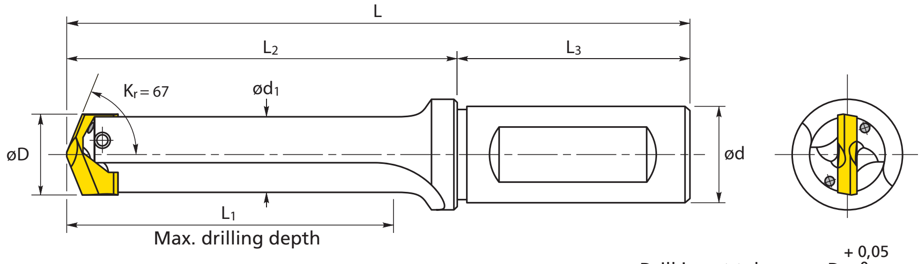
Grade	ISO class		Application
KR15 	P15	P40	PVD TiAlN/TiN coated carbide grade associated with a micrograin substrate. This has excellent wear resistance and very good thermal properties, and offers great versatility in use.
	M10	M30	
	K10	K30	
OR2500 	P10	P30	CVD coated carbide grade recommended for drilling of steels. Also suitable for cast irons and stainless steels.
	M05	M25	
	K05	K25	
OR5000 	P25	P45	CVD coated carbide grade for steel and stainless steel drilling.
	M15	M25	

GY-SAF

Drill program, GY
D = 12,7 - 35 mm



Cutting angle = 20° - Geometry 65



Drill insert tolerance: D $^{+0,05}_{0}$

Cylindrical shank

Reference	D	d	d_1	L	L_1	L_2	L_3	kg	Insert
3xD									
GY-127/150-045-QPC20	12.7 - 15.0	20	12.5	110	45	70	40	0.135	GY-1270-... - GY-1500-...
GY-148/170-050-QPC20	14.8 - 17.0	20	14.5	116	50	76	40	0.155	GY-1480-... - GY-1700-...
GY-165/190-060-QPC20	16.5 - 19.0	20	16.0	122	60	82	40	0.165	GY-1650-... - GY-1900-...
GY-185/210-065-QPC20	18.5 - 21.0	20	18.0	128	65	88	40	0.190	GY-1850-... - GY-2100-...
GY-205/230-070-QPC25	20.5 - 23.0	25	20.0	148	70	93	55	0.340	GY-2050-... - GY-2300-...
GY-225/260-080-QPC25	22.5 - 26.0	25	22.0	157	80	102	55	0.355	GY-2250-... - GY-2600-...
GY-261/290-090-QPC32	26.1 - 29.0	32	25.0	183	90	123	60	0.695	GY-2610-... - GY-2900-...
GY-285/350-105-QPC32	28.5 - 35.0	32	28.0	198	105	138	60	0.780	GY-2850-... - GY-3500-...
5xD									
GY-127/150-075-QPC20	12.7 - 15.0	20	12.5	140	75	100	40	0.155	GY-1270-... - GY-1500-...
GY-148/170-085-QPC20	14.8 - 17.0	20	14.5	150	85	110	40	0.180	GY-1480-... - GY-1700-...
GY-165/190-095-QPC20	16.5 - 19.0	20	16.0	160	95	120	40	0.200	GY-1650-... - GY-1900-...
GY-185/210-105-QPC20	18.5 - 21.0	20	18.0	170	105	130	40	0.240	GY-1850-... - GY-2100-...
GY-205/230-115-QPC25	20.5 - 23.0	25	20.0	195	115	140	55	0.410	GY-2050-... - GY-2300-...
GY-225/260-130-QPC25	22.5 - 26.0	25	22.0	210	130	155	55	0.470	GY-2250-... - GY-2600-...
GY-261/290-145-QPC32	26.1 - 29.0	32	25.0	238	145	178	60	0.830	GY-2610-... - GY-2900-...
GY-285/350-175-QPC32	28.5 - 35.0	32	28.0	268	175	208	60	0.990	GY-2850-... - GY-3500-...
8xD									
GY-127/150-120-QPC20	12.7 - 15.0	20	12.5	185	120	145	40	0.185	GY-1270-... - GY-1500-...
GY-148/170-135-QPC20	14.8 - 17.0	20	14.5	200	135	160	40	0.225	GY-1480-... - GY-1700-...
GY-165/190-150-QPC20	16.5 - 19.0	20	16.0	215	150	175	40	0.250	GY-1650-... - GY-1900-...
GY-185/210-165-QPC20	18.5 - 21.0	20	18.0	230	165	190	40	0.310	GY-1850-... - GY-2100-...
GY-205/230-185-QPC25	20.5 - 23.0	25	20.0	265	185	210	55	0.510	GY-2050-... - GY-2300-...
GY-225/260-210-QPC25	22.5 - 26.0	25	22.0	290	210	235	55	0.605	GY-2250-... - GY-2600-...

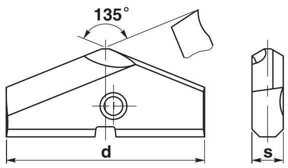
Spare parts

Drill	Insert clamping screw			Insert clamping screw			Key
	Reference	Size	Torque	Reference	Size	Torque	Reference
GY-127/150	DVZ 3773	M3	0.8 - 1.0 N.m	-	-	-	MA2.1214
GY-148/170 GY-165/190	DVZ 3774	M3	0.8 - 1.0 N.m	-	-	-	MA2.1214
GY-185/210	DVZ 3775	M4	1.0 - 1.2 N.m	-	-	-	MA2.884
GY-205/230 GY-225/260	DVZ 3776	M4	1.0 - 1.2 N.m	-	-	-	MA2.884
GY-261/290 GY-285/350	-	-	-	DVZ 3657	M5	12.5 - 3 N.m	MA2.669

DRILLING

GY-SAF

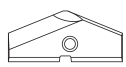
Insert program



Reference	d	s	KR15
Inserts for drills : GY-127/150...			
GY-1270-65	12.70	4.0	✓
GY-1280-65	12.80	4.0	✓
GY-1290-65	12.90	4.0	✓
GY-1300-65	13.00	4.0	✓
GY-1310-65	13.10	4.0	✓
GY-1320-65	13.20	4.0	✓
GY-1330-65	13.30	4.0	✓
GY-1340-65	13.40	4.0	✓
GY-1350-65	13.50	4.0	✓
GY-1360-65	13.60	4.0	✓
GY-1370-65	13.70	4.0	✓
GY-1380-65	13.80	4.0	✓
GY-1390-65	13.90	4.0	✓
GY-1400-65	14.00	4.0	✓
GY-1410-65	14.10	4.0	✓
GY-1420-65	14.20	4.0	✓
GY-1430-65	14.30	4.0	✓
GY-1440-65	14.40	4.0	✓
Inserts for drills : GY-127/150... or GY-148/170...			
GY-1450-65	14.50	4.0	✓
GY-1460-65	14.60	4.0	✓
GY-1470-65	14.70	4.0	✓
GY-1480-65	14.80	4.0	✓
GY-1490-65	14.90	4.0	✓
GY-1500-65	15.00	4.0	✓
Inserts for drills : GY-148/170...			
GY-1510-65	15.10	4.0	✓
GY-1520-65	15.20	4.0	✓
GY-1530-65	15.30	4.0	✓
GY-1540-65	15.40	4.0	✓
GY-1550-65	15.50	4.0	✓
GY-1560-65	15.60	4.0	✓
GY-1570-65	15.70	4.0	✓
GY-1580-65	15.80	4.0	✓
GY-1590-65	15.90	4.0	✓
GY-1600-65	16.00	4.0	✓
GY-1610-65	16.10	4.0	✓

Reference	d	s	KR15
Inserts for drills : GY-148/170...			
GY-1620-65	16.20	4.0	✓
GY-1630-65	16.30	4.0	✓
GY-1640-65	16.40	4.0	✓
Inserts for drills : GY-148/170... or GY-165/190...			
GY-1650-65	16.50	4.0	✓
GY-1660-65	16.60	4.0	✓
GY-1670-65	16.70	4.0	✓
GY-1680-65	16.80	4.0	✓
GY-1690-65	16.90	4.0	✓
GY-1700-65	17.00	4.0	✓
Inserts for drills : GY-165/190...			
GY-1710-65	17.10	4.0	✓
GY-1720-65	17.20	4.0	✓
GY-1730-65	17.30	4.0	✓
GY-1740-65	17.40	4.0	✓
GY-1750-65	17.50	4.0	✓
GY-1760-65	17.60	4.0	✓
GY-1770-65	17.70	4.0	✓
GY-1780-65	17.80	4.0	✓
GY-1790-65	17.90	4.0	✓
GY-1800-65	18.00	4.0	✓
GY-1810-65	18.10	4.0	✓
GY-1820-65	18.20	4.0	✓
GY-1830-65	18.30	4.0	✓
GY-1840-65	18.40	4.0	✓
Inserts for drills : GY-165/190... or GY-185/210...			
GY-1850-65	18.50	4.0	✓
GY-1860-65	18.60	4.0	✓
GY-1870-65	18.70	4.0	✓
GY-1880-65	18.80	4.0	✓
GY-1890-65	18.90	4.0	✓
GY-1900-65	19.00	4.0	✓

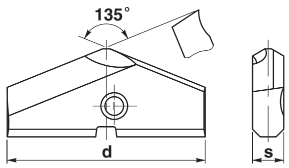
Top form geometry

Top form geometry	P Steel	M Stainless steel	K Cast iron	N Non-ferrous aluminum	S Super alloys	H Hardened materials	Insert
 65	**KR15**	KR15	**KR15**	-	-	-	 Ø 12,7 - 35

DRILLING

GY-SAF

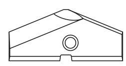
Insert program



Reference	d	s	KR15
Inserts for drills : GY-185/210...			
GY-1910-65	19.10	4.0	✓
GY-1920-65	19.20	4.0	✓
GY-1930-65	19.30	4.0	✓
GY-1940-65	19.40	4.0	✓
GY-1950-65	19.50	4.0	✓
GY-1960-65	19.60	4.0	✓
GY-1970-65	19.70	4.0	✓
GY-1980-65	19.80	4.0	✓
GY-1990-65	19.90	4.0	✓
GY-2000-65	20.00	4.0	✓
GY-2010-65	20.10	4.0	✓
GY-2020-65	20.20	4.0	✓
GY-2030-65	20.30	4.0	✓
GY-2040-65	20.40	4.0	✓
Inserts for drills : GY-185/210... or GY-205/230...			
GY-2050-65	20.50	4.0	✓
GY-2060-65	20.60	4.0	✓
GY-2070-65	20.70	4.0	✓
GY-2080-65	20.80	4.0	✓
GY-2090-65	20.90	4.0	✓
GY-2100-65	21.00	4.0	✓
Inserts for drills : GY-205/230...			
GY-2110-65	21.10	4.0	✓
GY-2120-65	21.20	4.0	✓
GY-2130-65	21.30	4.0	✓
GY-2140-65	21.40	4.0	✓
GY-2150-65	21.50	4.0	✓
GY-2160-65	21.60	4.0	✓
GY-2170-65	21.70	4.0	✓
GY-2180-65	21.80	4.0	✓
GY-2190-65	21.90	4.0	✓
GY-2200-65	22.00	4.0	✓
GY-2210-65	22.10	4.0	✓

Reference	d	s	KR15
GY-2220-65	22.20	4.0	✓
GY-2230-65	22.30	4.0	✓
Inserts for drills : GY-205/230... or GY-225/260...			
GY-2250-65	22.50	4.0	✓
GY-2260-65	22.60	4.0	✓
GY-2270-65	22.70	4.0	✓
GY-2280-65	22.80	4.0	✓
GY-2290-65	22.90	4.0	✓
GY-2300-65	23.00	4.0	✓
Inserts for drills : GY-225/z260...			
GY-2310-65	23.10	4.0	✓
GY-2320-65	23.20	4.0	✓
GY-2350-65	23.50	4.0	✓
GY-2360-65	23.60	4.0	✓
GY-2370-65	23.70	4.0	✓
GY-2380-65	23.80	4.0	✓
GY-2400-65	24.00	4.0	✓
GY-2420-65	24.20	4.0	✓
GY-2430-65	24.30	4.0	✓
GY-2450-65	24.50	4.0	✓
GY-2460-65	24.60	4.0	✓
GY-2470-65	24.70	4.0	✓
GY-2480-65	24.80	4.0	✓
GY-2490-65	24.90	4.0	✓
GY-2500-65	25.00	4.0	✓
GY-2510-65	25.10	4.0	✓
GY-2520-65	25.20	4.0	✓
GY-2530-65	25.30	4.0	✓
GY-2540-65	25.40	4.0	✓
GY-2550-65	25.50	4.0	✓
GY-2560-65	25.60	4.0	✓
GY-2570-65	25.70	4.0	✓
GY-2580-65	25.80	4.0	✓
GY-2600-65	26.00	4.0	✓

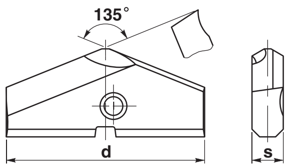
Top form geometry

Top form geometry	P Steel	M Stainless steel	K Cast iron	N Non-ferrous aluminum	S Super alloys	H Hardened materials	Insert
65	**KR15**	KR15	**KR15**	-	-	-	 Ø 12,7 - 35

DRILLING

GY-SAF

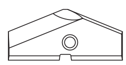
Insert program



Reference	d	s	KR15
Inserts for drills : GY-261/290...			
GY-2610-65	26.10	5.0	✓
GY-2620-65	26.20	5.0	✓
GY-2650-65	26.50	5.0	✓
GY-2670-65	26.70	5.0	✓
GY-2680-65	26.80	5.0	✓
GY-2700-65	27.00	5.0	✓
GY-2710-65	27.10	5.0	✓
GY-2750-65	27.50	5.0	✓
GY-2800-65	28.00	5.0	✓
GY-2820-65	28.20	5.0	✓
GY-2830-65	28.30	5.0	✓
Inserts for drills : GY-261/290... or GY-285/350...			
GY-2850-65	28.50	5.0	✓
GY-2860-65	28.60	5.0	✓
GY-2870-65	28.70	5.0	✓
GY-2880-65	28.80	5.0	✓
GY-2890-65	28.90	5.0	✓
GY-2900-65	29.00	5.0	✓
GY-2910-65	29.10	5.0	✓
Inserts for drills : GY-285/350...			
GY-2950-65	29.50	5.0	✓
GY-2970-65	29.70	5.0	✓
GY-2980-65	29.80	5.0	✓
GY-2990-65	29.90	5.0	✓
GY-3000-65	30.00	5.0	✓
GY-3010-65	30.10	5.0	✓

Reference	d	s	KR15
GY-3020-65	30.20	5.0	✓
GY-3030-65	30.30	5.0	✓
GY-3050-65	30.50	5.0	✓
GY-3060-65	30.60	5.0	✓
GY-3070-65	30.70	5.0	✓
GY-3100-65	31.00	5.0	✓
GY-3150-65	31.50	5.0	✓
GY-3170-65	31.70	5.0	✓
GY-3180-65	31.80	5.0	✓
GY-3200-65	32.00	5.0	✓
GY-3210-65	32.10	5.0	✓
GY-3220-65	32.20	5.0	✓
GY-3230-65	32.30	5.0	✓
GY-3250-65	32.50	5.0	✓
GY-3270-65	32.70	5.0	✓
GY-3300-65	33.00	5.0	✓
GY-3310-65	33.10	5.0	✓
GY-3350-65	33.50	5.0	✓
Inserts for drills : GY-285/350...			
GY-3370-65	33.70	5.0	✓
GY-3400-65	34.00	5.0	✓
GY-3420-65	34.20	5.0	✓
GY-3450-65	34.50	5.0	✓
GY-3470-65	34.70	5.0	✓
GY-3480-65	34.80	5.0	✓
GY-3500-65	35.00	5.0	✓

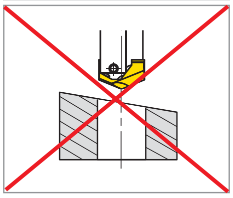
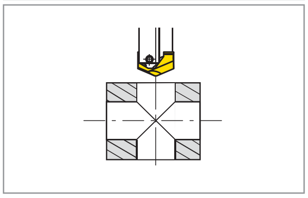
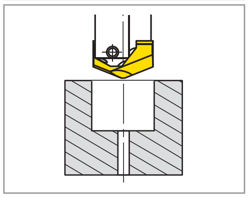
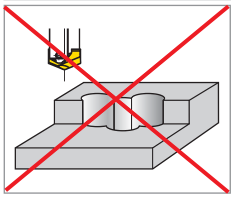
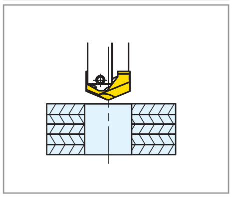
Top form geometry

Top form geometry	P Steel	M Stainless steel	K Cast iron	N Non-ferrous aluminum	S Super alloys	H Hardened materials	Insert
	**KR15**	KR15	**KR15**	-	-	-	 Ø 12,7 - 35

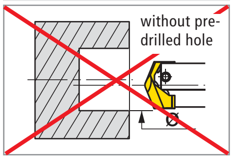
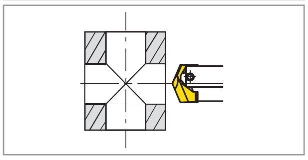
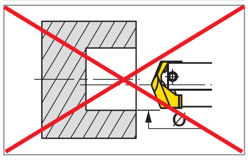
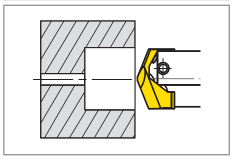
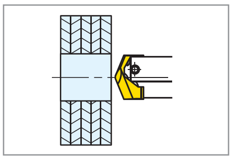
GY-SAF
Drill characteristics

Drilling possibilities

Rotary drills

Inclined plane	Perpendicular holes	Pre-drilled holes	Plunging	Stacked metal plates
				
Prohibited	If drilled hole and secant hole are in the same plane	If pre-drilled hole is concentric	Prohibited	

Fixed drills

Off-centre	Perpendicular holes	Pre-drilled holes	Pre-drilled holes	Stacked metal plates
				
Prohibited	If drilled hole and secant hole are in the same plane	Prohibited	If pre-drilled hole is concentric	

GY-SAF

Drill characteristics

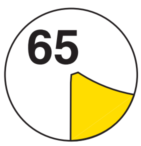
Cutting data

		Strenght resistance Rm (MPa)	Hardness HB	Geometry	Cutting speed V_c (m/min)	Feed f_n (mm/rev)		
						Ø 12.7 - 16.7	Ø 16.7 - 22	Ø 22 - 35
P Steel	With carbon < 0.2%	310-580	80-170	65	60-120	0.05 - 0.15	0.08 - 0.20	0.15 - 0.25
	With carbon < 0.35%	340-680	90-200	65	55-110	0.05 - 0.13	0.08 - 0.18	0.15 - 0.20
	With carbon 0.4%	520-930	150-275	65	50-100	0.05 - 0.13	0.08 - 0.18	0.15 - 0.20
	Low alloy, hardened and tempered	310-840	80-250	65	40-70	0.05 - 0.13	0.08 - 0.18	0.15 - 0.20
	Low alloy, hardened and tempered	745-1360	220-400	65	30-60	0.05 - 0.13	0.08 - 0.18	0.12 - 0.20
	High alloy, annealed	310-840	80-250	65	40-70	0.05 - 0.13	0.08 - 0.18	0.15 - 0.20
	High alloy, hardened and tempered	840-1580	250-450	65	30-50	0.05 - 0.08	0.06 - 0.10	0.08 - 0.15
	Non-alloy steel casting	340-760	90-225	65	50-80	0.05 - 0.13	0.08 - 0.20	0.12 - 0.25
	Low alloy steel casting	520-745	150-220	65	45-70	0.05 - 0.11	0.08 - 0.15	0.10 - 0.20
	High alloy steel casting	600-775	175-230	65	40-60	0.05 - 0.08	0.06 - 0.10	0.08 - 0.15
M Stainless steel	Annealed, martensitic, ferritic	-	90-225	65	30 - 40	0.05 - 0.08	0.05 - 0.08	0.07 - 0.10
	Annealed, austenitic	-	150-250	65	30 - 40	0.05 - 0.08	0.05 - 0.08	0.07 - 0.10
K Cast iron	Malleable ferritic cast iron	-	110-145	65	70-100	0.08 - 0.20	0.10 - 0.25	0.15 - 0.25
	Malleable pearlitic cast iron	-	150-270	65	60-90	0.08 - 0.15	0.10 - 0.20	0.15 - 0.20
	Grey cast iron (FG)	-	150-220	65	80-110	0.08 - 0.20	0.10 - 0.25	0.15 - 0.25
	Grey cast iron (FG)	-	200-330	65	60-90	0.08 - 0.15	0.10 - 0.20	0.15 - 0.20
	Nodular GS, ferritic	-	125-230	65	70-100	0.08 - 0.20	0.10 - 0.25	0.15 - 0.25
	Nodular GS, perlitic	-	200-300	65	60-90	0.08 - 0.15	0.10 - 0.20	0.15 - 0.20
N Aluminum & non-ferrous	Aluminum alloy < 6% Si	-	75-100	15	100-250	0.05 - 0.20	0.08 - 0.25	0.10 - 0.30
	Aluminum alloy > 6% Si	-	90-120	15	100-250	0.05 - 0.20	0.08 - 0.25	0.10 - 0.30
	Brass, lead	-	90	15	120-160	0.05 - 0.20	0.08 - 0.25	0.10 - 0.30

Geometry and grade descriptions

Geometry 65

P	Geometry 65, with its reinforced edge and its specific chip form, guarantees very high stability during cutting. It contributes to a large extent to the very good stiffness of the drill even with high feed rates. Associated with Grade KR15, it gives excellent results in materials such as steels and cast irons.	Reinforced edge
M		
K		



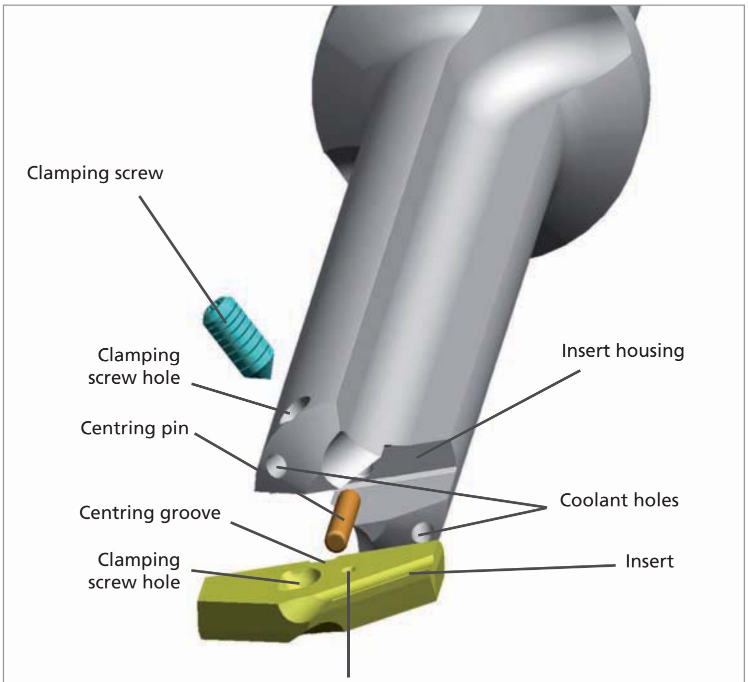
Grade KR15

P10	P30	PVD TiAlN / TiN Coated carbide grade combined with a micrograin substrate. This has excellent wear resistance and very good thermal properties, and offers great versatility in use.
M10	M25	
K10	K25	

GY-SAF
Drill characteristics

Precautions for use

Important notes
① Do not use the tools at depths greater than dimension L1 representing the maximum drilling depth.
② Use the shortest possible drill for maximum rigidity.
③ Central cooling strongly recommended in drilling of depths greater than the diameter.
④ Check the clamping of the part to be drilled and the rigidity of the machine spindle.
⑤ Use arbors with lateral clamping screws.(i.e. Weldon)
⑥ GY-SAF tools can be used either in fixed mode or in rotating mode.



Drill codification

GY	-	127	/	150	-	075	-	QP	C	20
1		2		3		4		5	6	7

1 - Range	2 - Min. drilling Ø	3 - Max. drilling Ø	4 - Max. drilling depth
GY : GY-SAF	12,7 mm	15,0 mm	75 mm

5 - Type of shank	6 - Coolant	7 - Shank diameter
QP : Shank with flat	C : Coolant holes	20 mm

DRILLING

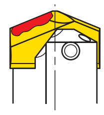
GY-SAF
Drill characteristics

Problem solving

Sticking on the cutting edge

Causes:
Insufficient cutting speed
Poor edge sharpness

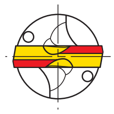
Solutions:
Increase cutting speed
Select another geometry
Lubricate more



Flank wear too great

Causes:
Cutting speed too high
Feed rate too low

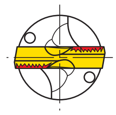
Solutions:
Reduce cutting speed
Increase feed rate



Main cutting edge chipped

Causes:
Rigidity of part and/or tool insufficient
Interrupted cutting
Poor insert geometry

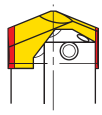
Solutions:
Attach part correctly
Improve attachment of tool
Change insert more frequently
Use a more suitable geometry



Wear on diameter

Cause:
Run-out too great

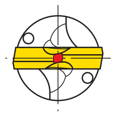
Solutions:
Increase cutting speed
Control run-out when possible
Control coaxiality between machine axis and tool axis



Wear on web of insert

Causes:
Cutting speed too low
Feed motion too great

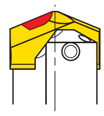
Solutions:
Increase cutting speed
Reduce feed rate



Breakage on major edge

Cause:
Incorrect insert geometry

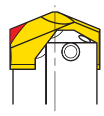
Solution:
Choose another geometry



Plastic deformation of cutting angle

Causes:
Cutting speed too high
Coolant quantity insufficient

Solutions:
Reduce cutting speed
Increase coolant quantity (volume, pressure)

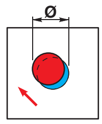


GY-SAF
Drill characteristics

Problem solving (continued)

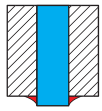
Incorrect position of hole

Causes:	Solutions:
Attachment of part and/or tool insufficient	Clamp part correctly
Run-out error too great	Control run-out when possible
Drilling on a non-flat surface	Spot face drilling area with a milling cutter (2 cuts)
Web of drill too large	Reduce web
	Improve attachment of tool
	Reduce feed rate for first few millimeter of cut



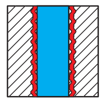
Burr too great on hole exit

Causes:	Solutions:
Feed motion too great	Reduce feed rate
Excessive wear of major edge	Change insert



Incorrect surface condition

Causes:	Solutions:
Attachment of part and/or tool insufficient	Attach part correctly
Run-out too great	Control run-out when possible
Insufficient coolant	Increase coolant quantity (volume, pressure)
Incorrect cutting conditions	Check spindle loose



GY-SAF

Drill characteristics

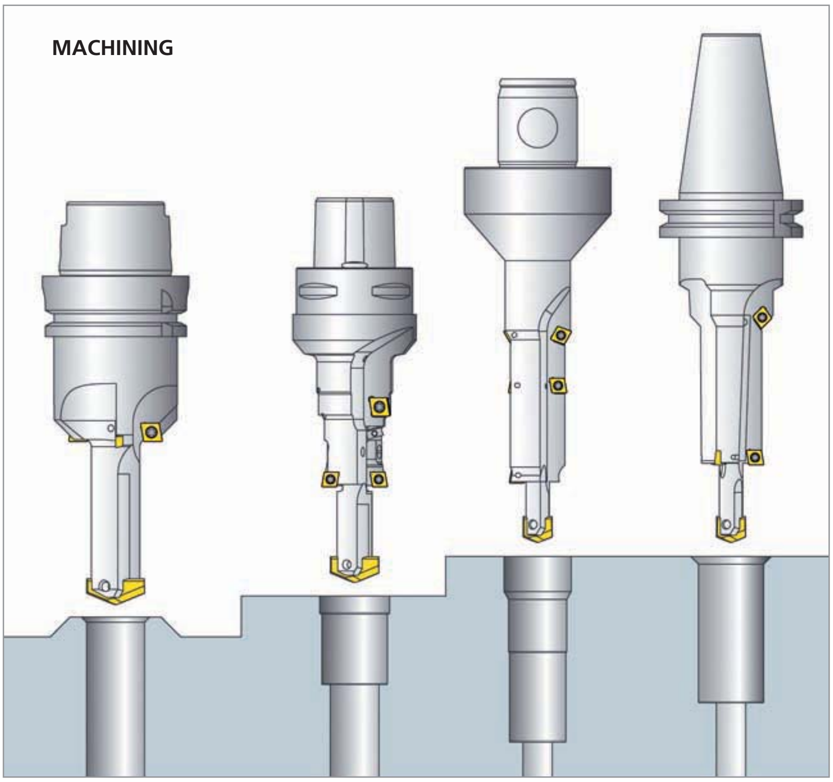
Special drills

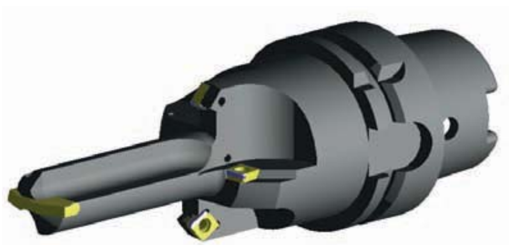
Absolute versatility

Special GY-SAF tools can be produced on a wide variety of shanks in accordance with your specific needs, allowing drilling, spot facing, mill cutting/threading and boring operations with a single tool.

Advantages of special GY-SAF tools

- Better concentricity owing to simultaneous drilling, boring and plunge feed actions.
- The central cooling and the geometry of the insert enable better control and better evacuation of the chips.
- Reduction of cycle time thanks to combined drills.
- Reduction of tool costs by reduction of quantities of tool holders required.
- The removable inserts eliminate sharpening operations.



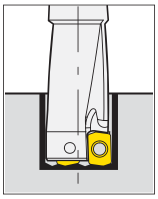


SHANKS
Special drills can be produced on request with different shanks. SAF-CAPTO - HSK - KM - UTS - WELDON WHISTLE NOTCH - ABS - SA - CM

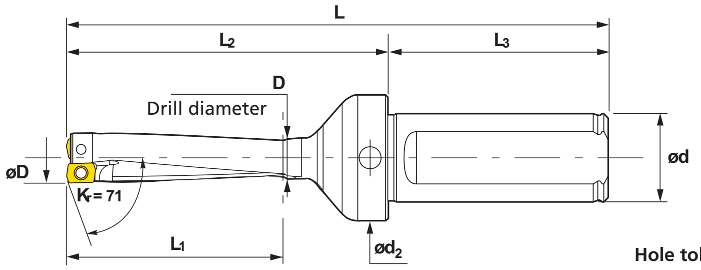
SILVER-DRILL

Drill program, SD 100

D = 12 -16 mm



Cutting angle = 15°



Maximum drilling depth

Hole tolerance (2xD) $^{+0,1}_{-0,3}$

Hole tolerance (4xD) $^{+0,2}_{-0,3}$

Cylindrical shank

Reference	D	d	d_2	L	L_1	L_2	L_3	kg	Insert
2xD									
SD 100A/2-M1200-L20-R	12.0	20	28.5	98	24	48	50	0.175	LCMT 04...
SD 100A/2-M1250-L20-R	12.5	20	28.5	98	25	48	50	0.175	LCMT 04...
SD 100A/2-M1300-L20-R	13.0	20	28.5	99	26	49	50	0.175	LCMT 04...
SD 100A/2-M1350-L20-R	13.5	20	28.5	100	27	50	50	0.180	LCMT 04...
SD 100A/2-M1400-L20-R	14.0	20	28.5	101	28	51	50	0.180	LCMT 04...
SD 100A/2-M1450-L20-R	14.5	20	28.5	101	29	51	50	0.180	LCMT 04...
SD 100A/2-M1500-L20-R	15.0	20	28.5	102	30	52	50	0.185	LCMT 04...
SD 100A/2-M1550-L20-R	15.5	20	28.5	103	31	53	50	0.185	LCMT 04...
SD 100A/2-M1600-L20-R	16.0	20	28.5	104	32	54	50	0.190	LCMT 04...
4xD									
SD 100A/4-M1200-L20-R	12.0	20	28.5	122	48	72	50	0.185	LCMT 04..
SD 100A/4-M1250-L20-R	12.5	20	28.5	123	50	73	50	0.185	LCMT 04..
SD 100A/4-M1300-L20-R	13.0	20	28.5	125	52	75	50	0.185	LCMT 04..
SD 100A/4-M1350-L20-R	13.5	20	28.5	127	54	77	50	0.190	LCMT 04..
SD 100A/4-M1400-L20-R	14.0	20	28.5	129	56	79	50	0.195	LCMT 04.
SD 100A/4-M1450-L20-R	14.5	20	28.5	130	58	80	50	0.200	LCMT 04..
SD 100A/4-M1500-L20-R	15.0	20	28.5	132	60	82	50	0.200	LCMT 04..
SD 100A/4-M1550-L20-R	15.5	20	28.5	134	62	84	50	0.210	LCMT 04..
SD 100A/4-M1600-L20-R	16.0	20	28.5	136	64	86	50	0.215	LCMT 04..

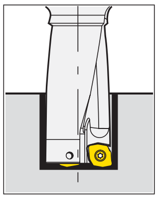
Spare parts

Dø	Insert clamping screw				Screw driver for insert screw		Spare part kit
	Reference	Size	Torque	Torx	Reference	Torx	Reference
12.0 - 16.0	DVF 3632	M2.2	0.7-0.9 Nm	7IP	TX 207PLUS	7IP	DDR 3644

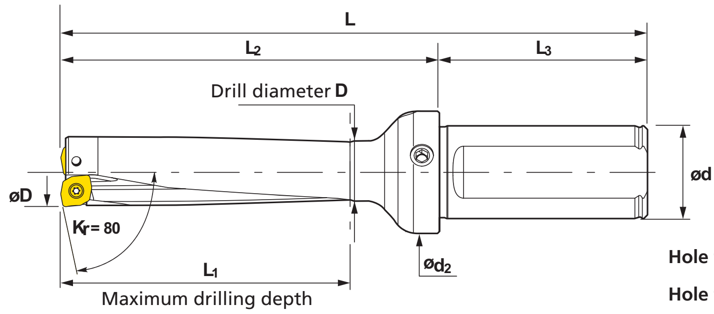
SILVER-DRILL

Drill program, SD 100

D = 16,5 - 30 mm



Cutting angle = 15°



Hole tolerance (2xD) $^{+0,1}_{-0,3}$

Hole tolerance (4xD) $^{+0,2}_{-0,3}$

Cylindrical shank

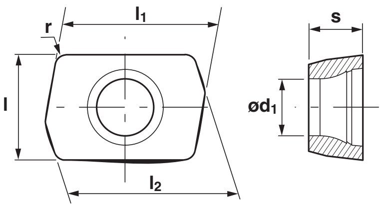
Reference	D	d	d_2	L	L_1	L_2	L_3	kg	Insert
2xD									
SD100 A 2M 1650 L20R	16.5	20	28.5	104	33	54	50	0.180	XPMT 06...
SD100 A 2M 1700 L20R	17.0	20	28.5	105	34	55	50	0.185	XPMT 06...
SD100 A 2M 1750 L20R	17.5	20	28.5	106	35	56	50	0.185	XPMT 06...
SD100 A 2M 1800 L20R	18.0	20	28.5	107	36	57	50	0.190	XPMT 06...
SD100 A 2M 1850 L20R	18.5	20	28.5	107	37	57	50	0.190	XPMT 06...
SD100 A 2M 1900 L20R	19.0	20	28.5	108	38	58	50	0.195	XPMT 06...
SD100 A 2M 2000 L20R	20.0	20	28.5	110	40	60	50	0.205	XPMT 06...
SD100 A 2M 2100 L20R	21.0	20	28.5	111	42	61	50	0.215	XPMT 06...
SD100 A 2M 2200 L25R	22.0	25	33	124	44	68	56	0.335	XPMT 08...
SD100 A 2M 2300 L25R	23.0	25	33	125	46	69	56	0.340	XPMT 08...
SD100 A 2M 2400 L25R	24.0	25	33	127	48	71	56	0.355	XPMT 08...
SD100 A 2M 2500 L25R	25.0	25	33	128	50	72	56	0.365	XPMT 08...
SD100 A 2M 2600 L32R	26.0	32	43	139	52	79	60	0.605	XPMT 09...
SD100 A 2M 2700 L32R	27.0	32	43	140	54	80	60	0.615	XPMT 09...
SD100 A 2M 2800 L32R	28.0	32	43	142	56	82	60	0.635	XPMT 09...
SD100 A 2M 2900 L32R	29.0	32	43	143	58	83	60	0.645	XPMT 09...
SD100 A 2M 3000 L32R	30.0	32	43	145	60	85	60	0.670	XPMT 09...
4xD									
SD100 A 4M 1650 L20R	16.5	20	28.5	137	66	87	50	0.205	XPMT 06...
SD100 A 4M 1700 L20R	17.0	20	28.5	139	68	89	50	0.210	XPMT 06...
SD100 A 4M 1750 L20R	17.5	20	28.5	141	70	91	50	0.215	XPMT 06...
SD100 A 4M 1800 L20R	18.0	20	28.5	143	72	93	50	0.225	XPMT 06...
SD100 A 4M 1850 L20R	18.5	20	28.5	144	74	94	50	0.225	XPMT 06...
SD100 A 4M 1900 L20R	19.0	20	28.5	146	76	96	50	0.235	XPMT 06...
SD100 A 4M 2000 L20R	20.0	20	28.5	150	80	100	50	0.250	XPMT 06...
SD100 A 4M 2100 L20R	21.0	20	28.5	153	84	103	50	0.275	XPMT 06...
SD100 A 4M 2200 L25R	22.0	25	33	168	88	112	56	0.390	XPMT 08...
SD100 A 4M 2300 L25R	23.0	25	33	171	92	115	56	0.405	XPMT 08...
SD100 A 4M 2400 L25R	24.0	25	33	175	96	119	56	0.430	XPMT 08...
SD100 A 4M 2500 L25R	25.0	25	33	178	100	122	56	0.450	XPMT 08...
SD100 A 4M 2600 L32R	26.0	32	43	191	104	131	60	0.685	XPMT 09...
SD100 A 4M 2700 L32R	27.0	32	43	194	108	134	60	0.705	XPMT 09...
SD100 A 4M 2800 L32R	28.0	32	43	198	112	138	60	0.745	XPMT 09...
SD100 A 4M 2900 L32R	29.0	32	43	201	116	141	60	0.775	XPMT 09...
SD100 A 4M 3000 L32R	30.0	32	43	205	120	145	60	0.820	XPMT 09...

Spare parts

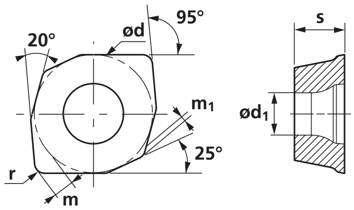
Dø	Insert clamping screw				Screw driver for insert screw		Spare part kit
	Reference	Size	Torque	Torx	Reference	Torx	Reference
16.5 - 21.0	DVF 0939	M2.2	0.7-0.9 Nm	7IP	TX 207PLUS	7IP	DDR 0941
22.0 - 25.0	DVF 3509	M2.5	0.9-1.4 Nm	8IP	TX 208PLUS	8IP	DDR 3677
26.0 - 30.0	DVF 0943	M3	1.2-1.8 Nm	9IP	TX 209PLUS	9IP	DDR 0944

SILVER-DRILL

Insert program



LCMT... 57

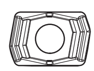
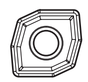


XPMT...57

Reference	l	s	d_1	l_1	l_2	r	KR15	OR5000
Drills ø 12-16 mm								
LCMT 040205 EN-57	4.6	2.38	2.5	6.682	7.082	0.5	✓	✓

Reference	d	s	d_1	m	m_1	r	KR15	OR5000
Drills ø 16.5-30 mm								
XPMT 060204 EN-57	6.35	2.38	2.5	1.308	0.287	0.4	✓	✓
XPMT 080308 EN-57	7.94	3.18	2.8	1.338	0.328	0.8	✓	✓
XPMT 09T308 EN-57	9.52	3.97	3.4	1.619	0.41	0.8	✓	✓

Top form geometry

Top form geometry	P Steel	M Stainless steel	K Cast iron	N Non-ferrous aluminum	S Super alloys	H Hardened materials	Insert
57	KR15 OR5000	KR15 OR5000	KR15	-	-	-	
57	KR15 OR5000	KR15 OR5000	KR15	-	-	-	

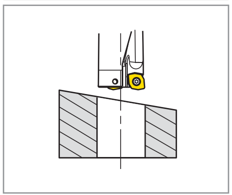
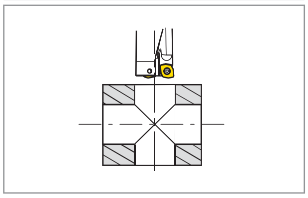
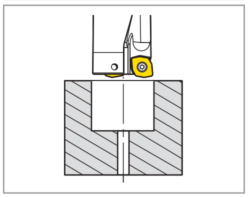
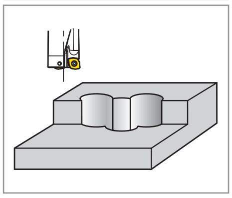
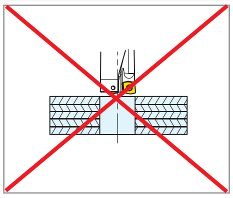
DRILLING

SILVER-DRILL

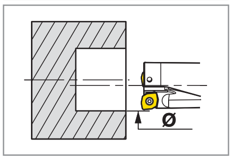
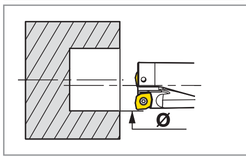
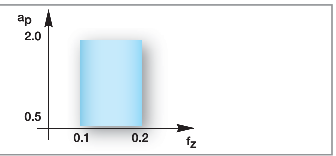
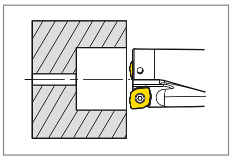
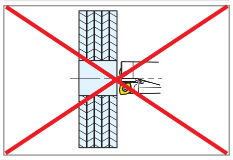
Drill characteristics

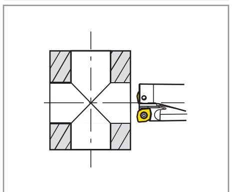
Drilling possibilities

Rotary drills

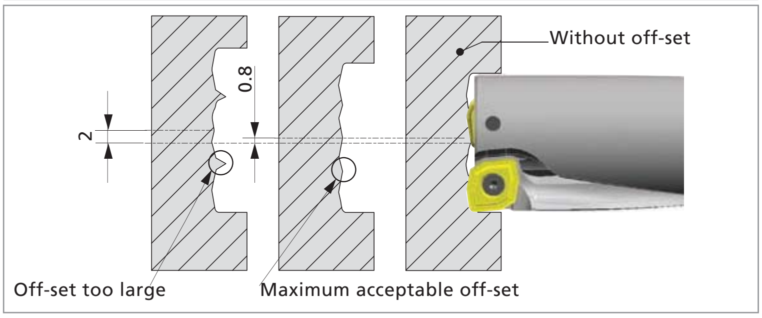
Inclined plane	Perpendicular holes	Pre-drilled holes	Plunging	Stacked metal plates
				
If inclined plane > à 2°, reduce the fz values from 50% to 75%. Do not exceed 30°	If secant hole is higher from 1/4 than drilled hole, reduce the fz from 50% crossing drilled hole	Pre-drilled hole should not be higher from 1/4 than the drilled hole	Reduce the fz values by 50%	Prohibited

Fixed drills

Off-centre	Reboring	Reboring with chip control	Pre-drilled holes	Stacked metal plates
				
See maximum off-centre values, page 521	Only with 2xD drill		Pre-drilled hole should not be higher from 1/4 than the drilled hole	Prohibited

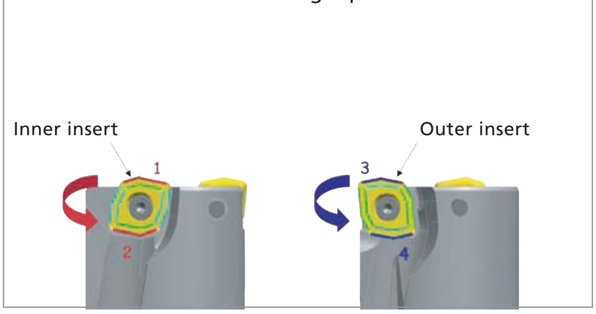
Perpendicular holes

If secant hole is higher from 1/4 than drilled hole, reduce the fz from 50% crossing drilled hole

Off-centre drilling example with stationery drill ø23 2xD

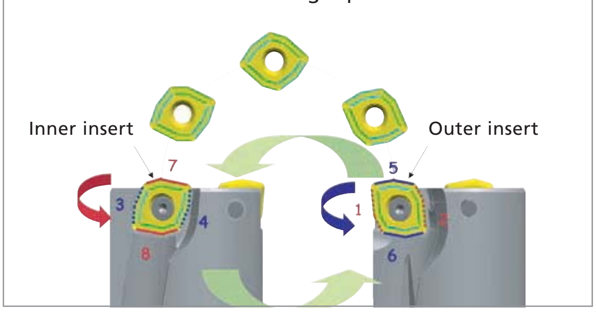


Use of all edges with the XPMT inserts

Use of **first 2** edges per insert



Use of **last 2** edges per insert



SILVER-DRILL
Drill characteristics

Off-center drilling for stationery drills

Insert	Drill diameter	Maximum Off-set recommended with 4x diameter	2x diameter theoretical maximum Off-set value
LCMT0400205 EN-57	12	0.5 mm	1.4 mm
	12.5	0.5 mm	1.3 mm
	13	0.5 mm	1.2 mm
	13.5	0.5 mm	1.05 mm
	14	0.5 mm	0.95 mm
	14.5	0.5 mm	0.8 mm
	15	0.5 mm	0.7 mm
	15.5	0.5 mm	0.55 mm
	16	0.45 mm	0.45 mm
XPMT060208 EN-57	16.5	0.5 mm	1.3 mm
	17	0.5 mm	1.2 mm
	17.5	0.5 mm	1.05 mm
	18	0.5 mm	0.95 mm
	18.5	0.5 mm	0.8 mm
	19	0.5 mm	0.7 mm
	20	0.45 mm	0.45 mm
	21	0.2 mm	0.2 mm
XPMT080308 EN-57	22	0.5 mm	1.1 mm
	23	0.5 mm	0.8 mm
	24	0.5 mm	0.55 mm
	25	0.35 mm	0.35 mm
XPMT09T308 EN-57	26	0.5 mm	1.45 mm
	27	0.5 mm	1.2 mm
	28	0.5 mm	0.9 mm
	29	0.5 mm	0.7 mm
	30	0.45 mm	0.45 mm

Note : Off-sets are valid only when the part is not pre-drilled.
Do not use the 4x diameter drill to rebore an existing hole.

SILVER-DRILL

Drill characteristics

Set-up for lathe

Drill installation to the lathe

To expand a hole diameter by off center drilling, the top face (rake) of the outboard insert should be parallel with the X axis as shown in Fig. 1.
It is preferable to install the drill by using the longer flat on the shank. In this position the outboard insert is facing up and towards the operator (Fig. 3).
The shorter flat is an optional flat which allows you to put the drill at 180° if necessary (Fig. 4).

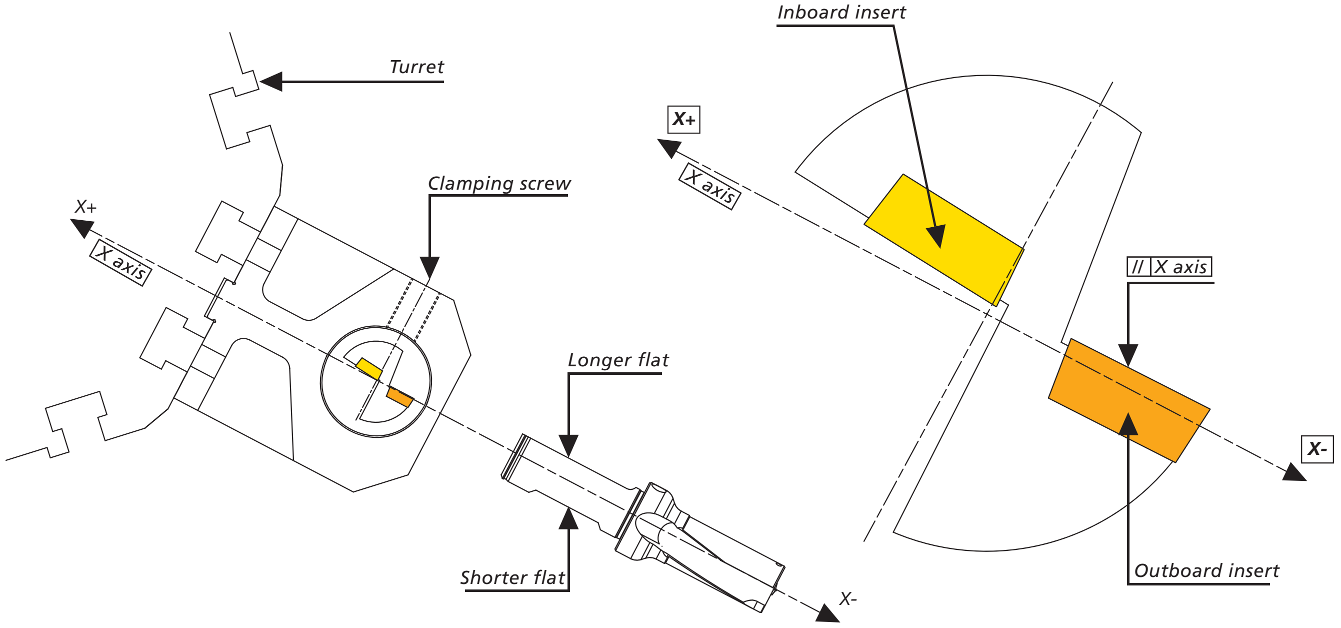


Fig. 1 Installation to the lathe

Center height adjustement

Be sure that the top face of the inboard insert is set around 0.1 mm below the centerline.

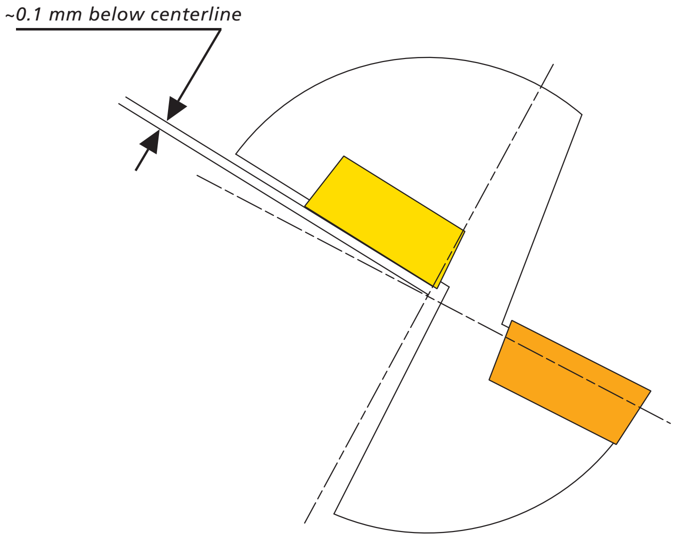


Fig. 2 Center height adjustement

Please note, the insert’s top (rake) faces are not parallel.

SILVER-DRILL
Drill characteristics

Set-up for lathe (continued)

Cutting diameter adjustement

The shank of the drill has two flats at 180°. Therefore, according to the inserts orientation, the adjustment of the cutting diameter is possible towards the X+ or X- direction.

General case: To increase the cutting diameter, move towards the X- direction.

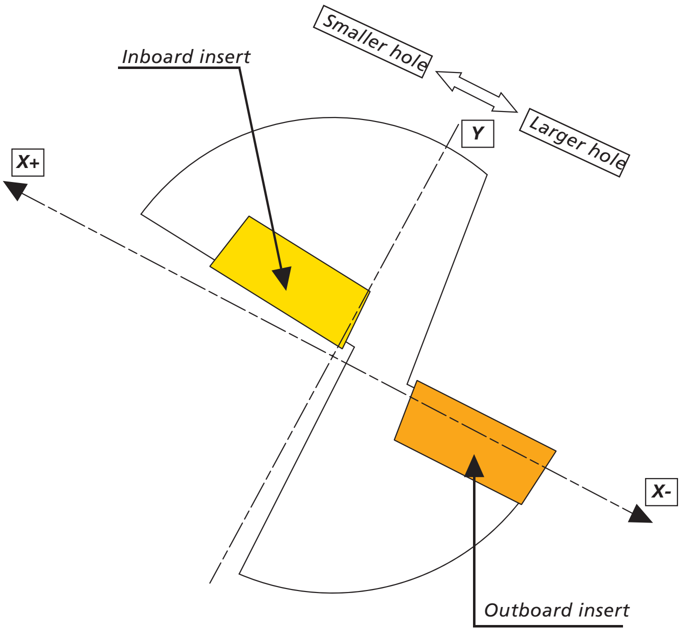


Fig. 3 Outboard insert facing up

Particular case: To increase the cutting diameter, move towards the X+ direction.
(For example: when programming a negative motion is problematic)

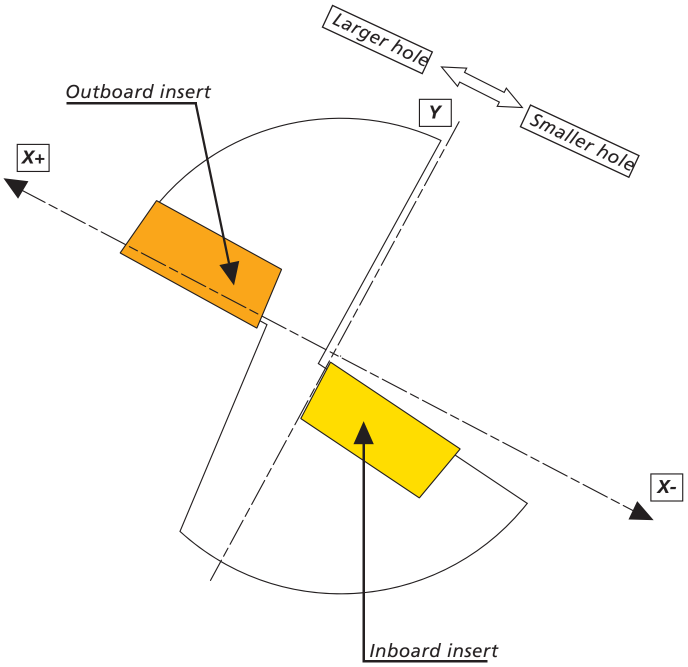


Fig. 3 Outboard insert facing down

DRILLING

SILVER-DRILL
Drill characteristics

Set-up for lathe (continued)

Off-center

It is possible to obtain a bigger hole than the theoretical drill diameter.
See information page 521 for the off-center drilling chart.
If the drill is set too much off-center, interference with the front part of the drill body and the bottom part of the hole will occur (Fig. 5).
The possibility to obtain a slightly smaller hole than the theoretical drill diameter is possible on the condition that the offset should not be more than 0.05 mm. Again, If it is too much off-center, interference with the drill body diameter and the hole diameter will occur (Fig. 6).

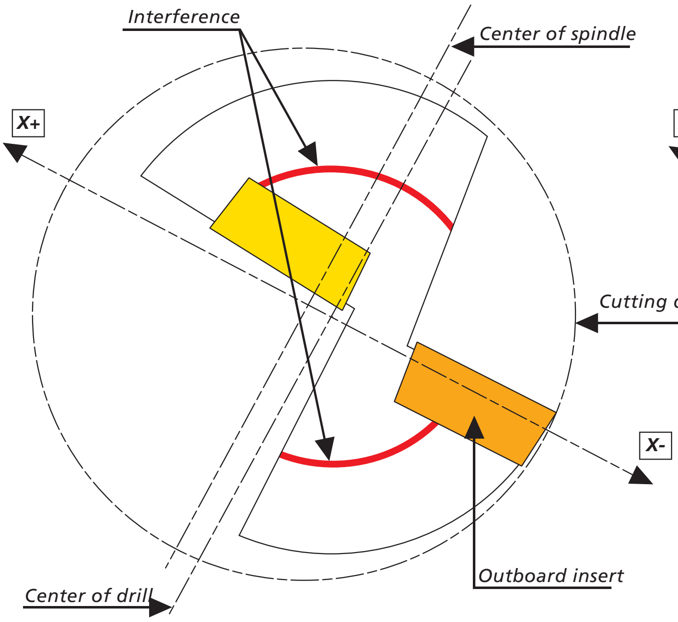


Fig. 5 Interference if excessive offset for a larger hole

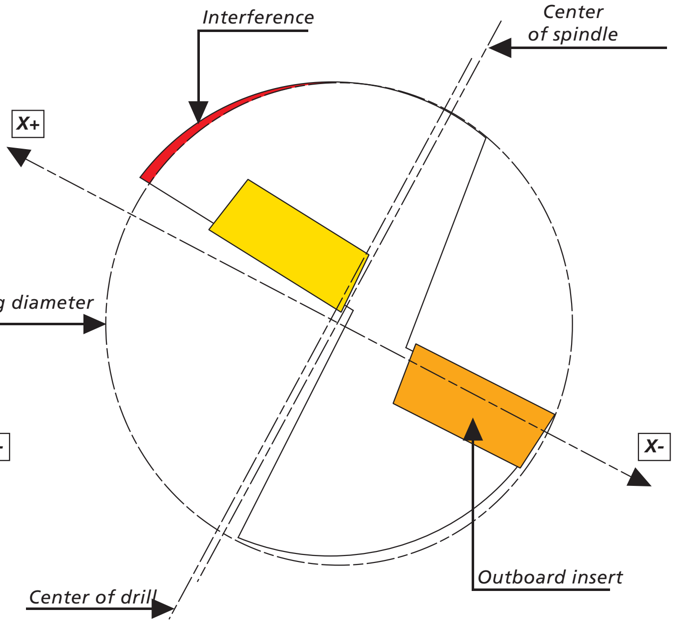


Fig. 6 Interference if excessive offset for a smaller hole

Checking of the drill position

Because the cutting forces, the alignment of the turret, and the different lathe clearances are all able to change the drill behaviour, it is strongly recommended to check the drill position before drilling a final hole.

a – Drill a shallow **blind** hole which is 10% to 15% of the hole diameter.

b – Check the shallow hole to verify that a core which has a diameter < 0.3 mm remains in the center (Fig. 7).

If the core is smaller or non-existent then the inboard insert is on or above center and insert breakage near the center of the drill may occur.

If the core is larger than 0.4 mm then the inboard insert is positioned too far below center and the drill can bend and deflect more than normal.
In both cases it is necessary to adjust the drill position relative to the turret centerline.
However, a simple rotation of the drill at 180° will solve most of these problems.

DRILLING

SILVER-DRILL
Drill characteristics

Set-up for lathe (continued)

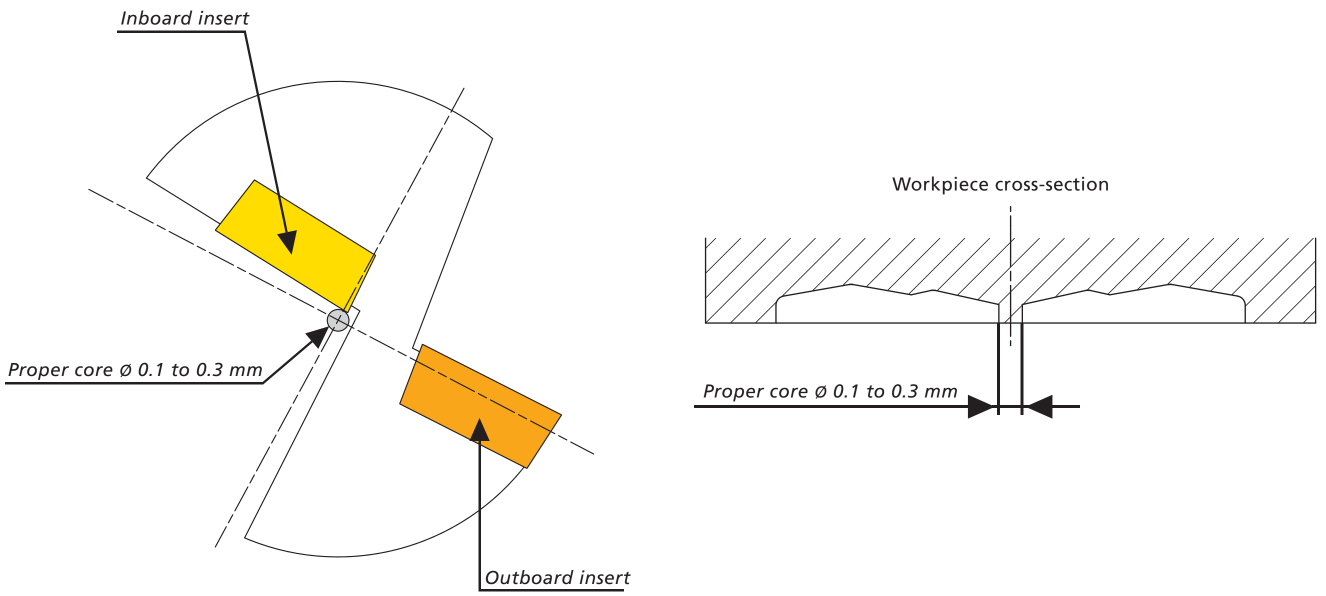


Fig. 7 Center core

c – Drill a hole one time diameter depth with a moderate feed rate (~25% of the minimum recommended feed rate) to check you have good swarf evacuation.
The easiest way to check for good chip evacuation is to put a chip that was cut into the matching flute and then check to see if it fits well (Fig. 8).
d – Afterwards, optimize the cutting conditions.

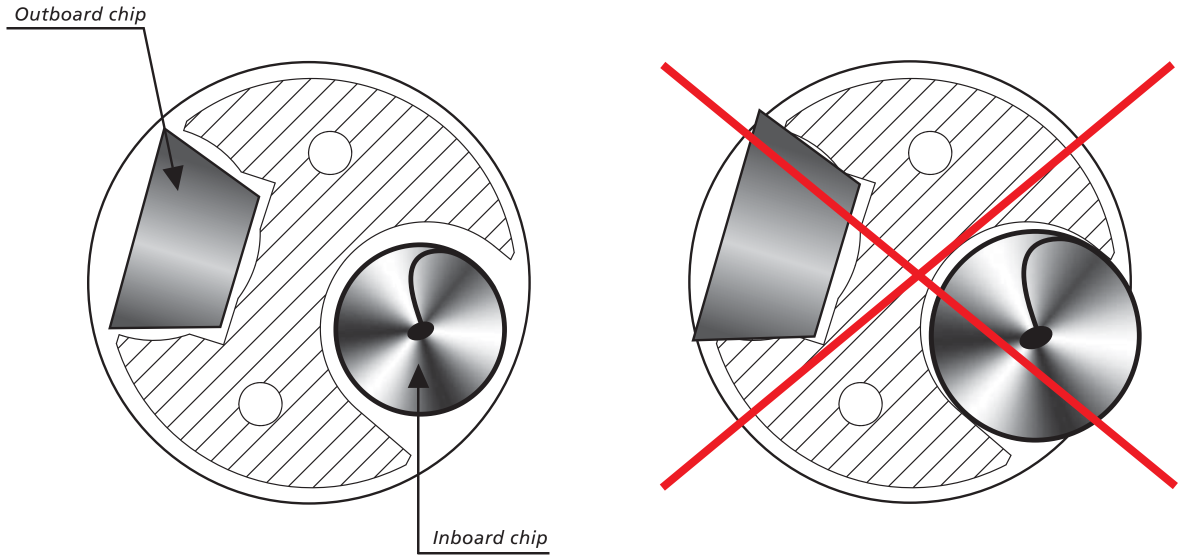


Fig. 8 Chips size checking

SILVER-DRILL

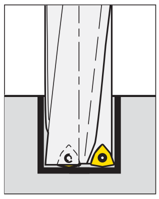
Drill characteristics

Cutting data

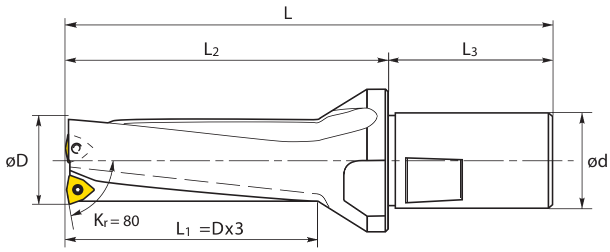
Material		Strength resis-tance Rm MPa	Hard-ness HB	Cutting speed	LCMT040205				XPMT060204		XPMT080308		XPMT09T308	
					Ø 12 to 14 mm		Ø 14.5 to 16 mm		Ø 16.5 to 21 mm		Ø 22 to 26 mm		Ø 26 to 30 mm	
					Feed mm/rev length									
					2 x Ø	4 x Ø	2 x Ø	4 x Ø	2 x Ø	4 x Ø	2 x Ø	4 x Ø	2 x Ø	4 x Ø
P Steel	With carbon < 0.2%	310-580	80-170	280 (180-340)	0.06 (0.05-0.07)	0.03 (0.02-0.04)	0.07 (0.06-0.08)	0.05 (0.03-0.06)	0.10 (0.08-0.12)	0.08 (0.06-0.10)	0.12 (0.10-0.14)	0.10 (0.08-0.12)	0.14 (0.10-0.18)	0.12 (0.08-0.16)
	With carbon 0.35%	340-680	90-200	270 (170-320)										
	With carbon 0.4%	520-930	150-275	250 (150-300)										
	Low-alloy steel annealed	310-840	80-250	230 (140-290)										
	Low-alloy hardened and tempered	745-1470	220-450	160 (100-200)										
	High alloy annealed	310-840	80-250	190 (110-230)										
	High alloy, hardened and tempered	840-1580	250-450	125 (75-150)										
	Non-alloy steel casting	340-760	90-225	210 (125-250)										
	Low alloy steel casting	520-745	150-220	180 (110-220)										
	High alloy steel casting	600-775	175-230	150 (90-180)										
M Stainless steel	Martensitic. ferritic annealed steel	-	90-225	170 (140-230)	0.06 (0.05-0.07)	0.03 (0.02-0.04)	0.07 (0.06-0.08)	0.05 (0.03-0.06)	0.10 (0.08-0.12)	0.08 (0.06-0.10)	0.12 (0.10-0.14)	0.10 (0.08-0.12)	0.14 (0.10-0.18)	0.12 (0.08-0.16)
	Autenitic annealed steel	-	150-250	110 (80-150)										
K Cast iron	Malleable ferritic cast iron	-	110-145	180 (150-250)	0.10 (0.08-0.12)	0.08 (0.06-0.10)	0.12 (0.10-0.14)	0.10 (0.08-0.12)	0.16 (0.12-0.20)	0.14 (0.10-0.18)	0.18 (0.14-0.22)	0.16 (0.12-0.20)	0.20 (0.16-0.24)	0.18 (0.14-0.22)
	Malleable pearlitic cast iron	-	150-270	150 (120-210)										
	Grey cast iron (FG)	-	150-220	250 (150-320)										
	Grey cast iron (FG)	-	200-330	180 (150-210)										
	Nodular GS. ferritic	-	125-230	180 (140-180)										
	Nodular GS. pearlitic	-	200-300	140 (100-210)										

FY-SAF

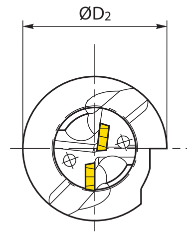
Drill program, FY-3D right hand drills
D = 31 - 54 mm



Cutting angle = 18°



Drills with shank Ød = 32/40 with flat



Hole tolerance (3xD) ± 0,2

Cylindrical shank

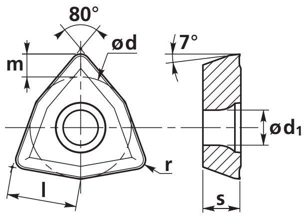
Reference	D	d	d_1	L	L_1	L_2	L_3	Insert
3xD								
FY-3D-31/36-32	31	32	50	176.5	93	118.5	58	WCMT 06
FY-3D-32/36-32	32	32	50	180	96	122	58	WCMT 06
FY-3D-33/37-32	33	32	50	184	99	126	58	WCMT 06
FY-3D-34/37-32	34	32	50	187.5	102	129.5	58	WCMT 06
FY-3D-35/38-32	35	32	50	191	105	133	58	WCMT 06
FY-3D-36/39-32	36	32	50	194.5	108	136.5	58	WCMT 06
FY-3D-37/39-32	37	32	50	198	111	140	58	WCMT 06
FY-3D-38/40-32	38	32	50	202	114	144	58	WCMT 06
FY-3D-39/41-32	39	32	50	205.5	117	147.5	58	WCMT 06
FY-3D-40/41-32	40	32	50	209	120	151	58	WCMT 06
FY-3D-41/42-32	41	32	50	212.5	123	154.5	58	WCMT 06
FY-3D-42/43-32	42	32	50	216	126	158	58	WCMT 06
FY-3D-43/49-40	43	40	60	230	129	162	68	WCMT 08
FY-3D-44/49-40	44	40	60	233.5	132	165.5	68	WCMT 08
FY-3D-45/50-40	45	40	60	237	135	169	68	WCMT 08
FY-3D-46/50-40	46	40	60	240.5	138	172.5	68	WCMT 08
FY-3D-47/51-40	47	40	60	244	141	176	68	WCMT 08
FY-3D-48/51-40	48	40	60	248	144	180	68	WCMT 08
FY-3D-49/52-40	49	40	60	251.5	147	183.5	68	WCMT 08
FY-3D-50/52-40	50	40	60	255	150	187	68	WCMT 08
FY-3D-51/53-40	51	40	60	258.5	153	190.5	68	WCMT 08
FY-3D-52/54-40	52	40	60	262	156	194	68	WCMT 08
FY-3D-53/54-40	53	40	60	266	159	198	68	WCMT 08
FY-3D-54/55-40	54	40	60	269.5	162	201.5	68	WCMT 08

Spare parts

	Insert clamping screw				Screwdriver for Insert screw		Spare part kit screw
	Reference	Size			Reference		Reference
WCMT 06	DVF 0943	M3	1.2 - 1.8 Nm	9IP	TX 209PLUS	9IP	DDR 0944
WCMT 08	27694	M3.5	3 - 4.1 N.m	T15	TX 215	T15	DDR 0261

FY-SAF

Insert program



	Reference	OR2500	OR5000	SY3	N	l	d	s	d_1	m	r
06	WCMT 06 T3 08-2P	✓	✓	✓	✓	6.51	9.525	3.97	3.4	2.202	0.8
	WCMT 06 T3 08-2S	-	✓	-	-	6.51	9.525	3.97	3.4	2.202	0.8
08	WCMT 08 04 12-2P	✓	✓	✓	-	8.70	12.70	4.76	4.4	2.862	1.2

Top form geometry

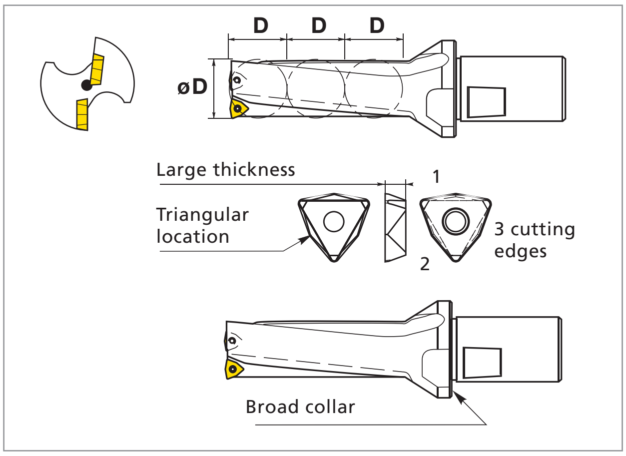
Top form geometry	P Steel	M Stainless steel	K Cast iron	N Non-ferrous aluminum	S Super alloys	H Hardened materials	Insert
2P	OR2500 **OR5000** SY3	OR2500 **OR5000**	**N**	-	-	-	
2S	**OR5000**	-	OR5000	-	-	-	

FY-SAF

Drill characteristics

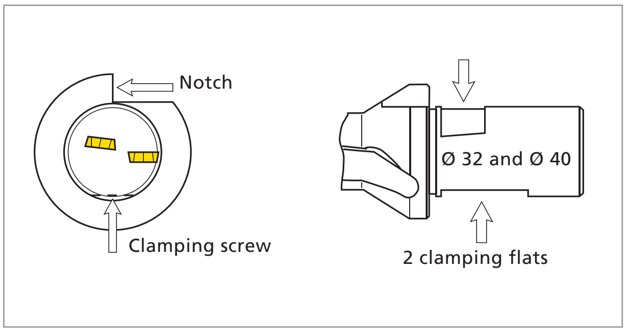
Drilling possibilities

The FY-SAF is designed to drill in solid material without guidance or pre-holes. The drilling is carried out on 3xD whatever the diameter D of the drill.
The helical flutes give the drill great rigidity and excellent chip evacuation.
The location of the inserts, based on a triangular shape, enable great repositioning accuracy.
The thickness of the inserts guarantees their strength.
The broad support collar in front of the shank favours good stability of the drill.

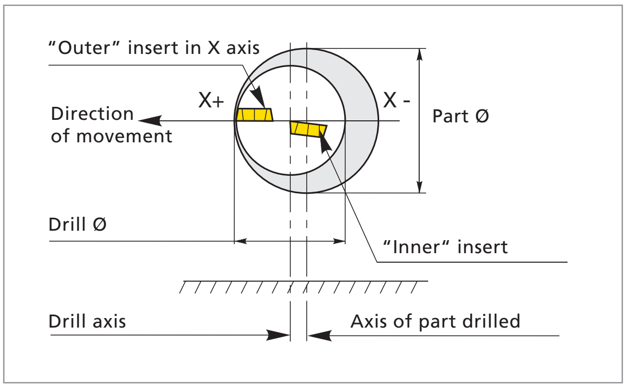


Use as fixed/rotating drill

There are two shank diameters for the FY-SAF drill range
Ø 32 for drills of Ø 31 to 42 mm
Ø 40 for drills of Ø 43 to 54 mm
The construction of the shank makes the fitting of FY-SAF drills possible on several different arbors.
Special shank: consult us.
On the arbor, the pin that locates into the notch in the drill helps prevent the shank tightening screw from becoming locked.
On right hand fluted drills the drilling torque is entirely taken up by the notch and pin.

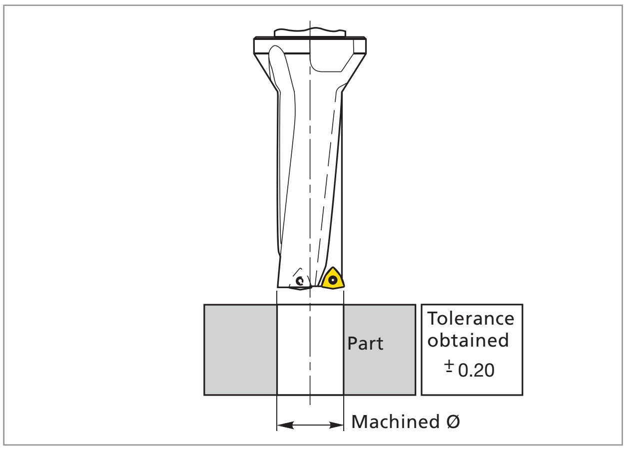


Excentration capacities:
As a fixed drill, the FY-SAF provides the possibility of drilling greater diameters in accordance with the values indicated on the collar of the drill. The movement is made on the X axis which is parallel to the slide of the machine and to the outer insert of the drill. It is not therefore necessary to stock all the drills to drill diameters from 31 to 54 mm.



FY-SAF range drilling tolerance

The hole tolerance obtained with the FY-SAF is ± 0.20 under normal conditions of use.
This value may deviate to a greater or lesser extent according to:
- the material machinability
- the machine spindle stiffness
- the part stiffness
- cutting forces
- etc.

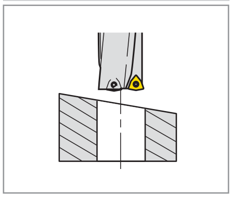


DRILLING

FY-SAF
Drill characteristics

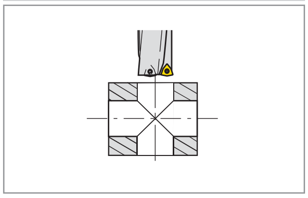
Drilling possibilities (continued)
Rotary drills

Inclined plane



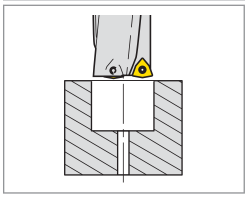
If inclined plane > à 2°, reduce the fz values from 50% to 75%. Do not exceed 30°

Perpendicular holes



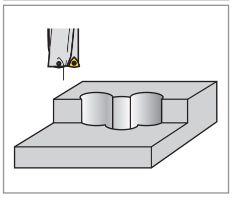
If secant hole is higher from 1/4 than drilled hole, reduce the fz from 50% crossing drilled hole

Pre-drilled holes



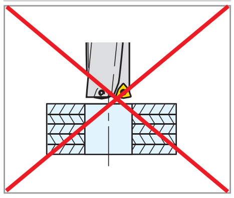
Pre-drilled hole should not be higher from 1/4 than the drilled hole

Plunging



Reduce the fz values by 50%

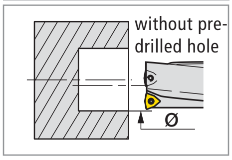
Stacked metal plates



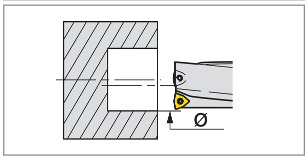
Prohibited

Fixed drills

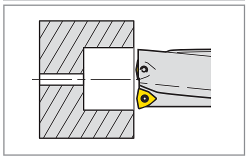
Off-centre



Reboring

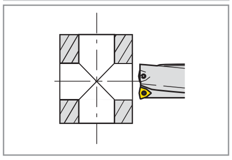


Pre-drilled holes



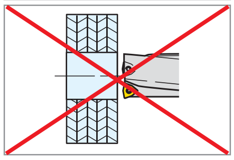
Pre-drilled hole should not be higher from 1/4 than the drilled hole

Perpendicular holes



If secant hole is higher from 1/4 than drilled hole, reduce the fz from 50% crossing drilled hole

Stacked metal plates



Prohibited

Cutting data

		Strenght resistance Rm (MPa)	Hardness HB	Cutting speed V_c (m/min)	Feed f_n (mm/rev)	
					Ø 31 - 42 mm	Ø 43 - 54 mm
P Steel	With carbon < 0.2%	310-580	80-170	250-350	0.12	0.12 - 0.16
	With carbon < 0.35%	340-680	90-200	250-350	0.12	0.12 - 0.16
	With carbon 0.4%	520-930	150-275	250-350	0.12	0.12 - 0.16
	Low alloy, hardened and tempered	310-840	80-250	150-250	0.08 - 0.10	0.10 - 0.12
	Low alloy, hardened and tempered	745-1360	220-450	150-250	0.08 - 0.10	0.10 - 0.12
	High alloy, annealed	310-840	80-250	150-250	0.08 - 0.10	0.10 - 0.12
	High alloy, hardened and tempered	840-1580	250-450	150-250	0.08	0.10 - 0.12
	Non-alloy steel casting	340-760	90-225	150-310	0.10 - 0.12	0.12 - 0.16
	Low alloy steel casting	520-745	150-220	150-280	0.10 - 0.12	0.12 - 0.16
	High alloy steel casting	600-775	175-230	150-250	0.10 - 0.12	0.12 - 0.16
M Stainless steel	Annealed, martensitic, ferritic	-	90-225	100-180	0.06 - 0.08	0.08 - 0.10
	Annealed, austenitic	-	150-250	100-150	0.06 - 0.08	0.08 - 0.10
K Cast iron	Malleable ferritic cast iron	-	110-145	180-250	0.1 - 0.3	0.1 - 0.3
	Malleable pearlitic cast iron	-	150-270	120-150	0.1 - 0.3	0.1 - 0.3
	Grey cast iron (FG)	-	150-220	250-300	0.1 - 0.3	0.1 - 0.3
	Grey cast iron (FG)	-	200-330	180-250	0.1 - 0.3	0.1 - 0.3
	Nodular GS, ferritic	-	125-230	180-250	0.1 - 0.3	0.1 - 0.3
	Nodular GS, perlitic	-	200-300	150-180	0.1 - 0.3	0.1 - 0.3

FY-SAF

Drill characteristics

Drill codification

FY	-	3	D	-	31	/	36	-	32
1		2	3		4		5		6

1 - Range
FY : FY-SAF

2 - Max. drilling depth
3 : 3 times the min. drilling diameter

3 - Hand of drill
D : Right-hand

4 - Nominal diameter
31 : 31 mm

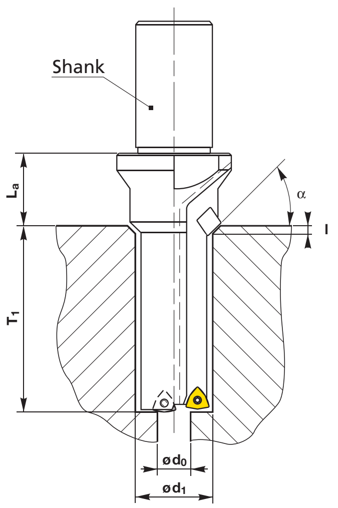
5 - Max drilling diameter by excentration (fixed tool)
36 : 36 mm

6 - Shank diameter
32 : 32 mm

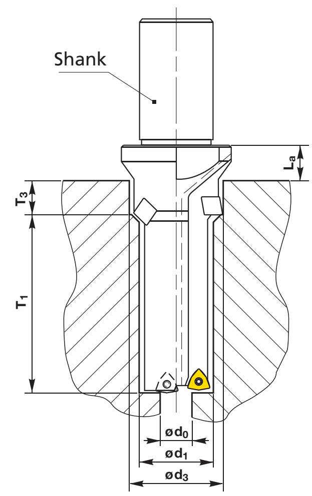
Special drills

All the combined special drills are produced with straight flutes.

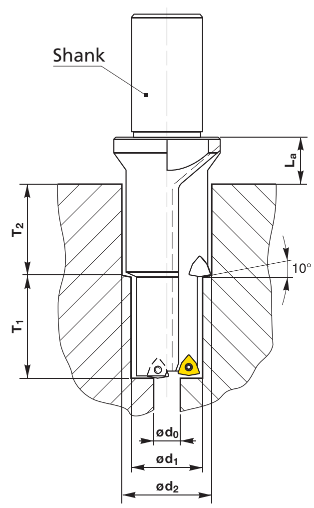
Drilling + chamfering



Drilling + chamfering + spot facing



Staggered drilling



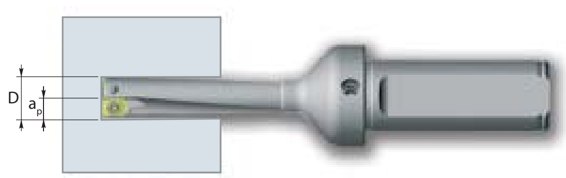
DRILLING

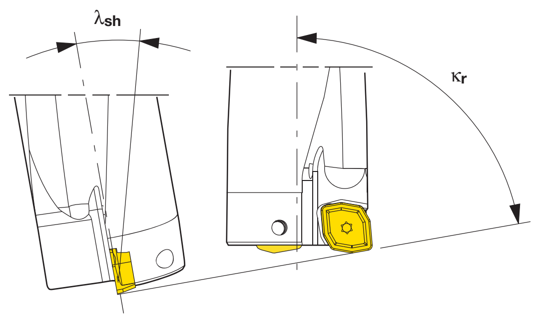
DRILLING FORMULAE

Parameters to determine		Known parameters		Formula
Cutting speed (m/min)	v_c	Machined diameter (mm)	D_m	$v_c = \frac{\pi \times D_m \times n}{1\,000}$
		Spindle speed (r/min)	n	
Spindle speed (r/min)	n	Cutting speed (m/min)	v_c	$n = \frac{1\,000 \times v_c}{\pi \times D_m}$
		Machined diameter (mm)	D_m	
Feed per minute (mm/min)	v_f	Feed per revolution (mm/r)	f_n	$v_f = f_n \times n$
		Spindle speed (r/min)	n	
Corrected specific cutting force (N/mm²) according to feed rate, κ_r angle and cutting angle	K_{cfz}	Specific cutting force for chip thickness = 0.4 mm (N/mm²)	$K_{c0.4}$	$K_{cfz} = K_{c0.4} \left(\frac{0.4}{f_n \times \sin \kappa_r}\right)^{0.22} \times \left(1 + \frac{6 - \lambda_{sh}}{100}\right)$
		Feed per revolution (mm/r)	f_n	
		Entering angle (degree)	κ_r	
		Cutting angle (degree)	λ_{sh}	
Feed thrust (N)*	F_f	Depth of cut (mm)	a_p	$F_f = 0.5 \times a_p \times f_n \times K_{cfz} \times \sin \kappa_r$
		Feed per revolution (mm/r)	f_n	
		Corrected specific cutting force (N/mm²)	K_{cfz}	
		Entering angle (degree)	k_r	
Torque (Nm)*	M_c	Machined diameter (mm)	D_m	$M_c = \frac{D_m \times f_n \times K_{cfz} \times a_p}{2\,000} \left(1 - \frac{a_p}{D_m}\right)$
		Feed per revolution (mm/r)	f_n	
		Corrected specific cutting force (N/mm²)	K_{cfz}	
		Depth of cut (mm)	a_p	
Net power (kW)*	P_c	Depth of cut (mm)	a_p	$P_c = \frac{a_p \times f_n \times K_{cfz} \times v_c}{60\,000} \left(1 - \frac{a_p}{D_m}\right)$
		Feed per revolution (mm/r)	f_n	
		Corrected specific cutting force (N/mm²)	K_{cfz}	
		Cutting speed (m/min)	v_c	
		Machined diameter (mm)	D_m	

* Add the off-load powers.

Power calculated for a new tool





DRILLING FORMULAE

Drilling use example

Material to be drilled =	XC35
Hardness =	275 HB

Drilled diameter =	20 mm
Depth =	30 mm

Drill =	SD 100A/2-M2000-L20-R
Insert =	XPMT 06 02 04 EN-57 KR15

Material to be drilled

Revolutions per minute: with $v_c = 270$

$$n = \frac{270 \times 1\,000}{\pi \times 20} = 4\,297 \text{ r/min}$$

Feed per minute: with $f_n = 0.08$

$$v_f = 4\,297 \times 0.08 = 344 \text{ mm/min}$$

Cutting force corrected for a feed rate of 0.08:
$K_{c\,0.4}$ for XC35 = 2 100

$$K_{cfz} = 2\,100 \left(\frac{0.4}{0.08 \times \sin 80°}\right)^{0.22} \times \left(1 + \frac{6 - 15}{100}\right) = 3\,061 \text{ N/mm}^2$$

Torque required:

$$M_c = \frac{20 \times 0.08 \times 3\,061 \times 10}{2\,000} \times \left(1 - \frac{10}{20}\right) = 12.2 \text{ Nm}$$

$D = 20$ $f_n = 0.08$ $K_{cfz} = 3\,061$ $a_p = 10$

Feed thrust required:

$$F_f = 0.5 \times 10 \times 0.08 \times 3\,061 \times \sin 80° = 1\,205 \text{ N}$$

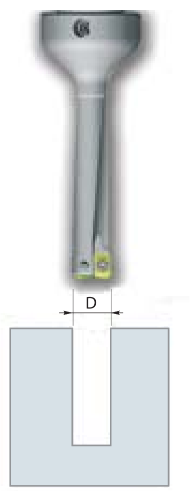
$a_p = 10$ $f_n = 0.08$ $K_{cfz} = 3\,061$ $\kappa_r = 80°$

Net power:

$$P_c = \frac{10 \times 0.08 \times 3\,061 \times 270}{60\,000} \times \left(1 - \frac{10}{20}\right) = 5.5 \text{ kW}$$

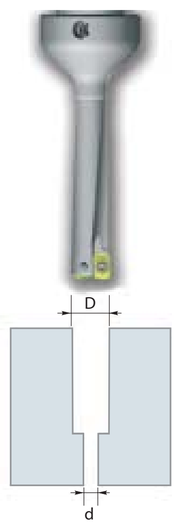
$D = 20$ $f_n = 0.08$ $K_{cfz} = 3\,061$ $a_p = 10$ $v_c = 270$

Volume of material removed



$$Q = \frac{\pi \times R^2 \times V_f}{1\,000}$$

Blind hole



$$Q = \frac{\left(\left(\frac{D}{2}\right)^2 - \left(\frac{d}{2}\right)^2\right) \times \pi \times v_f}{1\,000}$$

With a pre-hole

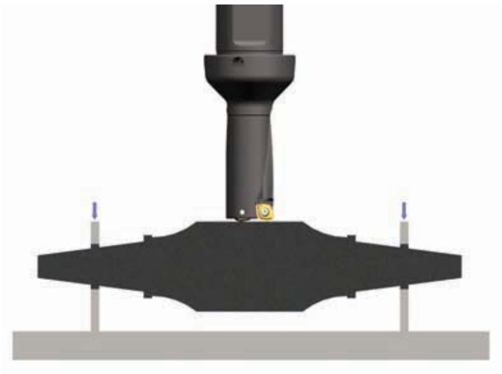
SPECIFIC CUTTING FORCE

Cutting force K_c 0.4 - f_z 0.4 - κ_r 90° - Cutting angle of + 6°				
Material		Strenght resistance Rm (MPa)	Hardness HB	Specific cutting force ($K_{c0.4}$)
P Steel	With carbon < 0.2%	445	125	1900
	With carbon < 0.35%	500	150	2100
	With carbon 0.4%	680	200	2250
	Low alloy, hardened and tempered	1000	300	2700
	Low alloy, hardened and tempered	1190	350	2850
	High alloy, annealed	680	200	2600
	High alloy, hardened and tempered	1095	325	3900
	Non-alloy steel casting	610	180	2000
	Low alloy steel casting	680	200	2500
	High alloy steel casting	760	225	2700
M Stainless steel	Annealed, martensitic, ferritic	-	90-225	2300
	Annealed, austenitic	-	150-250	2450
K Cast iron	Malleable ferritic cast iron	-	130	1100
	Malleable pearlitic cast iron	-	230	1100
	Grey cast iron (FG)	-	180	1100
	Grey cast iron (FG)	-	260	1500
	Nodular GS, ferritic	-	160	1100
	Nodular GS, perlitic	-	250	1800
N Aluminum & non-ferrous	Aluminum alloy < 6% Si	-	75-100	800
	Aluminum alloy > 6% Si	-	90-120	820
	Brass, lead	-	90	750
S High temp alloys	Annealed Ni or Co base alloy	-	250	3500
	Maturated Ni or Co base alloy	-	350	4150
	Cast nickel base	-	320	4150
	Titanium	950-1050	300	1700
H Hardened materials	Hardened steel	-	45 < 55HRC	4500

PRECAUTIONS FOR USE

To obtain correct chipbreaking, it is advised not to reduce the cutting speed to less than those recommended in the cutting data table.
In cases of interrupted cutting, inclined entries or exits or transverse holes, it is recommended to work with reduced feed rates.
Drilling exit burrs can be avoided by reducing the feed rate on exit of the hole.
For optimum use of the drills it is necessary to have rigid machines with high speeds or rotation, particularly for the use of small-diameter drills.
When drilling parts with thin walls, it is essential to provide clamping systems which eliminate bending or vibrations of the part during machining.

INCORRECT CLAMPING



Risk of bending and eccentric motion

CORRECT CLAMPING

No risk of bending or movement

When drilling a through-hole, a disc will be formed as the drill breaks through. This is often ejected at high speed, which could cause injury or damage.
To prevent any accident, the chuck should be fitted with an adequate guard.

With some materials chips cannot be fragmented during machining (certain stainless steels, heat resistant materials, soft steels).
To evacuated chips correctly, the feed rate must be reduced and the speed increased in order to form a folded chip.

DRILLING WITH COOLANT

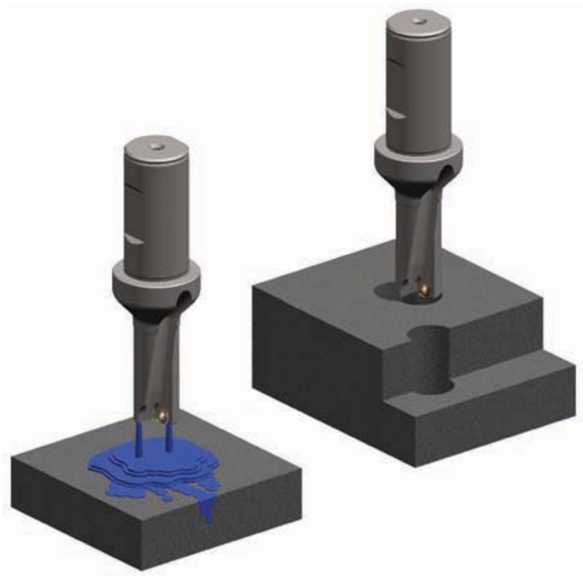
Good coolant practices are essential for optimizing drill tool life and chip removal.
Key elements are
- Volume
- Pressure
- Direction

General conditions of use

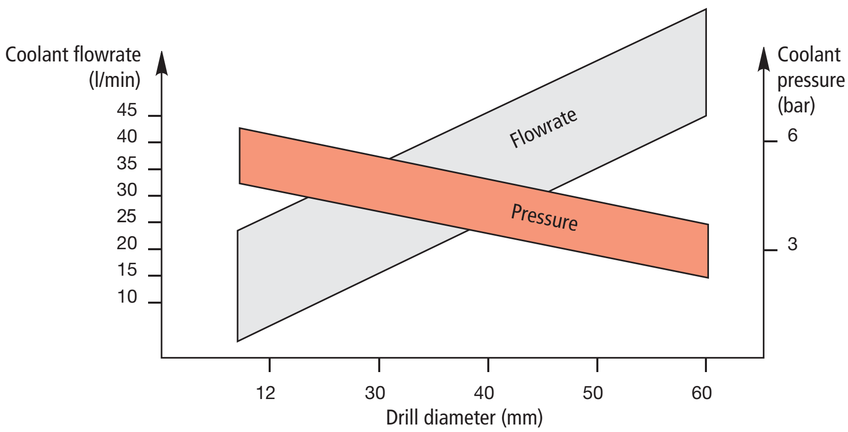
The use of internal coolant is strongly recommended for all cases.
However if internal coolant is not available, see the recommendations bellow.

All drills do not require any high-pressure pumps.
The coolant pressure available is usually sufficient.

STRONGLY RECOMMENDED



Recommended pressure and flow rate values



PROBLEM SOLVING

Problem	Solution
Vibrations	Reduce the overhang as much as possible Check if the tool and part are tight Increase the feed rate Increase the cutting speed for soft materials Reduce the cutting speed for hard materials
Chip jam	Increase the feed rate to obtain fragmenting Increase the coolant pressure
Chipped inserts	Reduce the feed rate at the drilling entry Select a softer insert grade Reduce the feed Check if the assembly is correct Reduce the cutting speed with hard materials
Insert incorrectly seated	Clean insert seat Check if insert seat is damaged, replace drill
Poor tool life	Check material reference and cutting data Increase coolant flow Clamp tool and/or secure part better Inspect/repair spindle
Wear on clearance	Reduce the cutting speed Increase the coolant pressure Increase the feed Select a harder insert grade
Conical drilling	Check the insert wear Increase the coolant pressures Check the fragmenting of the chip Reduce the feed rate while retaining correct fragmenting of the chip Clamp tool or part better
Drilled hole, Undersize or oversize	Check the insert wear Increase the coolant pressure Reduce the feed Clamp tool and/or secure part better Realign drill Check machine spindle


PINZBOHR
2CT 75 402

MODULAR BORING SYSTEM DESCRIPTION

Safety boring system is a range of rough and finish boring heads covering diameters from 6 mm. up to 500 mm.
There are three types of boring heads:
1) Rough boring heads (two inserts) with synchronized adjustment.
2) Finish boring heads (one insert).
3) Micro adjustable boring heads (for small diameters) fitting indexable insert pocket boring bars.
All these boring heads are radially adjustable to machine different diameters.
Mating adaptors are available in principal shank configurations.
Shank, extensions and reducers compliment the arbors and heads to offer a complete flexibility across the range.
The system features a wide range of ISO standard insert pocket choices and indexable cartridges.
The taper screw design allows units to be changed without removing tools from spindle. Main components are manufactured from Nickel-Chrome alloy steel, heat treated to 58-60 HRC.
Precision ground slides ensure accuracy of adjustment throughout the heads working life.

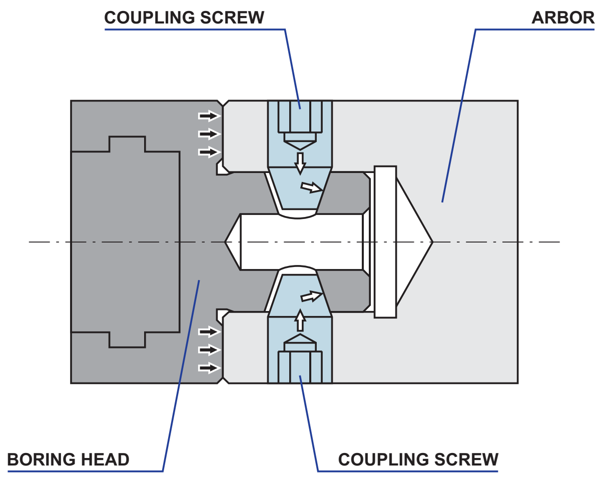
Coupling system

High rigidity

By tightening the two cone shaped coupling screws, high axial forces are developed in the tapered holes of the pilot shank.
These axial forces preload the contact surface between the flange faces of the coupled components withhigh axial pressure for ample support against lateral loads.
It can also dampen vibrations.

Positive tool orientation

The locating pin guarantees repeat positioning between components at all times.
All arbors, extensions and reducers are shipped complete with coupling screws.



Advantages

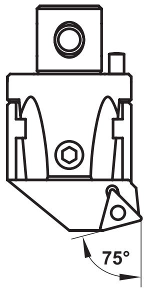
Practical modular system: different types of boring heads with arbors, extensions, reducers allow price reduction when tooling up the machine.
Wide range of diameters: 6 to 500 mm.
High accuracy and rigidity: clamping with taper screws (coupling screws).
Safety-set assembly designed to prevent damaging the adjustment screw.
Synchronized adjustment in rough boring heads (no need pre-setting slides with individual adjustment).
Fine adjustment in finish boring heads: graduated dial and read out precision up to 0.002 mm. in diameter.
Main components Nickel-Chrome alloy steel heat treated to 58-60 HRC.
Ground components to ensure accurate production.

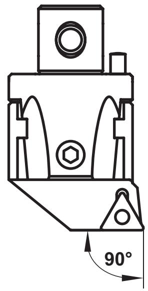
BORING

MODULAR BORING SYSTEM DESCRIPTION

Finish boring heads

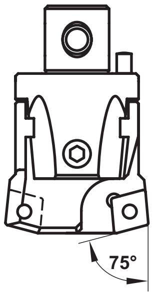
These adjustable boring heads do have a read-out precision of 0.002 mm Ø.
For diameters from 24 mm up to 220 mm,
finish boring heads are available in two choices of angle approach:
75° & 90° and feature various insert pocket geometries to choose.

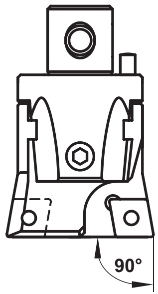




Rough boring heads

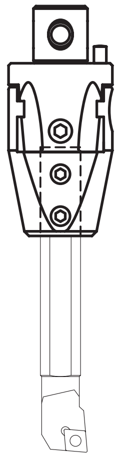
These boring heads with two cutting edges do have synchronized adjustment.
This advantage means not to waste time in presetting
the two cutting edges for a balanced cut.
For diameters from 24 mm up to 220 mm,
rough boring heads are available in two choices of angle approach:
75° & 90° and feature various insert pocket geometries to choose.





Micro boring heads

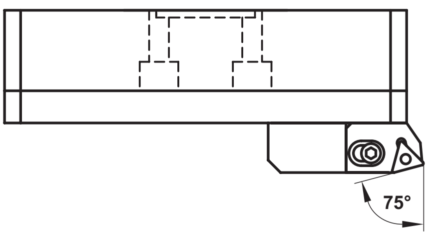
Safety MICRO heads are used in combination with
indexable ISO boring bars, these units can produce bores
down to 8 mm diameter and up to 38 mm diameter. These
MICRO heads fit the standard **Safety** arbors size 27, 32 and
42 mm diameter (recommended in extra short execution).
Graduated dial and read out precision of 0.002 mm Ø.

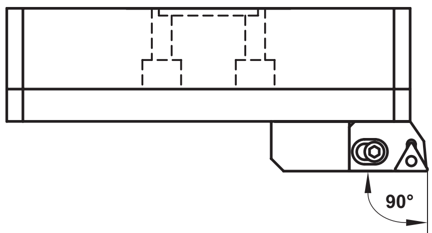


Large diameter heads

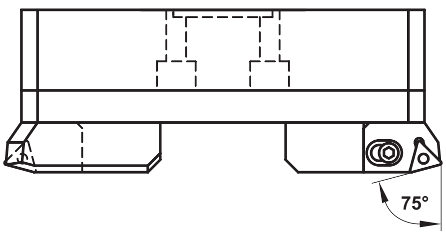
These boring heads, either rough and finish do have graduated dial
and a read out precision of 0.002 mm Ø and a diameter range from 220 mm up to 500 mm.
Four facing coupling screws do the assembly of large diameter heads to its holder.
By using ADT 100 50 adaptor it is possible to assemble these boring heads to the standard **Safety** holders (size 100) to allow the use of longer holders for deep boring applications in large diameter heads.

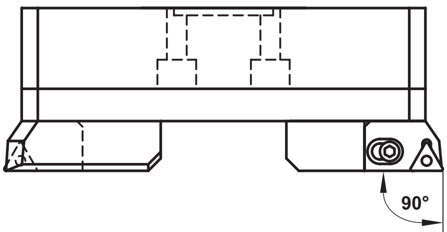
Finish boring heads



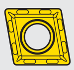
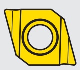


Rough boring heads





PROGRAM OVERVIEW

	Roughing heads p. 546 to 549			Finishing heads p. 550
				
	D22.. D27.. D32.. D42.. D54..	D68.. D85.. D100.. D200..	D300.. D400.. D500..	A22.. A27.. A32.. A42.. A54..
Boring diameter (mm)	24 - 82	80 - 220	220 - 500	24 - 82
Hole tolerance	IT9	IT9	IT9	IT7
Max. boring depth	5xD	4xD	360 mm	5xD
Entry angle	75° - 90°	75° - 90°	75° - 90°	75° - 90°
Type of tool	With two inserts	With two inserts on cartridges offset or not	With two inserts on cartridges offset or not	With one insert
Adjustment precision in finishing (mm Ø)	-	-	-	0.002
 **p. 554, 555, 557**	CC/CP.. 0602..	-	-	CC/CP.. 0602..
	CC/CP.. 0803..	-	-	CC/CP.. 0803..
	CC/CP.. 09T3..	-	-	CC/CP.. 09T3..
	CC.. 1204..	CC.. 1204..	CC.. 1204..	CC.. 1204..
	CN.. 1204..	CN.. 1204..	CN.. 1204..	CN.. 1204..
 **p. 555, 556**	-	-	-	-
 **p. 556**	-	-	-	-
	-	-	-	TP.. 0902..
	TC/CP.. 16T3..	TC/CP.. 16T3..	TC/CP.. 16T3..	TC/CP.. 16T3..

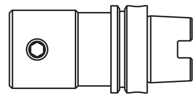
BORING

PROGRAM OVERVIEW

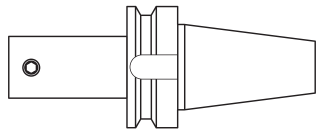
MICRO heads
p. 551, 552

A27 006.. A27 008.. A32 008.. A32 010.. A42 010.. A42 012.. A42 016..	- - - - - - A42 016..
ISO bars	MICRO bars
8 - 38	8 - 38
IT6	IT6
46 - 104 mm	36 - 73 mm
91° - 95°	52°30′ - 91° - 95°
With one insert Shank, diameter 6 - 8 - 10 - 12 - 16	With one insert Shank, diameter 16
0.002	0.002
CC/CP.. 0602..	CC/CP.. 0602..
-	-
CC/CP.. 09T3..	CC/CP.. 09T3..
-	-
-	-
EP.. 0502..	EP.. 0502..
-	TC.. 06T1..
TC/CP.. 0902..	TC/CP.. 0902..
TC/CP.. 16T3..	TC/CP.. 16T3..

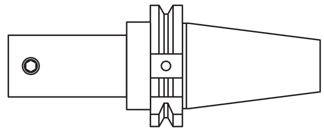
Arbors
p. 560 to 565



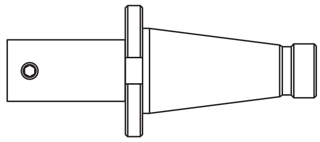
HSK / DIN 69893



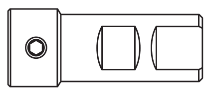
MAS BT 403



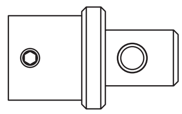
ISO 7388 / DIN 69871



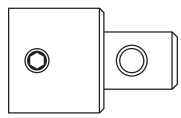
ISO STANDARD / DIN 2080



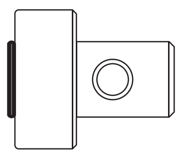
Weldon



Reducer



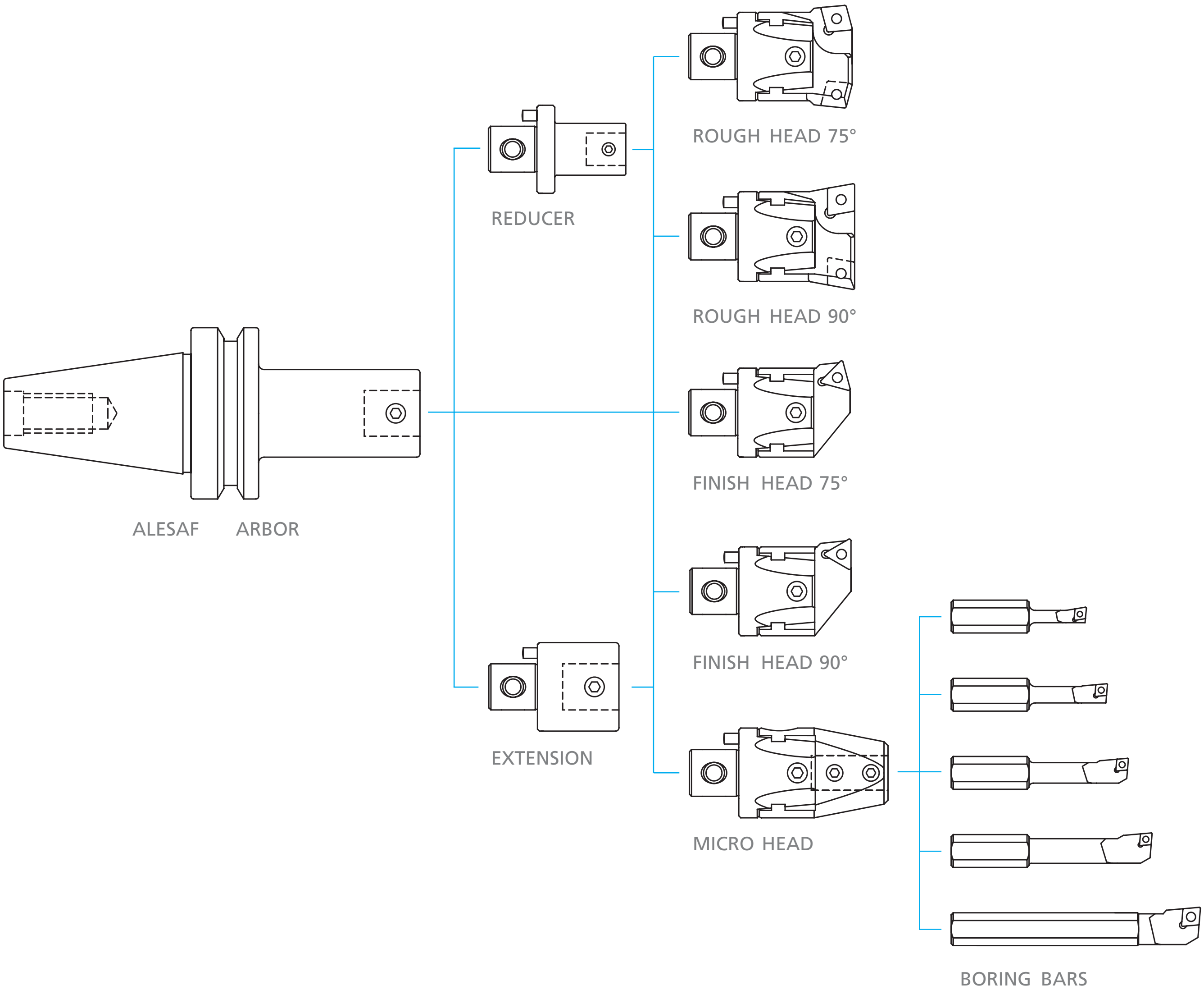
Extension



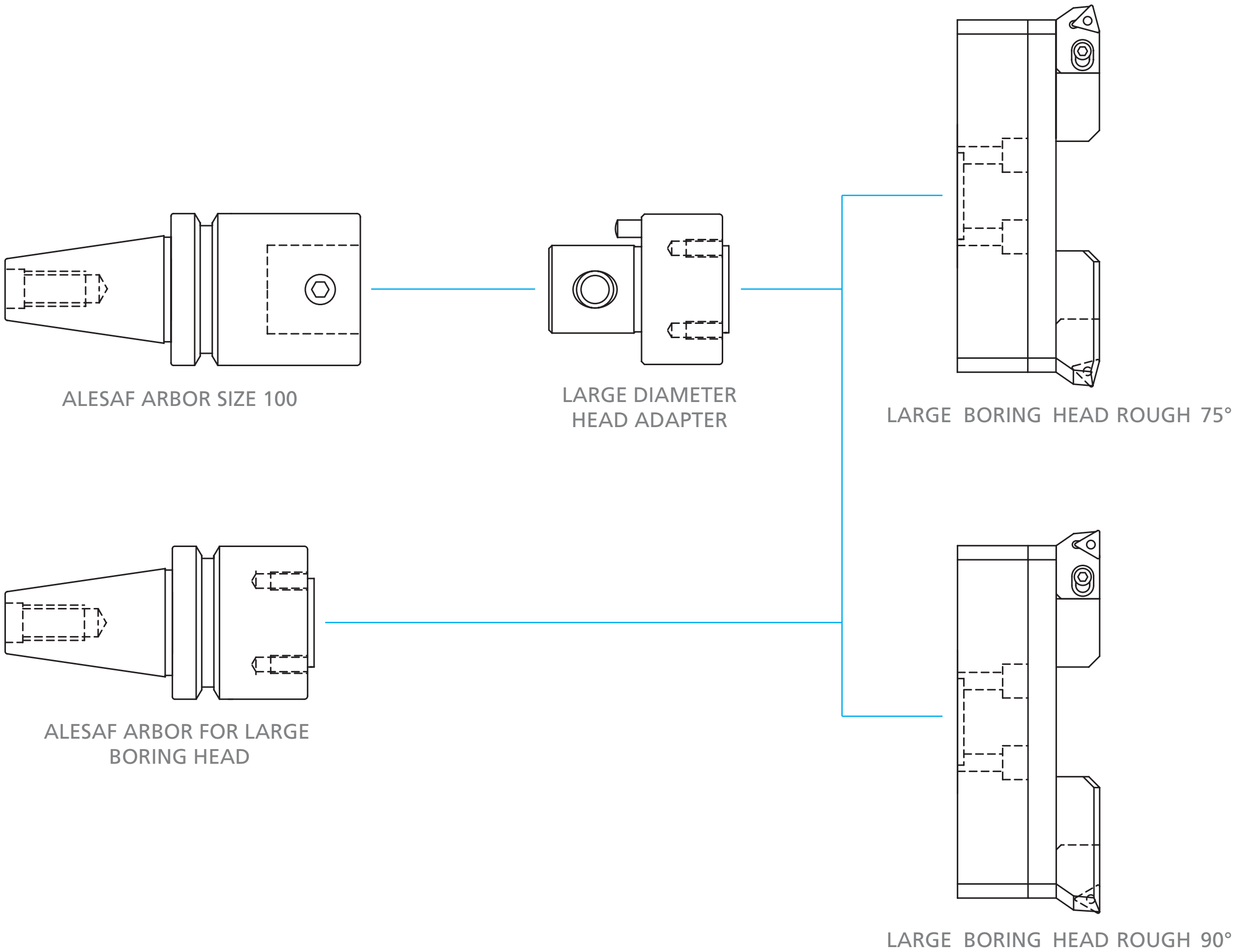
Large diameter head adapter

BORING

PROGRAM OVERVIEW

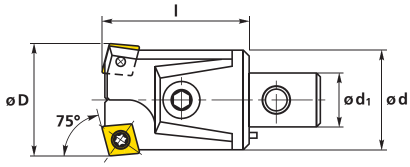


PROGRAM OVERVIEW

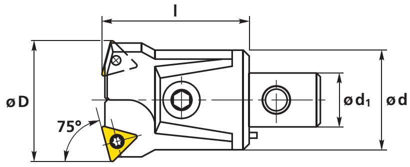


BORING HEADS

Roughing heads - 75°
D = 24 - 82 mm



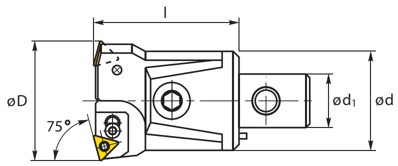
N°1



N°2

Reference	Fig.	D_{min}	D_{max}	d	d_1	l	kg	Insert style	Insert screw	Screw driver
D 22 75 400	N°1	24	30	22	12	34	0.100	CC.. 06 02...	27854	TX 208
D 27 75 401	N°1	29	40	27	15	42	0.180	CC.. 08 03...	27974	TX 210
D 27 75 409	N°1	29	40	27	15	42	0.180	CC.. 09 T3...	28106	TX 215
D 32 75 401	N°1	39	50	32	20	45	0.260	CC.. 08 03...	27974	TX 210
D 32 75 409	N°1	39	50	32	20	45	0.260	CC.. 09 T3...	28106	TX 215
D 42 75 300	N°2	49	65	42	24	56	0.600	TC.. 16 T3...	28107	TX 215
D 42 75 402	N°1	49	65	42	24	56	0.600	CC.. 12 04...	28349	TX 220
D 42 75 402N	N°1	53	65	42	24	56	0.600	CN.. 12 04...	TT 402N	174.1-863
D 54 75 300	N°2	63	82	54	28	66	1.100	TC.. 16 T3...	28107	TX 215
D 54 75 402	N°1	63	82	54	28	66	1.100	CC.. 12 04...	28349	TX 220
D 54 75 402N	N°1	63	82	54	28	66	1.100	CN.. 12 04...	TT 402N	174.1-863

Roughing heads with cartridges - 75°
D = 80 - 220 mm

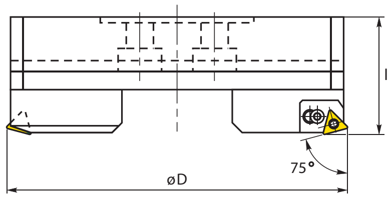


Reference	D_{min}	D_{max}	d	d_1	l	kg	Insert style	
D 68 75 2CT 300	80	102	68	36	86	2.300	TC..16T3..	2CT 75 300
D 68 75 2CT 402	80	102	68	36	86	2.300	CC.. 12 04...	2CT 75 402
D 68 75 2CT 402N	80	102	68	36	86	2.300	CN.. 12 04...	2CT 75 402N
D 85 75 3CT 300	100	125	85	50	100	4.300	TC..16T3..	3CT 75 300
D 85 75 3CT 402	100	125	85	50	100	4.300	CC.. 12 04...	3CT 75 402
D 85 75 3CT 402N	100	125	85	50	100	4.300	CN.. 12 04...	3CT 75 402N
D 100 75 3CT 300	125	160	110	60	100	6.800	TC..16T3..	3CT 75 300
D 100 75 3CT 402	125	160	110	60	100	6.800	CC.. 12 04...	3CT 75 402
D 100 75 3CT 402N	125	160	110	60	100	6.800	CN.. 12 04...	3CT 75 402N
D 200 75 3CT 300	160	220	145	60	100	9.000	TC..16T3..	3CT 75 300
D 200 75 3CT 402	160	220	145	60	100	9.000	CC.. 12 04...	3CT 75 402
D 200 75 3CT 402N	160	220	145	60	100	9.000	CN.. 12 04...	3CT 75 402N

BORING

BORING HEADS

Roughing heads with cartridges - 75°
D = 220 - 500 mm

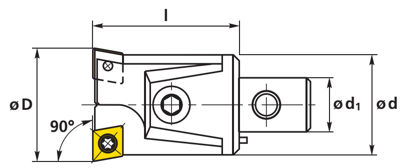


Reference	D_{min}	D_{max}	d	d_1	l	kg	Insert style	
D 300 75 3CT 300	220	320	-	-	90	10.100	TC..16T3..	3CT 75 300
D 300 75 3CT 402	220	320	-	-	90	10.100	CC.. 12 04...	3CT 75 402
D 300 75 3CT 402N	220	320	-	-	90	10.100	CN.. 12 04...	3CT 75 402N
D 400 75 3CT 300	290	400	-	-	90	13.750	TC..16T3..	3CT 75 300
D 400 75 3CT 402	290	400	-	-	90	13.750	CC.. 12 04...	3CT 75 402
D 400 75 3CT 402N	290	400	-	-	90	13.750	CN.. 12 04...	3CT 75 402N
D 500 75 3CT 300	370	500	-	-	90	16.900	TC..16T3..	3CT 75 300
D 500 75 3CT 402	370	500	-	-	90	16.900	CC.. 12 04...	3CT 75 402
D 500 75 3CT 402N	370	500	-	-	90	16.900	CN.. 12 04...	3CT 75 402N

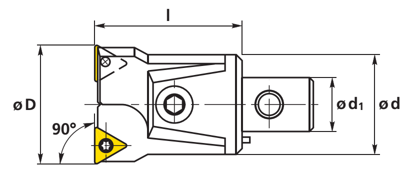
BORING

BORING HEADS

Roughing heads - 90°
D = 24 - 82 mm



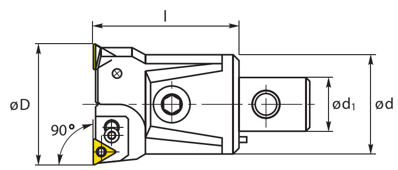
N°1



N°2

Reference	Fig.	D_{min}	D_{max}	d	d_1	l	kg	Insert style	Insert screw	Screw driver
D 22 90 400	N°1	24	30	22	12	34	0.100	CC.. 06 02...	27854	TX 208
D 27 90 401	N°1	29	40	27	15	42	0.180	CC.. 08 03...	27974	TX 210
D 27 90 409	N°1	29	40	27	15	42	0.180	CC.. 09 T3...	28106	TX 215
D 32 90 401	N°1	39	50	32	20	45	0.260	CC.. 08 03...	27974	TX 210
D 32 90 409	N°1	39	50	32	20	45	0.260	CC.. 09 T3...	28106	TX 215
D 42 90 300	N°2	49	65	42	24	56	0.600	TC.. 16 T3...	28107	TX 215
D 42 90 402	N°1	49	65	42	24	56	0.600	CC.. 12 04...	28349	TX 220
D 42 90 402N	N°1	53	65	42	24	56	0.600	CN.. 12 04...	TT 402N	174.1-863
D 54 90 300	N°2	63	82	54	28	66	1.100	TC.. 16 T3...	28107	TX 215
D 54 90 402	N°1	63	82	54	28	66	1.100	CC.. 12 04...	28349	TX 220
D 54 90 402N	N°1	63	82	54	28	66	1.100	CN.. 12 04...	TT 402N	174.1-863

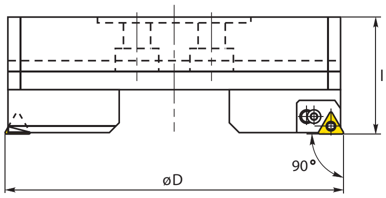
Roughing heads with cartridges - 90°
D = 80 - 220 mm



Reference	D_{min}	D_{max}	d	d_1	l	kg	Insert style	
D 68 90 2CT 300	80	102	68	36	86	2.300	TC..16T3..	2CT 90 300
D 68 90 2CT 402	80	102	68	36	86	2.300	CC.. 12 04...	2CT 90 402
D 68 90 2CT 402N	80	102	68	36	86	2.300	CN.. 12 04...	2CT 90 402N
D 85 90 3CT 300	100	125	85	50	100	4.300	TC..16T3..	3CT 90 300
D 85 90 3CT 402	100	125	85	50	100	4.300	CC.. 12 04...	3CT 90 402
D 85 90 3CT 402N	100	125	85	50	100	4.300	CN.. 12 04...	3CT 90 402N
D 100 90 3CT 300	125	160	110	60	100	6.800	TC..16T3..	3CT 90 300
D 100 90 3CT 402	125	160	110	60	100	6.800	CC.. 12 04...	3CT 90 402
D 100 90 3CT 402N	125	160	110	60	100	6.800	CN.. 12 04...	3CT 90 402N
D 200 90 3CT 300	160	220	145	60	100	9.000	TC..16T3..	3CT 90 300
D 200 90 3CT 402	160	220	145	60	100	9.000	CC.. 12 04...	3CT 90 402
D 200 90 3CT 402N	160	220	145	60	100	9.000	CN.. 12 04...	3CT 90 402N

BORING HEADS

Roughing heads with cartridges - 90°
D = 220 - 500 mm

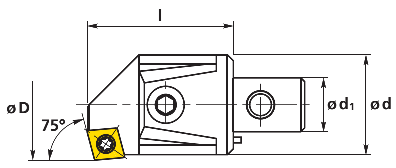


Reference	D_{min}	D_{max}	d	d_1	l	kg	Insert style	
D 300 90 3CT 300	220	320	-	-	90	10.100	TC..16T3..	3CT 90 300
D 300 90 3CT 402	220	320	-	-	90	10.100	CC.. 12 04...	3CT 90 402
D 300 90 3CT 402N	220	320	-	-	90	10.100	CN.. 12 04...	3CT 90 402N
D 400 90 3CT 300	290	400	-	-	90	13.750	TC..16T3..	3CT 90 300
D 400 90 3CT 402	290	400	-	-	90	13.750	CC.. 12 04...	3CT 90 402
D 400 90 3CT 402N	290	400	-	-	90	13.750	CN.. 12 04...	3CT 90 402N
D 500 90 3CT 300	370	500	-	-	90	16.900	TC..16T3..	3CT 90 300
D 500 90 3CT 402	370	500	-	-	90	16.900	CC.. 12 04...	3CT 90 402
D 500 90 3CT 402N	370	500	-	-	90	16.900	CN.. 12 04...	3CT 90 402N

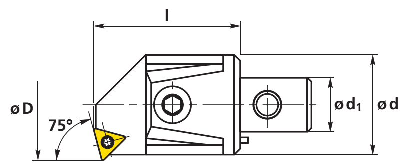
BORING

BORING HEADS

Finishing heads - 75°
D = 24 - 82 mm



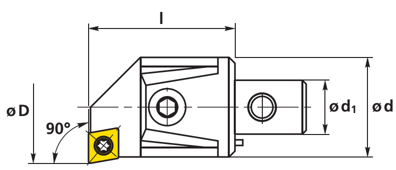
N°1



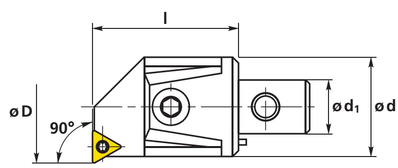
N°2

Reference	Fig.	D_{min}	D_{max}	d	d_1	l	kg	Insert style	Insert screw	Screw driver
A 22 75 310	N°2	24	30	22	12	34	0.080	TP.. 09 02..	27854	TX 208
A 22 75 400	N°1	24	30	22	12	34	0.080	CC.. 06 02...	27854	TX 208
A 27 75 310	N°2	29	40	27	15	42	0.180	TP.. 09 02..	27854	TX 208
A 27 75 401	N°1	29	40	27	15	42	0.180	CC.. 08 03...	27974	TX 210
A 27 75 409	N°1	29	40	27	15	42	0.180	CC.. 09 T3...	28106	TX 215
A 32 75 310	N°2	39	50	32	20	45	0.250	TP.. 09 02..	27854	TX 208
A 32 75 401	N°1	39	50	32	20	45	0.250	CC.. 08 03...	27974	TX 210
A 32 75 409	N°1	39	50	32	20	45	0.250	CC.. 09 T3...	28106	TX 215
A 42 75 300	N°2	49	65	42	24	56	0.580	TC.. 16 T3...	28107	TX 215
A 54 75 300	N°2	63	82	54	28	66	1.050	TC.. 16 T3...	28107	TX 215

Finishing heads - 90°
D = 24 - 82 mm



N°1

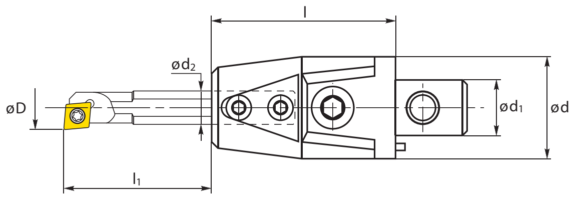


N°2

Reference	Fig.	D_{min}	D_{max}	d	d_1	l	kg	Insert style	Insert screw	Screw driver
A 22 90 310	N°2	24	30	22	12	34	0.080	TP.. 09 02..	27854	TX 208
A 22 90 400	N°1	24	30	22	12	34	0.080	CC.. 06 02...	27854	TX 208
A 27 90 310	N°2	29	40	27	15	42	0.180	TP.. 09 02..	27854	TX 208
A 27 90 401	N°1	29	40	27	15	42	0.180	CC.. 08 03...	27974	TX 210
A 27 90 409	N°1	29	40	27	15	42	0.180	CC.. 09 T3...	28106	TX 215
A 32 90 310	N°2	39	50	32	20	45	0.250	TP.. 09 02..	27854	TX 208
A 32 90 300	N°2	39	50	32	20	45	0.250	TC.. 16 T3...	28107	TX 215
A 32 90 401	N°1	39	50	32	20	45	0.250	CC.. 08 03...	27974	TX 210
A 32 90 409	N°1	39	50	32	20	45	0.250	CC.. 09 T3...	28106	TX 215
A 42 90 300	N°2	49	65	42	24	56	0.580	TC.. 16 T3...	28107	TX 215
A 42 90 402	N°1	49	65	42	24	56	0.580	CC.. 12 04...	28349	TX 220
A 42 90 402N	N°1	53	65	42	24	56	0.580	CN.. 12 04...	TT 402N	174.1-863
A 54 90 300	N°2	63	82	54	28	66	1.050	TC.. 16 T3...	28107	TX 215
A 54 90 402	N°1	63	82	54	28	66	1.050	CC.. 12 04...	28349	TX 220
A 54 90 402N	N°1	63	82	54	28	66	1.050	CN.. 12 04...	TT 402N	174.1-863

MICRO BORING HEADS

Finishing heads
D = 08 - 38 mm



Reference	D_{min}	D_{max}	d	d_1	d_2	l	l_1 (1)	kg	ISO tool
A 27 006	8	20	27	15	6	50	36	0.180	S06D SELPR 05
A 27 008	10	21	27	15	8	50	46	0.180	S08F SCLCR 06
A 32 008	10	21	32	20	8	58	46	0.370	S08F SCLCR 06
A 32 010	13	25	32	20	10	58	51	0.370	S10G SCLCR 06
A 42 010	13	29	42	24	10	70	51	0.690	S10G SCLCR 06
A 42 012	16	34	42	24	12	70	63	0.690	S12H SCLCR 06
A 42 016	20	38	42	24	16	70	73	0.690	S16J SCLCR 09

(1) All ISO boring bars with a shank diameter of 6 to 16 mm can be fitted on ALESAF MICRO heads. However, to avoid vibrations, the tool must be cut in such a way that the maximum dimension L_1 is at most equal to 4 times the diameter of the tool shanks (d_2).
This length may be increased if anti-vibration tools with a carbide body are used.

Spare parts

Reference	Tool tightening screw	Clamping screw
A 27 006	Hc M5x8	D27 21
A 27 008	Hc M5x8	D27 21
A 32 008	Hc M5x8	D32 21
A 32 010	Hc M6x10	D32 21
A 42 010	Hc M6x10	D42 21
A 42 012	Hc M8x12	D42 21
A 42 016	Hc M8x12	D42 21

Accessories

Tool tightening key	Locking key	Adjustment key
174.1-863	174.815	174.1-870
174.1-863	174.815	174.1-870
174.1-863	174.815	174.1-863
174.1-864	174.815	174.1-863
174.1-864	186-843	174.1-864
174.815	186-843	174.1-864
174.815	186-843	174.1-864

ALESAF MICRO Kits

Reference	Contents	
KIT A 42-016-DR	1 MICRO head	A 42 016
	1 MICRO bar	S 06/16-SEXPR-05
	1 MICRO bar	S 08/16-SCLCR-06
	1 MICRO bar	S 10/16-SCLCR-06
	1 MICRO bar	S 12/16-SCLCR-06
	1 MICRO bar	S 16/16-SCLCR-09
	6 inserts	CCMT 06 02 04
	2 inserts	CCMT 09 T3 04
	2 inserts	EPMT 05 02 02

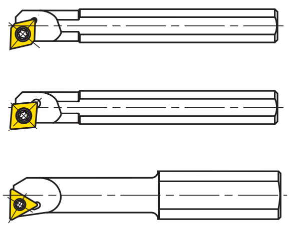
Reference	Contents	
KIT A 42-016-AD	1 MICRO head	A 42 016
	1 adapter	D42/27/45
	1 MICRO bar	S 06/16-SEXPR-05
	1 MICRO bar	S 08/16-SCLCR-06
	1 MICRO bar	S 10/16-SCLCR-06
	1 MICRO bar	S 12/16-SCLCR-06
	1 MICRO bar	S 16/16-SCLCR-09
	6 inserts	CCMT 06 02 04
	2 inserts	CCMT 09 T3 04
	2 inserts	EPMT 05 02 02

BORING BARS FOR MICRO BORING HEADS

Steel shank ISO boring bars

Reference	Insert style	Insert screw	Screw driver
S 06D-SELPR-05	EP.. 05 02 ...	28588	TX207
S 08F-SCLCR-06	CC.. 06 02 ...	27927	TX 208
S 10G-SCLCR-06	CC.. 06 02 ...	27927	TX 208
S 12H-SCLCR-06	CC.. 06 02 ...	27927	TX 208
S 16J-SCLCR-09	CC.. 09 T3 ...	28106	TX 215
S 16J-STFCR-09	TC.. 09 02..	27927	TX 208
S 16J-STFCR-16	TC.. 16 T3..	28107	TX 215

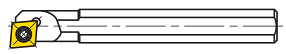
S-SELP
S-SCLC
S-STFC



Carbide shank ISO boring bars

Reference	Insert style	Insert screw	Screw driver
C 08G-SCLCR-06	CC.. 06 02..	27927	TX 207
C 10J-SCLCR-06	CC.. 06 02..	27927	TX 207
C 12K-SCLCR-06	CC.. 06 02..	27927	TX 207
C 16L-SCLCR-09	CC.. 09 T3..	28107	TX 215

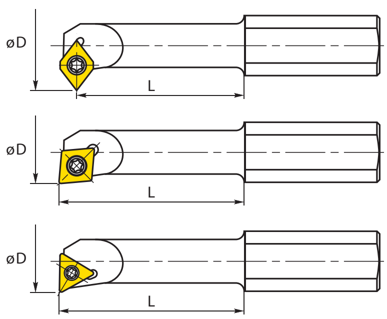
C-SCLC



Boring bars for A 42 016

Reference	D_{min}	D_{max}	L	Insert style	Insert screw	Screw driver
S 06/16-SEXPR-05	8	26	25	EP.. 05 02...	28588	TX 207
S 08/16-SCLCR-06	10	28	35	CC.. 06 02...	27927	TX 208
S 10/16-SCLCR-06	13	31	45	CC.. 06 02...	27927	TX 208
S 12/16-SCLCR-06	16	34	57	CC.. 06 02...	27927	TX 208
S 16/16-SCLCR-09	20	38	73	CC.. 09 T3...	28106	TX 215
S 06/16-STFCR-06	8	26	25	TCMT 06 T1...	28588	TX 207
S 08/16-STFCR-06	10	28	35	TCMT 06 T1...	28588	TX 207
S 10/16-STFCR-09	13	31	45	TCMT 09 02...	5513-020-05	TX 208
S 12/16-STFCR-09	16	34	57	TCMT 09 02...	5513-020-05	TX 208
S 16/16-STFCR-09	20	38	73	TCMT 09 02...	5513-020-05	TX 208
S 16/16-STFCR-16	20	38	73	TCMT 16 T3...	28107	TX 215

S-SEXP
S-SCLC
S-STFC

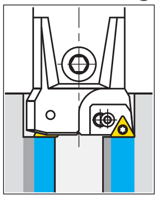


BORING

CARTRIDGES FOR STANDARD BORING HEADS

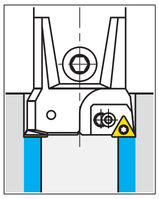
Cartridges - 75° - 90°

Offset boring

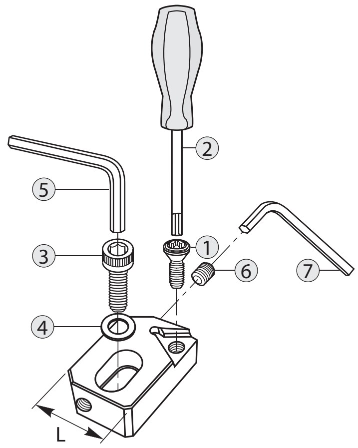


2CT... + 2CT...S
or
3CT... + 3CT...S

Symmetrical boring



2CT... + 2CT...
or
3CT... + 3CT...



Reference	L	kg	Insert style	①	②	③	④	⑤	⑥	⑦
2CT 75 300	22.5	0.05	TC.. 16 T3..	28106	TX215	CHc M6x20	Ø 6	186-843	Hc M4x20	174.1-870
3CT 75 300	28	0.10	TC.. 16 T3..	28107	TX215	CHc M6x25	Ø 6	186-843	Hc M6x35	174.1-864
2CT 90 300	22.5	0.05	TC.. 16 T3..	28106	TX215	CHc M6x20	Ø 6	186-843	Hc M4x20	174.1-870
2CT 90 300 S	23	0.05	TC.. 16 T3..	28106	TX215	CHc M6x20	Ø 6	186-843	Hc M4x20	174.1-870
3CT 90 300	28	0.10	TC.. 16 T3..	28107	TX215	CHc M6x25	Ø 6	186-843	Hc M6x35	174.1-864
3CT 90 300 S	28.5	0.10	TC.. 16 T3..	28107	TX215	CHc M6x25	Ø 6	186-843	Hc M6x35	174.1-864
2CT 75 402	22.5	0.05	CC.. 12 04..	28349	TX220	CHc M6x20	Ø 6	186-843	Hc M4x20	174.1-870
2CT 75 402N	22.5	0.05	CN.. 12 04..	TT 402N	174.1-863	CHc M6x20	Ø 6	186-843	Hc M4x20	174.1-870
3CT 75 402	28	0.10	CC.. 12 04..	28349	TX220	CHc M6x25	Ø 6	186-843	Hc M6x35	174.1-864
3CT 75 402N	28	0.10	CN.. 12 04..	TT 402N	174.1-863	CHc M6x25	Ø 6	186-843	Hc M6x35	174.1-864
2CT 90 402	22.5	0.05	CC.. 12 04..	28349	TX220	CHc M6x20	Ø 6	186-843	Hc M4x20	174.1-870
2CT 90 402 S	23	0.05	CC.. 12 04..	28349	TX220	CHc M6x20	Ø 6	186-843	Hc M4x20	174.1-870
2CT 90 402N	22.5	0.05	CN.. 12 04..	TT 402N	174.1-863	CHc M6x20	Ø 6	186-843	Hc M4x20	174.1-870
2CT 90 402N S	23	0.05	CN.. 12 04..	TT 402N	174.1-863	CHc M6x20	Ø 6	186-843	Hc M4x20	174.1-870
3CT 90 402	28	0.10	CC.. 12 04..	28349	TX220	CHc M6x25	Ø 6	186-843	Hc M6x35	174.1-864
3CT 90 402 S	28.5	0.10	CC.. 12 04..	28349	TX220	CHc M6x20	Ø 6	186-843	Hc M6x35	174.1-864
3CT 90 402N	28	0.10	CN.. 12 04..	TT 402N	174.1-863	CHc M6x25	Ø 6	186-843	Hc M6x35	174.1-864
3CT 90 402N S	28.5	0.10	CN.. 12 04..	TT 402N	174.1-863	CHc M6x20	Ø 6	186-843	Hc M6x35	174.1-864

BORING

CARBIDE INSERTS

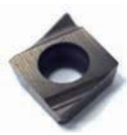
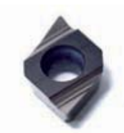
Chipbreaker	Reference	MTCVD grades								PVD grades					Uncoated grades					Cermet
		1505	1510	5615	5625	5635	8515	8525	8535	8620	9605	KX20	KR20	KX05	KX2	N	S15	S4	SY3	NTB10
CCGT 1L 	CCGT 060202-1L										✓	✓			✓					
	CCGT 060204-1L										✓	✓			✓					
	CCGT 080302-1L										✓	✓								
	CCGT 080304-1L										✓	✓			✓					
	CCGT 09T302-1L										✓	✓			✓					
	CCGT 09T304-1L										✓	✓			✓					
	CCGT 09T308-1L										✓	✓			✓					
	CCGT 120408-1L										✓	✓			✓					
CCGT PF4 	CCGT 09T302-PF4				✓															
CCGT PM2 	CCGT 060204-PM2				✓						✓									
	CCGT 060208-PM2				✓		✓				✓									
	CCGT 09T304-PM2				✓						✓									
	CCGT 09T308-PM2						✓				✓									
CCMT PF4 	CCMT 060202-PF4		✓	✓	✓															✓
	CCMT 060204-PF4		✓	✓	✓	✓														✓
	CCMT 080302-PF4				✓															✓
	CCMT 080304-PF4				✓															✓
	CCMT 080308-PF4				✓															
	CCMT 09T304-PF4		✓	✓	✓	✓														✓
	CCMT 09T308-PF4		✓	✓	✓															✓
CCMT PM3 	CCMT 060204-PM3			✓	✓	✓														
	CCMT 080304-PM3				✓															
	CCMT 09T304-PM3			✓	✓	✓														
	CCMT 09T308-PM3			✓	✓	✓														
CCMT PM4 	CCMT 080304-PM4				✓	✓														
	CCMT 080308-PM4				✓	✓														
	CCMT 09T308-PM4		✓	✓	✓	✓														
	CCMT 120408-PM4				✓	✓														
CCMT PM5 	CCMT 060202-PM5		✓	✓	✓			✓	✓		✓					✓				
	CCMT 060204-PM5		✓	✓	✓	✓	✓	✓	✓		✓					✓		✓		
	CCMT 060212-PM5								✓											
	CCMT 080304-PM5		✓	✓	✓	✓		✓	✓							✓		✓		
	CCMT 080308-PM5		✓	✓	✓				✓							✓				
	CCMT 09T304-PM5		✓	✓	✓	✓	✓	✓	✓		✓					✓				
	CCMT 09T308-PM5		✓	✓	✓	✓	✓	✓	✓		✓					✓				
	CCMT 120404-PM5		✓	✓	✓															
	CCMT 120408-PM5		✓	✓	✓		✓	✓	✓											
	CCMT 120412-PM5		✓		✓				✓											
CCMX L/R RC 	CCMX 060202 RC L														✓					
	CCMX 060202 RC R														✓					
	CCMX 080304 RC L														✓					
	CCMX 080304 RC R														✓					

✓: Article which can be ordered

Ordering example: CCGT 060202-1L 9605

BORING

CARBIDE INSERTS

Chipbreaker	Reference	MTCVD grades								PVD grades					Uncoated grades					Cermet
		1505	1510	5615	5625	5635	8515	8525	8535	8620	9605	KX20	KR20	KX05	KX2	N	S1S	S4	SY3	NTB10
CNMG F2 	CNMG 120404-F2		✓	✓	✓															
	CNMG 120408-F2			✓	✓															
CNMG F4 	CNMG 120404-F4				✓															✓
	CNMG 120408-F4				✓															
	CNMG 120412-F4				✓															
CNMG F5 	CNMG 120404-F5				✓		✓		✓	✓	✓			✓	✓					
	CNMG 120408-F5				✓		✓		✓	✓	✓	✓		✓	✓					
CNMG M2 	CNMG 120404-M2								✓		✓	✓								
	CNMG 120408-M2								✓	✓	✓	✓		✓	✓					
	CNMG 120412-M2								✓			✓								
CNMG M5 	CNMG 120404-M5		✓	✓	✓	✓	✓	✓	✓	✓	✓									
	CNMG 120408-M5		✓	✓	✓	✓	✓	✓	✓	✓	✓									
	CNMG 120412-M5		✓	✓	✓	✓	✓	✓	✓		✓									
	CNMG 120416-M5				✓															
CNMG R3 	CNMG 120408-R3	✓	✓	✓	✓	✓														
	CNMG 120412-R3		✓	✓	✓	✓														
	CNMG 120416-R3		✓																	
CPGX L/R JQ 	CPGX 080304FL-JQ														✓					
	CPGX 080304FR-JQ														✓					
	CPGX 09T304FL-JQ														✓					
CPGX L/R JR 	CPGX 060204FL-JR														✓					
	CPGX 060204FR-JR														✓					
	CPGX 080304FL-JR														✓					
	CPGX 080304FR-JR														✓					
CPGX L/R JZ 	CPGX 060202FL-JZ														✓					
	CPGX 060202FR-JZ														✓					
EPGX L/R JZ 	EPGX 050202FL-JZ														✓					
	EPGX 050202FR-JZ														✓					

✓: Article which can be ordered
Ordering example: CNMG 120404-F2 1510

BORING

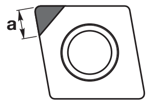
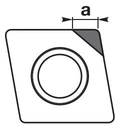
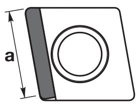
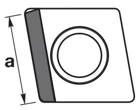
CARBIDE INSERTS

Chipbreaker		Reference	MTCVD grades								PVD grades					Uncoated grades				Cermet
			1505	1510	5615	5625	5635	8515	8525	8535	8620	9605	KX20	KR20	KX05	KX2	N	S15	S4	SY3	NTB10
EPMT PM5		EPMT 050202-PM5			✓	✓	✓	✓	✓	✓						✓					✓
TCGT 1L		TCGT 16T304-1L										✓	✓			✓					
		TCGT 16T308-1L										✓	✓			✓					
TCGT PF4		TCGT 06T102-PF4																			✓
		TCGT 090202-PF4																			✓
TCMT PF4		TCMT 06T102-PF4			✓																
		TCMT 06T104-PF4				✓															
		TCMT 090204-PF4		✓		✓															
		TCMT 16T304-PF4			✓	✓	✓														✓
		TCMT 16T308-PF4		✓		✓	✓														
		TCMT 16T312-PF4		✓																	
TCMT PM4		TCMT 16T308-PM4				✓	✓		✓												
TCMT PM5		TCMT 16T304-PM5		✓	✓	✓	✓		✓	✓		✓							✓		
		TCMT 16T308-PM5		✓	✓	✓	✓		✓	✓		✓							✓		
TCMX L/R RC		TCMX 16T304 RCL														✓					
		TCMX 16T304 RCR																✓			
TPGX L/R JQ		TPGX 090204FL-JQ																			✓
TPGX L/R JR		TPGX 16T304FL-JR																			✓
TPGX L/R JZ		TPGX 090202FL-JZ														✓					
		TPGX 090202FR-JZ														✓					

✓: Article which can be ordered
Ordering example: EPMT 050202-PM5   5615

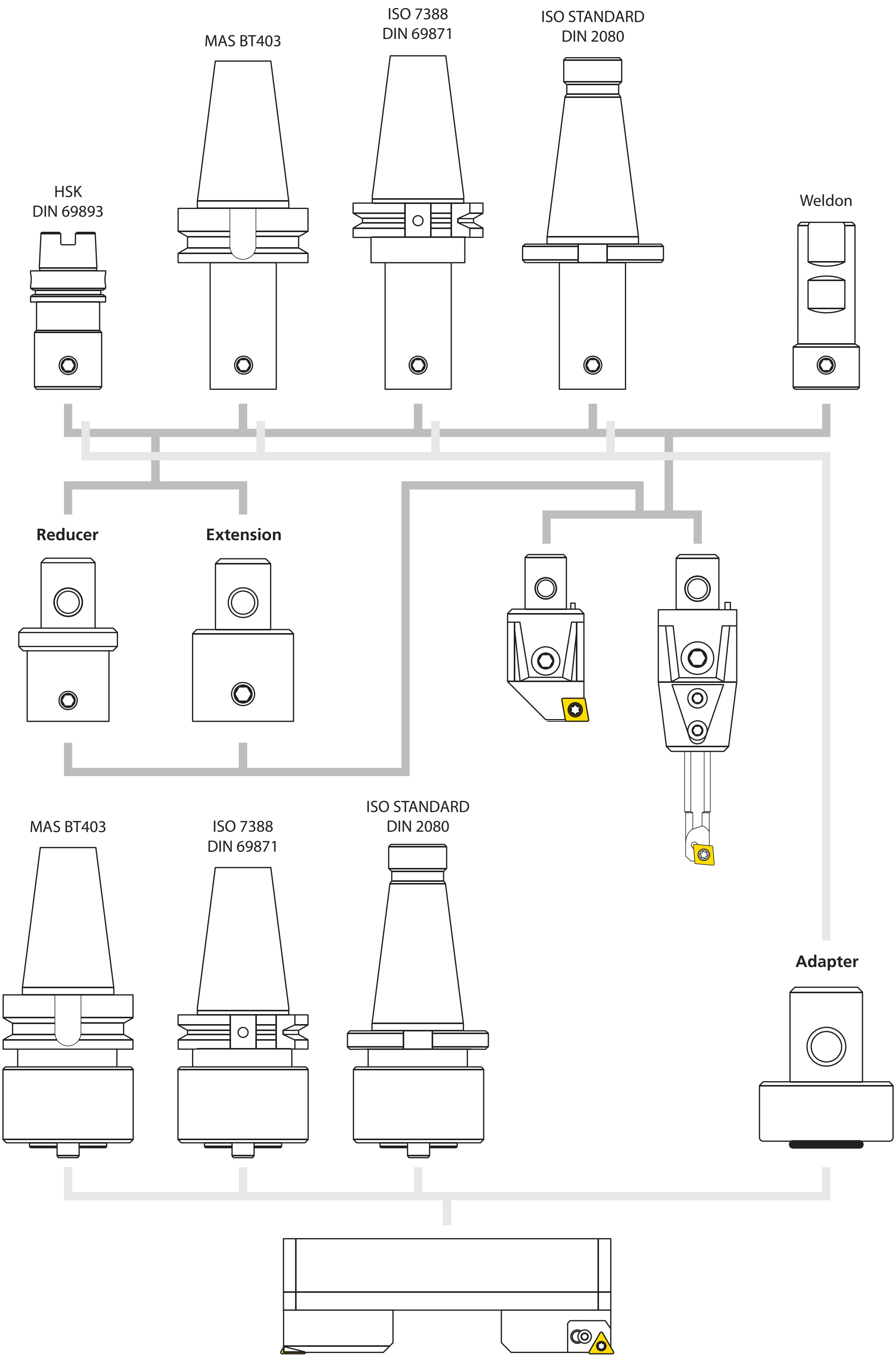
BORING

PCD INSERTS

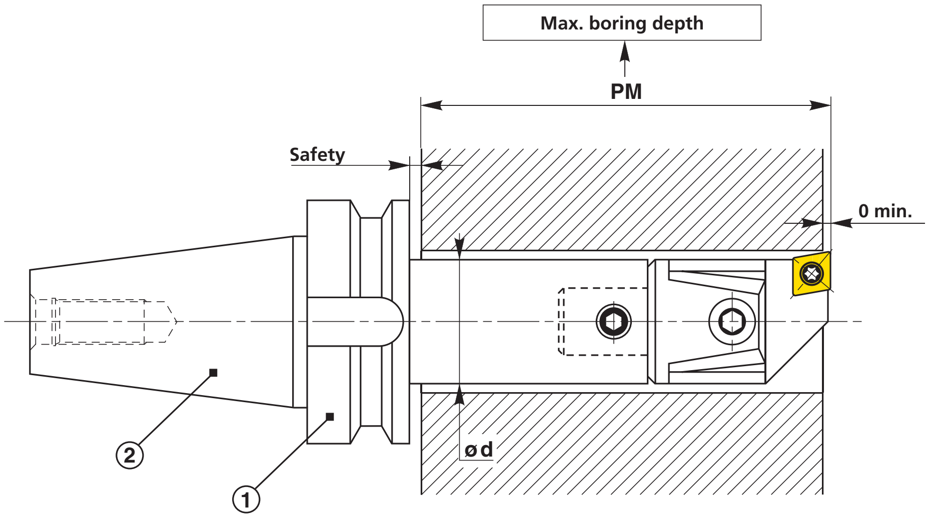
Style		ISO reference	Grades PC30	Grades D720	Dimensions (mm) a
CPGW … F CPGW … FN-30		CPGW 060204 F		✓	3.0
		CPGW 060208 F		✓	3.0
		CPGW 080304 F		✓	3.0
		CPGW 060202 FN-30-1	✓		3.0
		CPGW 060204 FN-30-1	✓		3.0
		CPGW 060208 FN-30-1	✓		3.0
		CPGW 080302 FN-30-1	✓		3.0
		CPGW 080304 FN-30-1	✓		3.0
		CPGW 080308 FN-30-1	✓		3.0
CPGW … FN-30G		CPGW 060204 FN-30G-1	✓		3.0
CPGW … FL/R-60 CPGW … FL/R-70 CPGW … FL/R-90 CPGW … HL CPGW … HR		CPGW 060202 FL-60-1	✓		6.0
		CPGW 060204 FL-60-1	✓		6.0
		CPGW 060208 FL-60-1	✓		6.0
		CPGW 080302 FL-70-1	✓		7.5
		CPGW 080304 FL-70-1	✓		7.5
		CPGW 080308 FL-70-1	✓		7.5
		CPGW 09T304 FL-90-1	✓		9.0
		CPGW 060202 FR-60-1	✓		6.0
		CPGW 060204 FR-60-1	✓		6.0
		CPGW 080304 FR-70-1	✓		7.5
		CPGW 080308 FR-70-1	✓		7.5
		CPGW 060204 HL		✓	
		CPGW 080308 HL		✓	
		CPGW 09T304 HL		✓	
		CPGW 080304 HR		✓	
CPGW … FL/R-60G CPGW … HRG		CPGW 060204 FR-60G1	✓		6.0
		CPGW 060204 HRG		✓	

✓: Article which can be ordered
Ordering example: CPGW 06 02 04 F PC30

PROGRAM OVERVIEW



CODIFICATION SYSTEM



Example :

BT	330	32	100
1	2	3	4

1 - Type of arbor	
BT :	MAS BT 403
AS :	ISO 7388 / 1 = DIN 69871 T1
OTT :	ISO Standard = DIN 2080
B :	Weldon
HSK :	DIN 69893

2 - Type of taper
330 : ISO 30
345 : ISO 45
340 : ISO 40
350 : ISO 50
550 : ISO 50 large Ø
560 : ISO 50 large Ø

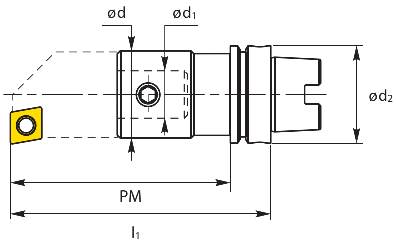
3 - Ø d
32 : 32 mm

4 - PM
100 : 100 mm

BORING

ARBORS FOR BORING HEADS

HSK - DIN 69893

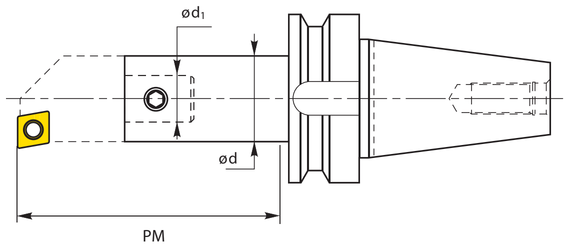


Reference	d	d_1	d_2	PM	l_1	kg	Coupling screw
HSK 63A 22 55	22	12	63	55	81	0.80	22-68
HSK 63A 27 65	27	15	63	65	91	0.85	27-610A
HSK 63A 32 75	32	20	63	75	101	0.90	32-810
HSK 63A 42 90	42	24	63	90	116	1.30	42-1014
HSK 63A 54 110	54	28	63	110	136	2.00	54-1220
HSK 63A 68 145	68	36	63	145	171	3.40	68-1624

BORING

ARBORS FOR BORING HEADS

MAS BT 403



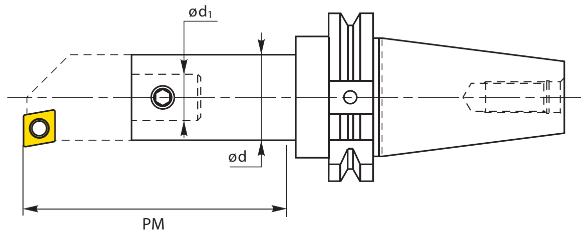
Reference	ISO taper	d	d_1	PM	kg	Coupling screw
BT 330 22 100	30	22	12	100	0.58	22-68
BT 330 27 55	30	27	15	55	0.45	27-610A
BT 330 27 100	30	27	15	100	0.64	27-610A
BT 330 32 60	30	32	20	60	0.45	32-810
BT 330 32 100	30	32	20	100	0.69	32-810
BT 340 22 50	40	22	12	50	1.20	22-68
BT 340 22 80	40	22	12	80	1.30	22-68
BT 340 22 100	40	22	12	100	1.39	22-68
BT 340 27 55	40	27	15	55	1.20	27-610A
BT 340 27 100	40	27	15	100	1.45	27-610A
BT 340 27 130	40	27	15	130	1.60	27-610A
BT 340 32 60	40	32	20	60	1.20	32-810
BT 340 32 100	40	32	20	100	1.47	32-810
BT 340 32 130	40	32	20	130	1.70	32-810
BT 340 42 75	40	42	24	75	1.30	42-1014
BT 340 42 160	40	42	24	160	2.25	42-1014
BT 340 42 200	40	42	24	200	2.75	42-1014
BT 340 54 90	40	54	28	90	1.80	54-1220
BT 340 54 160	40	54	28	160	2.80	54-1220
BT 340 54 200	40	54	28	200	3.55	54-1220
BT 340 68 160	40	68	36	160	2.80	68-1624
BT 340 68 200	40	68	36	200	3.90	68-1624
BT 340 85 200	40	85	50	200	5.90	85-1630
BT 340 100 200	40	100	60	200	6.20	100-2035
BT 350 22 80	50	22	12	80	4.20	22-68
BT 350 22 100	50	22	12	100	4.35	22-68
BT 350 27 55	50	27	15	55	4.05	27-610A
BT 350 27 100	50	27	15	100	4.40	27-610A
BT 350 27 130	50	27	15	130	4.50	27-610A
BT 350 32 60	50	32	20	60	3.95	32-810
BT 350 32 130	50	32	20	130	4.60	32-810
BT 350 32 160	50	32	20	160	4.80	32-810
BT 350 42 75	50	42	24	75	4.15	42-1014
BT 350 42 160	50	42	24	160	5.20	42-1014
BT 350 42 200	50	42	24	200	5.80	42-1014
BT 350 54 90	50	54	28	90	4.80	54-1220
BT 350 54 160	50	54	28	160	5.80	54-1220
BT 350 54 200	50	54	28	200	6.50	54-1220
BT 350 68 115	50	68	36	115	4.45	68-1624
BT 350 68 200	50	68	36	200	7.20	68-1624
BT 350 68 260	50	68	36	260	8.85	68-1624
BT 350 85 200	50	85	50	200	7.85	85-1630
BT 350 85 260	50	85	50	260	10.65	85-1630
BT 350 85 320	50	85	50	320	13.40	85-1630
BT 350 100 170*	50	100	60	170	6.15	100-2035
BT 350 100 260*	50	100	60	260	12.85	100-2035
BT 350 100 320*	50	100	60	320	16.50	100-2035
BT 550 160**	50	100	60	125	6.25	M12x40

* Compatible with heads Ø 200

** See page 569 for assembly of large-diameter heads

ARBORS FOR BORING HEADS

ISO 7388 - DIN 69871



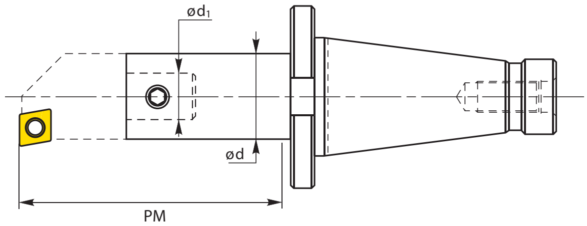
Reference	ISO taper	d	d_1	PM	kg	Coupling screw
AS 340 22 80	40	22	12	80	1.35	22-68
AS 340 22 100	40	22	12	100	1.45	22-68
AS 340 27 55	40	27	15	55	1.25	27-610A
AS 340 27 100	40	27	15	100	1.50	27-610A
AS 340 27 130	40	27	15	130	1.60	27-610A
AS 340 32 60	40	32	20	60	1.25	32-810
AS 340 32 100	40	32	20	100	1.50	32-810
AS 340 32 130	40	32	20	130	1.75	32-810
AS 340 42 75	40	42	24	75	1.30	42-1014
AS 340 42 160	40	42	24	160	2.10	42-1014
AS 340 42 200	40	42	24	200	2.60	42-1014
AS 340 54 120	40	54	28	120	1.85	54-1220
AS 340 54 160	40	54	28	160	2.45	54-1220
AS 340 68 160	40	68	36	160	2.50	68-1624
AS 345 32 130	45	32	20	130	2.85	32-810
AS 345 42 160	45	42	24	160	3.00	42-1014
AS 350 22 80	50	22	12	80	3.20	22-68
AS 350 22 100	50	22	12	100	3.75	22-68
AS 350 27 55	50	27	15	55	3.15	27-610A
AS 350 27 100	50	27	15	100	3.30	27-610A
AS 350 27 130	50	27	15	130	3.45	27-610A
AS 350 32 60	50	32	20	60	3.50	32-810
AS 350 32 130	50	32	20	130	4.10	32-810
AS 350 32 160	50	32	20	160	4.35	32-810
AS 350 42 75	50	42	24	75	3.60	42-1014
AS 350 42 160	50	42	24	160	4.60	42-1014
AS 350 42 200	50	42	24	200	5.15	42-1014
AS 350 54 90	50	54	28	90	4.10	54-1220
AS 350 54 160	50	54	28	160	5.10	54-1220
AS 350 54 200	50	54	28	200	5.95	54-1220
AS 350 68 115	50	68	36	115	3.50	68-1624
AS 350 68 200	50	68	36	200	6.10	68-1624
AS 350 68 260	50	68	36	260	7.80	68-1624
AS 350 85 200	50	85	50	200	6.15	85-1630
AS 350 85 260	50	85	50	260	9.40	85-1630
AS 350 85 320	50	85	50	320	6.15	85-1630
AS 350 100 190*	50	100	60	190	6.60	100-2035
AS 350 100 260*	50	100	60	260	10.90	100-2035
AS 350 100 320*	50	100	60	320	14.60	100-2035
AS 550 160**	50	100	60	125	6.00	M12x40

* Compatible with heads Ø 200

** See page 569 for assembly of large-diameter heads

ARBORS FOR BORING HEADS

ISO STANDARD - DIN 2080



Reference	ISO taper	d	d_1	PM	kg	Coupling screw
OTT 340 22 80	40	22	12	80	1.10	22-68
OTT 340 22 100	40	22	12	100	1.15	22-68
OTT 340 27 55	40	27	15	55	1.00	27-610A
OTT 340 27 100	40	27	15	100	1.25	27-610A
OTT 340 27 130	40	27	15	130	1.25	27-610A
OTT 340 32 60	40	32	20	60	1.00	32-810
OTT 340 32 100	40	32	20	100	1.25	32-810
OTT 340 32 130	40	32	20	130	1.45	32-810
OTT 340 42 75	40	42	24	75	1.05	42-1014
OTT 340 42 160	40	42	24	160	2.00	42-1014
OTT 340 42 200	40	42	24	200	2.50	42-1014
OTT 340 54 90	40	54	28	90	1.45	54-1220
OTT 340 54 160	40	54	28	160	2.45	54-1220
OTT 340 54 200	40	54	28	200	3.40	54-1220
OTT 340 68 160	40	68	36	160	2.45	68-1624
OTT 340 68 200	40	68	36	200	3.85	68-1624
OTT 350 22 80	50	22	12	80	3.25	22-68
OTT 350 22 100	50	22	12	100	3.35	22-68
OTT 350 27 55	50	27	15	55	3.05	27-610A
OTT 350 27 100	50	27	15	100	3.40	27-610A
OTT 350 27 130	50	27	15	130	3.50	27-610A
OTT 350 32 60	50	32	20	60	3.05	32-810
OTT 350 32 130	50	32	20	130	3.65	32-810
OTT 350 32 160	50	32	20	160	4.00	32-810
OTT 350 42 75	50	42	24	75	3.15	42-1014
OTT 350 42 160	50	42	24	160	4.20	42-1014
OTT 350 42 200	50	42	24	200	4.65	42-1014
OTT 350 54 90	50	54	28	90	4.40	54-1220
OTT 350 54 160	50	54	28	160	5.40	54-1220
OTT 350 54 200	50	54	28	200	6.00	54-1220
OTT 350 68 115	50	68	36	115	3.55	68-1624
OTT 350 68 200	50	68	36	200	6.10	68-1624
OTT 350 68 260	50	68	36	260	7.90	68-1624
OTT 350 85 200	50	85	50	200	7.20	85-1630
OTT 350 85 260	50	85	50	260	9.90	85-1630
OTT 350 85 320	50	85	50	320	12.40	85-1630
OTT 350 100 170*	50	100	60	170	6.00	100-2035
OTT 350 100 260*	50	100	60	260	11.30	100-2035
OTT 350 100 320*	50	100	60	320	16.05	100-2035
OTT 550 160**	50	100	60	125	6.15	M12x40

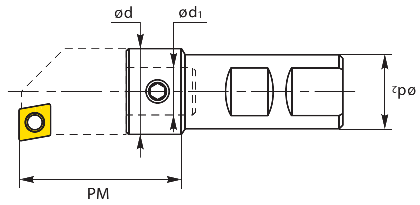
* Compatible with heads Ø 200

** See page 569 for assembly of large-diameter heads

BORING

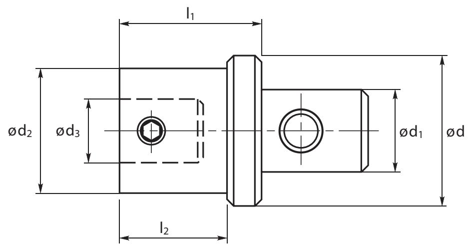
ARBORS FOR BORING HEADS

Weldon



Reference	d	d_1	d_2	PM	kg	Coupling screw
B 20 22 50	22	12	20	45	0.150	22-68
B 20 22 100	22	12	20	100	0.300	22-68
B 25 27 55	27	15	25	50	0.250	27-610A
B 25 27 100	27	15	25	95	0.450	27-610A

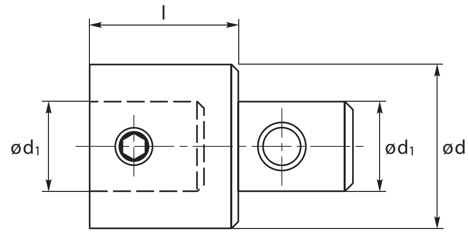
Reducers



Reference	d	d_1	d_2	d_3	l_1	l_2	kg	Coupling screw
R 27 22 36	27	15	22	12	36	26	0.20	22-68
R 42 22 58	42	24	22	12	58	48	0.35	22-68
R 32 27 34	32	20	27	15	34	24	0.25	27-610A
R 42 27 50	42	24	27	15	50	40	0.40	27-610A
R 68 27 95	68	36	27	15	95	83	1.05	27-610A
R 42 32 46	42	24	32	20	46	36	0.45	32-810
R 54 32 76	54	28	32	20	76	66	0.75	32-810
R 68 32 90	68	36	32	20	90	78	1.20	32-810
R 54 42 70	54	28	42	24	70	60	0.95	42-1014
R 68 42 82	68	36	42	24	82	70	1.40	42-1014
R 85 42 95	85	50	42	24	95	83	2.05	42-1014
R 68 54 72	68	36	54	28	72	60	1.65	54-1220
R 85 54 90	85	50	54	28	90	78	2.50	54-1220
R 85 68 100	85	50	68	36	100	88	3.35	68-1624
R 100 85 100	100	60	85	50	100	88	5.60	85-1630

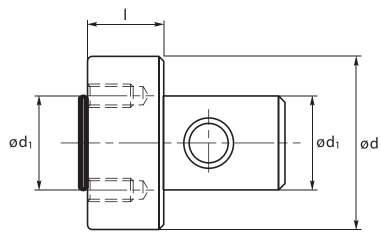
ARBORS FOR BORING HEADS

Extensions



Reference	d	d_1	l	kg	Coupling screw
P 22 20	22	12	20	0.095	22-68
P 22 30	22	12	30	0.140	22-68
P 27 30	27	15	30	0.180	27-610A
P 27 45	27	15	45	0.250	27-610A
P 32 35	32	20	35	0.260	32-810
P 32 52	32	20	52	0.375	32-810
P 42 40	42	24	40	0.480	42-1014
P 42 60	42	24	60	0.700	42-1014
P 54 50	54	28	50	0.950	54-1220
P 54 75	54	28	75	1.400	54-1220
P 68 60	68	36	60	1.800	68-1624
P 68 90	68	36	90	2.600	68-1624
P 85 70	85	50	70	3.050	85-1630
P 85 105	85	50	105	4.450	85-1630
P 100 80	100	60	80	4.600	100-2035
P 100 120	100	60	120	7.100	100-2035

Large-diameter head adapter



Reference	d	d_1	l	kg	Coupling screw
ADT 100-50	100	60	50	4.60	M12x40

BORING

CUTTING DATA

Material	Finish boring with single insert				Rough boring with double inserts			
	Diameter	Cutting speed v_c	Feed f_z	Cutting depth a_p	Diameter	Cutting speed v_c	Feed f_z	Max. cutting depth a_p
P CARBON STEEL	24 - 30	110 - 140	0.05 - 0.15	0.05 - 0.30	24 - 30	100 - 130	0.15 - 0.25	4.2
	29 - 40	115 - 150	0.05 - 0.15	0.05 - 0.30	29 - 40	105 - 140	0.15 - 0.30	5.7
	39 - 50	115 - 150	0.05 - 0.15	0.06 - 0.35	39 - 50	105 - 150	0.20 - 0.30	5.7
	49 - 102	115 - 150	0.10 - 0.20	0.06 - 0.35	49 - 102	105 - 150	0.25 - 0.35	6.3
	100 - 220	115 - 150	0.10 - 0.20	0.07 - 0.50	100 - 220	105 - 150	0.30 - 0.40	6.3
	220 - 500	115 - 150	0.10 - 0.20	0.07 - 0.50	220 - 500	105 - 150	0.30 - 0.40	6.3
P STEEL ALLOYS	24 - 30	100 - 130	0.05 - 0.15	0.05 - 0.30	24 - 30	90 - 120	0.15 - 0.25	4.2
	29 - 40	110 - 140	0.05 - 0.15	0.05 - 0.30	29 - 40	100 - 130	0.15 - 0.30	5.7
	39 - 50	110 - 150	0.05 - 0.15	0.06 - 0.35	39 - 50	100 - 130	0.20 - 0.30	5.7
	49 - 102	110 - 150	0.10 - 0.20	0.06 - 0.35	49 - 102	100 - 130	0.25 - 0.35	6.3
	100 - 220	110 - 150	0.10 - 0.20	0.07 - 0.50	100 - 220	100 - 130	0.30 - 0.40	6.3
	220 - 500	110 - 150	0.10 - 0.20	0.07 - 0.50	220 - 500	100 - 130	0.30 - 0.40	6.3
M STAINLESS STEEL	24 - 30	70 - 100	0.07 - 0.15	0.12 - 0.35	24 - 30	69 - 90	0.12 - 0.20	4.2
	29 - 40	80 - 110	0.07 - 0.15	0.12 - 0.35	29 - 40	70 - 100	0.15 - 0.25	5.7
	39 - 50	80 - 110	0.07 - 0.15	0.20 - 0.50	39 - 50	70 - 100	0.15 - 0.25	5.7
	49 - 102	80 - 110	0.10 - 0.20	0.20 - 0.50	49 - 102	70 - 100	0.20 - 0.30	6.3
	100 - 220	80 - 110	0.12 - 0.20	0.25 - 0.75	100 - 220	70 - 100	0.25 - 0.35	6.3
	220 - 500	80 - 110	0.12 - 0.20	0.25 - 0.75	220 - 500	70 - 100	0.25 - 0.35	6.3
K CAST IRON	24 - 30	70 - 100	0.07 - 0.15	0.12 - 0.35	24 - 30	60 - 110	0.20 - 0.30	4.2
	29 - 40	80 - 115	0.07 - 0.15	0.12 - 0.35	29 - 40	60 - 110	0.25 - 0.35	5.7
	39 - 50	80 - 115	0.07 - 0.15	0.20 - 0.50	39 - 50	60 - 110	0.25 - 0.35	5.7
	49 - 102	80 - 115	0.12 - 0.20	0.20 - 0.50	49 - 102	60 - 110	0.30 - 0.40	6.3
	100 - 220	80 - 115	0.12 - 0.20	0.25 - 0.75	100 - 220	60 - 110	0.30 - 0.45	6.3
	220 - 500	80 - 115	0.12 - 0.20	0.25 - 0.75	220 - 500	60 - 110	0.30 - 0.45	6.3
N ALUMINIUM, ALUMINIUM ALLOYS	24 - 30	150 - 300	0.05 - 0.15	0.12 - 0.35	24 - 30	120 - 300	0.20 - 0.30	4.2
	29 - 40	150 - 360	0.10 - 0.20	0.12 - 0.35	29 - 40	150 - 370	0.25 - 0.35	5.7
	39 - 50	150 - 360	0.10 - 0.20	0.20 - 0.50	39 - 50	150 - 370	0.25 - 0.35	5.7
	49 - 102	150 - 360	0.10 - 0.20	0.20 - 0.50	49 - 102	150 - 370	0.30 - 0.40	6.3
	100 - 220	150 - 360	0.10 - 0.25	0.25 - 0.75	100 - 220	150 - 370	0.30 - 0.45	6.3
	220 - 500	150 - 360	0.10 - 0.25	0.25 - 0.75	220 - 500	150 - 370	0.30 - 0.40	6.3
S TITANIUM	24 - 30	30 - 40	0.07 - 0.15	0.12 - 0.35	24 - 30	25 - 35	0.12 - 0.20	4.2
	29 - 40	30 - 45	0.07 - 0.15	0.12 - 0.35	29 - 40	30 - 40	0.15 - 0.25	5.7
	39 - 50	30 - 45	0.07 - 0.15	0.20 - 0.50	39 - 50	30 - 40	0.15 - 0.25	5.7
	49 - 102	30 - 45	0.10 - 0.20	0.20 - 0.50	49 - 102	30 - 40	0.20 - 0.30	6.3
	100 - 220	30 - 45	0.10 - 0.20	0.25 - 0.75	100 - 220	30 - 40	0.20 - 0.35	6.3
	220 - 500	30 - 45	0.10 - 0.20	0.25 - 0.75	220 - 500	30 - 40	0.20 - 0.35	6.3
S HARDENED ALLOYS	24 - 30	30 - 40	0.07 - 0.15	0.12 - 0.35	24 - 30	25 - 35	0.12 - 0.20	4.2
	29 - 40	30 - 45	0.07 - 0.15	0.12 - 0.35	29 - 40	30 - 40	0.15 - 0.25	5.7
	39 - 50	30 - 45	0.07 - 0.15	0.20 - 0.50	39 - 50	30 - 40	0.15 - 0.25	5.7
	49 - 102	30 - 45	0.10 - 0.20	0.20 - 0.50	49 - 102	30 - 40	0.20 - 0.30	6.3
	100 - 220	30 - 45	0.10 - 0.20	0.25 - 0.75	100 - 220	30 - 40	0.20 - 0.35	6.3
	220 - 500	30 - 45	0.10 - 0.20	0.25 - 0.75	220 - 500	30 - 40	0.20 - 0.35	6.3

See page 9 for grade table and page 45 to 49 for grade description

TECHNICAL INFORMATION

Head - arbor fitting system

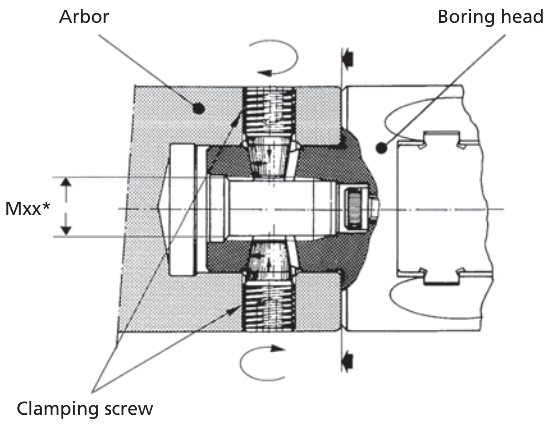
The boring heads, arbors and accessories featured in this catalogue are in case-hardened and hardened steel.

All the surfaces ensuring the correct functioning of the mechanism are ground.

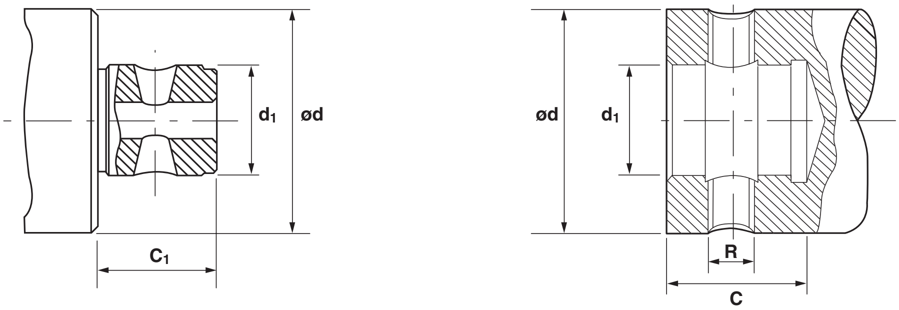
A rigorous check, carried out at each stage of manufacturing, ensures the quality of this range.

The ALESAF programme can be used on a conventional or numerical control machine.

** The Mxx thread in the shaft of the ALESAF heads is desined for manufacturing and must not be used for the attachment of these heads.*



ALESAF coupling dimensions

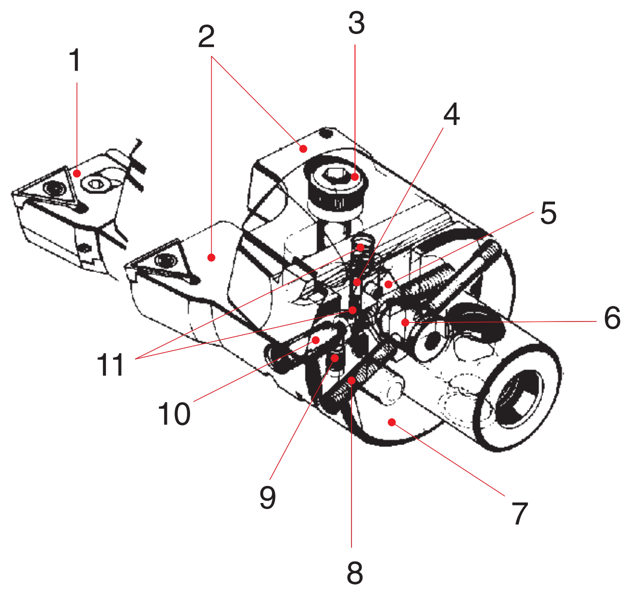


Boring heads				Arbors				
Diameter	d	d_1	C_1	d	d_1	C_1	R	Coupling screw
22	22	12	13	22	12	16	M6	22-68
27	27	15	16	27	15	18	M6	27-610
32	32	20	20	32	20	23	M8	32-810
42	42	24	25	42	24	28	M10	42-1014
54	54	28	30	54	28	35	M12	54-1220
68	68	36	40	68	36	42	M16	68-1624
85	85	50	50	85	50	58	M16	85-1630
100	110	60	60	100	60	64	M20	100-2035
200	145	60	60	100	60	64	M20	100-2035

TECHNICAL INFORMATION

Boring heads (Ø 24 to 220)

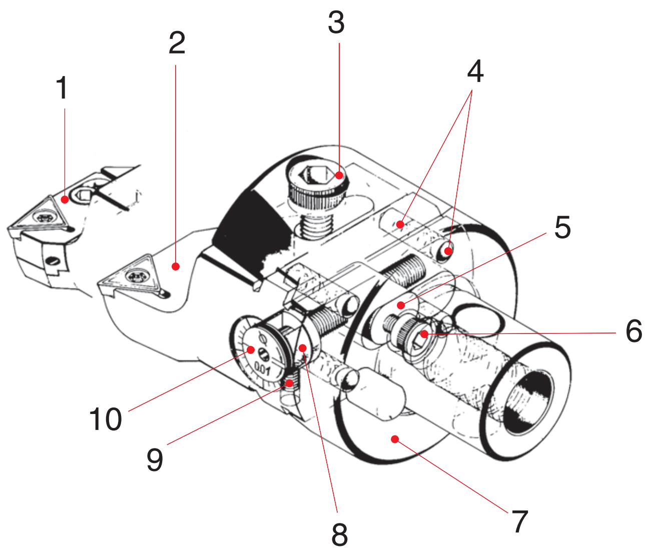
Roughing



Synchronised adjustment

1 - Cartridge
2 - Slides
3 - Clamping screw
4 - Rollers
5 - Connecting rod
6 - Connecting rod shaft
7 - Body
8 - Centring screw
9 - Positioning screw
10 - Adjustment screw
11 - Spring and adjustment nut

Finishing

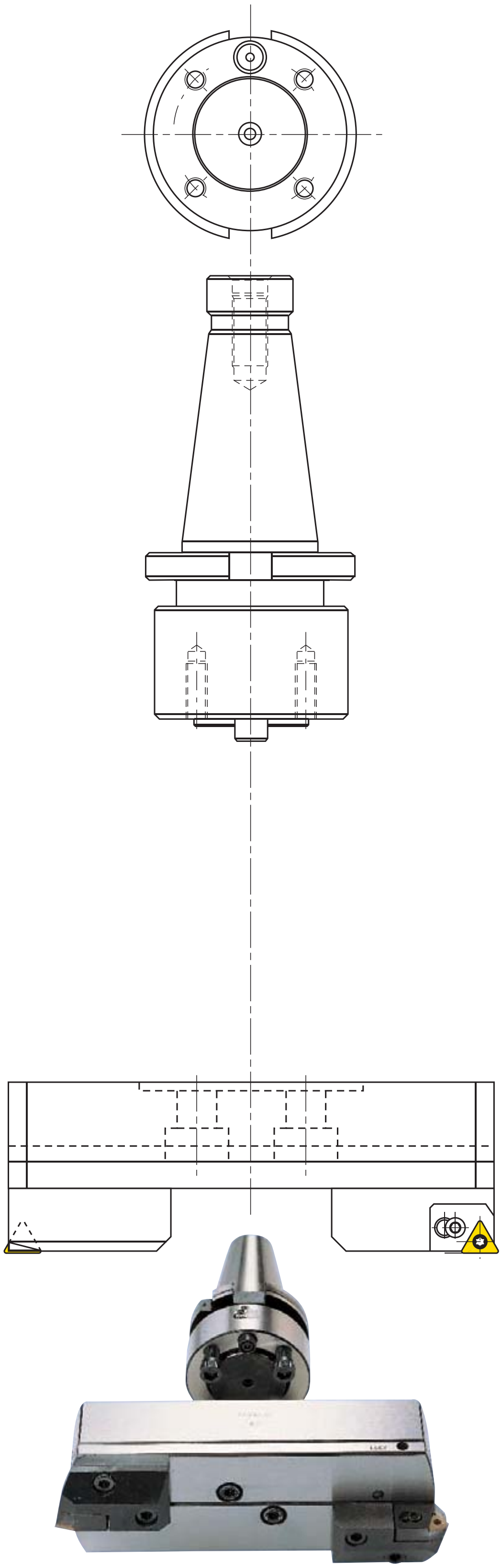


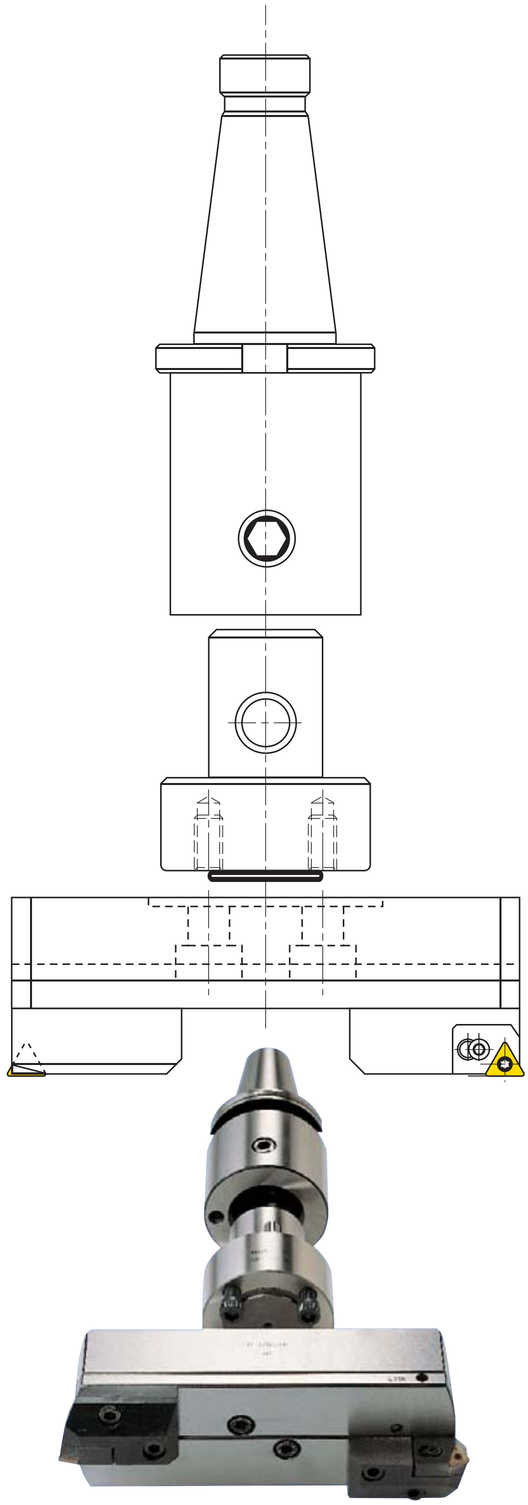
Micrometric adjustment

1 - Cartridge
2 - Slides
3 - Clamping screw
4 - Spring and balls
5 - Nut
6 - Nut screw
7 - Body
8 - Guide-jumper
9 - Positioning screw
10 - Micrometric adjustment screw

TECHNICAL INFORMATION

Assembly of large-diameter heads

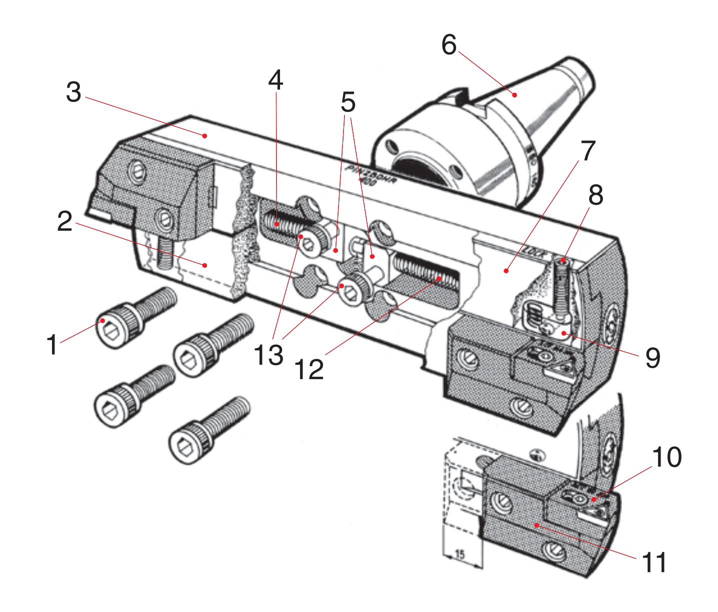




TECHNICAL INFORMATION

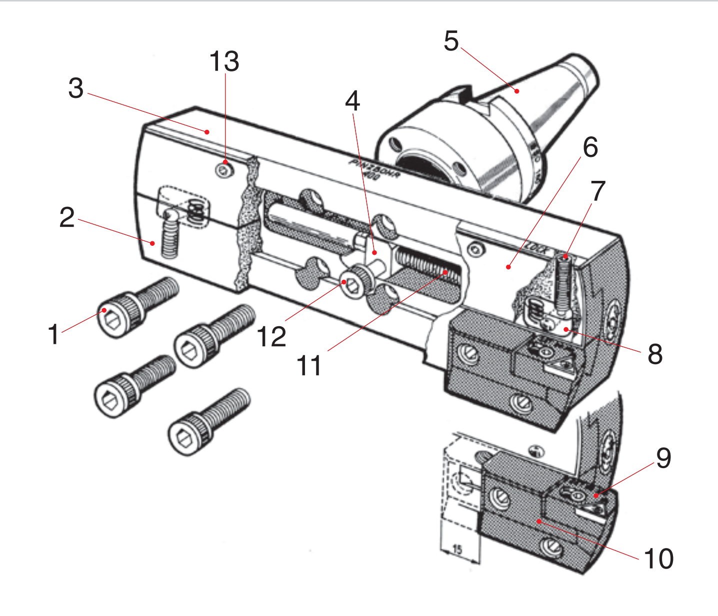
Instructions for fitting of large-diameter heads (Ø 220 to 500)

Roughing



1 - Attachment screw CHc M12 x 45
2 - Adjustable slide
3 - Body
4 - Left-handed adjustment screw
5 - Nut
6 - Arbor
7 - Adjustable slide
8 - Clamping screw M8 x 35
9 - Locking connecting rod
10 - Cartridge
11 - Cartridge support
12 - Right-handed adjustment screw
13 - Positioning screw

Finishing



1 - Attachment screw CHc M12 x 45
2 - Adjustable slide
3 - Body
4 - Nut
5 - Arbor
6 - Fixed slide
7 - Clamping screw M8 x 35
8 - Locking connecting rod
9 - Cartridge
10 - Cartridge support
11 - Right-handed adjustment screw
12 - Positioning screw
13 - Slide clamping screw M8 x 20

Fitting the head on the arbor :

- Remove the attachment screws and move the slides until the four holes for the arbor clamping screws appear.
- Place the coupling shank in its housing.
- Insert the four screws and lock them.

Fitting the slides on the head :

- Insert the two slides in the appropriate V-guides by sliding them, and centre the hole of the slide position screws with the hole of the corresponding nuts.
- Insert the screws and screw them in without tightening. The position screws have a double function: locking the slides and guiding the nut. To lock the position screws you must adjust the micrometric screw and, at the same time, open the slides completely to the travel limit.
- Screw in again by a few turns to close the slides and, while executing this operation, tighten the first screw.
- Repeat this operation with the second screw.

If the operation as been carried out correctly, the slides should slide with tightened screws (make sure that the slides lock is released during this operation).

TECHNICAL INFORMATION

Cutting data

The speed and feed chart are for rough guidance only. The optimum speeds and feed rates will depend on the material to be removed, the machine and the adjustment conditions, together with the overhang of the tool.

Boring depth – tool overhang for boring heads

It is possible to obtain depths of 5 times the diameter for heavy boring and 3 times the diameter for light (finishing) boring. When the overhang is increased, the mechanical stability of the body of the tool is reduced. Long tools will have a tendency towards deviation and harmonic vibration. Harmonic vibration can cause the movement of the adjustable components in the boring head, resulting in an outsize or conical hole. In many cases, increasing the feed rate and/or reducing the cutting speed can attenuate harmonic vibration. The behaviour of the boring head also changes when the slides are moved apart. The cutting speed and the feed rate must then be adjusted.

Insert radius

For heavy roughing the smallest possible insert radius must be selected, except for specific cases.
For finishing boring with low chip removal, the smallest insert radius available is recommended to minimise the lateral deviation of the tool. This is especially important for applications with very long overhangs.

Head for heavy boring at 75° - 90°

The head for 75° heavy boring must be used when a lot of material has to be removed and when the shape of the part permits.
The 75° head tends to self-centre on the pre-existing hole, and consequently cuts in a stable manner. If the pre-existing hole is off-centred, it is then recommended to use the 90° boring head as this has less tendancy to follow the pre-existing hole.

4 cutting edges per insert

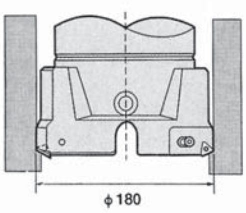
The rhombic insert usually has two cutting edges. However, 4 edges can be used if heads for 75° and 90° heavy boring in the same range of dimensions are used. The same thing is possible for a head for 75° heavy boring and a head for 90° light boring.

Boring depth

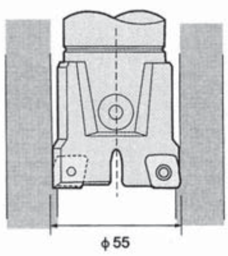
The maximum boring depth with steel boring bars should not exceed 5 times the diameter of the bar. For carbide bars, it is possible to increase the depth to up to 7 times the diameter. We recommend shortening the bar to the maximum overhang necessary in accordance with the boring depth required.

Examples of machining

Examples of rough boring

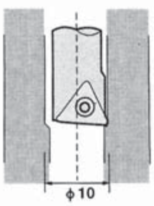


Through hole
Material = 42 Cr Mo 4
Boring head = D200 75 3CT 300
Arbor = BT350 100 260
Insert = TCMT 16T308
Cutting speed = 127 m/min
Cutting depth = 6 mm
Feed = 0.25 mm/rev
Boring depth = 200 mm
Coolant

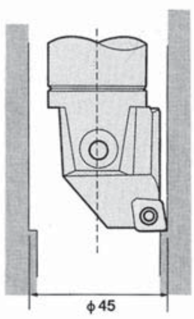


Blind hole
Material = CK 50
Boring head = D42 90 402
Arbor = BT350 42 160
Insert = CCMT 120408
Cutting speed = 108 m/min
Cutting depth = 3 mm
Feed = 0.3 mm/rev
Boring depth = 120 mm
Coolant

Examples of finish boring



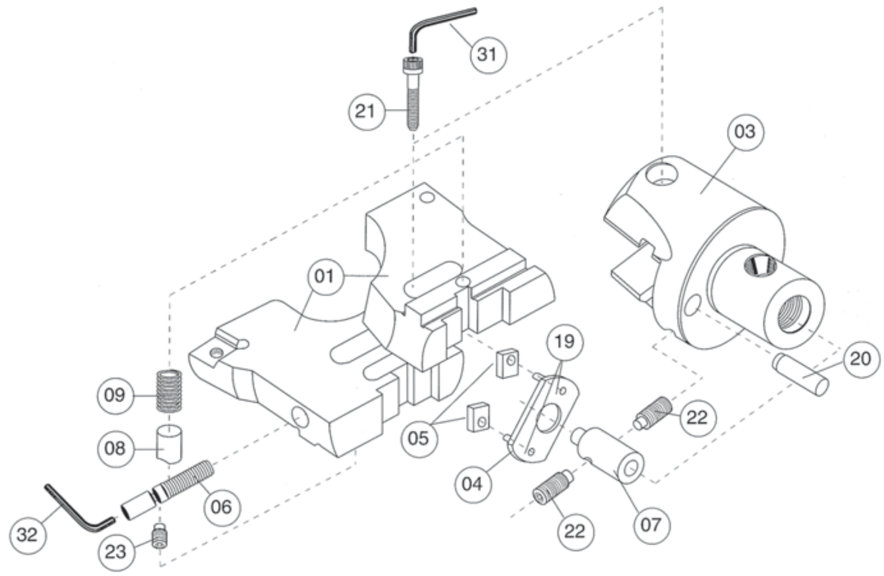
Finish boring small diameter
Material = Al Si 8 Cu 3
Boring head = A 32 010 + S10/16-STFCR-09
Arbor = BT350 32 60
Insert = TCMT 09 02 02
Cutting speed = 120 m/min
Cutting depth = 0.2 mm
Feed = 0.08 mm/rev
Boring depth = 14 mm
Coolant



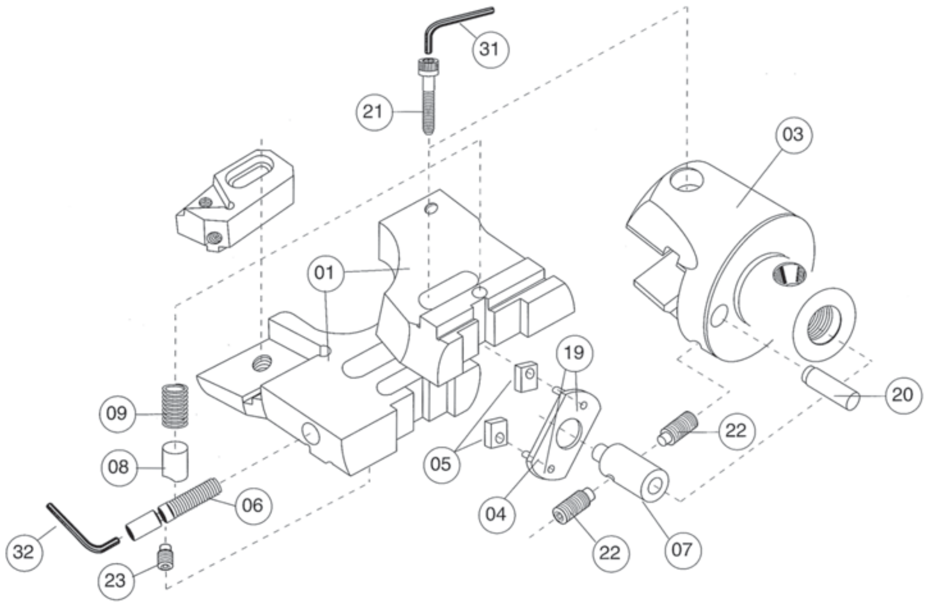
Refined boring
Material = St 35.8
Boring head = A32 90 409
Arbor = BT350 32 160
Insert = CCGT 09T304
Cutting speed = 156 m/min
Cutting depth = 0.2 mm
Feed = 0.1 mm/rev
Boring depth = 70 mm
Coolant

SPARE PARTS

Rough boring heads



Reference	Ø	01	03	04	05	06	07	08	09	19	20	21	22	23	31	32
D 22 75...	22	D2275 01...	D22 03	D22 04	-	D22 06	D22 07	D22 08	D22 09	D22 19	D22 20	D22 21	D22 22	D22 23	MA2.668	MA2.884
D 22 90...	22	D2290 01...	D22 03	D22 04	-	D22 06	D22 07	D22 08	D22 09	D22 19	D22 20	D22 21	D22 22	D22 23	MA2.668	MA2.884
D 27 75...	27	D2775 01...	D27 03	D27 04	-	D27 06	D22 07	D22 08	D27 09	D22 19	D27 20	D27 21	D27 22	D27 23	174-815	MA2.884
D 27 90...	27	D2790 01...	D27 03	D27 04	-	D27 06	D22 07	D22 08	D27 09	D22 19	D27 20	D27 21	D27 22	D27 23	174-815	MA2.884
D 32 75...	32	D3275 01...	D32 03	D32 04	-	D32 06	D32 07	A32 08	D32 09	D32 19	D32 20	D32 21	D32 22	D32 23	174-815	MA2.669
D 32 90...	32	D3290 01...	D32 03	D32 04	-	D32 06	D32 07	A32 08	D32 09	D32 19	D32 20	D32 21	D32 22	D32 23	174-815	MA2.669
D 42 75...	42	D4275 01...	D42 03	D42 04	D42 05	D42 06	D42 07	D42 08	D42 09	D22 20	D42 20	D42 21	D42 22	D42 23	186-843	MA2.668
D 42 90...	42	D4290 01...	D42 03	D42 04	D42 05	D42 06	D42 07	D42 08	D42 09	D22 20	D42 20	D42 21	D42 22	D42 23	186-843	MA2.668
D 54 75...	54	D5475 01...	D54 03	D54 04	D42 05	D54 06	D54 07	D54 08	D42 09	D22 20	D54 20	D54 21	D54 22	D42 23	186-844	MA2.668
D 54 90...	54	D5490 01...	D54 03	D54 04	D42 05	D54 06	D54 07	D54 08	D42 09	D22 20	D54 20	D54 21	D54 22	D42 23	186-844	MA2.668

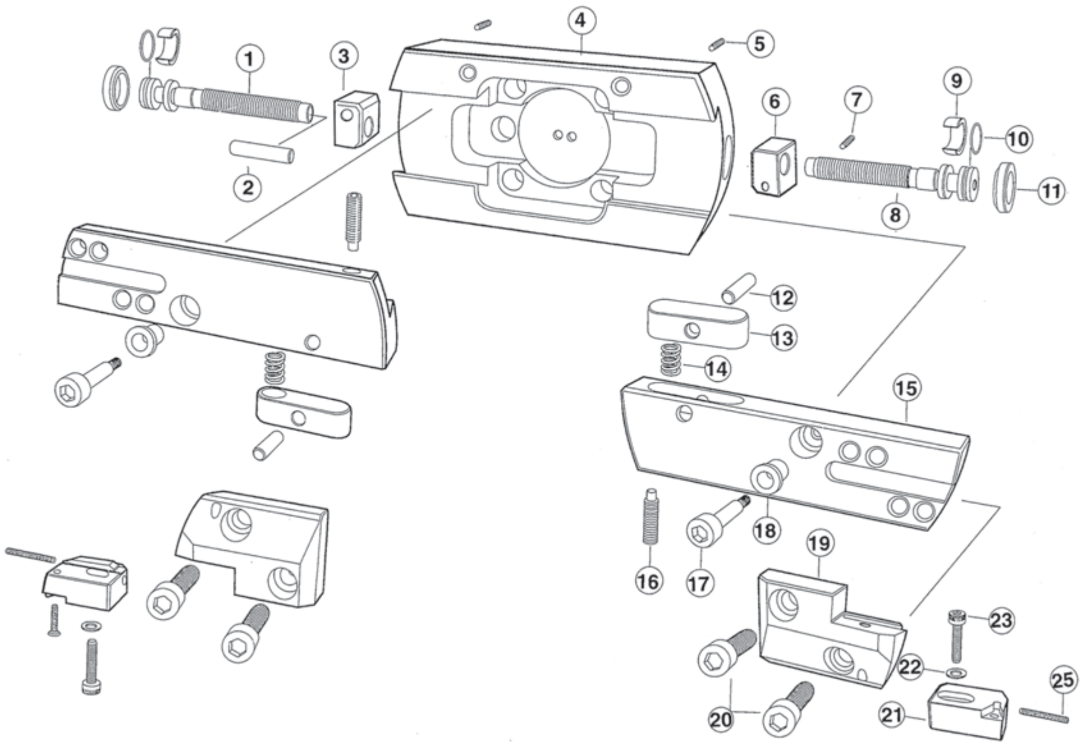


Reference	Ø	01	03	04	05	06	07	08	09	19	20	21	22	23	31	32
D 68.. 2CT...	68	D68..01 2CT	D68 03	D68 04	D68 05	D68 06	D68 07	D68 08	D68 09	D68 19	D68 20	D68 21	D68 22	D68 23	MA2.9449	186-843
D 85.. 3CT...	85	D85..01 3CT	D85 03	D85 04	D85 05	D85 06	D85 07	D85 08	D85 09	D85 19	D85 20	D85 21	D85 22	D85 23	MA2.9449	186-844
D 100.. 3CT...	100	D100..01 3CT	D100 03	D100 04	D85 05	D100 06	D100 07	D100 08	D85 09	D85 19	D100 20	D100 21	D85 22	D85 23	MA2.9449	186-844
D 200.. 3CT...	200	D200..01 3CT	D200 03	D100 04	D85 05	D200 06	D100 07	D100 08	D85 09	D85 19	D100 20	D100 21	D85 22	D85 23	MA2.9449	186-844

BORING

SPARE PARTS

Large-diameter rough boring heads

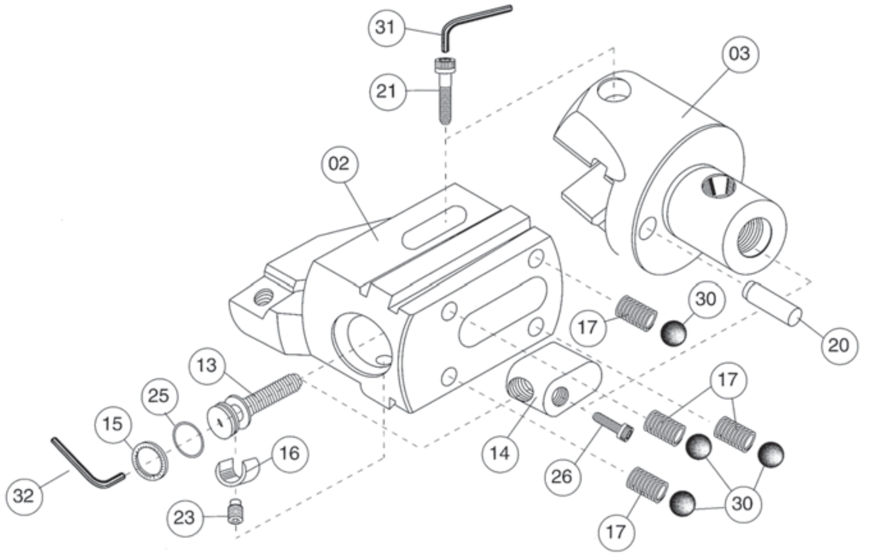


Reference	Ø	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	25
D 300	300	D300 51	D300 66	A300 55	D300 03	D68 23	D300 54	D300 65	D300 50	A68 16	A68 25	A68 15	D300 60	D300 56	D300 59	D300 01	D300 58	D300 57	D300 62	D300 49	D300 61	3CT...	D68 28	D85 27	D85 29
D 400	400	A400 51	D300 66	A300 55	D400 03	D68 23	D300 54	D300 65	D400 50	A68 16	A68 25	A68 15	D300 60	D300 56	D300 59	D400 01	D300 58	D300 57	D300 62	D300 49	D300 61	3CT...	D68 28	D85 27	D85 29
D 500	500	A500 51	D300 66	A300 55	D500 03	D68 23	D300 54	D300 65	D500 50	A68 16	A68 25	A68 15	D300 60	D300 56	D300 59	D500 01	D300 58	D300 57	D300 62	D300 49	D300 61	3CT...	D68 28	D85 27	D85 29

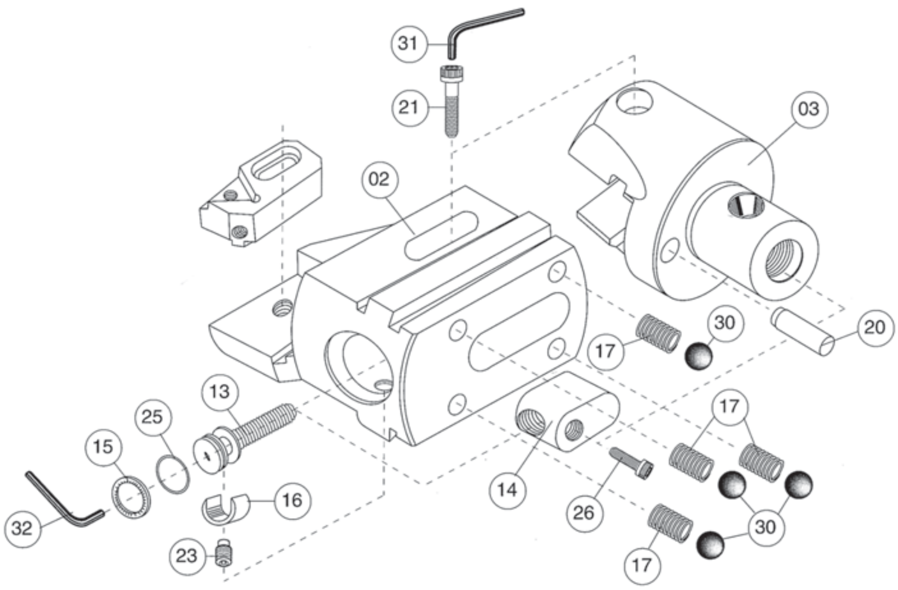
BORING

SPARE PARTS

Finish boring heads



Reference	Ø	02	03	13	14	15	16	17	20	21	24	25	26	30	31	32
A 22 75...	22	A2275 02...	A22 03	A22 13	A22 14	A22 15	A22 16	A22 17	D22 20	D22 21	D22 23	A22 25	A22 26	A22 30	MA2.668	MA2.884
A 22 90...	22	A2290 02...	A22 03	A22 13	A22 14	A22 15	A22 16	A22 17	D22 20	D22 21	D22 23	A22 25	A22 26	A22 30	MA2.668	MA2.884
A 27 75...	27	A2775 02...	A27 03	A27 13	A22 14	A22 15	A22 16	A27 17	D27 20	D27 21	D27 23	A22 25	A27 26	A27 30	174-815	MA2.884
A 27 90...	27	A2790 02...	A27 03	A27 13	A22 14	A22 15	A22 16	A27 17	D27 20	D27 21	D27 23	A22 25	A27 26	A27 30	174-815	MA2.884
A 32 75...	32	A3275 02...	A32 03	A32 13	A32 14	A32 15	A32 16	A27 17	D32 20	D32 21	D32 23	A22 25	A32 26	A27 30	174-815	MA2.669
A 32 90...	32	A3290 02...	A32 03	A32 13	A32 14	A32 15	A32 16	A27 17	D32 20	D32 21	D32 23	A22 25	A32 26	A27 30	174-815	MA2.669
A 42 75...	42	A4275 02...	A42 03	A42 13	A42 14	A42 15	A42 16	A42 17	D42 20	D42 21	D42 23	A42 25	A42 26	A42 30	186-843	MA2.668
A 42 90...	42	A4290 02...	A42 03	A42 13	A42 14	A42 15	A42 16	A42 17	D42 20	D42 21	D42 23	A42 25	A42 26	A42 30	186-843	MA2.668
A 54 75...	54	A5475 02...	A54 03	A54 13	A54 14	A42 15	A42 16	D54 09	D54 20	D54 21	D42 23	A42 25	A42 26	A54 30	186-844	MA2.668
A 54 90...	54	A5490 02...	A54 03	A54 13	A54 14	A42 15	A42 16	D54 09	D54 20	D54 21	D42 23	A42 25	A42 26	A54 30	186-844	MA2.668



Reference	Ø	02	03	13	14	15	16	17	20	21	24	25	26	30	31	32
A 68.. 2CT...	68	A68..02 2CT	A68 03	A68 13	A68 14	A68 15	A68 16	A68 17	D68 20	D68 21	D68 23	A68 25	A68 26	A68 30	MA2.9449	186-843
A 85.. 3CT...	85	A85..02 3CT	A85 03	A85 13	A85 14	A85 15	A85 16	D85 09	D85 20	D85 21	D85 23	A85 25	A85 26	A85 30	MA2.9449	186-844
A 100.. 3CT...	100	A100..02 3CT	A100 03	A85 13	A85 14	A85 15	A85 16	D85 09	D100 20	D100 21	D85 23	A85 25	A85 26	A85 30	MA2.9449	186-844
A 200.. 3CT...	200	A200..02 3CT	A200 03	A200 13	A85 14	A85 15	A85 16	D85 09	D100 20	D100 21	D85 23	A85 25	A85 26	A85 30	MA2.9449	186-844

BORING

NOTES


Modif. suite demande client du 15/12/09.
PORTE OUTIL D'EBAUCHE - FINITION.
TEM0573
TEM0573_D
Attachement UTISN type A
Zone de marquage

HARDNESS MEASUREMENT

HB: Brinell hardness number. Determined by applying a known load for a given length of time, indenting the test surface with a hardened steel or carbide ball of known diameter. The diameter of the indentation is microscopically measured and converted to the HB by standard tables.
HV: Vickers diamond pyramid number. Similar to the Brinell test, except the load is applied to the test surface for a specific time through a square base pyramid with 136° between opposing faces. The number, HV, is in kilograms divided by the square millimeters of the indentation area.
Rockwell hardness test: The test measures the depth of residual penetration by a steel ball or a diamond cone under given conditions of load.
The **"C" scale, HRC**, is utilized for hardened steels and some case-hardened parts.
The **"B" scale, HRB**, is used for medium-hard and/or some annealed metals such as medium carbon steel or cast iron.
The **"A" scale, HRA**, is used for thin steel and shallow case hardened steel.
Shore C: Scleroscope Hardness Test. A diamond-tipped hammer falls from a specific height through a glass tube with a graduated scale of 140. The distance of rebound is observed visually or recorded by indicator. The scleroscope is portable and easy to apply on large heavy parts.
Note: These values are only correct for non austenitic steels more than 2 mm thick.

Brinell	Vickers	Rockwell			Sclero-scope	Tensile strength
HB	HV	HRC	HRB	HRA	Shore C	R
111	117	-	65.7	42.1	15	390
116	122	-	67.6	43.1	18	410
121	127	-	69.8	44.2	19	420
126	132	-	72	45.3	20	440
131	137	-	74	46.3	-	460
137	143	-	76.4	47.5	21	470
143	150	-	78.7	48.7	22	500
149	156	-	80.8	49.9	23	510
156	163	-	82.9	51.1	-	530
163	171	-	85	52.3	25	560
167	175	-	86	52.8	-	570
170	178	-	86.8	53.3	26	580
174	182	-	87.8	53.9	-	600
179	188	-	89	54.6	27	610
183	192	-	90	55.2	28	630
187	196	-	90.7	55.6	-	640
192	202	-	91.9	56.4	29	650
197	207	-	92.8	56.9	30	670
201	212	-	93.8	57.5	31	690
207	218	-	94.6	58	32	700
212	222	-	95.5	58.6	-	720
217	228	-	96.4	59.2	33	740
223	234	-	97.3	59.7	-	760
229	241	20.5	98.2	60.3	34	780
235	247	21.7	99	60.9	35	800
241	253	22.8	100	61.5	36	820
248	261	24.2	-	62.5	37	840
255	269	25.4	-	63	38	860
262	276	26.6	-	63.6	39	890
269	284	27.6	-	64.1	40	910
277	292	28.8	-	64.5	41	940
285	301	29.9	-	65.3	-	970
293	309	30.9	-	65.8	43	990
302	319	32.1	-	66.3	45	1030
311	328	33.1	-	66.8	46	1050
321	339	34.3	-	67.5	47	1080
331	350	35.5	-	68.2	48	1120
341	360	36.6	-	68.6	50	1150
352	372	37.9	-	69.4	51	1200
363	383	39.1	-	69.9	52	1240
375	396	40.4	-	70.6	54	1290
388	410	41.8	-	71.4	56	1360
401	425	43.1	-	72	58	1420
415	440	44.5	-	72.8	59	1490
429	455	45.7	-	73.5	61	1540
444	472	47.1	-	74.1	63	1620
461	491	48.5	-	74.8	65	1700
477	508	49.6	-	75.6	66	1770
495	528	51	-	76.3	68	1860
514	547	52.1	-	76.8	70	1930
534	569	53.5	-	77.7	71	2020
555	591	54.7	-	78.3	73	2100
578	615	56	-	79	75	-
601	640	57.3	-	79.7	77	-
627	667	58.7	-	80.6	79	-
630	670	58.8	-	80.7	-	-
638	680	59.2	-	80.8	80	-
647	690	59.7	-	81	81	-
653	698	60	-	81.2	82	-
670	720	61	-	81.8	83	-
682	737	61.7	-	82.1	84	-
690	746	62	-	82.3	85	-
706	772	63	-	82.8	87	-
722	800	64	-	83.4	88	-

MATERIAL EQUIVALENT TABLES

Category	Germany		France	Italy	Japan	Sweden	USA	Great Britain		Spain	Trade Name
	Low carbon Steel										
P Steels	10 SPb 20	1.0722	10PbF2	CF10 SPb 20		-	-	-	-	10SPb20	
	GS-38	1.0416	230-400M			1306	-				
	H 1	1.0345	A37CP			1330	A515 65	1 501 161		F-1110	
	H II	1.0425	A42CP			1432	-				
	GS-45	1.0443	E23-45M			1305	A 27 65-35				
	St 36-1	1.0201	Fd5			1160	1006				
	RSt 37-2	1.0038	E24-2Ne		STKM 12.C	1311	A570 36	4360 40 C			
	St 37-3	1.0116	E24-U	Fe37-3		1312	A573-81 65	4360 40 B			
	St 44-2	1.0044	NFA35-501E28			1411	A36	4360 43 A			
	Ck 10	1.1121	XC10			1265	1010				
	St 37-1	1,112				1300		4360 40 A			
	StE 320-3Z					1421		1 501 160			
	C 15	1.0401	CC12	C15 C16		1350	1015	080 M 15	-	F-1110	
	C 22	1.0402	CC20	C20 C21		1450	1020	050A20	2C/2D	F.112	
	Ck 15	1,114	XC18	C16		1370	1015	080M15		F-1511	
	9 SMn36	1.0736	S300			-	1215	240M07	1B	12SMn35	
	9 SMnPb 36	1.0737	S300Pb	CF9 SMnPb 36		1926	12L14	-	-	12SMnPb35	
	9 SMn 28	1.0715	S250	CF9SMn28	SUM22	1912	1213	230M07	-	11SMn28	
	9 SMnPb 28	1.0718	S250Pb	CF9SMnPb28	SUM22L	1914	12L13	-	-	11SMnPb28	
	Medium and high carbon steel										
P Steels	Ck 25	1,116	XC 25			1450	1025	050 A 20		F-1120	
	StE 380	1,89		FeE390KG		2145	A572-60	4360 55 E			
	C 35	1,050	AF 55 C 35	C35		1550	1035	060 A 35		F-1130	
	Ck35	1,118	XC38	C35		1572	1035			F-1135	
	Cf 35	1.1183	XC38TS	C36	S35C	1572	1035	065A35	-	-	
	35 S 20	1.0726	35MF4			1957	1140	212M36	8M	F210G	
	C 45	1,050	AF 65 C 45	C45		1650	1045	080 M 46		F-5110	
	Ck45	1,119	XC45	C45	S45C	1660	1045	080 A47		F-1140	
	St 44-3	1.0144	E28-3		SM 400A.B.C	1412	A573-81	4360 43 C		-	
	45 S 20	1.0727	45MF4			1973	1151				
	ASt 45	1,044	A 48 FP			2103	A662 C	1 501 224			
	St50-2	1,005		FE50							
	St 52-3	1.0570	E36-3	Fe52BFN/Fe52CFN	SM490A.B.C.YA.YB	2132	-	4360 50 B		-	
	ASt 52	1,058	A 52 FP			2107	A738	1 501 224			
	GS-52	1,055	280-480 M			1505	A27 70-36	A2			
	Cf 53	1.1213	XC48TS	C53	S50C	1674	1050	060A52	-	-	
	C55	1,054		C55		1655	1055	070M55			
	Ck 55	1.1203	XC55	C50	S55C	-	1055	070M55	-	C55K	
	C 60	1.0601	CC55			1655	1060	080A62	43D		
	Ck 60	1.1221	XC60	C60	S58C	1678	1064	060 A 62	43D	F-1150	
	GS-60	1,055	320-560 M	C45		1606	A148 80-40	A3			
	St60-2	1,006		FE60-2							
	Ck 67	1.1231	XC 68	C70		1770	1070	070 A72		F-5103	
	St70-2	1,007		FE70-2							
	Ck 75	1.1248	XC75			1774	1080	060 A 78		F-5107	
	C 105 W1	1.1545	Y105	C36KU	SK 3	1880	W 1	BW 1A		F-5118	
	C 105 W1	1.1545	Y105V	C120KU	SPU4	2900	W210				
	Ck 101	1.1274	XC100			1870	1095	060 A 96		F-5117	
	C 105 W1	1.1545	Y105	C36KU	SK 3	1880	W 1	BW 1A		F-5118	
	C 105 W1	1.1545	Y105V	C120KU	SPU4	2900	W210				
	C 125W	1,166	Y120	C120KU	SK2		W112				
	Alloy Steel										
P Steels	16CrMo4	1,724	18CD4								
	16CrMo4 4	1,734		A 18 CrMo 4 5 KW			A 387				
	12CrMo19 5	1,736	Z10CD5.05	16CrMo20 5				3606-625			
	10 CrMo 9,10	1.7380	12CD 9,10	10 CrMo 9 10		2218	ASTM A182	1501-622	-	TU.H	

MATERIAL EQUIVALENT TABLES

Category	Germany		France	Italy	Japan	Sweden	USA	Great Britain		Spain	Trade Name
	Alloy Steel										
P Steels	17 MnV 6	-	NFA35-501E36	Fe E390KG		2142	A572-60	4360 55 E			
	19 Mn 6	1,047	A 52 CP			2101	A537 1	1 501 224		F-1518	
	20 Mn 5	1.1133	20M5	G22Mn3		1410	1022	120 M 19			
	28 Mn 6	1.1170	20M5		SCMn1	-	1330	150M28	14A	-	
	40 Mn 4	1.1157	35M5			-	1039	150M36	15	-	
	15 Mo 3	1.5415	15D3	16Mo3KW		2912	A204GrA	1501-240	-	16Mo3	
	16Mo5	1,542		16Mo5			4520	1503-245-420		16Mo5	
	15 Cr 3	1.7015	12C3		SCr415(H)	-	5015	523M15	-	-	
	32 CrMo 12	1.8515	30CD12	32 CrMo 12		2240	-	722 M 24		F-1712	
	55 Cr3	1.7176	55C3		SPU9(A)	-	5155	527A60	48	-	
	55 Si 7	1.0904	55S7	55Si8		2085	9255	250A53	45	56Si7	
	60 SiCr7	1.0961	60SC7	60SiCr8		-	9262	-	-	60SiCr8	
	14MoV6 3	1,772						1503-660-440		13MoCrV6	
	15 CrMo 5	1.7262	12CD4		SCM4(H)	2216	-	-	-	12CrMo4	
	13 CrMo 4.4	1.7335	15CD 3.5	14 CrMo 4 5		-	ASTM A182	1501-620Gr27	-	14CrMo45	
	14 NiCr 10	1.5732	14NC11	16 Ni Cr 10	SNC415(H)	-	3415	-	-	15NiCr11	
	14 Ni 6	1.5622	16N6	14 Ni 6		-	A350LF5	-	-	15Ni6	
	17 CrNiMo 6	1.6587	18NCD6			-	-	820A16	-	14NiCrMo13	
	40NiCrMo2	1,655		40NiCrMo2(KB)	SNCM240		8740	311-type 7		40NiCrMo2	
	49CrMo4	1,724									
	42CrV6	1,756									
	42 CrMo 4	1.7225	42CD4	42 CrMo 4	SCM440(H)	2244	4140	708M40	19A	42CrMo4	
	51CrMoV4	1,770	51CDV4	51CrMoV4							
	35 CrNiMo 6	1.6582	35NCD6	35 CrNiMo 6(KB)		2541	300M/4340M	817M40	24	F-1280	
	30NiCrMo16 6	1,675	35NCD16								
	50 NiCr 13	1.2721	55NCV6			2550	L6				
	21 NiCrMo2	1.6523	20NCD2	20 NiCrMo2	SNMC220(H)	2506	8620	805H20	362	F-1522	
	42 Cr 41	1,705	42 C 4 TS			2245		530 A 40		F-1207	
	20MoCrS4	1,542				2108		605A32		F520.S	
	16MnCr5	1,714				2127					
	55NiMoV6G	1,723		653M31		2512		823M30	33		
	32 NiCrMo 14 5	1,675	35NCD14					830 M 31		F-1260	
	34MoCrS4 G	1,704		10WCR 5		2092	L1	524A14			
	50 NiCr 13	1.2721	55NCV6			2550	L6	-		F-528	
	16 MnCr5	1.7131	16MC5	16 MnCr5		2511	5115	(527M20)	-	16MnCr5	
	25 CrMo 4	1.7218	25CD4(S)	25 CrMo 4(KB)	«SCM420;SCM430»	2225	4130	CDS 110	55Cr3	F-1251	GS25CrMo4
	32 CrMo 12	1.7361	30CD12	32 CrMo 12		2240	-	722 M 24	40B	F.124.A	32CrMo12
	34 Cr 4	1.7033	32C4	34 Cr 4(KB)	SCr430(H)	-	5132	530A32	18B	35Cr4	
	34 CrMo 4	1.7220	35CD4	35 CrMo 4	SCM432.SCCRM3	2234	«4137 ; 4135»	708A37	19B	F-1250	
	36NiCr10	1,574	30NC11				3435				
	36 NiCrMo 4	1.6511	40NCD3	38 NiCrMo 4(KB)			9840	816M40	110	35NiCrMo4	
	41 Cr 4	1.7035	42C4	41 Cr 4	SCr440(H)	-	5140	530A40	18	42Cr4	41Cr4
	55 Cr 31	1,718	55 C 3	55Cr31		2253					
	50 Cr V4	1.8159	50CV4	50CrV4	SUP10	2230	6150	735A50	47	51CrV4	
	100Cr2	1,350	100C2				E50100				
	55 NiCrMoV 6	1.2713	55NCDV 7		SKT4	-	L6	-	-	F.520.S	
	100 Cr 6	1.3505	100C6	100Cr6	SUJ2	2258	52100	534 A 99		F-5230	
	105 WCr 6	1.2419	105WC13	10WCr 6	SKS31	2140	-	-	-	105WCr5	
	100 Cr 6	1.2067	Y100C6			-	L3	BL3	-	100Cr6	
	36 NiCr 6	1.5710	35NC6		SNC236	-	3135	640A35	111A	-	
	56 Si 7	1,090	55S7			2090	9255	250A53	45	56Si7	
	14 NiCr14	1.5752	12NC15		SNC815(H)	-	«3415 ; 3310»	«655M13; A12»	36A	-	
	115CrV3	1,221	100C3	107CrV3KU			L2				
	90MnCrV8	1,284	90MV8	88MnV8KU			O2	BO2			
	45 WCrV 7	1.2542		45WCrV8KU		2710	S1	BS1			
	60WCrV7	1,255	55WC20	58WCr9KU			S1				

MATERIAL EQUIVALENT TABLES

Category	Germany		France	Italy	Japan	Sweden	USA	Great Britain		Spain	Trade Name
	Alloy Steel										
P Steels	14NiCrMO134	1.6657	16NCD13	15NiCrMO13							12NiCrMo134
	49CrMo4	1,724									
	42CrV6	1,756									
	51CrMoV4	1,770	51CDV4	51CrMoV4							
	24CrMoV5 5	1,773	20CDV6	21CrMoV5 11							
	GS-45 CrMoV10 4	1,776									
	21CrMoV5 11	1,807		35NiCr9							
	41 CrAlMo 7	1.8509	40CAD612	41 CrAlMo 7		2940	-	905M39	41B	41CrAlMo7	
	39CrMoV13 9	1,852		36CrMoV12				897M39	40C		
	40CrMnMo7	1,231		35CrMo8KU							
	35NiCr18	1,586									
	Tool Steel and Die Steel										
P Steels	X8Ni9	1,566		X10Ni9			ASTM A353	«1501-509;510»		XBNiO9	
	X12Ni 19	1.5680	Z18N 5			-	2515	-	-	-	
	X8Ni9	1,566		X10Ni9			ASTM A353	«1501-509;510»		XBNiO9	
	X40 CrMoV5 1	1.2344	Z40CDV5	X40CrMoV051KU	SKD61	2242	H 13	BH13	-	X40CrMoV5	
	X210CrW12	1,244		X215CrW12 1KU	SKD2	2312				X210CrW12	
	X30WCrV9 3	1.2581	Z30WCV 9	X28W09KU	SKD5	-	H21	BH21	-	X30WCrV9	
	X165CrMoV 12	1,260		X165CrMoV 12 KU		2310				X160CrMoV12	
	X37CrMoW5 1	1,261	Z35CWDV5	X35CrMoW 05 KU				BH12			
	S18/1/2/5	1,326	Z80WKCV	X78WCo1805KU	SKH3		T4	BT4		HS 18-1-1-5	
	X105 CrMo 17	1.4125	Z100CD17				440 C				
	X210CrW12	1,244		X215CrW12 1KU	SKD2	2312				X210CrW12	
	X18CrN 28	1.4749	Z10C24			2322	446				
	X210 Cr 12	1.2080	Z200CD12	X210 Cr 13 KU / X250Cr 12 KU	SKD1		D3	BD3	-	X210Cr12	
	S 2-9-2-8	1,325						BM 34		2-9-2-8	
	X155 CrVMo 12 1	1.2379	Z160CDV12	X155CrVMo12 1 KU		2310	D2				
	X155 CrVMo 12 1	1.2379	Z160CDV12	X155CrVMo12 1 KU		2310	D2				
						2223					
	G-X120Mn12	1,340	Z120M12	XG120Mn12	SCMnH/1			Z120M12		X210Mn12	
		1,340	2120 M12	GX120Mn12	SEMn H1	2183		BW 10		F-8251	
	S6-5-2	1.3343	Z40CSD10	15NiCrMo13	SUH3	2715	D3	4959BA2	-	-	
	S6/5/2/5	1.3243	KCV 06-05-05-04-02	HS6-5-2-5	SKH55	2723	M 35	BM 35		F-5613	
	S 7-4-2-5	1,325	Z110WKCDV07-05-04	HS 7-4-2-5		7-4-2-5				M 35	
	S 2-10-1-8	1,325	Z110DKCWV09-08-04	HS 2-9-1-8		2-10-1-8		BM 42		M 41	
	S 2-9-2-8	1,325						BM 34		2-9-2-8	
	S 10-4-3-10	1,321	Z130WKCDV	HS 10-4-3-10				BT42			
	Ferritic and Martensitic Stainless Steel										
M Stainless steels	X 6Cr 13	1.4000	Z 6C13		SUS403	2301	403 / 410 S	403S17	-	F.3110	Uginox F 13 S
	X7Cr13	1.4000	Z6C13	X6Cr13	SUS403	2301	403	403S17		F.3110	
	X7Cr14	1,400								F.8401	
	X6CrAi 13	1.4002	Z8CA12	X6CrAl13		-	405	405S17	-	-	Soleil B3
	X 12CrS 13	1.4005	Z12CF13	X12CrS 13	SUS416	2380	416				15,5Cr (Soleil AzU)
	GX 12Cr13	1.4006	Z10C13	X12Cr13	SUS410		410 M				MA 1
	X 10Cr 13	1.4006	Z10C14	X8Cr17	SUS430	2302	410	410S21	56A	F.3401	Uginox MA 1 (Soleil A2)
	X20 Cr 13	1.4021	Z20C13	X20 Cr 13		2303	420	420S37	-	-	Uginox MA 2 (Soleil A5)
	X30 Cr 13	1.4028	Z30C13			2304	420				Uginox MA 3
	X38 Cr13	1.4031	Z40C14			2304	420				
	X 46Cr 13	1.4034	Z38C13M / Z44C14	X40Cr14	SUS420J2	2304	420				Uginox MA 4
	G-X20Cr14	1,403	Z20C13M		SCS2			420C29	56B		
	X 8Cr 17	1.4016	Z 8C17	X 8Cr 17	SUS430	2320	430	430S15	960	F.3113	Uginox F 17 (Soleil B4)
	X 12CrMoS 17	1.4104	Z10CF17	X10CrS17	SUS430F	2383	430	-	-	F.3117	Soleil B4U
	X 6CrMo 17 1	1.4113	Z8CD1701	X8CrMo17	SUS434	2325	434	343S17	-	-	Uginox F 17 M
	X 5CrNi 13 4	1.4313	Z4CND134M	(G)X6CrNi304		2384	CA6-NM	425C11	-	-	
	X6 CrTi 17	1,451	Z4CT12	X6CrTi17			430Ti				
	X5 CrTi 12	1,451	Z 6CT12	X6CrTi12			409	409S19			

MATERIAL EQUIVALENT TABLES

Category	Germany		France	Italy	Japan	Sweden	USA	Great Britain		Spain	Trade Name
	Ferritic and Martensitic Stainless Steel										
M Stainless steels	X 10CrA118	1.4742	Z10CAS18	X8Cr17	SUS430	-	430	430S15	60	F.3113	
	X 10CrA124	1.4762	Z10CAS24	X16Cr26	SUH446	2322	446	-	-	-	
	X17CrNi 16 22	1.4057	Z15CNi602	X16CrNi16	SUS431	2321	431	431S29	57	F.3427	
	X2NiCoMoTi 18 8.5	1.6359	E-Z 2 NKD 18-8								Z 2 NKDT 18-08-05
	X5CrNiNb18-10	1.4546	Z10CHNb1810				348				X5CrNiNb1810
	X 53CrMnNiN21 9		Z52CMN2109		SUH35,SUS36	-	EV8	349S54	-	-	
	X80CrNiSi20	1,476	Z80CSN20.02	X80CrSiNi20	SUH4	-	HNV 6	443S65	59	F.320B	
	X 10CrA113	1.4724	Z10C13	X10CrA112	SUS405	-	405	403S37	-	F.311	
	X2CrNiMoSi19 5	1,442				2376	S31500				
	X 22CrNi 17	1.4057	Z15CN1703		SUS431	2321	431				15Cr7,1Ni2,5Mo
	X105 CrMo 17	1.4125	Z100CD17				440 C				
	Autenitic Stainless Steel										
M Stainless steels	X12CrNiTi18 9	1,488	Z6CNT18.12B	X6CrNiTi1811	SU321		321	321S320	58C	F.3523	
	X2CrMoTi 18 2	1.4521	Z3CDT18-02			2326	444				Uginox F 18 MT
	X5CrNiMoN17 13	1.4439	Z3CND18-14-06AZ				317 L4				
	X5CrNi13 4	1.4313	Z6CN13-4		SCS5	2385	CA6-NM				
	X12CrMnNi 18 8 5	1.4371	Z8CMN18-08-05			2357	202				
	X5 CrNi18 10	1.4350	Z6CN18-09	X5CrNi18 10	SUS304	2332/33	304	304S15	58E	F.3551	Uginox 18- 9 E (ICL 472)
	X2CrNiN18 10	1.4311	Z2CN18-10		SUS304LN	2371	304 LN	304S62	-	-	
	X10CrNi 18 8	1.4310	Z11CN17-08	X12CrNi 17 07	SUS301	2331	301				Uginox 17-7 B
	X8CrNi18 12	1,431	Z10CN18.9M	X8CrNi1910			305	309 S 19		F-3503	
	X6CrNiNb 18 10	1.4550	Z6CNNb18-10	X6CrNiNb 18 11	SUS347	2338	347	347S17	58 F	F.3552	19Cr9,5Ni
	G-X7CrNiNb18 9	1,455	Z4CNNb19.10M					347C17			
	X6CrNiTi 18 10	1.4541	Z6CNT18-10	X6CrNiTi 18 11	SUS321	2337	321	321S12	58B	F.3553	Uginox 18-10 T (ICL 472 T)
	X4CrNiMo17 12 2	1.4401	Z3CND17-11-02	X5CrNiMo 17 12	SUS316	2347	316				Uginox 17-10 M
	X2CrNiMo18 14 3	1.4435	E-Z2CND17-13	X2CrNiMo 17 12	SCS16 or SUS316L	2353	316 L				Uginox 18-13 MS
	X2CrNiMo17 12 2	1.4404	Z2CND17-12	X2CrNiMo 17 12		2348	316 L	316S13	-	-	Uginox 18-11 ML (ICL 164 BC)
	X2CrNiMoN 18 13	1.4429	Z3CND17-13 Az		SUS316LN	2375	316 LN				
	X6CrNiMoTi 17 12 2	1.4571	Z6CNDT17-12	X6CrNiTi 17 12		2350	316Ti	320S17	58J	F.3535	Uginox 17-11 MT (ICL 164 T)
	X2CrNiMo18 15 4	1.4438	Z2CND19-15	X2CrNiMo 18 16	SUS317L	2367	317 L	317S12	-	-	
			Z6CNDNb1713 B	X6CrNiMoNb 17 13		-	318	-	-	-	
	X53CrMnNiN219	1,487	Z53CMN21 09	X53CrMnNiN219			EV8	349S54			
	X12CrNi 25 21	1.4845	Z12CN25 20	X6CrNi 25 20	SUH310	2361	310 S	310S24	-	F.331	Uginox R 25-20
	X3CrNiMo17-13-3	1.4436	Z6CND18-12-03	X8CrNiMo 17 13		2343	316 Hmo	316S33	-	-	
	X15CrNiSi20 12	1.4828	Z15CNS20-12		SUH309	-	309	309S24	-	-	Uginox R 20-12
	X2CrNiMoN 17 11 2	1.4406	Z1NCDU25-20		SCS17	2370	316 LN	301S21	58C	F.8414	
	G-X5CrNi	1,458	Z4CNDNb	XG8CrNiMo 18 11	SCS22			318C17			
	X1CrNiMoAl 12 9		E-Z1CND12-09								Z1CNDA12-09
	X7CrNiAl 17 7	1.4568	Z8CNA17-07	X2CrNiMo1712	SUS631	2388	631	316S11	-	-	17-7PH
	-		Z1CNDU20-18-06AZ			2378	S31254	-	-	-	
	X10CrNiMoNb18 12	1.4583									
	X2CrNiMoN22 53		Z2CND22-05-03			2377	S31803	-	-	-	
	X2CrNiN23 4	1,462	Z2CN23 -04AZ			2327	S32304	-	-	-	
	X2CrNiMoN 22 5 3	1.4462	Z3CND22-05Az			2377	S31803				Uranus 45 N (46)
	X15CrNiSi 25 20	1.4841	Z15CNS25-20				310 / 314				X 18
	Grey Cast Iron										
K Cast irons	GG 10	0,601	Ft10D	G10	FC100	110	No 20 B				
	GG 15	0.6015	Ft15D	G15	FC150	115	No 25 B	Grade 150		FG 15	
	GG 20	0.6020	Ft20D	G20	FC200	120	No 30 B	Grade 220			
	GG 25	0.6025	Ft25D	G25	FC250	125	No 35 B	Grade 260		FG 25	
	GG 30	0.6030	Ft30D	G30	FC300	130	No 45 B	Grade 300		FG 30	
	GG 35	0.6035	Ft35D	G35	FC350	135	No 50 B	Grade 350		FG 35	
	GG 40	0.6040	Ft40D			140	No 55 B	Grade 400			

MATERIAL EQUIVALENT TABLES

Category	Germany		France	Italy	Japan	Sweden	USA	Great Britain		Spain	Trade Name
	Nodular Ductile Cast Iron										
K Cast irons	GGL-		A32-301			ISO-215	A436-72				
	NiCr 20 2		L-NC20 2			523	Type 2	L-NiCuCr202			
	GGG 40.3	0,704	FGS370-17			0717-12		SNG 370/17		FGE 38/17	
	GGG 35.3	0.7033	FGS370-17			0717-15					
	GGG 40	0.7040	FGS400-12		FCD400	0717-02	60-40-18	SNG 420/12		FGE 38-17	
	GGG-50	0.7050	FGS500-7		FCD500	0727-02	80-55-06	SNG 500/7		FGE 50-7	
	GGG 60	0.7060	FGS600-3			0732-03		SNG 600/3			
	GGG 70	0.7070	FGS700-2		FCD700	0737-01	100-70-03	SNG 700/2		FGS 70-2	
	GGG-NiCr202	0.6660	L-NC20 2			523	A436 Type 2	L-NiCuCr202		-	
	GGG-NiMn 13 7	0.7652	S-Mn137			772	-				
	GGG-NiCr 20 2	0.7660	S-NC202			776	A43D2	Grade S6		-	
	Maleable Cast Iron										
K Cast irons	GTW-40	0,804	MB40-10	GMB40				W410/4		GTW40	
	GTW-45	0,805		GMB45						GTW45	
	GTW-55	0,806								GTW55	
	GTW-65	0,807								GTW65	
	GTS-35	0,814	MN35-10			810	32510	B 340/12		GTS35	
	GTS-45	0.8145	Mn450		FCMW370	852	40010	P 440/7		GTS45	
	GTW-35	0,804	MB35-7					W340/3		GTW35	
	GTS-55	0.8155	MP50-5		FCMP540	854	50005	P 510/4		GTS55	
	GTS-55-04	0.8155	Mn550-4		FCMP490	854	A220-50005				
	GTS-65	0,817	MP60-3			858	70003	P 570/3		GTS65	
	GTS-65-02	0.8165	Mn650-3		FCMP590	856	A220-70003	P570/3		-	
	GTS-70	0.8170	Mn700-2		FCMP690	862	A220-80002	P690/2			
	GTS-70-02	0.8170	Mn700-2		FCMP690	864	A220-90001				
	Aluminum Alloys										
N Aluminum Non-ferrous	Al99.5	3.0255	A5/9050C				1000	L31/34/36			Al
	G-AlSI9MGWA	3,237	A-S7G			4251	SC64D	-	-	-	
	AlZnMgCu0.5	3.4344/45	AZ4GU/9051	811-04			7050	L 86			Al2,3Cu2,3MgSiMn6,2Zn
	G-MgZn4SE1Zr1	3,510	G-Z4TR				ZE41	MAG5			
	MgSE3Zn2Zr1	3,510	G-TR3Z2				EZ33	MAG6			
	G-MgAg3SE2Zr1	3,511	G-Ag22.5				QE22	MAG12			
	G-MgAl8Zn1	3,581	G-A9				AZ81	MAG1			
	G-MgAl9Zn1	3,591	G-A9Z1				AZ91	MAG7			
	G-AlSi10Mg(Cu)	3,238				4253	A360.2	LM9			
	G-AlSi7Mg	3,237					4218B				
	Copper Alloys										
N Aluminum Non-ferrous	G-CuSn 7 ZnPb	2,109	U-E 7 Z 5 Pb 4				C93200				
	G-CuSn 5 ZnPb	2,110	U-E 5 Pb 5 Z 5				C83600	LG2			
	G-CuPb 10 Sn	2,118	U-E 10 Pb 10				C93700	LB2			
	G-CuPb 15 Sn	2,118	U-Pb 15 E 8				C93800	LB1			
	CuZn15	2,024	CuZn 15				C23000	CZ 102			
	CuZn30	2,027	CuZN 30				C26000	CZ 106			
	CuZn37	2,032	CuZn 36/27	C2700			C27200	CZ 108			
	G-CuZn 35 Al 1	2,059	U-Z 36 N 3				C86500	HTB 1			
	G-CuZn 34 Al 2	2,060	U-Z 36 N 3				C86200	HTB 1			
	G-CuPb20Sn	2,119	U-Pb 20				C94100	LB 5			
	G-CuCrF 35	2,129					C81500	CC1-FF			
	CuCrZr	2,129	U-Cr 0.8 Zr				C18200	CC 102			
	CuAl 10 Ni 5 Fe 4	2,097	U-A 10 N				C6300	Ca 104			
	G-CuSn 10	2,105					C90700	CT 1			
	G-CuSn 12	2,105	UE 12 P				C90800	Pb 2			

MATERIAL EQUIVALENT TABLES

Category	Germany		France	Italy	Japan	Sweden	USA	Great Britain		Spain	Trade Name
	Iron Base super Alloys										
S Super alloys	X1NiCrMoCu25 20 5	1.4539	Z2NCDU25-20			2562	904 L	-		-	Uranus B6
	X1NiCrMoCu25 20 5	1.4539	Z2NCDU25-20			2562	UNSV0890A	-		-	Uranus B6
	X5NiCrTi 2615	1.4980	E-Z 6 NCTDV 25.15			2570	660				Z8NCTV25-15BFF
	X10NiCrAlTi3221	1.4876	Z10NC32-21				B 163				Incoloy 800 HT
	G-X40NiCrSi38 18	1,487		XG50NiCr39 19	SCH15			330C11			
	X5NiCrAlTi 31 20	1,496					N 08330				
	X12NiCrSi 36 16	1.4864	Z12NCS35-16	F-3313	SUH330		330	-	-	-	
	X2NiCrAlTi 32 20	1,456					N 08800	NA 15			
	X1NiCrMoCu 32 28 7	1,456					N 08831				
	X1NiCrMoCuN 31 27 4	1.4563	Z1NCDU31-27-03			2584	N08028	-	-	-	
	X 5 Ni CrTi 25 15						AMS 5732 - 5737				A -286
	X40CoCrNi20 20	1,498	Z42CNKDWNb								
	Nickel Base super Alloys										
S Super alloys	NiMo16CrTi	2,461									Hastelloy C-4
		2.4650									Nimonic C-263
	NiCr20Co18Ti	2.4632	Nc20ATV								Nimonic 90
	NiCr22Fe18Mo	2.4665	NC22FeD				AMS 5754 E	-	-	-	Nimonic PE 13
	NiCo15Cr15MoAlTi	2.4636	NCK15ATD								Nimonic 115
			NCK18TDA								Udimet 710
	NiCr18Co18MoTi	2.4983	NCK19DAT				AMS 5751				Udimet 500
		2.4603	NC22FeD				AMS 5754				Hastelloy X
	NiCo15CrMoAlTi	2.4636	NCK20AT								Udimet 700
	NiCr15Co19MoTi	2.4650	NCK20D								Nimonic 263/C263
	NiCo20C15MoAlTi	2.4634	NCKD20ATV								Nimonic 105
	NiCr20Ti	2.4630	NC20T					HR5,203-4	-	-	Nimonic 75
	NiCu30Fe	2.4360	NU30								Monel 400
	NiCr15Fe	2.4816	NC15Fe				AMS 5665				Inconel 600
	NiCr23Fe	2.4851					AMS 5715				Inconel 601
	NiCr22Mo9Nb	2.4856	NC22FeDNB				5666	-	-	-	Inconel 625
	NiCr21Mo	2.4858	NC21FeDU								Incoloy 825
	G-NiMo30	2,481	ND16C15				AMS 5750				Hastelloy C & C 276
			NC14K8								René 95
	NiCr29Fe	2,464	NC 30 Fe								Inconel 690
	NiCu30Al	2,438	NU 30 AT				4676	NA 18			Monel K-500
			38C16NBT				AMS 5702				Inconel 706
	S-NiCr13Al6MoNb	LW2.4670	NC12AD				AMS 5391				Inconel 713
	S-NiCr13Al6MoNb	LW2.4670	NC13AD				SAE 5391 A				Nimocast 842
			NC15FeTNbA				AMS 5667				Inconel X-750
	NiCr16FeTi		NC16FeTi				AMS5541				Inconel 722
			NC18K15TDA								Udimet 720
	NiCr19Co11MoTi	2.4973	NC19KDT				AMS 5399	-	-	-	René 41
	NiCr20Co16MoTi		NC19KDUV								Nimonic PK33
	NiCr20TiAk	2.4631	NC20TA					HR401,601	-	-	Nimonic 80A
	NiFe35Cr14MoTi	LW2.4662	ZSNCDT42				AMS 5660	-	-	-	Incoloy 901
	NiCr19Fe19NbMo	LW2.4668	NC19FeN				5383				Udimet 718
	NiCr19Fe19NbMo	LW2.4668	NC19FeNB				AMS 5589	HR8	-	-	Inconel 718
	NiCr19Fe19NbMo	LW2.4668	NC20K14				AMS 5544	-	-	-	Waspaloy
	NiCu30Al	2,438	NU 30 AT				4676	NA 18			Monel K-500
	NiCr15MoTi	LW2 4662	ZSNCDT42				AMS 5661 A				Nimonic 901
	S-NiMo30	2.4800	ND37FeV				AMS 5396				Hastelloy B
	NiCr18CoMo	2.4666	NKOD20ATU				AMS 5753				Nimonic PK 25
	NiFe33Cr17Mo		NW11AC								Nimonic PE 16
	NiCr16Fe7TiAl	2,469									Inconel 751
	NiCr16FeTi	2.4669	NC16FeTNb				AMS 5582				Inconel X-750
	G-NiMo28	2,469									Hastelloy B

MATERIAL EQUIVALENT TABLES

Category	Germany		France	Italy	Japan	Sweden	USA	Great Britain		Spain	Trade Name
	Cobalt Base super Alloys										
S Super alloys	CoCr20W15Ni	LW2.4964	KC20WN				AMS 5759				Haynes 25
	CoCr22W14Ni		KC22WN				AMS 5772				Haynes 188
	Titanium Alloys										
S Super alloys	Ti 1	3,703					R 50250	2 TA 1			
	TiCu2	3,712						2 TA 21-24			
	Ti 1 Pd	3,723					R 52250	TP 1			
	TiAl 3 V 2.5	3,720									
	TiAl6V4ELI	-	-			-	AMS R56401	TA11	-	-	-
	TiAl5Sn2.5	3.7115	T-A5E			-	AMS R54520	TA14/17	-	-	Ti5Al2.5Sn
	TiAl5Sn2	3,712									
	TiAl6Sn2Zr4Mo2Si	3,715					R 54620				
	TiAl6V4	3.7165	T-A6V			-	AMS R56400	TA10-13/TA28	-	-	Ti6Al4V
	TiAl6V6Sn2	3,718									
	TiAl4Mo4Sn2Si0,5	3,719	T-A4DE			-	-	TA 45-51/TA 57	-	-	Ti4Al4Mo2Sn0,5Si
	Hardened Materials										
H Hard materials	X100CrMo13	1,411			C4BS	2258-08	440A				
	X110CrMoV15	1,411			AC4A	2534-05	610				
	X65CrMo14				AC4A	2541-06	0-2				
	Chilled Cast Iron										
H Hard materials	G-X 260 NiCr 4 2	0,962				0512-00	Ni-Hard 2	Grade 2 A			
	G-X 330 NiCr 4 2	0,963				0513-00	Ni-Hard 1	Grade 2 B			
	G-X 260 NiCr 4 2	0,962				0512-00	Ni-Hard 2	Grade 2 A			
	G-X 330 NiCr 4 2	0,963				0513-00	Ni-Hard 1	Grade 2 B			
	G-X 300 CrNiSi 9 5 2	0,963					Ni-Hard 4				
	G-X 300 CrMo 15 3	0,964									
	G-X 300 CrMoNi 15 2 1	0,964									
	G-X 260 CrMoNi 20 2 1	0,965									
	G-X 260 Cr 27	0,965				0466-00	A 532 III A 25% Cr	Grade 3 D			
	G-X 300 CrMo 27 1	0,966									

GUIDE TO WORKPIECE MATERIAL

Category		Material designation example DIN	Material designation example AFNOR	Material designation example USA
P Steel	Free machining and low carbon	Ck10, 20Mn5	XC10, 20M5	1010, 1022
	Medium carbon and high carbon	CK45, 45S20	XC42, 42MF4	1045, 1151
	Alloy and easy to machine tool steels	25 CrMo4, 34 CrNiMo6	25CD4, 35NCD6	4130, 4340
	Tool steels and die	X155CrVMo12 1	Z160CDV12	D2
M Stainless steel	Ferritic and martensitic	X10Cr13, X6CrAl13	Z10C13, Z8CA12	410, 405
	Austenitic	X2CrNi19 11, X4CrNiMo17 12 2	Z2CN18 10, Z7CND17 11 02	304L, 316
	PH and duplex	X7CrNiAl 17 7	Z8CNA17 07	631, 17-7PH
K Cast iron	Gray cast iron	GG25	FT25, FGL250	No 35B
	Ductile and malleable low & medium tensile	GGG40	FGS400	60-40-18
	Ductile and malleable high tensile	GGG60	FGS600	100-70-03
N Aluminum & non-ferrous	Aluminum alloys < 7% silicon	AlCuMg1, AlZn4.5Mg1	AU4G, AZ5G	2024, 7075
	Aluminum alloys 7% - 18% silicon	GD-ALSi12	AS13	A380, 383
	Non-ferrous	Precious metals, copper & brass alloys, plastics, magnesium alloys		
S High temp alloys	Iron base alloys	X15CrNiSi25 20, X5NiCrTi26 15	Z15CNS25 20, Z6NCTDV25 15	310, A286
	Nickel and cobalt base alloys	Inconel 625, 718, waspaloy, nimonic 90, monel alloys L-605		
	Titanium alloys	TiAl6V4, TiAl5SN2.5	TA6V, TA5E	6Al4V, 5Al2.5Sn
H Hardened materials	Heat treated steels	40-50 HRC		
	Heat treated tool & die steels	50-60 HRC		
	Chilled & ni-resist cast irons	40-60 HRC		

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Notes

Notes

DET NORSKE VERITAS

MANAGEMENT SYSTEM CERTIFICATE
CERTIFICAT SYSTEME DE MANAGEMENT DE LA QUALITE

Certificate No. 2007-SKM-AQ-2486

Ceci certifie que
This is to certify that

SAFETY

51 RUE DE LA GARENNE - 92310 SEVRES
USINES DE FONDETTES – 37230 FONDETTES
FRANCE

est en confomité avec la norme de Systemè de Management de la Qualité:
has been found to conform to the Management System Standard:

ISO 9001:2008

Le validité de ce certificate couvres:
This Certificate is valid for:

Conception, fabrication, commercialisation et vente d´outils coupants en carbure de tungstene. Prestations de service: assistance technique chez les clients et formation des utilisateurs aux produits.

Design, manufacturing, marketing and sales of Tungsten Carbide cutting tools. Technical service and support at customers and training of product users.

Le validité de ce certificat repose sur la validité du certificat 2007-SKM-AQ-2441, Sandvik Tooling
The validity of this certificate is based on the validity of certificate 2007-SKM-AQ-2441, Sandvik Tooling

Initial Certification date:
1992-09-01

This Certificate is valid until:
2013-01-31

The audit has been performed under the supervision of:
Doris Forsberg
Lead Auditor

SWEDAC ACKREDITERING
1053
ISO/IEC 17021

Place and date:
Stockholm, 2010-01-31

for the Accredited Unit:
DNV CERTIFICATION AB,
SWEDEN

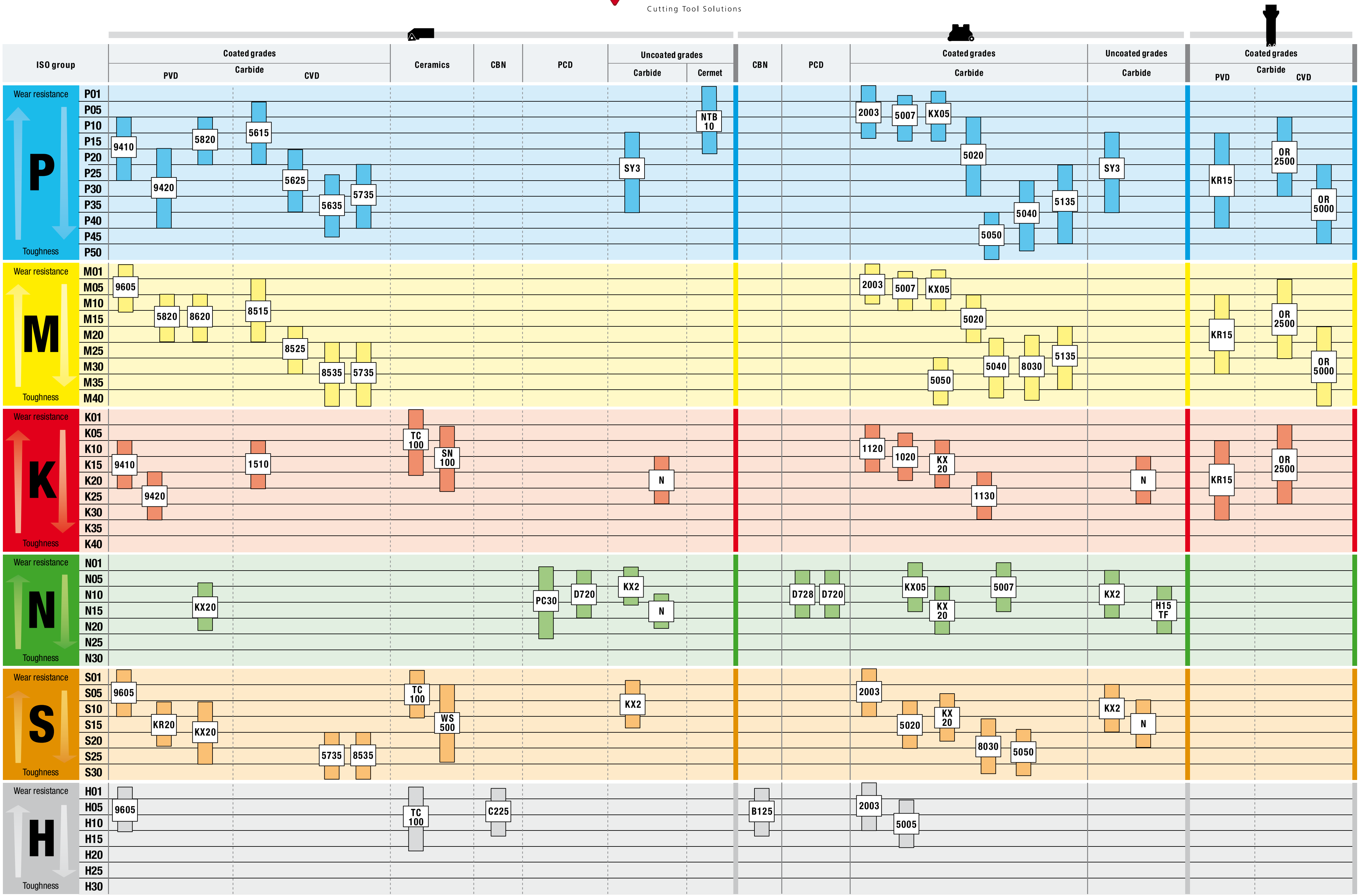
Ann-Louise Pått
Management Representative

Lack of fulfilment of conditions as set out in the Certification Agreement may render this Certificate invalid.

DET NORSKE VERITAS, BOX 6046, 171 06 SOLNA, SWEDEN. TEL: +46 8 587 940 00 FAX: +46 8 651 70 43

Safety

Cutting Tool Solutions



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