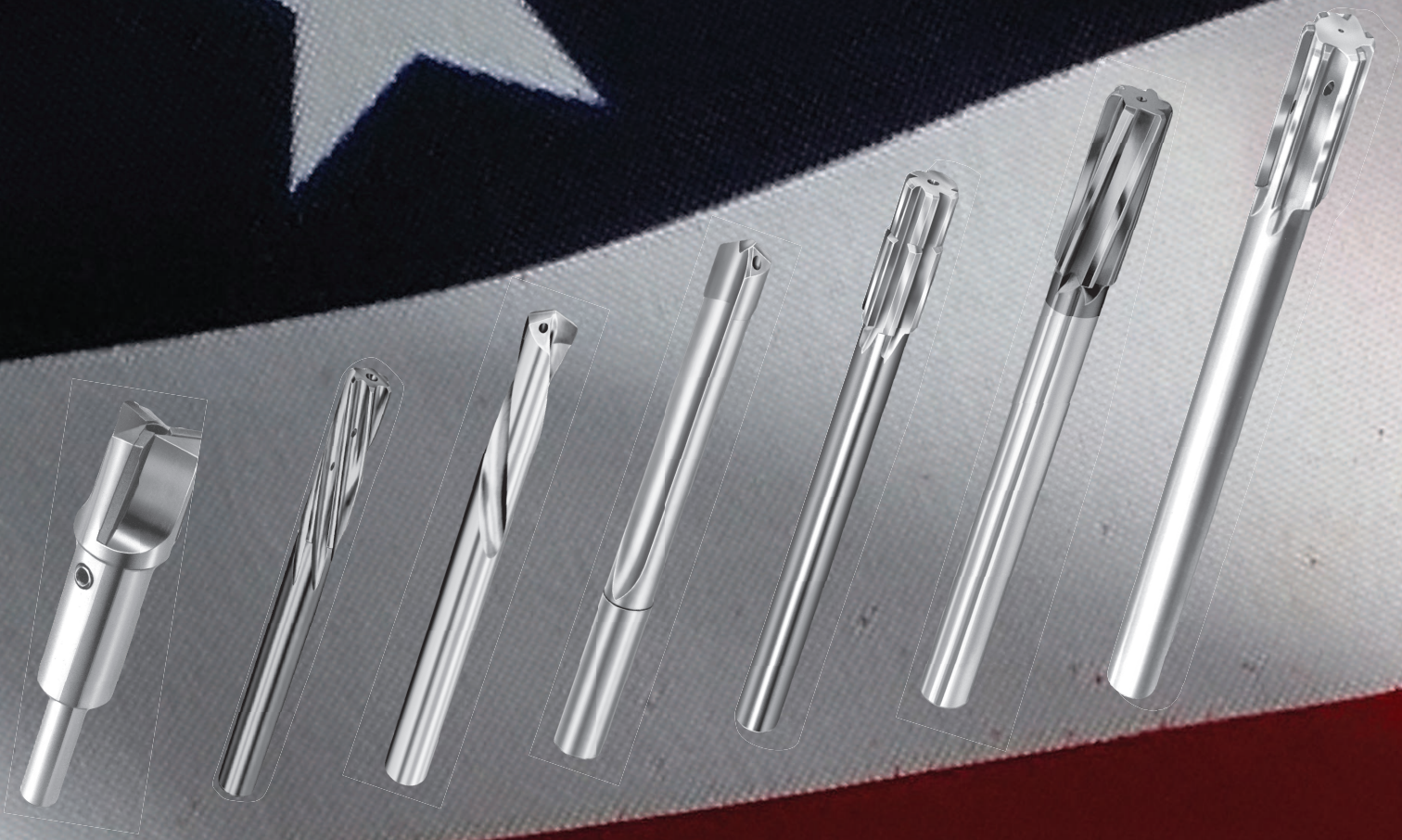
HANNIBAL

Carbide Tool, Inc

ISO 9001 Certified



CARBIDE TIPPED & SOLID CARBIDE CUTTING TOOLS

2018 Tool Selector Guide & Pricing

WHY HANNIBAL IS ACKNOWLEDGED WORLD CLASS...

THE HANNIBAL WORLD CLASS DIFFERENCE: END USER BENEFITS:

QUALITY — CONSISTENT QUALITY

- ISO 9001 certified since August 18, 1999
- Mature quality system – Ford Q101 certified in 1989 and many other major end users' certifications
- Continuous product & quality improvement
- Emphasis on defect prevention & variation reduction

- Tighter tolerances mean better products
- Longer tool life means less down time
- Lower tool cost per part machined

SERVICE — EXCEPTIONAL SERVICE

- Over 97% of line item orders filled – huge finished tool inventory
- Over 97% of orders shipped same date received – drop shipments
- Over 96% of special order tools shipped on promised date
- Special order tool quotes usually same day, always by next day

- Reduces end user's tool inventory cost
- Enables successful "Just in Time" programs
- Reduces tool procurement lead times
- Eliminates end user's production delays

VALUE — SUPERIOR VALUE

- Competitively priced
- Dramatically outperforms high speed steel tools
- Technically advanced tool geometries, carbide grades & titanium coatings outperform all competitors
- Material specific tools for more demanding applications
- Tool selection & application support available on the phone or in the field – just call us

- Dramatically reduces tool cost per operation
- Improves end user's competitive position
- Better performing tools

RESPONSIVENESS — MARKET DRIVEN RESPONSIVENESS

- End user demands generated our standard tool offering of over 20,000 stocked line items
- Solution focused technical & engineering staff
- Tool design creativity based on extensive field experience
- No minimum order size

- Multi-operation tools eliminate operations
- Comprehensive tooling solutions
- Ease of doing business
- Personalized service

LEADERSHIP — RESPONSIBLE LEADERSHIP

- Extensive & deep management commitment
- Long term planning emphasized
- Highest standards of integrity in all of our relationships – customers, suppliers, and employees
- 1999 Recipient of American Eagle Award – Employee Category

- Constantly improving tool supplier
- Availability of latest tool technology
- Understands end user's specific tooling requirements

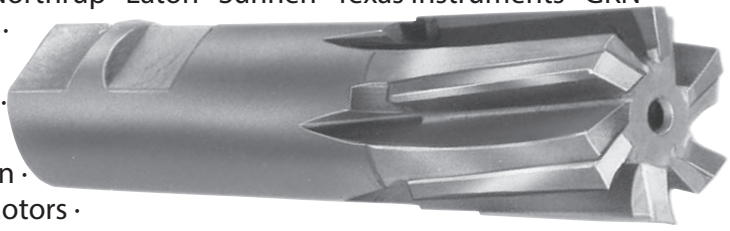
STABILITY — FOR TODAY & TOMORROW

- Strong, financially sound – no debt
- One family ownership with three generations of solid commitment to the cutting tool industry
- Stable, loyal employee team at all levels – tool makers, technical/ engineering, customer service, and management
- Extremely small employee turnover

- Dependable long term supplier partner
- Continuity of individual relationships

HANNIBAL'S WORLD CLASS END USERS

John Deere · Boeing · Sikorsky · Caterpillar · Cummins Engine · General Electric · Vought Aircraft · Navistar · Cloyes · Bell Helicopter · Kennedy Valve · Grumman · Northrup · Eaton · Sunnen · Texas Instruments · GKN · Detroit Diesel · Pratt & Whitney · Lockheed · Homelite · Ford · Mack · Sundstrand · Delco · Briggs & Stratton · Cooper · Colt · Mercury Marine · Delta · Borg Warner · Harrison Radiator · Gardners · NACCO · Otis Elevator · Golden's Foundry · APEX · Remington · Parker · Spartan · Stratoflight · Bosch · Dexter · Allied · Alcoa · General Motors · Sturm Ruger · General · Rockwell · Copeland · Harley Davidson · Cleveland Pneumatic · Saginaw Steering · Smith & Wesson · Hamilton Standard · Vermeer · Jacobs · AAR · IngersollChrysler · Alcoa · Dana · ACME ·



WORLD CLASS CONTENTS

MARKET REQUESTS – HANNIBAL RESPONDS

Requests for quicker delivery on larger diameter reamers.
HANNIBAL adds Expanded size ranges:
- h6 Shank Reamers now up to 1" diameter pages 31-32
- Extended Length Reamers now up to 1" diameter pages 35-40
- Material Specific Reamers up to 2-1/2" page 78
- Coolant Reamers up to 2" pages 90-93
- Solid Carbide Head Reamers now up to 1" diameter pages 110-111

Requests for Spiral Flutes in the h6 Shank Reamers offering.
HANNIBAL adds Right and Left Spiral Flute design:
- Right Spiral Flutes page 33
- Left Spiral Flutes page 34

Requests for a Twist Drill for Steel applications.
HANNIBAL adds a Cobalt Jobber Drill offering:
- Cobalt Jobber Drills page 138

Requests for Stagger Tooth Cutters.
HANNIBAL adds Stagger Tooth Side Milling Cutters:
- Stagger Tooth Side Milling Cutters page 162

Requests for Modified Cutters for Steel applications.
HANNIBAL adds Cutters for Steel applications that can be ground to specified width sizes with radii and/or chamfers:
- Modified Cutters for Steel pages 166-169

a personal note . . .

Hannibal Carbide Tool's continuous improvement journey to meet customer needs has led us to create new standard tool types and expanded size offerings based on repetitive full special requests. This value added approach reduces the cost to our customers and delivery times are reduced from weeks to days. When we don't have a standard tool that meets our customer's need, we modify our standard tools. This results in faster deliveries and competitive prices. Our Material Specific tooling has specific carbide grades and/or cutting tool geometry for the material being machined that extends tool life and improves finish. Our mission is to find the right cutting tool for the job whether standard, modified or full special! Our customer service specialists and application engineers will work with you to make this happen. The entire Hannibal Carbide Tool Team looks forward to your call and working with you to get you the best cutting tool for the application.

Paul Enander

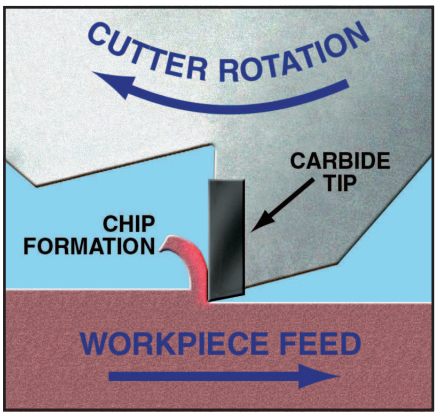
Paul Enander

HANNIBAL

ALL ABOUT CARBIDE TECHNICAL INFORMATION

THE CUTTING PROCESS

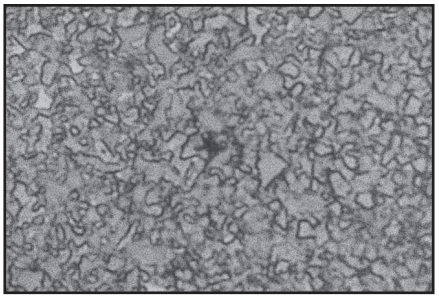
- Intense concentrated force at the cutting edge separates the metal's individual crystals
- Continuous flowing chip is separated from the workpiece
- Chip moves up cutting tool face until chip's internal stresses cause a chip fracture and chip breaks away as a segmented or discontinuous chip
- Large amount of heat is generated at cutting edge during chip separation and as chip flows along cutting tool face
- Individual carbide grains are so very hard that they do not flow or deform under the intense forces and very high temperatures



CHIP FORMATION

CARBIDE PRODUCTION

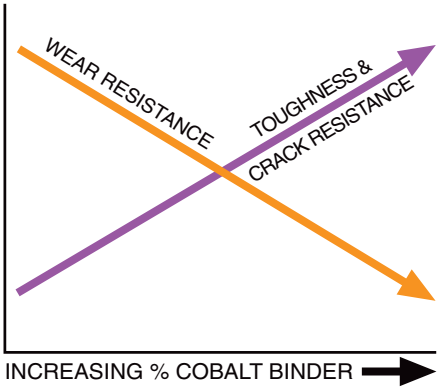
- Carbide powders are created by heating metal powders, usually tungsten, and carbon to a very high temperature – over 2800°F
- Resultant tungsten carbide powder grains are extremely hard and stable at elevated temperatures
- These carbide powders are sorted by grain size and recombined in appropriate ratios to achieve specified physical properties
- Cobalt metal powders are thoroughly mixed with the tungsten powders and forced under high pressure (30,000 psi) into multicavity molds of the desired shape and size
- Carbide rounds are made with an extrusion process
- Carbide blanks are low temperature pre-sintered to develop sufficient physical strength for handling
- Finally, the carbide blank is high temperature sintered at 2500°F to 2900°F; a dramatic shrinkage of almost 40% volume occurs as the carbide blank internally pulls together, resulting in an extremely dense & hard material

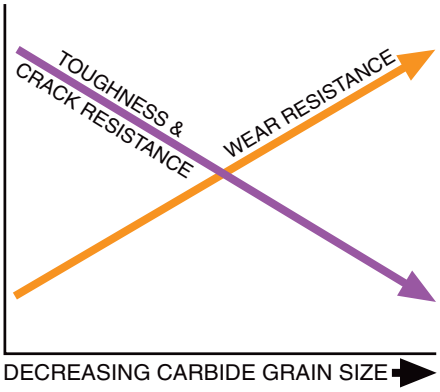

C-2 TUNGSTEN CARBIDE
HIGH MAGNIFICATION (1000X)

CARBIDE TECHNICAL

- Types of Carbide Powders
  - Tungsten Carbide (WC) — Primary carbide component
  - Titanium Carbide (TiC) — Added to increase resistance to abrasive wear or cratering of chip forming surface
  - Tantalum Carbide (TaC) — Added to increase resistance to cutting edge deformation at higher temperatures during heavy cuts
- Cobalt binder is a major factor in determining the carbide's hardness and toughness (see upper right graph)
- Toughness is the carbide's ability to withstand the mechanical shock or impact load experienced in the cutting process
- Carbide conducts heat away from cutting edge and chip formation surface two to three times faster than high speed steel
- Carbide surface is very hard and resists abrasive wear that results in early tool failure of high speed steel tools
- Micrograin carbides are used in positive-rake tool designs where a free cutting edge is needed but is relatively unsupported
- Tough shock resistant grades are softer and more prone to wear; harder wear resistant grades are less able to withstand shock loads in interrupted cuts (see lower right graph)

IMPORTANT NOTE: Some solid carbide tools now utilize a cobalt enriched cutting edge zone. HANNIBAL has utilized this same principle for many years — our hardened tough alloy steel bodies have always enabled us to select the carbide grade best suited for the cutting edge without the limitation of their lower structural strength.





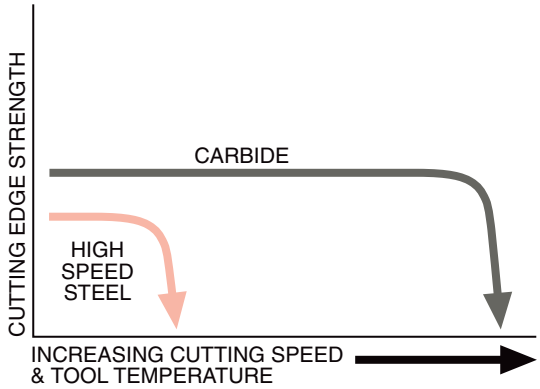
THE HANNIBAL CARBIDE TIPPED END USER ADVANTAGE

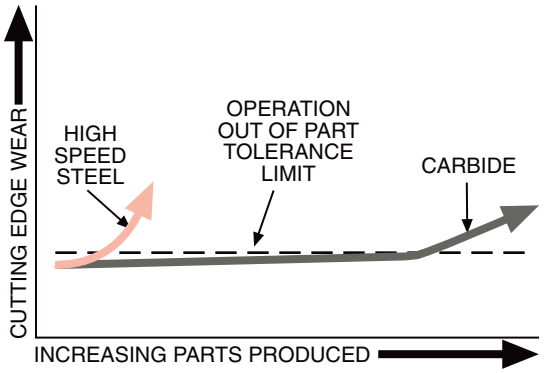
CARBIDE TIPPED VS. HIGH SPEED STEEL

ADVANTAGE #1
- Higher feeds & speeds
- Retains cutting edge at very high machining temperature (see upper right graph)
- More aggressive machining reduces cycle time

ADVANTAGE #2
- Exceptional wear resistance at cutting edge
- Holds size far longer (see lower right graph)

ADVANTAGE #3
- Far longer runs before resharpening
- Reduces machine downtime for tool changes
- Chip forming surface resists wear much better
- Cratering minimized





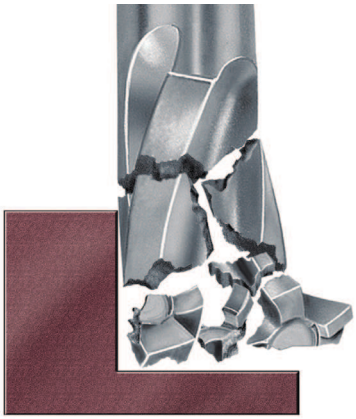
CARBIDE TIPPED VS. SOLID CARBIDE

ADVANTAGE #1
- Carbide grade selected for cutting characteristics – not compromised for structural strength
- More aggressive cutting edge geometries – shear, edge & rake angles
- Hardened tough alloy steel body provides superior structure to absorb shock loads

ADVANTAGE #2
- Carbide cracks stopped in steel body pocket rather than shattering the entire tool
- Reduced scrap & machine downtime as even a cracked carbide tipped tool keeps cutting
- A shattered solid carbide tool often damages the piece being machined

ADVANTAGE #3
- Tipped tools usually cost less than solid carbide
- Expensive carbide only used for cutting edge & chip forming surface
- Often utilize specialty carbides not available in solid round forms

CRACKED **SOLID CARBIDE** TOOL **SHATTERS**



CARBIDE TIPPED VS. CARBIDE INSERT

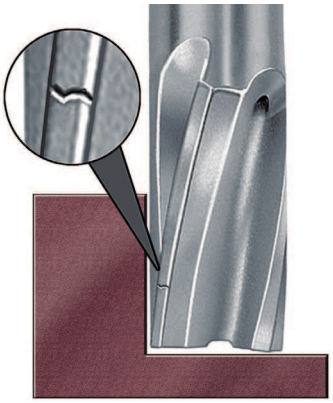
ADVANTAGE #1
- Initial tooling costs far lower for carbide tipped tools

ADVANTAGE #2
- Insert pocket interferes with chip flow
- Vibration-free brazed carbide tip permits higher feeds & speeds since inserts simply cannot be securely clamped to avoid all vibration problems
- Far better finish using carbide tipped tools

ADVANTAGE #3
- Inserts are impractical for many operations such as reaming and most drilling

CRACKED **CARBIDE TIPPED** TOOL **KEEPS CUTTING**

TOUGH ALLOY STEEL BODY STOPS CRACK



TOOL SELECTION USING CHIP CLASSIFICATIONS

1 FIND THE MATERIAL BEING MACHINED	2 CONFIRM CHIP FORM – BASED ON DRILL CHIP
ALUMINUM ALLOY - CAST ..... 308.0, 356.0, 360.0, 380.0, 390.0, 514.0 ALUMINUM ALLOY - WROUGHT ..... 3003, 4032, 5052, 6061, 7075 COPPER ALLOY - TOUGH ..... 110, 170, 172, 175, 280, 425, 610, 655 LEAD ALLOY ..... ALLOYS 7, 8, 13, 15, 1Sb-9Sb NON-METAL AND PLASTIC ..... Bakelite, Nylon, Polystyrene, PVC ZINC - DIE CAST ALLOY ..... AC41A, AG40A, AMS4803, ZDC NO. 7	***LONG STRINGY CHIPS*** (WROUGHT ALUMINUM, COPPER, AND PLASTIC) ***MEDIUM LENGTH CURLED CHIPS*** (ALL OTHER MATERIALS) • CHIP EVACUATION IS KEY WHEN DRILLING OR REAMING THESE MATERIALS
ALUMINUM BRONZE ..... 614, 952-958 BRASS - LEADED AND FREE CUTTING ..... 340, 342, 353, 360, 370, 485 BRASS - YELLOW, RED, NAVAL ..... 268, 270,464-467 COMMERCIAL BRONZE (LEADED) ..... 314 MAGNESIUM ALLOY ..... AM60A, AZ21A, AZ91B-C, K1A NICKEL SILVER 745-770, 973-978	***SHORT CHIPS*** • THESE MATERIALS CREATE NO MAJOR DRILLING OR REAMING PROBLEMS
DUCTILE CAST IRON - AUSTENITIC ..... D-2, D-2B, D-2C, D-2M, D-3, D-3A, D-4, D-5 FERRITIC ..... 60-40-18, 65-45-12, D4018, D4512 FERRITIC-PEARLITIC ..... 80-55-06, D5506 PEARLITIC-MARTENSITIC ..... 100-70-03, D7003 MARTENSITIC ..... 120-90-02, DQ&T GRAY CAST IRON ..... 20, 25, 30, 35, 40, 45, 50, 55 MALLEABLE CAST IRON - FERRITIC OR PEARLITIC 32510, 35018, 45008, M3210, M4504	***DISCONTINUOUS CURLED CHIPS*** • THESE MATERIALS ARE VERY ABRASIVE WHICH CAN CAUSE RAPID WEAR OF THE TOOL MARGINS AND CUTTING EDGES
LOW AND MEDIUM CARBON STEEL - WROUGHT ..... 1005-1029, 1030-1050 LOW CARBON STEEL - CAST ..... 1010, 1020 MEDIUM CARBON STEEL - CAST 1030, 1040, 1050	***LONG CONTINUOUS CHIPS*** • HEAT TREATMENT MAY IMPROVE THE MACHINABILITY OF SOME OF THESE MATERIALS • CARBIDE TIPPED DRILLS ARE NOT GENERALLY RECOMMENDED FOR PLAIN CARBON STEEL
LOW AND MEDIUM CARBON ALLOY STEEL ..... 4320, 4340, 4620, 5015, 8620, 9310 LOW AND MEDIUM CARBON ALLOY STEEL - FREE MACH ..... 4140, 4142Se, 4145Te, 4150, 86L20 MEDIUM AND HIGH CARBON ALLOY STEEL - LEADED ..... 41L30, 41L40, 41L50 STAINLESS STEEL - 300 SERIES (FREE MACH.) ..... 303, 303MA, 303Pb, 303 PLUS X, 303Se STAINLESS STEEL - 400 SERIES ..... 409, 410, 420, 430, 436 STAINLESS STEEL - 400 SERIES (FREE MACH.) 416, 416Se, 420F, 430F, 440F	***THICK CURLED CHIPS*** • HEAT TREATMENT MAY IMPROVE THE MACHINABILITY OF SOME OF THESE MATERIALS • COOLANT FED DRILLS ARE GENERALLY RECOMMENDED FOR THESE MATERIALS
ARMOR PLATE ..... HY-80, HY-100, HY-180, MIL-S-12560 HIGH CARBON ALLOY STEEL ..... 50100, 51100, 52100 HIGH STRENGTH STEEL - WROUGHT ..... 300M, 4330V, 98BV40, HP 9-4-20 MARAGING STEEL ..... GRADES 200, 250, 300, 350, HY 230 NITRIDING STEEL ..... Nitralloy 125, 135, 135 Mod., 230 TOOL STEEL ..... SERIES A2, D2, H13, M50, P20, S7, W1	***SHORT WIRY CURLED CHIPS*** • CHIP DISCOLORATION IS COMMON WITH THESE MATERIALS • THESE STEELS ARE DIFFICULT TO MACHINE DUE TO THE HIGH CARBON AND ALLOY CONTENT • COOLANT FED DRILLS ARE GENERALLY RECOMMENDED FOR THESE MATERIALS
IRON BASE ALLOY ..... A-286, Discaloy, Incoloy 800-802 NICKEL BASE ALLOY ..... Hastelloy C, Inconel 600, 625, 718, 825 STAINLESS STEEL - 300 SERIES ..... 302, 304, 309, 314, 316, 330, 347, 385 STAINLESS STEEL - PH SERIES ..... 15-5PH, 16-6PH, 17-4PH, AM-350 TITANIUM ALLOY Ti-6Al-4V, Ti-10v-2Fe-3Al, 98.9, 99.5	***LONG WIRY CHIPS*** • CHIP DISCOLORATION IS COMMON WITH THESE MATERIALS • THIS GROUP MAY WORK HARDEN IF NOT MACHINED WITH CORRECT FEED RATES

3 LOCATE CHIP CLASS

NON-FERROUS LONG CHIPS

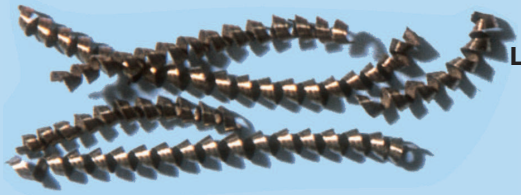
CHIP CLASS **20**

NON-FERROUS SHORT CHIPS

CHIP CLASS **40**

CAST IRONS

CHIP CLASS **60**

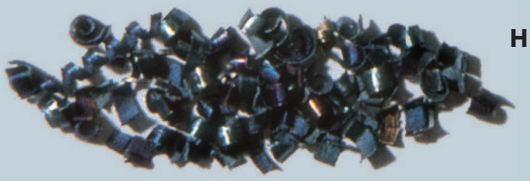


LOW STRENGTH STEELS

CHIP CLASS **80**

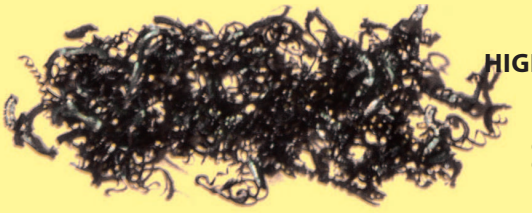
MEDIUM STRENGTH STEELS

CHIP CLASS **100**



HIGH STRENGTH STEELS

CHIP CLASS **120**



HIGH TEMPERATURE ALLOYS

CHIP CLASS **140**

4 SELECT FROM RECOMMENDATIONS IN TOOL SELECTOR BOX

TOOL SELECTOR

CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
20	NON-FERROUS - LONG CHIPS	
40	NON-FERROUS - SHORT CHIPS	
60	CAST IRONS	
80	LOW STRENGTH STEELS	
100	MEDIUM STRENGTH STEELS	
120	HIGH STRENGTH STEELS	
140	HIGH TEMPERATURE ALLOYS	

HANNIBAL'S RECOMMENDED TOOL TYPE(S) APPEAR IN TOOL SELECTOR BOX FOR EACH CATALOG ITEM

"/" = PREFERRED TYPE NOTED FIRST (e.g., "459/458")
"or" = NO PREFERENCE (e.g., "620 or 622")

WORLD CLASS HCT MADE IN USA

MILLING STAINLESS STEELS CHIP CLASSIFICATIONS

MATERIAL MACHINED	CHIP CLASS
FREE MACHINING 300 SERIES	60
FERRITIC 400 SERIES MARTENSITIC 400 SERIES	100
AUSTENITIC 200 OR 300 SERIES PH SERIES	140

HANNIBAL'S CHIP CLASSIFICATIONS ARE BASED ON EACH MATERIAL'S MOST COMMON CONDITION. SPECIAL HEAT TREATMENTS OR PROCESSING MAY CHANGE THE MATERIAL'S MACHINING CHARACTERISTICS. THIS HANNIBAL GUIDE IS A SUGGESTED STARTING POINT FOR TOOL SELECTION.

FEEDS & SPEEDS — DRILLING OR REAMING
GENERAL PURPOSE OR COOLANT FED

CHIP CLASS	MATERIAL BEING MACHINED	MATERIAL EXAMPLES	BRINELL HARDNESS	CHIP DESCRIPTION
20	**ALUMINUM ALLOY** CAST AND WROUGHT	308.0, 356.0, 360.0, 380.0, 383.0, 390.0, 2024, 3003, 4032, 5052, 6061, 7075	30-150 (500 kg)	DISCONTINUOUS FLAKY OR LONG STRINGY
	COPPER ALLOY TOUGH	101, 110, 115, 120, 130, 142, 155, 170, 172, 175, 195, 425, 610, 630, 655, 725, 805, 826, 910	40-200 (500 kg)	LONG CONTINUOUS
	LEAD ALLOY	Alloys 7, 8, 13, 15 1Sb, 4Sb, 6Sb, 8Sb, 9Sb	10-20 (500 kg)	DISCONTINUOUS TIGHTLY CURLED
	PLASTIC	ABS, Acrylic, Allyl, Bakelite, Epoxy, Furan, Nylon, Polyethylene, Polystyrene, PVC	–	CONTINUOUS
	ZINC ALLOY	AC41A, AG40A, AMS4803, ILZRO 12, ZDC NO. 7, GRADES 903, 925	80-100	LONG TIGHTLY CURLED
40	**ALUMINUM BRONZE**	614, 952-958	40-175	SHORT LOOSELY CURLED
	COPPER ALLOY/BRASS/BRONZE FREE MACHINING	268, 270, 314, 332, 335, 340, 342, 353, 356, 360, 370, 464-467, 485, 838, 945	10-100 Rb	FLAT SMALL
	MAGNESIUM ALLOY	AM60A, AZ21A, AZ91B-C, HM31A, K1A, ZE41A, ZK40A	50-90 (500 kg)	FLAT SMALL
	NICKEL SILVER	745, 752, 754, 757, 700, 973-978	10-100 Rb	LOOSELY CURLED
60	**CAST IRON-DUCTILE** AUSTENITIC (NI-RESIST)	TYPES D-2, D-2B, D-2C, D-2M, D-3, D-3A, D-4, D-5, D-5B	120-275	DISCONTINUOUS TIGHTLY CURLED
	CAST IRON-DUCTILE FERRITIC & FERRITIC-PEARLITIC	GRADES 60-40-18, 65-45-12, 80-55-06, D4018, D4512, D5506	140-270	DISCONTINUOUS TIGHTLY CURLED
	CAST IRON-DUCTILE MARTENSITIC & PEARLITIC-MARTENSITIC	GRADES 100-70-03, 120-90-02, D7003, DQ&T	270-400	DISCONTINUOUS TIGHTLY CURLED
	CAST IRON-GRAY FERRITIC & FERRITIC-PEARLITIC	CLASSES 20, 25, 30, 35, 40 GRADES G1800, G2500, G3000	120-220	DISCONTINUOUS
	CAST IRON-GRAY PEARLITIC	CLASSES 45, 50, 55, 60 GRADES G3500, G4000	220-320	DISCONTINUOUS
	CAST IRON-MALLEABLE FERRITIC & PEARLITIC	CLASSES 32510, 35018, 40010, 45008 GRADES M3210, M4504, M5003	110-240	DISCONTINUOUS
	CAST IRON-MALLEABLE TEMPERED MARTENSITE	GRADES 60004, 70003, 80002 GRADES M5003, M8501	200-320	DISCONTINUOUS
80	**STEEL-LOW & MEDIUM STRENGTH** FREE MACHINING	1108-1119, 1132-1151, 10L17, 10L18, 10L50, 11L44, 12L13, 12L14, 12L15	100-250	DISCONTINUOUS LOOSELY CURLED
	STEEL-LOW & MEDIUM STRENGTH WROUGHT	1005-1029, 1030-1050, 1513, 1518, 1524, 1552	100-375	CONTINUOUS STRINGY
100	**ALLOY STEEL-LOW & MEDIUM STRENGTH** FREE MACHINING	41L30, 41L40. 41L50, 86L20, 4142Se, 4145Te	100-275	DISCONTINUOUS TIGHTLY CURLED
	ALLOY STEEL-LOW & MEDIUM STRENGTH	1330, 1345, 1515, 4012, 4130, 4140, 4150, 4320, 4340, 4620, 5130, 8620, 8630, 8645, 9310	85-375	LOOSELY CURLED
	STAINLESS STEEL 400 SERIES	409, 410, 414, 420, 430, 436, 442, 446	135-325	DISCONTINUOUS TIGHTLY CURLED
	STAINLESS STEEL FREE MACHINING	203 EZ, 303, 303MA, 303Pb, 303 PLUS X, 303Se, 416, 416Se, 420F, 430F, 440F	135-275	SHORT TIGHTLY CURLED
120	**ALLOY STEEL-HIGH STRENGTH, MARAGING STEEL, NITRIDING STEEL, TOOL STEEL**	50100, 51100, 52100, GRADES 200-350, Nitralloy, SERIES A2, D2, H13, M50, P20, S7, WI	175-400	CONTINUOUS WIRY
140	**HIGH TEMP ALLOY** NICKEL & IRON	A-286; Hastelloy C; Inconel 600, 625, 718, 825; Monel 400; Nimonic 75, 80; Rene 41; Waspaloy	140-300	CONTINUOUS WIRY
	STAINLESS STEEL 300 SERIES	301, 302, 304, 309, 314, 316, 321, 330, 347, 385, Nitronic 32, 33, 40, 50, 60	135-375	WIRY LOOSELY CURLED
	STAINLESS STEEL PH SERIES	13-8 Mo, 15-5PH, 16-6PH, 17-4PH, 17-7PH, AM-350, AM-355	150-440	WIRY LOOSELY CURLED
	TITANIUM ALLOY	98.9, 99.0, 99.2, 99.5, Ti-6Al-4V, Ti-6Al-6V2Sn, Ti-8Mn, Ti-10v-2Fe-3Al	110-380	CONTINUOUS WIRY

TOOL. APPLIC.	CUTTING SPEED (SFM) STARTING RANGE*		FEED RATE (INCHES PER REVOLUTION) HOLE DIAMETER IN INCHES																			
			⅛		¼		⅜		½		⅝		¾		1		1¼		1½	
	GENERAL PURPOSE	COOLANT FED	GEN. PUR-POSE	COOL-ANT FED	GEN. PUR-POSE	COOL-ANT FED	GEN. PUR-POSE	COOL-ANT FED	GEN. PUR-POSE	COOL-ANT FED	GEN. PUR-POSE	COOL-ANT FED	GEN. PUR-POSE	COOL-ANT FED	GEN. PUR-POSE	COOL-ANT FED	GEN. PUR-POSE	COOL-ANT FED	GEN. PUR-POSE	COOL-ANT FED
DRILL	250-350	375-550	.003	–	.005	.004	.007	.005	.008	.006	.010	.006	.011	.007	.014	.009	.017	–	.019	–
REAM	150-250	200-300	.004	–	.006	.008	.008	.010	.011	.013	.012	.015	.013	.017	.016	.021	.019	.022	.020	.024
DRILL	125-190	225-300	.002	–	.005	.004	.007	.005	.008	.006	.009	.007	.010	.008	.012	.010	.014	–	.016	–
REAM	50-90	70-105	.005	–	.006	.008	.008	.010	.010	.013	.011	.014	.012	.016	.014	.018	.016	.019	.017	.020
DRILL	350-450	400-500	.003	–	.005	.004	.006	.006	.007	.007	.008	.008	.009	.009	.013	.013	.015	–	.017	–
REAM	150-250	200-300	.002	–	.006	.008	.008	.010	.012	016	.014	.017	.015	.018	.018	.022	.021	.024	.022	.026
DRILL	175-450	–	.002	–	.004	–	.005	–	.005	–	.006	–	.008	–	.009	–	.010	–	.012	–
REAM	90-250	125-300	.004	–	.005	.006	.007	.008	.008	.009	.009	.010	.012	.014	.014	.016	.016	.018	.018	.020
DRILL	300-400	400-500	.003	–	.005	.004	.007	.005	.009	.006	.011	.008	.012	.009	.014	.010	.016	–	.018	–
REAM	140-210	170-240	.005	–	.007	.009	.008	.011	.010	.013	.011	.014	.012	.016	.015	.020	.018	.022	.020	.025
DRILL	125-190	200-300	.002	–	.005	.004	.007	.005	.008	.006	.009	.007	.010	.008	.012	.010	.014	–	.016	–
REAM	50-90	70-105	.004	–	.006	.008	.010	.013	.012	.015	.014	.016	.016	.018	.018	.021	.020	.024	.022	.028
DRILL	225-400	300-450	.003	–	.005	.004	.007	.005	.008	.006	.009	.007	.010	.008	.012	.010	.014	–	.016	–
REAM	100-250	125-300	.005	–	.008	.010	.011	.014	.015	.020	.017	.022	.018	.024	.020	.026	.022	.028	.025	.032
DRILL	300-400	450-550	.003	–	.005	.005	.006	.006	.007	.007	.008	.008	.009	.009	.013	.013	.015	–	.016	–
REAM	130-190	150-250	.005	–	.010	.012	.012	.015	.015	.018	.016	.019	.017	.020	.020	.024	.022	.026	.025	.028
DRILL	125-190	225-300	.002	–	.005	.004	.007	.005	.008	.006	.009	.007	.010	.008	.012	.010	.014	–	.016	–
REAM	50-90	70-190	.004	–	.006	.007	.008	.010	.010	.012	.011	.013	.012	.014	.014	.017	.015	.018	.016	.018
DRILL	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
REAM	45-70	65-100	.004	–	.006	.008	.007	.009	.008	.011	.010	.014	.013	.016	.015	.018	.018	.020	.020	.025
DRILL	150-225	200-250	.002	–	.004	.004	.006	.005	.008	.006	.010	.007	.012	.008	.014	.010	.016	–	.018	–
REAM	50-90	70-105	.004	–	.005	.007	.008	.010	.010	.012	.012	.015	.014	.017	.017	.022	.020	.024	.023	.027
DRILL	–	200-250	–	–	–	.004	–	.005	–	.006	–	.007	–	.008	–	.010	–	–	–	–
REAM	35-60	50-85	.004	–	.006	.008	.007	.009	.008	.010	.009	.011	.010	.013	.012	.014	.014	.017	.016	.019
DRILL	175-300	250-400	.002	–	.005	.004	.007	.006	.009	.008	.011	.010	.014	.012	.017	.015	.018	–	.019	–
REAM	65-135	95-190	.005	–	.008	.010	.010	.013	.011	.014	.013	.017	.016	.020	.020	.024	.022	.028	.025	.030
DRILL	130-225	225-325	.002	–	.004	.004	.006	.006	.007	.008	.009	.010	.010	.012	.013	.015	.016	–	.018	–
REAM	45-70	55-100	.004	–	.006	.008	.008	.010	.009	.012	.010	.014	.012	.015	.014	.018	.018	.020	.020	.026
DRILL	125-190	200-250	.002	–	.005	.004	.008	.006	.009	.008	.010	.008	.011	.008	.012	.010	.014	–	.016	–
REAM	60-120	70-105	.004	–	.006	.007	.010	.012	.011	.014	.012	.014	.013	.014	.014	.017	.016	.020	.018	.022
DRILL	100-150	200-250	.002	–	.004	.004	.006	.005	.007	.006	.008	.007	.010	.008	.012	.010	.014	–	.016	–
REAM	45-70	65-100	.004	–	.006	.008	.008	.010	.010	.012	.012	.014	.013	.015	.015	.020	.018	.023	.025	.030
DRILL	125-175	150-250	.003	–	.004	.005	.008	.006	.010	.008	.012	.009	.014	.010	.017	.012	.018	–	.019	–
REAM	70-100	100-150	.005	–	.008	.012	.010	.014	.012	.016	.014	.018	.015	.020	.020	.025	.025	.030	.030	.035
DRILL	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
REAM	30-85	40-110	.004	–	.008	.009	.009	.011	.011	.013	.013	.015	.015	.017	.018	.022	.020	.024	.022	.026
DRILL	–	100-220	–	–	–	.005	–	.006	–	.007	–	.008	–	.010	–	.012	–	–	–	–
REAM	65-100	90-135	.005	–	.008	.010	.010	.012	.015	.018	.017	.020	.018	.022	.022	.025	.025	.027	.027	.030
DRILL	–	100-150	–	–	–	.005	–	.006	–	.007	–	.008	–	.010	–	.012	–	–	–	–
REAM	40-85	65-100	.005	–	.010	.012	.012	.015	.015	.018	.018	.022	.020	.024	.025	.028	.027	.030	.030	.033
DRILL	–	110-150	–	–	–	.004	–	.005	–	.006	–	.007	–	.008	–	.010	–	–	–	–
REAM	40-90	50-100	.003	–	.005	.007	.006	.007	.007	.008	.008	.009	.008	.009	.010	.012	.011	.014	.012	.015
DRILL	100-150	125-190	.002	–	.004	.004	.005	.005	.006	.006	.007	.007	.008	.007	.010	.008	.012	–	.014	–
REAM	65-100	90-135	.004	–	.006	.008	.007	.009	.008	.010	.009	.011	.009	.012	.010	.013	.011	.013	.012	.014
DRILL	–	100-150	–	–	–	.004	–	.006	–	.007	–	.008	–	.010	–	.012	–	–	–	–
REAM	35-70	50-100	.004	–	.006	.007	.007	.008	.008	.009	.009	.011	.010	.012	.011	.014	.012	.015	.013	.016
DRILL	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
REAM	15-85	20-115	.003	–	.005	.006	.005	.007	.005	.007	.006	.008	.007	.008	.008	.010	.010	.012	.012	.015
DRILL	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
REAM	40-75	60-90	.003	–	.004	.006	.005	.007	.006	.008	.006	.008	.007	.009	.008	.010	.009	.011	.010	.012
DRILL	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
REAM	35-70	50-90	.003	–	.004	.006	.004	.006	.005	.007	.006	.008	.007	.009	.008	.010	.009	.012	.010	.014
DRILL	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
REAM	30-45	40-60	.004	–	.006	.008	.008	.010	.010	.013	.011	.014	.011	.014	.012	.016	.013	.016	.014	.018

*Use low end of speed range for high end of hardness range.

ENGINEERED COATINGS FOR CARBIDE TIPPED TOOLS

GENERAL PURPOSE | MATERIAL SPECIFIC | COOLANT FED

BENEFITS OF USING COATED TOOLS

- HIGHER FEEDS AND SPEEDS
- INCREASED TOOL LIFE
- TOLERANCES HELD LONGER
- IMPROVED WORKPIECE FINISHES

COATING SELECTOR GUIDE

CHIP CLASS	MATERIAL MACHINED	DRILLING	REAMING	COUNTERBORING		MILLING	
		WET	WET	WET	DRY	WET	DRY
20	NON-FERRROUS LONG CHIPS	ZrN	TiCN/ZrN	ZrN	ZrN	ZrN	ZrN
40	NON-FERROUS SHORT CHIPS	ZrN	TiCN/ZrN	ZrN	ZrN	ZrN	ZrN
60	CAST IRONS	AlTiN	TiCN/AlTiN	AlTiN	AlTiN	AlTiN	AlTiN
80	LOW STRENGTH STEELS	AlTiN	AlTiN	AlTiN	AlTiN	AlTiN	AlTiN
100	MEDIUM STRENGTH STEELS	AlTiN	AlTiN	AlTiN	AlTiN	AlTiN	AlTiN
120	HIGH STRENGTH STEELS	AlTiN	AlTiN	AlTiN	AlTiN	AlTiN	AlTiN
140	HIGH TEMPERATURE ALLOYS	AlTiN	AlTiN	AlTiN	*	AlTiN	*

* Chip class 140 materials should not be machined dry

IMPORTANT STEPS IN TOOL COATING SELECTION

1. Use the HANNIBAL Tool Coating Selector Guide to select the *recommended coating* for the machining operation being performed on your specific material.
2. Review the selected coating's detailed description on page 11 to confirm that it meets your specific conditions & requirements.
3. Without a trial production run, you cannot be certain that a specific coating will be the very best for your particular application.
   - Do not order a large quantity of coated standard tools but rather order several with different coatings & review the trial production run results. Then order the full quantity with the most effective coating.
   - When ordering coated special tools, request several tools with different coatings & review the trial production run results before selecting the most effective coating for the balance of the special tool order.
4. The many variables involved in selecting the very best coating for your specific application can only be resolved by trial production run & analysis. Improved coated tool performance will offset your initial time & effort.

PRE-CONDITIONS FOR SUCCESSFUL USE OF COATED TOOLS

- Good operator/manufacturing engineering skills to maximize coating benefits.
- Adequate horsepower and rigidity for maximum feeds and speeds.
- Resharpening policy to only resharpen a tool's cutting edges, thereby preserving the flute face coating.

RESHARPENING METHODS FOR PRESERVING THE FLUTE FACE COATING

- Drills: Grind lips only
- Reamers: Grind relief on chamfers only
- Counterbores: Grind relief on cutting edges only
- End Mills: Grind relief on OD and/or end teeth only
- Milling Cutters: Grind relief on OD and/or side teeth only

SPECIFIC QUALIFIED COATING COMPANIES

PVD Coating Service companies have significant equipment & processing differences that can dramatically influence the coating's effectiveness for different types of tools. HANNIBAL has selected several technically focused coating companies that collectively can meet our customers' exacting needs for all coatings & tool types.

WHY COATED TOOLS IMPROVE PRODUCTIVITY

1. Thermal Insulation – Heat at the cutting edge is a primary reason why tools break down. Coatings bond a thermally insulating barrier to the tool to reject heat from the tool surface back into the chip, thus protecting the tool substrate and making it last longer. Some coatings, such as TiAlN and AlTiN under certain conditions, actually produce a hard layer of aluminum oxide (an excellent insulator) during the cut.

2. Mechanical Strength – Abrasion from the chip flow combined with microscopic roughness of the tool surface tends to wear the substrate and dull the cutting edge during normal operations. The high hardness, lower friction coefficient, and reduced surface roughness of coatings allow the chip to flow off the surface of the tool. This reduces built up edge and wear so tool life is increased.

3. Chemical Resistance – Heat, pressure, coolant, and workpiece material all add to the chemically reactive forces present at the cutting edge. When reactive elements are brought together under these conditions, the uncoated tool will degrade. Coatings protect the tool substrate from exposure to these reactive forces thus stabilizing the cutting edge even under the harshest conditions.

COATING COMPARISONS

	TiN	TiCN	ZrN	AlTiN
Hardness (Vickers)	2200	3000	2500	3600
Relative Toughness (1=Toughest)	3	2	2	4
Max Service Temperature	525°C (975°F)	400°C (750°F)	600°C (1110°F)	750°C (1380°F)
Friction Coefficient	.50	.40	.50	.60
Thickness	2-4 microns	2-4 microns	2-4 microns	2-4 microns
Surface Roughness (R_aµm)	.20	.17	.20	.30

PVD COATINGS
TiN – TiCN – ZrN – AlTiN
FOR IMPROVED PERFORMANCE OF WET MACHINING

PHYSICAL VAPOR DEPOSITION (PVD)

HANNIBAL utilizes the Physical Vapor Deposition (PVD) process exclusively. PVD has a much lower process temperature than Chemical Vapor Deposition (CVD), thus preserving the strength and hardness of the alloy steel body and allowing for more aggressive machining without tool failure. The fine finish of PVD also results in a smoother, sharper cutting edge which stabilizes the cutting process, reduces edge build up, and improves surface finish on the workpiece.

TiN

Titanium Nitride coating with its familiar gold color remains a popular general purpose coating. The excellent wear resistance, thermal stability, and low coefficient of friction reduces built up edge, improving thermal transfer of heat away from the tool.

- Hardness (Vickers): 2200
- Max Service Temp: 525°C (975°F)
- Friction Coefficient: .50
- Thickness: 2-4 microns
- Surface Roughness ($R_a$um): .20

Applications: A good general purpose coating for drilling, reaming, counterboring and milling of Chip Class 20 thru 140 materials. Drilling and reaming should be restricted to shallow holes (<2.5x tool diameter) and to applications where coolant reaction must be minimized.

TiCN

Titanium Carbonitride, blue grey in color, has a hard, smooth finish which offers improved wear and built up edge resistance. Performs well on applications where low to moderate temperatures are generated at the cutting edge.

- Hardness (Vickers): 3000
- Max Service Temp: 400°C (750°F)
- Friction Coefficient: .40
- Thickness: 2-4 microns
- Surface Roughness ($R_a$um): .17

Applications: Excellent for machining materials which generate low cutting edge temperatures. Because of the relatively low service temperature of TiCN, coolant must be applied correctly to control the temperature at the cutting edge. Failure to do so can lead to premature wear of the coated surface.

ZrN

Zirconium Nitride, light gold in color, is excellent when machining non-ferrous and plastic materials. Offers a higher service temperature than TiCN.

- Hardness (Vickers): 2500
- Max Service Temp: 600°C (1110°F)
- Friction Coefficient: .50
- Thickness: 2-4 microns
- Surface Roughness ($R_a$um): .20

Applications: Very reliable coating when moderate temperatures are generated at the cutting edge. Generally most effective in Chip Class 20 thru 40 materials.

AlTiN

Aluminum Titanium Nitride, black in color, is excellent in abrasive and high temperature applications (>800°C). AlTiN creates a hard aluminum oxide layer during the cutting process. It is now the choice coating for Chip Classes 60 thru 140, in all applications.

- Hardness (Vickers): 3600
- Max Service Temp: 750°C (1380°F)
- Friction Coefficient: .60
- Thickness: 2-4 microns
- Surface Roughness ($R_a$um): .30

Applications: Preferred coating for tough and abrasive materials. Recommended for use when milling, drilling, reaming or counterboring titanium alloys, high temperature alloys, and other abrasive and difficult to machine materials.

MODIFICATIONS OF STANDARD TOOLS
DRILLS - END MILLS - C'BORES - REAMERS - CUTTERS

LOW COST & PROMPT DELIVERY

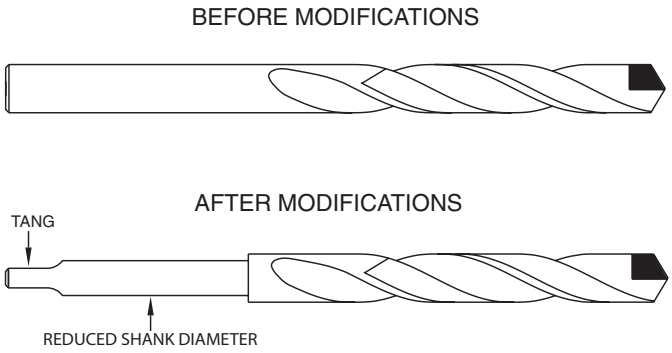
Over 20% of standard tools ordered specify one or more modifications

WHY MODIFY A STANDARD TOOL?

- Modification of cutting form often eliminates subsequent machining operations
- Modifications often improve cutting geometries for machining extra tough or abrasive materials
- Shank modifications often improve tool holding or driving
- Very short lead times – usually within one week, sometimes same day
- Very economical for small quantities – often used to try new application ideas before committing to a large quantity, special tool order with longer delivery

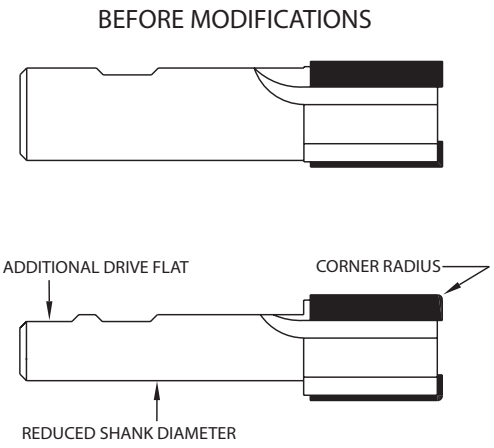
DRILLS

- Modified tool diameter
- Non-stocked metric tool diameter
- Modified point and/or angle
- Shortened shank
- Reduced shank diameter
- Flat(s) on shank
- Extra long shank
- Tanged shank
- Shank whistle notch for set screw
- Coatings available:
  - TITANIUM NITRIDE – TiN
  - TITANIUM CARBONITRIDE – TiCN
  - ZIRCONIUM NITRIDE – ZrN
  - AL TITANIUM NITRIDE – AlTiN
- For core drills, see reamers' modification list



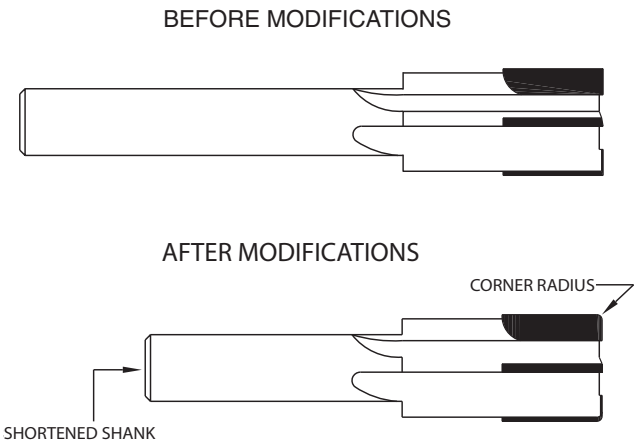
END MILLS

- Modified tool diameter
- Metric tool diameter
- Cutting diameter reduced for step or pilot
- Corner chamfer or corner radius
- Shortened shank
- Reduced shank diameter
- Additional shank drive flat(s)
- Coolant outlets
- Coatings available:
  - TITANIUM NITRIDE – TiN
  - TITANIUM CARBONITRIDE – TiCN
  - ZIRCONIUM NITRIDE – ZrN
  - AL TITANIUM NITRIDE – AlTiN



COUNTERBORES

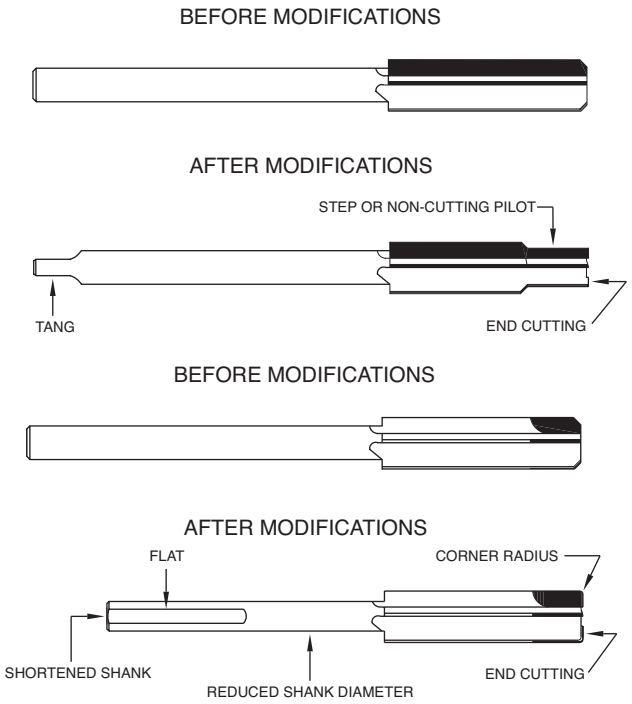
- Modified tool diameter
- Non-stocked metric tool diameter
- Cutting diameter reduced for step
- Corner chamfer or corner radius
- Shortened shank
- Reduced shank diameter
- Flat(s) on shank
- Tanged shank
- Shank whistle notch for set screw
- Smaller taper shank
- Coatings available:
  - TITANIUM NITRIDE – TiN
  - TITANIUM CARBONITRIDE – TiCN
  - ZIRCONIUM NITRIDE – ZrN
  - AL TITANIUM NITRIDE – AlTiN



REAMERS

- Modified tool diameter
- Non-stocked metric tool diameter
- Closer tool diameter tolerance
- Cutting diameter reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diameter back taper
- Shortened shank
- Reduced shank diameter
- Flat(s) on shank
- Tanged shank
- Shank whistle notch for set screw
- Smaller taper shank
- Coatings available:

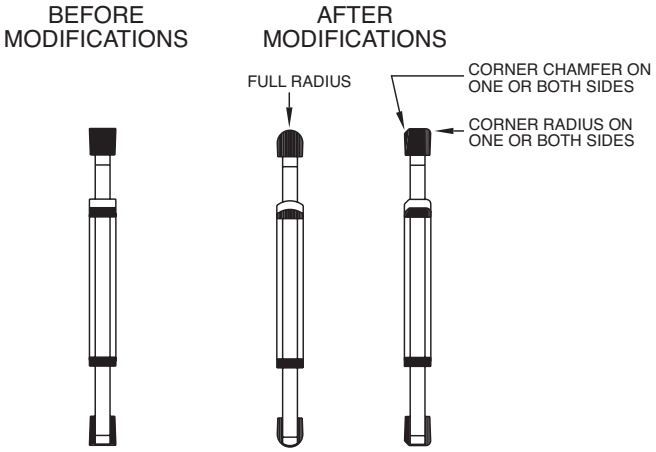
TITANIUM NITRIDE – TiN
TITANIUM CARBONITRIDE – TiCN
ZIRCONIUM NITRIDE – ZrN
AL TITANIUM NITRIDE – AlTiN



SLITTING SAWS & SIDE MILLING CUTTERS

- Alternate chamfer every other tooth
- Corner chamfer or corner radius on one side
- Corner chamfer or corner radius on both sides
- Full radius
- Reduced face width
- Closer tool diameter tolerance
- Chip breakers
- Matched tool diameter set(s)
- Reduced hub width
- Additional keyway
- Coatings available:

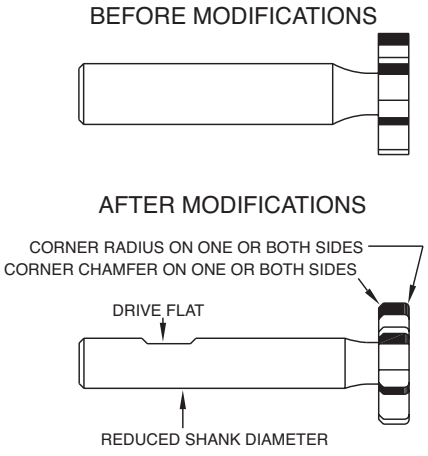
TITANIUM NITRIDE – TiN
TITANIUM CARBONITRIDE – TiCN
ZIRCONIUM NITRIDE – ZrN
AL TITANIUM NITRIDE – AlTiN



KEYSEAT CUTTERS & MISCELLANEOUS CUTTERS

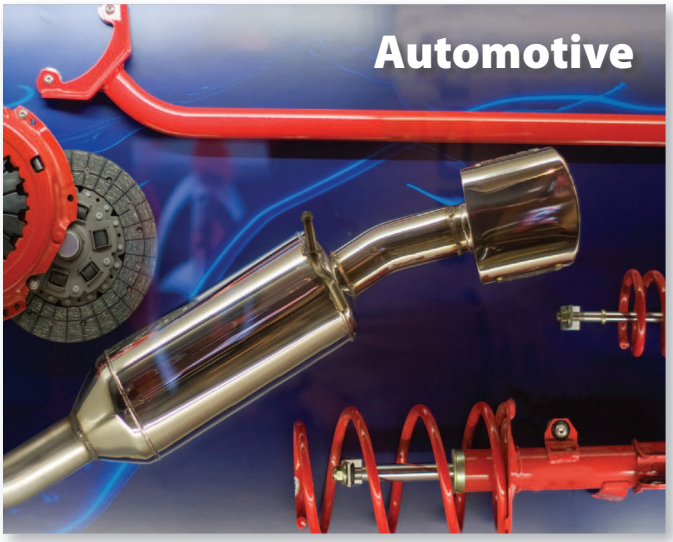
- Modified tool diameter
- Metric tool diameter
- Modified face width
- Metric face width
- Corner chamfer or corner radius on one side
- Corner chamfer or corner radius on both sides
- Reduced neck diameter
- Shortened shank
- Reduced shank diameter
- Shank drive flat(s)
- Coatings available:

TITANIUM NITRIDE – TiN
TITANIUM CARBONITRIDE – TiCN
ZIRCONIUM NITRIDE – ZrN
AL TITANIUM NITRIDE – AlTiN



SPECIAL ENGINEERED TOOLS TO PRINT

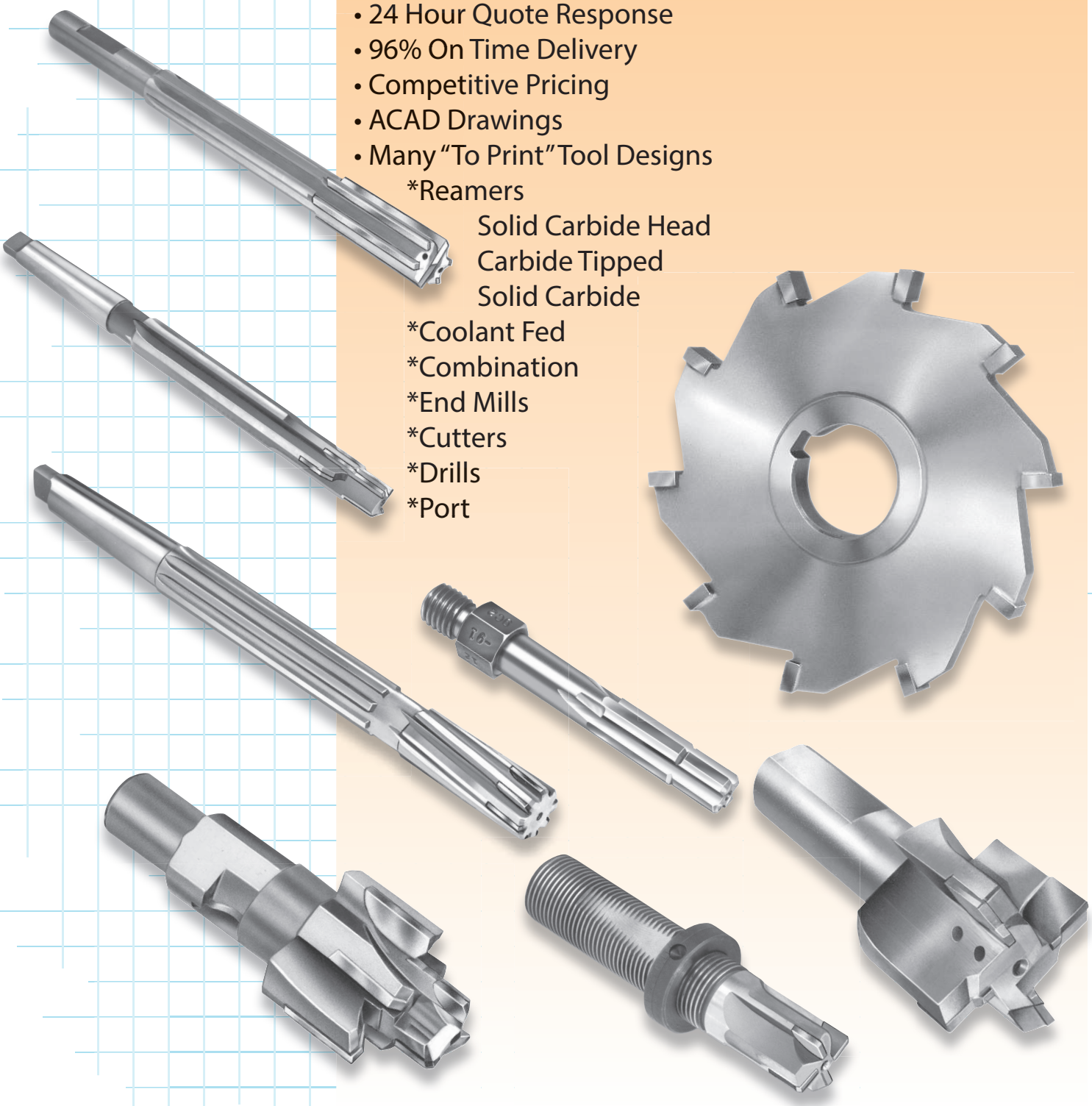
QUALITY "MADE TO PRINT" TOOLS FOR ALL MANUFACTURING SECTORS



SPECIAL ENGINEERED TOOLS TO PRINT

ENGINEERED TOOLS TO YOUR SPECIFICATIONS

- Over 40 Years Experience in "Made to Print" Tooling
- Experienced Tech Support 7 am – 5 pm C.S.T.
- 24 Hour Quote Response
- 96% On Time Delivery
- Competitive Pricing
- ACAD Drawings
- Many "To Print" Tool Designs
  - *Reamers
    - Solid Carbide Head
    - Carbide Tipped
    - Solid Carbide
  - *Coolant Fed
  - *Combination
  - *End Mills
  - *Cutters
  - *Drills
  - *Port



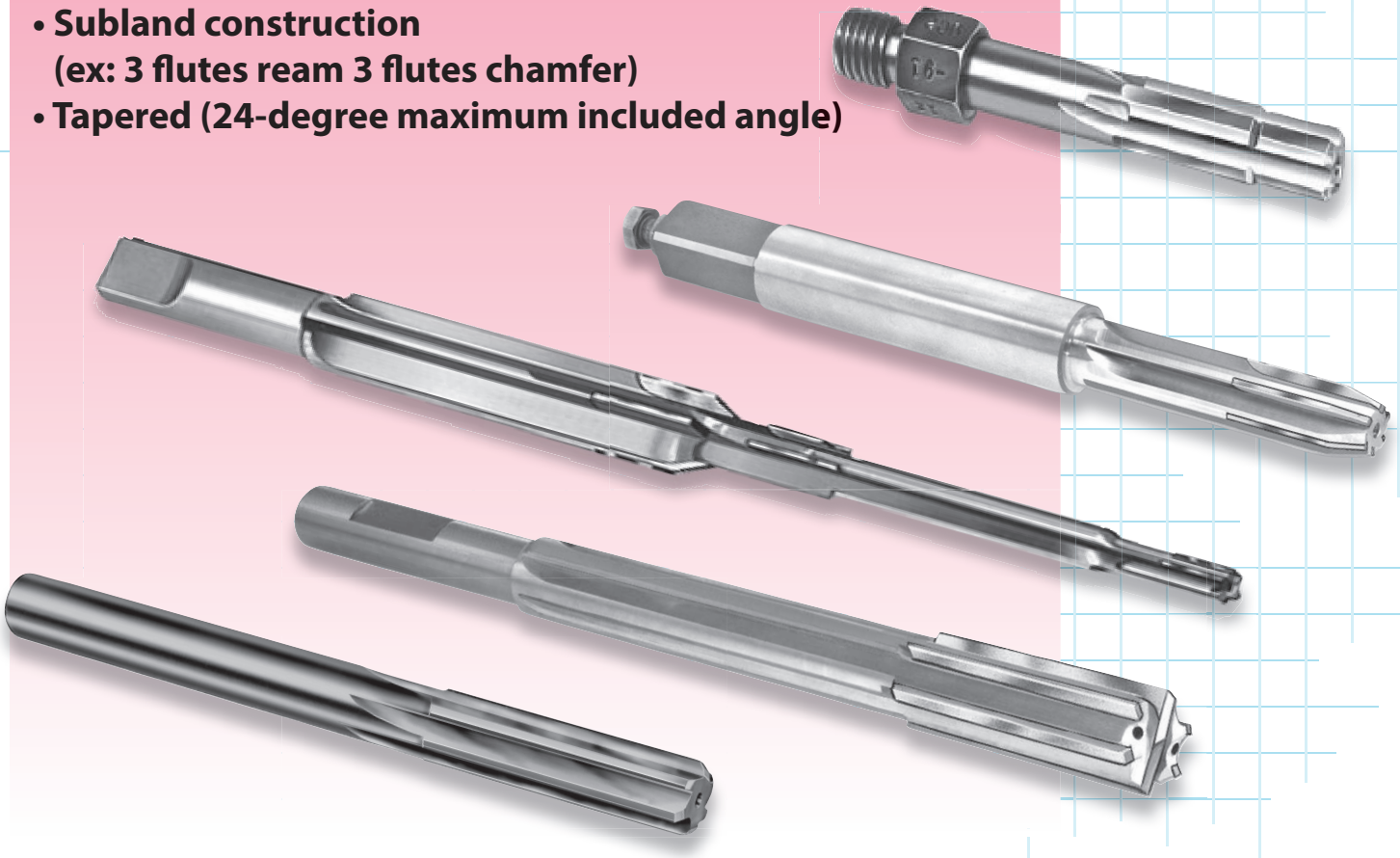
SPECIAL ENGINEERED TOOLS TO PRINT

QUALITY "MADE TO PRINT" TOOLS FOR ALL MANUFACTURING SECTORS

REAMERS

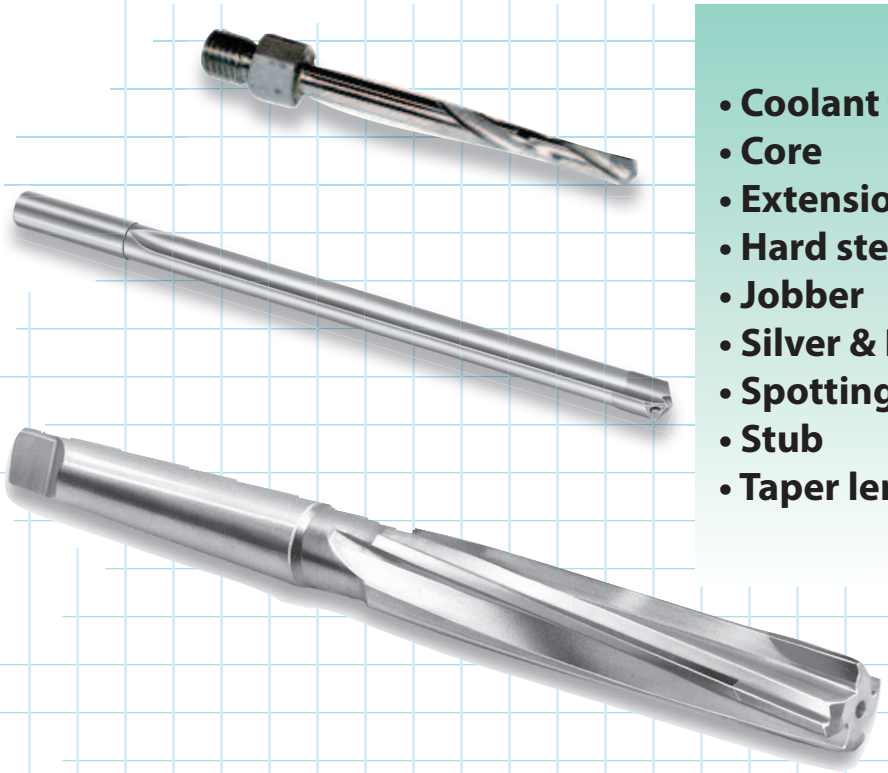
Carbide Tipped – Solid Carbide – Solid Carbide Head

- **Center Cutting**
- **Coolant Fed (center and flute outlet)**
- **Deep Hole (should be coolant fed if possible)**
- **Hand**
- **Long Length (length/diameter ratio limitations)**
- **Line**
- **Odd number of flutes and irregular spaced flutes**
- **Piloted (Front or Rear)**
- **Pipe tap**
- **Shell (max diameter 3.250", max arbor size is #10)**
- **Shell reamer arbors (straight and taper shank)**
- **Step (all diameters are cutting)**
- **Stub screw machine**
- **Subland construction**
  (ex: 3 flutes ream 3 flutes chamfer)
- **Tapered (24-degree maximum included angle)**



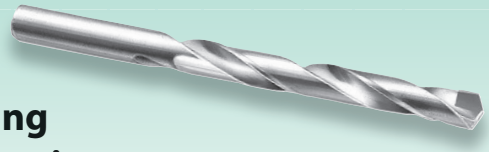
SPECIAL ENGINEERED TOOLS TO PRINT

ENGINEERED TOOLS TO YOUR SPECIFICATIONS



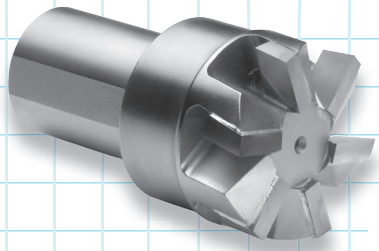
DRILLS

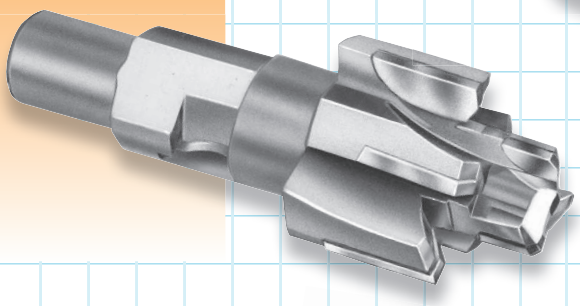
- Coolant fed — straight and spiral flutes
- Core
- Extension
- Hard steel
- Jobber
- Silver & Deming
- Spotting/Centering
- Stub
- Taper length

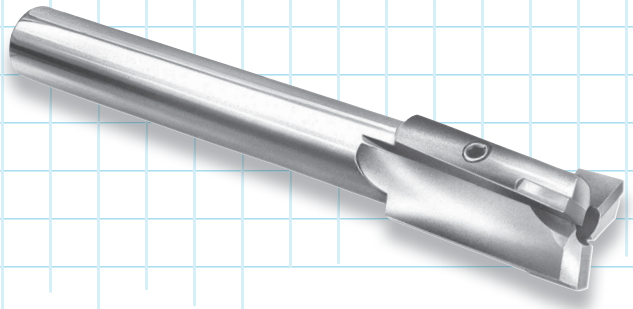


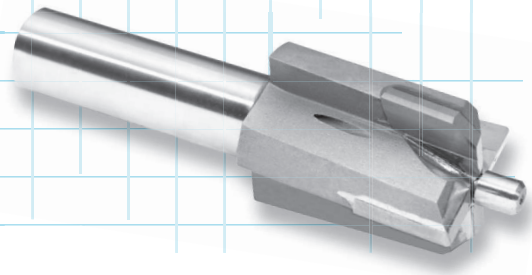
COUNTERBORES & SPOT FACE

- Aircraft
- Center cutting
- Piloted
- Radial/pin drive shank
- Stub taper shank
- Step
- Subland



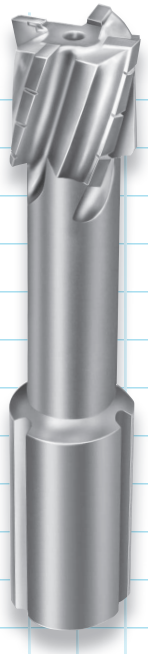






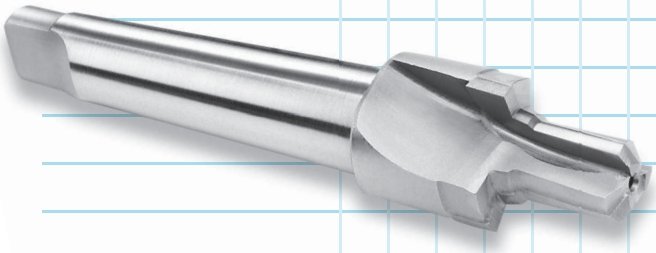
SPECIAL ENGINEERED TOOLS TO PRINT

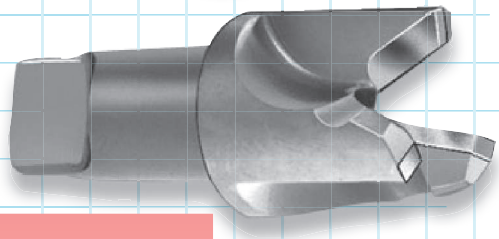
ENGINEERED TOOLS TO YOUR SPECIFICATIONS



END MILLS

- Center cutting
  (25° max spiral, 1½" max diameter)
- Coolant fed (center or flute feed)
- Corner rounding (¾" maximum radius)
- Longer length of cut (4 times diameter max)
- O.D. chipbreakers
- Tapered (24° max included angle)

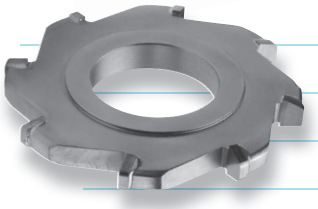


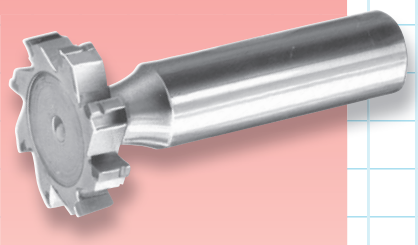


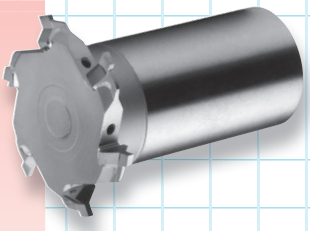
CUTTERS

SHANK TYPE

- Chamfer
- Double angle
- Dovetail
- Face Mills
- Keyseat
- Port
- Radius - convex
- T-Slot





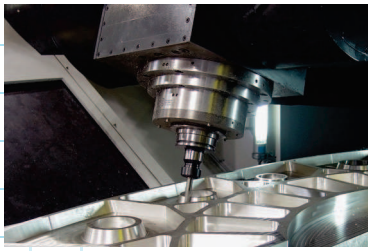


ARBOR MOUNTED TYPE

- Double angle
- Full radius (convex only)
- Matched sets
- Side Milling
- Slitting Saw
- Shell Mill

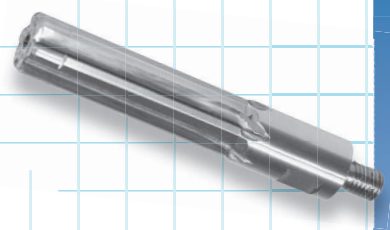
SPECIAL ENGINEERED TOOLS TO PRINT

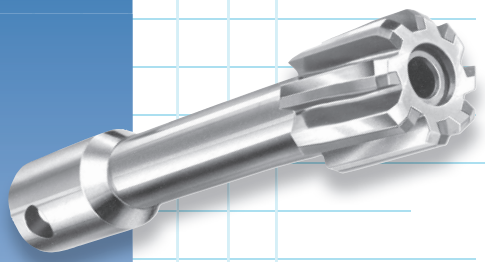
QUALITY "MADE TO PRINT" TOOLS FOR ALL MANUFACTURING SECTORS

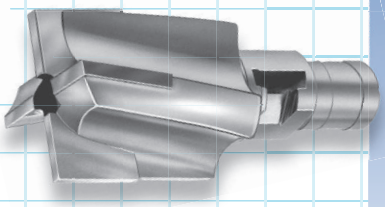


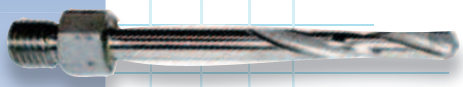
SHANK CONFIGURATIONS

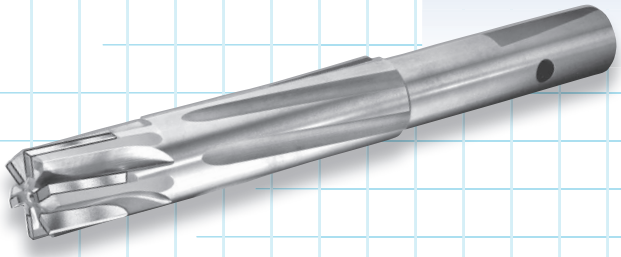
- Acme thread with nut
- End adjusting screw (for length pre-setting)
- Hex adapter
- Pin drive
- Quick-change adapters
- Radial drive
- Square drive
- Straight
- Tanged
- Taper
- Threaded
- Weldon flats
- Whistle notch

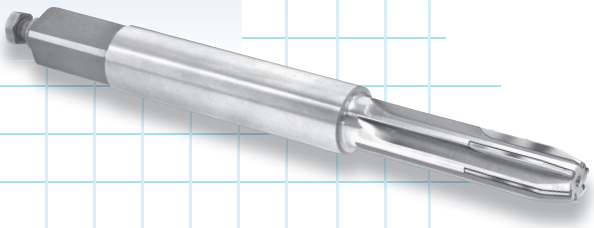


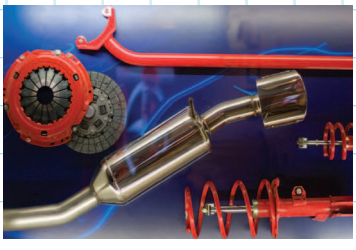








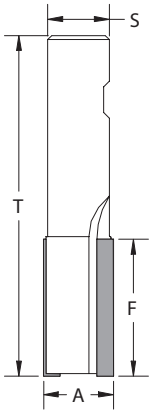




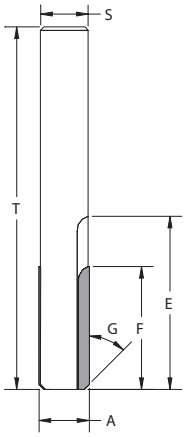
CARBIDE TIPPED SPECIALS QUOTE FORM

REQUIRED INFORMATION FOR QUOTING AND ORDERING
FAX TO 800-633-7302 or E-MAIL TO sales@hannibalcarbide.com

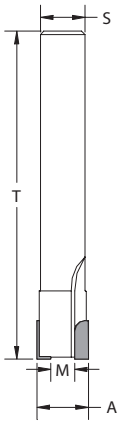
CARBIDE TIPPED - SHANK TYPE TOOLS



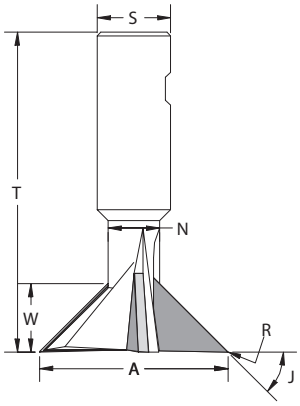
❑ **END MILL**



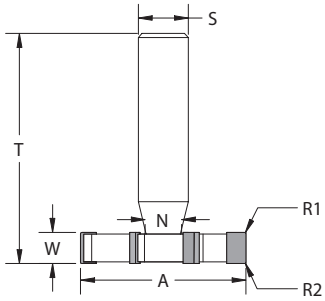
❑ **REAMER**



❑ **COUNTERBORE**



❑ **DOVETAIL**



❑ **KEYSEAT**

QUOTE REQUEST FORM:

INDIVIDUAL: _____

COMPANY: _____

CITY/STATE: _____

FAX #: _____ **PHONE #:** _____

QUANTITY BREAKS: _____ **pcs** _____ **pcs** _____ **pcs** _____ **pcs**

Chip class of MATERIAL BEING MACHINED (from page 6–8)

❑ **20** ❑ **40** ❑ **60** ❑ **80** ❑ **100** ❑ **120** ❑ **140** ❑ **Other Material** _____

BODY OF TOOL

T= _____ Overall Length S= _____ Shank Diameter A= _____ Major Diameter
G= _____° Chamfer Angle

FLUTES

E= _____ Flute Length F= _____ Carbide Length

❑ Straight Flutes
Number of Flutes _____

❑ Right Hand Cutting
❑ Right Hand Spiral _____°

❑ Left Hand Cutting
❑ Left Hand Spiral _____°

IF PILOTED ❑ Cutting Pilot
Head Diam. _____

❑ Non-Cutting Pilot
Head Length _____

M= Min. Cutting Diam._____

IF STEP REAMER ❑ Cutting Step ❑ Non-Cutting Step
(Also see pages 98-100) Minor Diam. _____ Step Length _____ Step Angle _____°

IF KEYSEAT W= _____ Width
N= _____ Neck Diameter

❑ Straight Tooth
❑ Staggered Tooth

R1= _____ Radius/Chamfer
R2= _____ Radius/Chamfer

IF DOVETAIL

N= _____ Neck Diam. J= _____° Angle R= _____ Radius W= _____ Width

ADDITIONAL APPLICATION NOTES: _____

Special order tool quotes usually same day; always next. Over 96% of Special tool orders shipped on promise date.

CARBIDE TIPPED SPECIALS QUOTE FORM

REQUIRED INFORMATION FOR QUOTING AND ORDERING
FAX TO 800-633-7302 or E-MAIL TO sales@hannibalcarbide.com

CARBIDE TIPPED - ARBOR TYPE TOOLS

D= _____ **Cutter Diameter**

W= _____ **Cutter Width**

A= _____ **Arbor Hole Diam.**

N= _____ **# of Teeth**

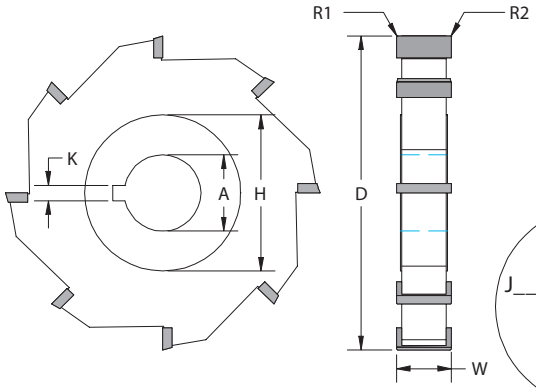
H= _____ **Hub Diameter**

K= _____ **Keyway Size**

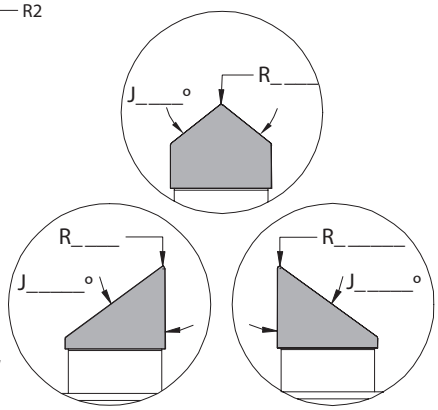
R1= _____ **Radius/Chamfer**

R2= _____ **Radius/Chamfer**

❑ **Straight Tooth**
❑ **Straight Stagger**
❑ **Herringbone Stagger**



❑ **MILLING CUTTER**
❑ **SLITTING SAW**



❑ **ANGLE CUTTER**
(Fill in "J" & "R")

QUOTE REQUEST FORM:

INDIVIDUAL: _____

COMPANY: _____

CITY/STATE: _____

FAX #: _____ **PHONE #:** _____

QUANTITY BREAKS: _____ pcs _____ pcs _____ pcs _____ pcs

Chip class of MATERIAL BEING MACHINED (from page 6–8)

❑ 20 ❑ 40 ❑ 60 ❑ 80 ❑ 100 ❑ 120 ❑ 140 ❑ Other Material _____

Special order tool quotes usually same day; always next. Over 96% of Special tool orders shipped on promise date.

WARNING - Because cutting tools may shatter or break, government regulations require the use of safety glasses and other safety equipment at all times in the vicinity of cutting tool use. Grinding of solid carbide or carbide tipped tools will produce carbide and braze dust that may be hazardous to your health. Use adequate ventilation and read the applicable "Material Safety Data Sheets."

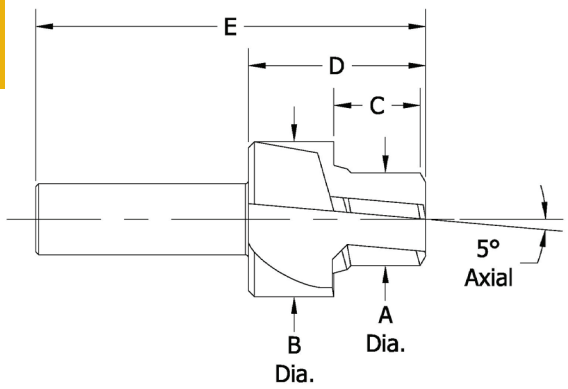
LIMITED WARRANTY

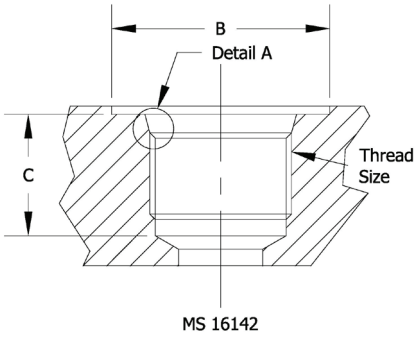
Hannibal Carbide Tool, Inc. does not give any warranty on its products except as follows: Hannibal Carbide Tool, Inc. warrants to original equipment manufacturers, distributors and industrial and commercial users of its products that each new product manufactured or supplied by Hannibal Carbide Tool, Inc. shall be free from defects in material and workmanship. Hannibal Carbide Tool, Inc.'s sole obligation under this warranty is limited to furnishing, without additional charge, a replacement for, or at its option, repairing or issuing credit for any such product which shall within one year from the date of sale by Hannibal Carbide Tool, Inc. be returned freight prepaid to Hannibal Carbide Tool, Inc. and which upon inspection is determined by Hannibal Carbide Tool, Inc. to be defective in materials or workmanship. The provisions of this warranty shall not apply to any product which has been subjected to misuse; improper operating conditions, machine setup or application of cutting fluid; or which has been repaired or altered if such repair or alteration in the judgment of Hannibal Carbide Tool, Inc. would adversely affect performance of the product. Complete written information with respect to all such matters, including operating condition, machine setup, cutting fluid, cutting speed and feed rate, must be furnished to Hannibal Carbide Tool, Inc. as a prerequisite to its consideration of any claim or complaint under this warranty.

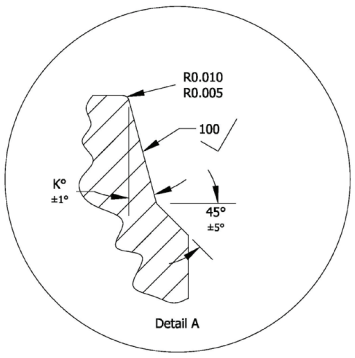
THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Hannibal Carbide Tool, Inc. shall have no liability or responsibility on any claim of any kind, whether in contract, tort or otherwise, for any loss or damage arising out of, connected with, or resulting from the manufacture, sale, delivery or use of any product sold hereunder, in excess of the cost of replacement or repair provided herein. IN NO EVENT SHALL HANNIBAL CARBIDE TOOL, INC. BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES. Hannibal Carbide Tool, Inc. makes no other warranty, expressed or implied, except the warranty against defects in material and workmanship set forth above; and Hannibal Carbide Tool, Inc. neither assumes nor authorizes any other person or entity to assume for it any other obligation or liability in connection with any of its products.

SPECIAL PORT CONTOUR TOOLS CARBIDE TIPPED

REQUIRED INFORMATION FOR QUOTING AND ORDERING
FAX TO 800-633-7302 or E-MAIL TO sales@hannibalcarbide.com







A=Reamer Dia. **B**=Spotface Dia. **C**=Reamer Length **D**=Head Length **E**=OAL **K**=Sealing Seat Angle

QUOTE REQUEST FORM:

INDIVIDUAL: _____

COMPANY: _____

CITY/STATE: _____

FAX #: _____ **PHONE #:** _____

QUANTITY BREAKS: _____ pcs _____ pcs _____ pcs _____ pcs

Chip class of MATERIAL BEING MACHINED (from page 6–8)

❑ 20 ❑ 40 ❑ 60 ❑ 80 ❑ 100 ❑ 120 ❑ 140 ❑ Other Material _____

TYPE OF TOOL:

- ❑ A.N.D. 10050 Integral Reamer Pilot Series
- ❑ ISO 6149-1 Metric Port without I.D. Groove
- ❑ Metric Port Reamer Pilot Series
- ❑ MS33649 Integral Reamer Pilot Series
- ❑ S.A.E. Ports - MS16142 - J514F - J1926

SHANK STYLE _____

SHANK LENGTH _____

THREAD SIZE _____

COOLANT FED YES or NO

A = _____ REAMER DIAMETER

B = _____ SPOTFACE DIAMETER

C = _____ REAMER LENGTH

D = _____ HEAD LENGTH

E = _____ OVERALL LENGTH

K = _____ SEALING SEAT ANGLE

ADDITIONAL APPLICATION NOTES: _____

Special order tool quotes usually same day; always next. Over 96% of Special tool orders shipped on promise date.

REAMER GUIDE

BASIC TECHNICAL INFORMATION FOR REAMERS

HANNIBAL CARBIDE would like to inform you of some basic technical knowledge regarding reamers. Following these guidelines will reduce overall set-up time, while increasing productivity. Selecting the right tool, proper stock removal and correct speeds and feeds are all important and covered here in the HANNIBAL Reamer Guide. Ream it right the first time with HANNIBAL.

.....from the Hannibal Technical Team

FLUTE STYLES

Straight:

Best suited for non-chip forming materials, i.e. cast iron, bronze and free cutting brass.
Preferred hole condition would be a thru hole.

Right Hand Spiral:

Designed to pull the chip out of the hole in a blind hole application.
Due to aggressive flute geometry, a right hand spiral may cut slightly oversized.
Effective in bridging interruptions, such as keyways, cross-holes, etc.
Excellent in highly ductile materials.

Left Hand Spiral:

Excellent in thru holes, as the flutes tend to push the chips out ahead of the reamer.
Effective in bridging interruptions, such as keyways, cross-holes, etc.
Good for reaming hard materials.
Should provide the very best size and finish.

Expansion Reamers:

Designed for high production runs in abrasive materials, when size or finish can be rapidly lost.
Expand the diameter by turning the screw clockwise.
The tool is now ready to be reground back to its original diameter and resharpened.
This process should produce like new tool performance.

COOLANT OPTIONS

Center Fed Coolant (axial):

Center fed coolant design is used for blind hole reaming.
Combine center fed coolant with right hand spiral for maximum chip clearing ability in highly ductile material.

Flute Fed Coolant (radial):

Flute fed coolant design is used for thru hole reaming.
Effective in a cavity large enough for chip clearance.
Flute fed coolant will flush the chips ahead of the reamer, providing the best hole size and finish.

REAMER GUIDE

BASIC TECHNICAL INFORMATION FOR REAMERS

While developing optimum conditions will require some investment in time, it will be beneficial by reducing cycle times and getting the best possible tool life. There are several elements to evaluate in this section. These elements are key to maximizing tool efficiency.

OPTIMUM OPERATING CONDITIONS

Stock Removal:

2%-3% of the reamer diameter will normally be appropriate stock removal when reaming.
Example: a .500" diameter tool would remove .010"-.015" of stock.
Example: a 1.0" diameter tool would remove .020"-.030" of stock.
These examples cover finish reaming.
When your application calls for a rough ream, stock removal can be up to 5%
See "Pre-Ream Drill Size Chart" on page 26.

Runout (TIR) Concerns:

One of the most overlooked areas in reaming.
It is critical to the function of the tool to be running concentric with the machine spindle.
Some of the most important areas to consider include:

Tool Holders - precision collets and hydraulic chucks are widely used for straight shank tools. When using hydraulic chucks be sure shank diameter tolerance is acceptable. If using taper shank reamers make sure holders are free from dirt, grit and burrs that could cause the shank to not seat properly.

Tool Overhang - Use the shortest tool possible. Runout multiplies rapidly as the distance from the spindle increases.

Rigid Fixturing - Make sure the part piece is secure. Movement of the piece may cause tool breakage, oversized holes, poor finish and would shorten tool life.

Checking TIR - Check the reamer diameter with a dial indicator (at the circular margin). Ideally a reamer should run within .001" TIR.

Coolant feeding reamers:

Coolant induced thru the reamer should be utilitized when possible.
Benefits include better finishes, superior tool life and the ability to increase speeds and feeds.

Speeds and Feeds:

Reaming is a finishing operation and the correct combination of speed and feed is critical to tool life. Proper speeds & feeds must be run to achieve size, straightness and finish. See pages 8 and 9 for starting speed and feed information and further guidelines.

Tool Geometry and Carbide Grade:

Geometry may be altered to obtain optimum performance and extend tool life.
Material specific carbide grades are beneficial in reaming material of a specific hardness & condition. Hannibal offers stocked material specific reamers in most all styles.

REAMER GUIDE

BASIC TECHNICAL INFORMATION FOR REAMERS

DEVELOPING OPTIMUM SPEED AND FEEDS

- Most reamer manufacturers will provide you with a starting point for speeds and feeds. It is very important to remember when optimizing your cycle that increasing feed will give you quicker cycles than running higher SFM at lower feed rates.
- With the surface feet per minute (SFM) at the manufacturers low range, begin trying to increase the feed rate. Increase in small increments, .001 - .0015 per revolution. Continue to increase the feed until an undesirable condition develops. This could be an unacceptable finish, a bell, tapered, or egg shaped hole, or poor size. At this point return to the previous feed rate. You are now at or close to the optimum feed rate.
- Increase the speed in increments of 10-20 SFM. Like the feed, increase until undesirable conditions appear, then return to the previous SFM. You should now be at or near the optimum speed and feed. It may also be necessary to fine-tune these numbers after a few runs to achieve the very best tool life.
- As you seek the optimum speed and feed for your application, look and listen for signs or sounds that could save you time. Listen for the reamer squealing upon entry—this means speed or feed is too high or alignment is poor. Examine the chip for size and color. Examine the finish for signs of chatter.

AVOIDING PROBLEMS – Common Problem Areas to Avoid.

- **Improper Tool** - make sure you are using the correct flute style and tool type.
- **Stock Removal** - HANNIBAL recommends 2-3% of the reamer diameter as a starting point for stock removal. 2% for steels and tough alloys, 3% for non-ferrous materials and cast irons. Solid carbide & carbide tipped reamers must have adequate stock to remove or they will rub in the hole and generate excessive heat, which leads to premature tool wear.
- **Improper Speeds & Feeds** - The right combination of speeds and feeds is critical to tool life and consistent size and finish. Getting the correct starting points is a key element. Reaming is a finishing operation and proper speeds and feeds must be run to achieve size, straightness and finish.
- **Poor Fixturing** - If the fixturing cannot hold the piece securely and in line with the spindle, then producing a good finish will be very difficult. A reamed hole is only going to be as good as the machine and fixturing used to machine and hold the part.
- **Excessing Runout (spindle or tool holder)** - Runout leads to poor finishes, oversized, tapered, and bellmouth holes, as well as poor tool life. Floating holders or bushings can sometimes be used to compensate for runout, but the best solution is to fix the problem.
- **Improper Coolant** - Make sure the coolant you are using is recommended for reaming your particular materials. Many coolants will prove effective for reaming if the concentration level is maintained with specifications. Take the time to check the levels on a regular basis.
- **Improper Sharpening or Geometry** - If a new tool works fine, but fails to perform after resharpening, the problem is obvious. However, depending on the hardness and condition of the material you are reaming, the tool geometry may need to be altered to get optimum performance and tool life. Geometries most often changed are the circular margins, radial rake, and the primary chamfer clearance.
- **Material Changes (hardness and/or condition)** - Castings lead the way in inconsistency. Hard spots, free carbides, and scale can all lead to inconsistent results when reaming. A heat treatment that varies just a few points from part to part can cause problems.

REAMER GUIDE

BASIC TECHNICAL INFORMATION FOR REAMERS

HANNIBAL PRE-REAM DRILL SIZE CHART

REAMER DIAMETER FRACTION - DECIMAL (NOMINAL)	HOLE SIZE TO LEAVE 2%	DRILL SIZE TO LEAVE 2%	HOLE SIZE TO LEAVE 3%	DRILL SIZE TO LEAVE 3%
1/8 - .1250	.1225	31	.1213	3.0mm
9/64 - .1406	.1378	29	.1364	3.4mm
5/32 - .1562	.1532	24	.1516	25
11/64 - .1719	.1685	19	.1667	4.2mm
3/16 - .1875	.1838	14	.1819	15
13/64 - .2031	.1990	5.0mm	.1970	9
7/32 - .2188	.2144	5.4mm	.2122	4
15/64 - .2344	.2297	1	.2274	5.7mm
1/4 - .2500	.2450	C	.2425	6.1mm
17/64 - .2656	.2600	6.5mm	.2576	F
9/32 - .2812	.2756	I	.2728	6.9mm
19/64 - .2969	.2910	7.3mm	.2880	7.25mm
5/16 - .3125	.3063	7.75mm	.3031	N
21/64 - .3281	.3215	8.1mm	.3183	O
11/32 - .3438	.3370	8.5mm	.3335	8.4mm
23/64 - .3594	.3522	S	.3486	8.8mm
3/8 - .3750	.3675	9.25mm	.3638	23/64
25/64 - .3906	.3828	9.6mm	.3789	V
13/32 - .4062	.3982	10.0mm	.3941	25/64
27/64 - .4219	.4135	10.4mm	.4092	13/32
7/16 - .4375	.4288	10.8mm	.4244	27/64
29/64 - .4531	.4440	11.2mm	.4395	7/16
15/32 - .4688	.4594	11.6mm	.4547	29/64
31/64 - .4844	.4747	12.0mm	.4699	15/32
1/2 - .5000	.4900	31/64	.4850	12.2mm
33/64 - .5156	.5053	1/2	.5000	12.6mm
17/32 - .5312	.5206	33/64	.5153	13.0mm
35/64 - .5469	.5360	17/32	.5305	13.4mm
9/16 - .5625	.5513	35/64	.5456	13.8mm
37/64 - .5781	.5665	9/16	.5608	14.2mm
19/32 - .5938	.5820	37/64	.5760	14.5mm
39/64 - .6094	.5972	19/32	.5911	14.9mm
5/8 - .6250	.6125	39/64	.6063	15.3mm
41/64 - .6406	.6278	5/8	.6214	15.7mm
21/32 - .6562	.6431	41/64	.6365	16.1mm
43/64 - .6719	.6585	21/32	.6517	16.5mm
11/16 - .6875	.6738	17.0mm	.6669	16.8mm
45/64 - .7031	.6890	11/16	.6820	17.2mm
23/32 - .7188	.7044	45/64	.6972	17.6mm
47/64 - .7344	.7197	18.2mm	.7124	18.0mm
3/4 - .7500	.7350	18.5mm	.7275	18.3mm
49/64 - .7656	.7502	18.9mm	.7426	18.8mm
25/32 - .7812	.7656	19.3mm	.7578	3/4
51/64 - .7969	.7810	19.7mm	.7730	49/64
13/16 - .8125	.7963	20.1mm	.7881	25/32
53/64 - .8281	.8115	20.5mm	.8034	51/64
27/32 - .8438	.8270	20.8mm	.8185	13/16
55/64 - .8594	.8422	21.25mm	.8336	53/64
7/8 - .8750	.8575	21.6mm	.8488	27/32
57/64 - .8906	.8728	22.0mm	.8639	55/64
29/32 - .9062	.8881	22.5mm	.8790	7/8
59/64 - .9219	.9035	22.8mm	.8942	57/64
15/16 - .9375	.9188	23.25mm	.9094	29/32
61/64 - .9531	.9340	23.5mm	.9245	59/64
31/32 - .9688	.9494	24.0mm	.9397	15/16
63/64 - .9844	.9647	24.4mm	.9549	61/64
1 - 1.0000	.9800	24.75mm	.9700	31/32

This chart allows for drill oversize based on study done by the United States Cutting Tool Institute

REAMER SELECTION GUIDE BASED ON HOLE CONDITION

GENERAL PURPOSE | MATERIAL SPECIFIC | COOLANT FED

CARBIDE LENGTH

- Use flute long carbide for hole depths exceeding maximum shallow depth (shown in table to right)

Hole Diameter	Max. Shallow Hole Depth
.1875" thru .3125"	.500"
.3126" thru .7188"	.625"
.7189" thru 1.0625"	.750"
1.0626" thru 1.5000"	.875"

FLUTE STYLES

- Straight Flutes - Good in a wide variety of applications
- Right Spiral Flutes - Tend to bridge interruptions such as keyways, slots or intersecting holes; Good chip clearing ability for ductile materials and blind holes
- Left Spiral Flutes - Also tend to bridge interruptions; Good for cast irons, heat treated steels and other hard materials Do **not** use in blind holes
- Expansion Reamers - Economical for abrasive materials

MATERIAL CHIP CLASS	FLUTE STYLE	THRU HOLE				BLIND HOLE			
		SHALLOW		DEEP		SHALLOW		DEEP	
		STR. SHANK	TPR. SHANK	STR. SHANK	TPR. SHANK	STR. SHANK	TPR. SHANK	STR. SHANK	TPR. SHANK
20 ALUMINUM ALLOY COPPER ALLOY (TOUGH) LEAD ALLOY NON-METAL & PLASTIC ZINC ALLOY	**GENERAL PURPOSE TYPES**								
	SPIRAL	420 - pg. 68	422 - pg. 70	440 - pg. 42	–	410 - pg. 68	412 - pg. 70	–	–
	STRAIGHT	400 - pg. 46	402 - pg. 54	450 - pg. 56	452 - pg. 62	400 - pg. 46	402 - pg. 54	450 - pg. 56	452 - pg. 62
	EXPANSION	465 - pg. 64	467 - pg. 66	465 - pg. 64	467 - pg. 66	465 - pg. 64	467 - pg. 66	465 - pg. 64	467 - pg. 66
	MATERIAL SPECIFIC TYPES								
	SPIRAL	433 - pg. 86	–	482 - pg. 87	–	432 - pg. 84	–	442 - pg. 85	–
	STRAIGHT	407 - pg. 76	472 - pg. 80	457 - pg. 78	453 - pg. 81	407 - pg. 76	472 - pg. 80	457 - pg. 78	453 - pg. 81
	EXPANSION	464 - pg. 82	461 - pg. 83	464 - pg. 82	461 - pg. 83	464 - pg. 82	461 - pg. 83	464 - pg. 82	461 - pg. 83
	COOLANT FED TYPES								
	SPIRAL	427 - pg. 96	–	427 - pg. 96	–	411 - pg. 94	–	411 - pg. 94	–
	STRAIGHT	416 - pg. 92	–	416 - pg. 92	–	414 - pg. 90	–	414 - pg. 90	–
40 ALUMINUM BRONZE BRASS BRONZE MAGNESIUM ALLOY NICKEL SILVER	**GENERAL PURPOSE TYPES**								
	SPIRAL	420 - pg. 68	422 - pg. 70	440 - pg. 42	–	410 - pg. 68	412 - pg. 70	–	–
	STRAIGHT	400 - pg. 46	402 - pg. 54	450 - pg. 56	452 - pg. 62	400 - pg. 46	402 - pg. 54	450 - pg. 56	452 - pg. 62
	EXPANSION	465 - pg. 64	467 - pg. 66	465 - pg. 64	467 - pg. 66	465 - pg. 64	467 - pg. 66	465 - pg. 64	467 - pg. 66
	MATERIAL SPECIFIC TYPES								
	SPIRAL	433 - pg. 86	–	482 - pg. 87	–	432 - pg. 84	–	442 - pg. 85	–
	STRAIGHT	407 - pg. 76	472 - pg. 80	457 - pg. 78	453 - pg. 81	407 - pg. 76	472 - pg. 80	457 - pg. 78	453 - pg. 81
	EXPANSION	464 - pg. 82	461 - pg. 83	464 - pg. 82	461 - pg. 83	464 - pg. 82	461 - pg. 83	464 - pg. 82	461 - pg. 83
	COOLANT FED TYPES								
	SPIRAL	427 - pg. 96	–	427 - pg. 96	–	411 - pg. 94	–	411 - pg. 94	–
	STRAIGHT	416 - pg. 92	–	416 - pg. 92	–	414 - pg. 90	–	414 - pg. 90	–
60 DUCTILE CAST IRON GRAY CAST IRON MALLEABLE CAST IRON NODULAR CAST IRON	**GENERAL PURPOSE TYPES**								
	SPIRAL	420 - pg. 68	422 - pg. 70	440 - pg. 42	–	410 - pg. 68	412 - pg. 70	–	–
	STRAIGHT	400 - pg. 46	402 - pg. 54	450 - pg. 56	452 - pg. 62	400 - pg. 46	402 - pg. 54	450 - pg. 56	452 - pg. 62
	EXPANSION	465 - pg. 64	467 - pg. 66	465 - pg. 64	467 - pg. 66	465 - pg. 64	467 - pg. 66	465 - pg. 64	467 - pg. 66
	MATERIAL SPECIFIC TYPES								
	SPIRAL	437 - pg. 86	–	483 - pg. 87	–	436 - pg. 84	–	443 - pg. 85	–
	STRAIGHT	408 - pg. 76	473 - pg. 80	458 - pg. 78	454 - pg. 81	408 - pg. 76	473 - pg. 80	458 - pg. 78	454 - pg. 81
	EXPANSION	466 - pg. 82	462 - pg. 83	466 - pg. 82	462 - pg. 83	466 - pg. 82	462 - pg. 83	466 - pg. 82	462 - pg. 83
	COOLANT FED TYPES								
	SPIRAL	428 - pg. 96	–	428 - pg. 96	–	413 - pg. 94	–	413 - pg. 94	–
	STRAIGHT	426 - pg. 92	–	426 - pg. 92	–	424 - pg. 90	–	424 - pg. 90	–
80 - 100 - 120 LOW STRENGTH STEEL MEDIUM STRENGTH STEEL HIGH STRENGTH STEEL TOOL STEEL	**GENERAL PURPOSE TYPES**								
	SPIRAL	420 - pg. 68	422 - pg. 70	440 - pg. 42	–	410 - pg. 68	412 - pg. 70	–	–
	STRAIGHT	400 - pg. 46	402 - pg. 54	450 - pg. 56	452 - pg. 62	400 - pg. 46	402 - pg. 54	450 - pg. 56	452 - pg. 62
	EXPANSION	465 - pg. 64	467 - pg. 66	465 - pg. 64	467 - pg. 66	465 - pg. 64	467 - pg. 66	465 - pg. 64	467 - pg. 66
	MATERIAL SPECIFIC TYPES								
	SPIRAL	439 - pg. 86	–	484 - pg. 87	–	438 - pg. 84	–	444 - pg. 85	–
	STRAIGHT	409 - pg. 76	474 - pg. 80	459 - pg. 78	455 - pg. 81	409 - pg 76	474 - pg. 80	459 - pg. 78	455 - pg. 81
	STRAIGHT	480 - pg. 74	–	480 - pg. 74	–	480 - pg. 74	–	480 - pg. 74	–
	EXPANSION	468 - pg. 82	463 - pg. 83	468 - pg. 82	463 - pg. 83	468 - pg. 82	463 - pg. 83	468 - pg. 82	463 - pg. 83
	COOLANT FED TYPES								
	SPIRAL	429 - pg. 96	–	429 - pg. 96	–	415 - pg. 94	–	415 - pg. 94	–
	STRAIGHT	435 - pg. 92	–	435 - pg. 92	–	434 - pg. 90	–	434 - pg. 90	–
140 IRON BASE ALLOY NICKEL BASE ALLOY 300 SERIES STAINLESS 400 SERIES STAINLESS PH SERIES STAINLESS TITANIUM ALLOY	**GENERAL PURPOSE TYPES**								
	SPIRAL	420 - pg. 68	422 - pg. 70	440 - pg. 42	–	410 - pg. 68	412 - pg. 70	–	–
	STRAIGHT	400 - pg. 46	402 - pg. 54	450 - pg. 56	452 - pg. 62	400 - pg. 46	402 - pg. 54	450 - pg. 56	452 - pg. 62
	EXPANSION	465 - pg. 64	467 - pg. 66	465 - pg. 64	467 - pg. 66	465 - pg. 64	467 - pg. 66	465 - pg. 64	467 - pg. 66
	MATERIAL SPECIFIC TYPES								
	SPIRAL	439 - pg. 86	–	484 - pg. 87	–	438 - pg. 84	–	444 - pg. 85	–
	STRAIGHT	409 - pg. 76	474 - pg. 80	459 - pg. 78	455 - pg. 81	409 - pg. 76	474 - pg. 80	459 - pg. 78	455 - pg. 81
	EXPANSION	468 - pg. 82	463 - pg. 83	468 - pg. 82	463 - pg. 83	468 - pg. 82	463 - pg. 83	468 - pg. 82	463 - pg. 83
	COOLANT FED TYPES								
	SPIRAL	429 - pg. 96	–	429 - pg. 96	–	415 - pg. 94	–	415 - pg. 94	–
	STRAIGHT	435 - pg. 92	–	435 - pg. 92	–	434 - pg. 90	–	434 - pg. 90	–

COST EFFECTIVE REAMER SELECTION CARBIDE TIPPED VS. HSS AND COBALT

1 FIND THE CLASS FOR MATERIAL BEING REAMED - SEE PAGES 6 & 7

2 DETERMINE MATERIAL CONDITION AND HARDNESS

3 DETERMINE TOTAL NUMBER OF HOLES TO BE REAMED, THEN LOCATE MOST COST EFFECTIVE REAMER ON MATERIAL CONDITION/HARDNESS LINE

REAMER SELECTOR

CHIP CLASS	MATERIAL CLASS	MATERIAL CONDITION/HARDNESS	TOTAL NUMBER OF HOLES TO BE REAMED								
			1	5	10	20	40	80	160	320	640
20	**NON-FERROUS** LONG CHIPS	SOFT - UNDER 10% SILICON	HSS	HSS	HSS	HSS	**CT**	**CT**	**CT**	**CT**	**CT**
		ABRASIVE - OVER 10% SILICON	HSS	Cobalt	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**
40	**NON-FERROUS** SHORT CHIPS	SOFT - FREE MACHINING	HSS	HSS	HSS	HSS	**CT**	**CT**	**CT**	**CT**	**CT**
		HARD - HIGH TENSILE	HSS	Cobalt	Cobalt	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**
60	**CAST IRONS**	SOFT - 120 TO 220 Bhn	HSS	HSS	HSS	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**
		MEDIUM - 220 to 300 Bhn	HSS	Cobalt	Cobalt	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**
		HARD - OVER 300 Bhn	HSS	Cobalt	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**
80	**LOW STRENGTH STEELS**	SOFT - 80 TO 175 Bhn	HSS	HSS	HSS	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**
		MEDIUM - 176 TO 275 Bhn	HSS	Cobalt	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**
		HARD - OVER 275 Bhn	Cobalt	Cobalt	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**
100	**MEDIUM STRENGTH STEELS**	SOFT - 150 TO 275 Bhn	HSS	HSS	HSS	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**
		MEDIUM - 276 TO 425 Bhn	HSS	Cobalt	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**
		HARD - OVER 45 Rc	Cobalt	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**
120	**HIGH STRENGTH STEELS**	SOFT - 135 TO 275 Bhn	HSS	HSS	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**
		MEDIUM - 276 TO 425 Bhn	Cobalt	Cobalt	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**
		HARD - OVER 45 Rc	Cobalt	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**
140	**HIGH TEMP ALLOYS**	ALL CONDITIONS	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**	**CT**

CT=Carbide Tipped HSS=High Speed Steel

DECREASE YOUR MACHINING COST PER HOLE REAMED WITH CARBIDE TIPPED REAMERS

Why is **total cost** per hole reamed **far lower** with **carbide tipped** reamers despite its higher initial cost? Because of:

- Higher feeds & speeds due to heat resistant cutting edges — reduces machine cycle time per part
- Consistent quality — maintains hole size and surface finish far longer
- Longer tool life — reduces down time for tool changes

REAMER PROBLEM SOLVING GUIDE CARBIDE TIPPED

REAMING PROBLEMS	POSSIBLE CAUSES	POSSIBLE SOLUTIONS
1. POOR FINISH	Unequal chamfers	Regrind reamer with equal chamfer height
	Incorrect margins	Regrind reamer with narrower margins for reaming higher tensile materials
	Excessive spindle runout	Use bushing — .0002"/.0003" over reamer diameter
	Chatter	Increase feed and reduce speed rate
		Use power feed unless material is hard
		Use spiral fluted reamer
		Grind secondary lead angle immediately behind 45° chamfer
	Insufficient cutting action	Specify reamer with positive radial rake to reduce cutting pressure — may produce slightly larger diameter holes
2. OVERSIZED HOLES TAPERED HOLES BELL MOUTH HOLES	Misalignment	Check fixturing & setup for possible causes; use floating holder if necessary Consider using precision bushings or piloted reamers
	Incorrect feed and/or speed	Verify feeds & speeds (see pages 8 & 9)
3. EXCESSIVE TOOL WEAR	Improper stock removal	Change pre-ream hole size to leave 2 to 3% of tool diameter
	Excessive reaming pressure	Decrease feed rate (see "Feeds & Speeds" Chart on pages 8 & 9)
		See solution for "improper stock removal" in #3
	Misalignment	See solution for "misalignment" in #2
4. CROOKED HOLES	Drill walking or incorrect sharpening	Correct drilling operation — reamer will follow drilled hole Increase 90° included chamfer angle to 120° – 180°
5. TOOL BREAKAGE	Excessive reaming pressure	See solution for "excessive reaming pressure" in #3
	Misalignment	See solution for "misalignment" in #2

CARBIDE TIPPED REAMERS TECHNICAL INFORMATION

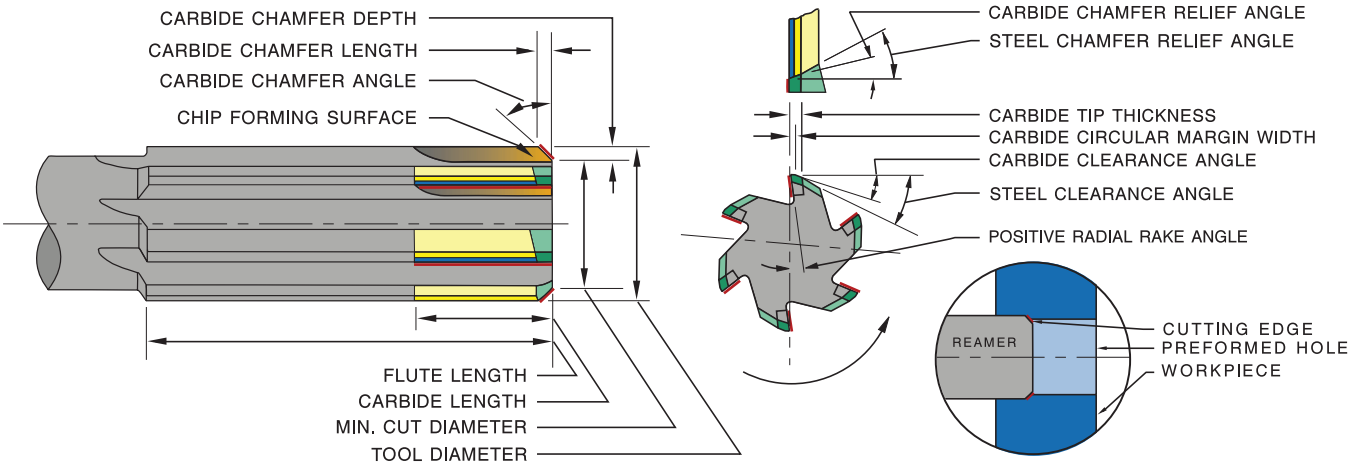
REAMER BASICS

- The reamer is used to finish machine a previously formed hole to an exact diameter with a smooth finish. It should **not** be used to significantly enlarge a hole (max. 5% – depending on material and hardness).
- Carbide tipped reamers are especially appropriate for close tolerance reaming. Because carbide is very highly resistant to wear, the reamer will produce accurate hole size and a smooth finish far longer than high speed steel or cobalt.
- The reamer is an end cutting tool, cutting only on the chamfer's edge at the outside diameter of the preformed hole. The standard 45° chamfer angle provides effective cutting action for most materials.
- Reamer Types:
  General Purpose – Superior performance over high speed steel and cobalt; good in a wide variety of materials
  Material Specific – Excellent in large production runs due to material specific carbide & tool geometry
  Coolant Fed – Exceptional performance and tool life using material specific reamer technology and coolant fed capabilities; maximizes feeds & speeds

TECHNICAL REAMING GUIDE INFORMATION PAGES 23-29
Contact us for a PDF copy of "HANNIBAL'S Guide to Cost Effective Reaming." It includes:

Reamer Expedite Fees: Order must be recieved by 2:00 PM CST
Does not apply to types 401, 403, 431, 441, 490, and EL Reamers
18 pieces max per diameter
Does NOT require air shipment of the product

Reamer Diameter	Service	Fee
Up to 1.0000"	24 Hour	75.00
Up to 1.0000"	48 Hour	50.00
Over 1.0000"	48 Hour	75.00
Over 1.0000"	72 Hour	50.00



REAMER SPECIFICATIONS

- Geometry and carbide grade appropriate for material being machined
- Carbide tips brazed to tough hardened alloy steel body, except expansion reamers which are not hardened
- Polished flutes for easy chip flow
- ASME/ANSI B94.2; NAS 897; USCTI
- Precision ground cutting edges
- "Taper Shank No." refers to American Standard taper series (formerly Morse taper series) per ASME/ANSI B5.10
- Material specific reamer shanks are ground to next smallest shank diameter listed in NAS 897 if tool diameter is within .005" of shank diameter
- Expansion reamers can be expanded for regrinding as follows:

Tool Diameter	Guaranteed Minimum Expansion
5/16" - 15/32"	.006"
1/2" - 31/32"	.010"
1" - 1 1/2"	.013"
1 9/16" - 2 1/2"	.015"

REAMER TOLERANCES

- Tool diameter tolerance:
  General purpose & **Coolant fed**
  Thru 1½" tool diameter: plus .0003", minus .0000"
  Over 1½" tool diameter: plus .0004", minus .0000"
  Material specific (excluding coolant fed)
  Thru ½" tool diameter: plus .0002", minus .0000"
  Over ½" tool diameter thru ¾": plus .0003", minus .0000"
  Over ¾" tool diameter: plus .0004", minus .0000"
- Closer tool diameter tolerance pricing per tool:

Standard Tolerance	Modified to Closer Tolerance		
	.0003"	.0002"	.0001"
.0004"	$1	$3	$5
.0003"	–	$1	$3
.0002"	–	–	$3

- Shank diameter tolerance:
  General purpose
  minus .0005", minus .0015"
  Material specific (NAS) & Coolant fed
  Thru 23/32" tool diameter: plus .0000", minus .0010"
  Over 23/32" tool diameter: plus .0000", minus .0015"

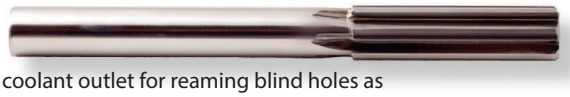
REAMERS INDEX AND COMPARISON CHART

DESCRIPTION	HANNIBAL FRAC. PAGE	HANNIBAL METRIC PAGE	HANNIBAL TOOL TYPE	CJT	CLEVELAND	FULLERTON	IMCO	MORSE	MAFORD
EXTENDED LENGTH REAMERS									
Straight Flutes – Flute Long Carbide	**35**	–	457EL/458EL/459EL	–	–	–	–	–	–
Right Spiral Flutes – Flute Long Carbide	**37**	–	442EL/443EL/444EL	–	–	–	–	–	–
Left Spiral Flutes - Flute Long Carbide	**39**	–	482EL/483EL/484EL	–	–	–	–	–	–
EXTENDED LENGTH REAMERS - COOLANT FED									
Straight Flutes – Flute Long Carbide	**36**	–	416EL/426EL/435EL	–	–	–	–	–	–
Right Spiral Flutes – Flute Long Carbide	**37**	–	411EL/413EL/415EL	–	–	–	–	–	–
Left Spiral Flutes - Flute Long Carbide	**40**	–	427EL/428EL/429EL	–	–	–	–	–	–
COOLANT FED REAMERS									
Straight Flutes – Center Fed	**90**	**91**	414/424/434	452	–	–	–	–	–
Straight Flutes – Flute Fed	**92**	**93**	416/426/435	452A	–	–	–	–	–
Right Spiral Flutes – Center Fed	**94**	–	411/413/415	453	–	–	–	–	–
Right Spiral Flutes – Flute Fed	**95**	–	417/418/419	453A	–	–	–	–	–
Left Spiral Flutes – Flute Fed	**96**	–	427/428/429	–	–	–	–	–	–
Metcut Type – Right Spiral Flutes	**97**	–	490	–	–	–	–	–	–
GENERAL PURPOSE CHUCKING REAMERS									
Stub Length – Straight Flutes	**42**	**43**	430	–	–	50SM	8200	5670	–
Stub Length – Left Spiral Flutes	**42**	**43**	440	–	4701	50SML	8250	5669	–
Jobbers Drill Length – Straight Flutes	**44**	–	401	–	–	–	–	–	–
Dowell Pin Sizes/Over & Under Sizes	**45**	–	477/479	–	–	–	–	–	–
Straight Flutes – Straight Shank	**46**	**52**	400	450	4703	50SS	8000	5655	–
Dowell Pin Sizes/Over & Under Sizes	**47**	–	476/478	450	–	–	8003/2	–	–
Wire & Letter Sizes	**45**	–	400	–	–	–	–	–	–
Stocked .0005" Increments	**48**	–	400	–	–	–	–	–	–
Straight Flutes – Taper Shank	**54**	**55**	402	–	–	50TS	8010	5656	–
Straight Flute Long Carbide – Straight Shank	**56**	**57**	450	480	–	50SF	8100	5659	–
Stocked .0005" Increments	**58**	–	450	–	–	–	–	–	–
Straight Flute Long Carbide – Taper Shank	**62**	**63**	452	–	–	–	8110	5660	–
Expansion Type – Straight Shank	**64**	**65**	465	490	–	50ES	8500	5733	–
Expansion Type – Taper Shank	**66**	**67**	467	495	–	50ET	8510	5734	–
Right Spiral Flutes – Straight Shank	**68**	**69**	410	470	–	50SR	8020	5653	–
Right Spiral Flutes – Taper Shank	**70**	–	412	–	–	–	8040	–	–
Left Spiral Flutes – Straight Shank	**68**	**69**	420	–	–	50SL	8030	5651	–
Left Spiral Flutes – Taper Shank	**70**	–	422	–	–	–	8050	–	–
Jobbers – Taper Shank	**41**	–	403	–	–	–	–	–	–
h6 SHANK REAMERS									
Straight Flutes - Center Fed	**31**	**31**	–	–	–	–	–	–	–
Straight Flutes - Flute Fed	**32**	**32**	–	–	–	–	–	–	–
Right Spiral Flutes - Center Fed	**33**	**33**	–	–	–	–	–	–	–
Left Spiral Flutes - Flute Fed	**34**	**34**	–	–	–	–	–	–	–
MATERIAL SPECIFIC CHUCKING REAMERS									
Stub Length – Straight Flutes	**88**	–	470/471/475	–	–	–	–	–	–
Straight Flutes & Shank – For Steels	**74**	**73**	480	–	–	–	–	–	–
Dowell Pin Sizes/Over & Under Sizes	**75**	–	486/488	–	–	–	–	–	–
Straight Flutes – Straight Shank	**76**	**77**	407/408/409	–	4703	–	–	–	–
Straight Flutes – Taper Shank	**80**	–	472/473/474	–	4715	–	–	–	–
Straight Flute Long Carbide – Straight Shank	**78**	**79**	457/458/459	–	–	–	–	–	–
Straight Flute Long Carbide – Taper Shank	**81**	–	453/454/455	–	–	–	–	–	–
Expansion Type – Straight Shank	**82**	–	464/466/468	–	704	–	–	–	–
Expansion Type – Taper Shank	**83**	–	461/462/463	–	716	–	–	–	–
Right Spiral Flutes – Straight Shank	**84**	–	432/436/438	–	4711	–	–	–	–
Right Spiral Flt Long Carbide – Straight Shank	**85**	–	442/443/444	–	–	–	–	–	–
Left Spiral Flutes – Straight Shank	**86**	–	433/437/439	–	4709	–	–	–	–
Left Spiral Flute Long Carbide – Straight Shank	**87**	–	482/483/484	–	–	–	–	–	–
PIPE TAP REAMERS									
Straight Shank	**41**	–	446	–	–	–	–	–	–
Taper Shank	**41**	–	447	–	–	–	–	–	–
SEMI-FINISHED REAMERS	**53**	–	7 Types	–	–	–	Many	Many	–
SHELL REAMERS									
Straight Flutes	**71**	–	431	–	–	–	–	5625	–
Left Spiral Flutes	**72**	–	441	–	–	–	–	–	–
Arbors – Straight Shank	**72**	–	481	–	–	–	–	505	–
Arbors – Taper Shank	**72**	–	481	–	–	–	–	506	–
SOLID CARBIDE REAMERS									
Straight Flutes (General Purpose)	**105**	**105**	804	–	1730	1400	9000	5661	272
Wire & Letter Sizes	**105**	–	804	–	–	1400	9000	–	272
Stocked .0005" Increments	**106**	–	804	–	–	–	–	–	272
Straight Flutes (Material Specific)	**104**	–	802/803	–	1730	1410	–	–	272
Right Spiral Flutes (Material Specific)	**104**	–	812/813	–	1711	1410R	–	–	–
Left Spiral Flutes (Material Specific)	**104**	–	822/823	–	–	1410L	–	–	272L
SOLID CARBIDE COOLANT FED REAMERS									
Straight Flutes (Material Specific)	**102**	–	806/807	–	–	–	–	–	–
Right Spiral Flutes (Material Specific)	**103**	–	816/817	–	–	–	–	–	–
Left Spiral Flutes (Material Specific)	**103**	–	828/829	–	–	–	–	–	–
SOLID CARBIDE HEAD REAMERS									
Straight Flutes – Steel Shank	**110**	–	800/801	–	–	1450	9500	–	–
Right Spiral Flutes – Steel Shank	**111**	–	810/811	–	–	1450R	–	–	–
Left Spiral Flutes – Steel Shank	**111**	–	820/821	–	–	1450L	–	–	–
STEP REAMERS									
Straight Flute Long Carbide	**98**	–	457/458/459 Step	–	–	–	–	–	–
Right Spiral Flute Long Carbide	**99**	–	442/443/444 Step	–	–	–	–	–	–
Left Spiral Flute Long Carbide	**100**	–	482/483/484 Step	–	–	–	–	–	–

PRECISION h6 SHANK REAMERS CARBIDE TIPPED TYPES 414h6, 424h6, 434h6 FRACTIONAL & METRIC

MATERIAL SPECIFIC COOLANT FED

CENTER FED FOR BLIND HOLES STRAIGHT FLUTES & SHANK



TYPE 414h6 - FOR NON-FERROUS MATERIALS
TYPE 424h6 - FOR CAST IRONS & MULTI-PURPOSE
TYPE 434h6 - FOR STEELS & HIGH TEMP ALLOYS

• Center coolant outlet • Polished flutes • Flute long carbide

USE:

- Center coolant outlet for reaming blind holes as chips are flushed ***back*** towards the shank
- Improves hole finish and permits higher feeds & speeds with longer tool life
- Use Tool Selector on page 90 to determine appropriate type

TOOL DIAMETER RANGE	TYPE 414h6 NON FERROUS EDP NO.	TYPE 424h6 CAST IRON EDP NO.	TYPE 434h6 STEEL/ HI-TEMP EDP NO.	DIMENSIONS				FINISHED TO MODIFIED TOOL DIAMETER PRICE EACH - BASED ON QUANTITY ORDERED					
				MAX. SHANK DIAM.	NO. OF FLTS	LENGTH FLT	LENGTH OVER-ALL	1	2	3	4	5-7	8-14*
0.3471 - 0.3780	41412h6	42412h6	43412h6	.3125	4	1 ¾	5	$201.35	$179.60	$172.40	$168.90	$165.15	$162.30
0.3781 - 0.4090	41413h6	42413h6	43413h6	.3125	4	1 ¾	5	201.75	180.20	172.95	169.45	165.80	162.75
0.4091 - 0.4410	41414h6	42414h6	43414h6	.3750	6	1 ¾	5	203.45	181.75	174.50	171.10	167.25	164.45
0.4411 - 0.4720	41415h6	42415h6	43415h6	.3750	6	1 ¾	5	204.85	183.15	175.90	172.45	168.70	165.85
0.4721 - 0.5030	41416h6	42416h6	43416h6	.4375	6	2	6	206.70	185.00	177.80	174.35	170.60	167.70
0.5031 - 0.5340	41417h6	42417h6	43417h6	.4375	6	2	6	210.30	188.55	181.40	177.95	174.25	171.30
0.5341 - 0.5660	41418h6	42418h6	43418h6	.4375	6	2	6	212.75	191.05	183.80	180.35	176.65	173.70
0.5661 - 0.5970	41419h6	42419h6	43419h6	.4375	6	2	6	216.25	194.55	187.25	183.90	180.20	177.25
0.5971 - 0.6280	41420h6	42420h6	43420h6	.5625	6	2 ¼	6	219.55	197.85	190.60	187.15	183.45	180.50
0.6281 - 0.6590	41421h6	42421h6	43421h6	.5625	6	2 ¼	6	238.40	216.70	209.40	206.05	202.30	199.40
0.6591 - 0.6910	41422h6	42422h6	43422h6	.5625	6	2 ¼	6	242.35	220.70	213.45	210.05	206.20	203.35
0.6911 - 0.7220	41423h6	42423h6	43423h6	.5625	6	2 ¼	6	250.90	229.30	222.05	218.55	214.85	211.90
0.7221 - 0.7530	41424h6	42424h6	43424h6	.6250	6	2 ½	6	250.90	229.30	222.05	218.55	214.85	211.90
0.7531 - 0.7840	41425h6	42425h6	43425h6	.6250	6	2 ½	6	257.10	235.45	228.15	224.70	221.00	218.05
0.7841 - 0.8160	41426h6	42426h6	43426h6	.6250	6	2 ½	6	257.10	235.45	228.15	224.70	221.00	218.05
0.8161 - 0.8470	41427h6	42427h6	43427h6	.6250	6	2 ½	6	264.40	242.70	235.50	232.00	228.25	225.30
0.8471 - 0.8780	41428h6	42428h6	43428h6	.7500	6	2 ⅝	6	272.95	251.25	244.00	240.55	236.85	233.90
0.8781 - 0.9090	41429h6	42429h6	43429h6	.7500	6	2 ⅝	6	298.35	276.65	269.40	265.95	262.25	259.30
0.9091 - 0.9410	41430h6	42430h6	43430h6	.7500	8	2 ⅝	6	298.35	276.65	269.40	265.95	262.25	259.30
0.9411 - 0.9720	41431h6	42431h6	43431h6	.7500	8	2 ⅝	6	299.30	277.55	270.35	266.90	263.15	260.25
0.9721 - 1.0030	41432h6	42432h6	43432h6	.8750	8	2 ¾	6	299.30	277.55	270.35	266.90	263.15	260.25

CENTER FED FOR BLIND HOLES STRAIGHT FLUTES & SHANK

TYPE 414h6 - FOR NON-FERROUS MATERIALS - METRIC
TYPE 424h6 - FOR CAST IRONS & MULTI-PURPOSE - METRIC
TYPE 434h6 - FOR STEELS & HIGH TEMP ALLOYS - METRIC

• Center coolant outlet • Polished flutes • Flute long carbide

MODIFICATIONS

MATERIAL SPECIFIC COOLANT FED

- Cut off
- End chamfer other than 45°
- End cutting or corner radius
- Increased/Decreased back taper
- Closer tool diameter tolerance (.0001")
- Cutting diameter reduced for step or pilot (Some modifications may affect the TIR)

TOOL DIAMETER RANGE	TYPE 414h6 NON FERROUS EDP NO.	TYPE 424h6 CAST IRON EDP NO.	TYPE 434h6 STEEL/ HI-TEMP EDP NO.	DIMENSIONS				FINISHED TO MODIFIED TOOL DIAMETER PRICE EACH - BASED ON QUANTITY ORDERED					
				MAX. SHANK DIAM. (mm)	NO. OF FLTS	LENGTH FLT (mm)	LENGTH OVER-ALL (mm)	1	2	3	4	5-7	8-14*
8.815 - 9.601	414095h6	424095h6	434095h6	8	4	45	127	$204.95	$183.35	$176.05	$172.50	$168.90	$165.90
9.602 - 10.389	414100h6	424100h6	434100h6	8	4	45	127	205.45	183.90	176.65	173.10	169.45	166.40
10.390 - 11.201	414110h6	424110h6	434110h6	10	6	45	127	207.00	185.50	178.25	174.70	171.10	168.05
11.202 - 12.000	414120h6	424120h6	434120h6	10	6	45	127	208.45	186.90	179.60	176.05	172.45	169.45
12.001 - 12.875	414125h6	424125h6	434125h6	10	6	51	153	210.30	188.85	181.45	177.95	174.35	171.30
12.876 - 13.565	414135h6	424135h6	434135h6	12	6	51	153	213.95	192.45	185.10	181.60	177.95	174.90
13.566 - 14.376	414140h6	424140h6	434140h6	12	6	51	153	216.35	194.70	187.50	183.95	180.35	177.30
14.377 - 15.164	414150h6	424150h6	434150h6	12	6	51	153	219.90	198.25	191.05	187.50	183.90	180.85
15.165 - 16.100	414160h6	424160h6	434160h6	14	6	57	153	223.15	201.60	194.30	190.75	187.15	184.10
16.101 - 16.740	414165h6	424165h6	434165h6	14	6	57	153	242.00	220.35	213.15	209.65	206.05	203.00
16.741 - 17.551	414175h6	424175h6	434175h6	14	6	57	153	245.95	224.45	217.20	213.65	210.05	206.95
17.552 - 18.340	414180h6	424180h6	434180h6	14	6	57	153	254.55	233.05	225.75	222.25	218.55	215.55
18.341 - 19.250	414190h6	424190h6	434190h6	16	6	64	153	254.55	233.05	225.75	222.25	218.55	215.55
19.251 - 20.126	414200h6	424200h6	434200h6	16	6	64	153	256.65	234.90	227.70	224.20	220.50	217.50
20.127 - 21.127	414210h6	424210h6	434210h6	16	6	64	153	263.90	242.20	234.95	231.50	227.80	224.85
21.128 - 22.127	414220h6	424220h6	434220h6	20	6	64	153	263.90	242.20	234.95	231.50	227.80	224.85
22.128 - 23.127	414230h6	424230h6	434230h6	20	6	67	153	297.75	276.00	268.80	265.30	261.60	258.65
23.128 - 24.127	414240h6	424240h6	434240h6	20	8	67	153	298.70	277.05	269.75	266.30	262.60	259.65
24.128 - 25.127	414250h6	424250h6	434250h6	20	8	70	153	298.70	277.05	269.75	266.30	262.60	259.65

*Quantities of 15 or more - Contact Hannibal Specials Dept.

PRECISION h6 SHANK REAMERS CARBIDE TIPPED TYPES 416h6, 426h6, 435h6 FRACTIONAL & METRIC

MATERIAL SPECIFIC · COOLANT FED

FLUTE FED FOR THRU HOLES STRAIGHT FLUTES & SHANK

TYPE 416h6 - FOR NON-FERROUS MATERIALS
TYPE 426h6 - FOR CAST IRONS & MULTI-PURPOSE
TYPE 435h6 - FOR STEELS & HIGH TEMP ALLOYS

• Coolant outlets in each flute • Polished flutes • Flute long carbide

USE:

- Flute coolant outlets for reaming thru holes as chips are flushed ***forward*** through the hole being reamed
- Improves hole finish and permits higher feeds & speeds with longer tool life
- Use Tool Selector on page 92 to determine appropriate type

TOOL DIAMETER RANGE	TYPE 416h6 NON FERROUS EDP NO.	TYPE 426h6 CAST IRON EDP NO.	TYPE 435h6 STEEL/ HI-TEMP EDP NO.	DIMENSIONS MAX. SHANK DIAM.	NO. OF FLTS	LENGTH FLT	LENGTH OVER-ALL	FINISHED TO MODIFIED TOOL DIAMETER PRICE EACH - BASED ON QUANTITY ORDERED 1	2	3	4	5-7	8-14*
0.3471 - 0.3780	41612h6	42612h6	43512h6	.3125	4	1 ¾	5	$202.70	$181.05	$173.80	$170.35	$166.70	$163.65
0.3781 - 0.4090	41613h6	42613h6	43513h6	.3125	4	1 ¾	5	206.70	185.00	177.80	174.35	170.60	167.70
0.4091 - 0.4410	41614h6	42614h6	43514h6	.3750	6	1 ¾	5	210.60	189.00	181.75	178.30	174.65	171.65
0.4411 - 0.4720	41615h6	42615h6	43515h6	.3750	6	1 ¾	5	210.60	189.00	181.75	178.30	174.65	171.65
0.4721 - 0.5030	41616h6	42616h6	43516h6	.4375	6	2	6	210.60	189.00	181.75	178.30	174.65	171.65
0.5031 - 0.5340	41617h6	42617h6	43517h6	.4375	6	2	6	220.30	198.65	191.45	188.00	184.25	181.35
0.5341 - 0.5660	41618h6	42618h6	43518h6	.4375	6	2	6	222.80	201.20	193.85	190.40	186.70	183.80
0.5661 - 0.5970	41619h6	42619h6	43519h6	.4375	6	2	6	224.50	202.80	195.55	192.05	188.35	185.50
0.5971 - 0.6280	41620h6	42620h6	43520h6	.5625	6	2 ¼	6	224.50	202.80	195.55	192.05	188.35	185.50
0.6281 - 0.6590	41621h6	42621h6	43521h6	.5625	6	2 ¼	6	244.15	222.50	215.15	211.75	208.00	205.10
0.6591 - 0.6910	41622h6	42622h6	43522h6	.5625	6	2 ¼	6	244.15	222.50	215.15	211.75	208.00	205.10
0.6911 - 0.7220	41623h6	42623h6	43523h6	.5625	6	2 ¼	6	257.95	236.20	229.00	225.60	221.75	218.95
0.7221 - 0.7530	41624h6	42624h6	43524h6	.6250	6	2 ½	6	257.95	236.20	229.00	225.60	221.75	218.95
0.7531 - 0.7840	41625h6	42625h6	43525h6	.6250	6	2 ½	6	258.85	237.10	229.90	226.40	222.70	219.75
0.7841 - 0.8160	41626h6	42626h6	43526h6	.6250	6	2 ½	6	258.85	237.10	229.90	226.40	222.70	219.75
0.8161 - 0.8470	41627h6	42627h6	43527h6	.6250	6	2 ½	6	265.25	243.60	236.35	232.90	229.15	226.20
0.8471 - 0.8780	41628h6	42628h6	43528h6	.7500	6	2 ⅝	6	273.85	252.15	244.90	241.45	237.75	234.80
0.8781 - 0.9090	41629h6	42629h6	43529h6	.7500	6	2 ⅝	6	302.25	280.55	273.30	269.80	266.10	263.15
0.9091 - 0.9410	41630h6	42630h6	43530h6	.7500	8	2 ⅝	6	308.20	286.45	279.25	275.80	272.05	269.15
0.9411 - 0.9720	41631h6	42631h6	43531h6	.7500	8	2 ⅝	6	308.20	286.45	279.25	275.80	272.05	269.15
0.9721 - 1.0030	41632h6	42632h6	43532h6	.8750	8	2 ¾	6	308.20	286.45	279.25	275.80	272.05	269.15

FLUTE FED FOR THRU HOLES STRAIGHT FLUTES & SHANK

TYPE 416h6 - FOR NON-FERROUS MATERIALS - METRIC
TYPE 426h6 - FOR CAST IRONS & MULTI-PURPOSE - METRIC
TYPE 435h6 - FOR STEELS & HIGH TEMP ALLOYS - METRIC

• Coolant outlets in each flute • Polished flutes • Flute long carbide

MODIFICATIONS

MATERIAL SPECIFIC · COOLANT FED

- Cut off
- End chamfer other than 45°
- End cutting or corner radius
- Increased/Decreased back taper
- Closer tool diameter tolerance (.0001")
- Cutting diameter reduced for step or pilot (Some modifications may affect the TIR)

TOOL DIAMETER RANGE	TYPE 416h6 NON FERROUS EDP NO.	TYPE 426h6 CAST IRON EDP NO.	TYPE 435h6 STEEL/ HI-TEMP EDP NO.	DIMENSIONS MAX. SHANK DIAM. (mm)	NO. OF FLTS	LENGTH FLT (mm)	LENGTH OVER-ALL (mm)	FINISHED TO MODIFIED TOOL DIAMETER PRICE EACH - BASED ON QUANTITY ORDERED 1	2	3	4	5-7	8-14*
8.815 - 9.601	416095h6	426095h6	435095h6	8	4	45	127	$206.35	$184.75	$177.45	$173.95	$170.35	$167.25
9.602 - 10.389	416100h6	426100h6	435100h6	8	4	45	127	210.30	188.85	181.45	177.95	174.35	171.30
10.390 - 11.201	416110h6	426110h6	435110h6	10	6	45	127	214.25	192.75	185.50	181.90	178.30	175.30
11.202 - 12.000	416120h6	426120h6	435120h6	10	6	45	127	214.25	192.75	185.50	181.90	178.30	175.30
12.001 - 12.875	416125h6	426125h6	435125h6	10	6	51	153	214.25	192.75	185.50	181.90	178.30	175.30
12.876 - 13.565	416135h6	426135h6	435135h6	12	6	51	153	223.90	202.35	195.10	191.60	188.00	184.90
13.566 - 14.376	416140h6	426140h6	435140h6	12	6	51	153	226.40	204.85	197.65	194.10	190.40	187.45
14.377 - 15.164	416150h6	426150h6	435150h6	12	6	51	153	228.15	206.55	199.25	195.70	192.05	189.10
15.165 - 16.100	416160h6	426160h6	435160h6	14	6	57	153	228.15	206.55	199.25	195.70	192.05	189.10
16.101 - 16.740	416165h6	426165h6	435165h6	14	6	57	153	247.85	226.15	218.95	215.40	211.75	208.75
16.741 - 17.551	416175h6	426175h6	435175h6	14	6	57	153	247.85	226.15	218.95	215.40	211.75	208.75
17.552 - 18.340	416180h6	426180h6	435180h6	14	6	57	153	261.55	239.95	232.65	229.15	225.60	222.55
18.341 - 19.250	416190h6	426190h6	435190h6	16	6	64	153	261.55	239.95	232.65	229.15	225.60	222.55
19.251 - 20.126	416200h6	426200h6	435200h6	16	6	64	153	258.40	236.70	229.45	226.00	222.30	219.30
20.127 - 21.127	416210h6	426210h6	435210h6	16	6	64	153	264.80	243.05	235.85	232.40	228.65	225.75
21.128 - 22.127	416220h6	426220h6	435220h6	20	6	64	153	264.80	243.05	235.85	232.40	228.65	225.75
22.128 - 23.127	416230h6	426230h6	435230h6	20	6	67	153	301.70	280.00	272.75	269.30	265.60	262.60
23.128 - 24.127	416240h6	426240h6	435240h6	20	8	67	153	307.65	286.00	278.75	275.30	271.55	268.60
24.128 - 25.127	416250h6	426250h6	435250h6	20	8	70	153	307.65	286.00	278.75	275.30	271.55	268.60

*Quantities of 15 or more - Contact Hannibal Specials Dept.

PRECISION h6 SHANK REAMERS CARBIDE TIPPED TYPES 411h6, 413h6, 415h6 FRACTIONAL & METRIC

MATERIAL SPECIFIC COOLANT FED

CENTER FED FOR BLIND HOLES RIGHT SPIRAL FLUTES

TYPE 411h6 - FOR NON-FERROUS MATERIALS
TYPE 413h6 - FOR CAST IRONS & MULTI-PURPOSE
TYPE 415h6 - FOR STEELS & HIGH TEMP ALLOYS

• Center coolant outlet • Polished flutes • Flute long carbide

USE:

- Center coolant outlet for reaming blind holes as chips are flushed ***back*** towards the shank
- Improves hole finish and permits higher feeds & speeds with longer tool life
- Use Tool Selector on page 94 to determine appropriate type

TOOL DIAMETER RANGE	TYPE 411h6 NON FERROUS EDP NO.	TYPE 413h6 CAST IRON EDP NO.	TYPE 415h6 STEEL/ HI-TEMP EDP NO.	DIMENSIONS				FINISHED TO MODIFIED TOOL DIAMETER PRICE EACH - BASED ON QUANTITY ORDERED					
				MAX. SHANK DIAM.	NO. OF FLTS	LENGTH FLT	LENGTH OVER-ALL	1	2	3	4	5-7	8-14*
0.3471 0.3780	41112h6	41312h6	41512h6	.3125	4	1 ¾	5	$205.30	$183.65	$176.40	$172.95	$169.25	$166.25
0.3781 0.4090	41113h6	41313h6	41513h6	.3125	4	1 ¾	5	205.80	184.05	176.85	173.40	169.65	166.75
0.4091 0.4410	41114h6	41314h6	41514h6	.3750	6	1 ¾	5	207.45	185.75	178.50	175.05	171.35	168.40
0.4411 0.4720	41115h6	41315h6	41515h6	.3750	6	1 ¾	5	209.00	187.25	180.05	176.60	172.85	169.90
0.4721 0.5030	41116h6	41316h6	41516h6	.4375	6	2	6	215.50	193.75	186.55	183.05	179.35	176.40
0.5031 0.5340	41117h6	41317h6	41517h6	.4375	6	2	6	221.75	200.10	192.80	189.35	185.65	182.70
0.5341 0.5660	41118h6	41318h6	41518h6	.4375	6	2	6	221.75	200.10	192.80	189.35	185.65	182.70
0.5661 0.5970	41119h6	41319h6	41519h6	.4375	6	2	6	228.85	207.10	199.90	196.40	192.70	189.75
0.5971 0.6280	41120h6	41320h6	41520h6	.5625	6	2 ¼	6	228.85	207.10	199.90	196.40	192.70	189.75
0.6281 0.6590	41121h6	41321h6	41521h6	.5625	6	2 ¼	6	252.90	231.25	224.00	220.55	216.80	213.85
0.6591 0.6910	41122h6	41322h6	41522h6	.5625	6	2 ¼	6	252.90	231.25	224.00	220.55	216.80	213.85
0.6911 0.7220	41123h6	41323h6	41523h6	.5625	6	2 ¼	6	262.00	240.30	233.05	229.60	225.90	222.90
0.7221 0.7530	41124h6	41324h6	41524h6	.6250	6	2 ½	6	248.45	226.80	219.55	216.10	212.35	209.40
0.7531 0.7840	41125h6	41325h6	41525h6	.6250	6	2 ½	6	279.00	257.25	250.05	246.60	242.85	239.95
0.7841 0.8160	41126h6	41326h6	41526h6	.6250	6	2 ½	6	281.95	260.30	253.00	249.60	245.85	242.90
0.8161 0.8470	41127h6	41327h6	41527h6	.6250	6	2 ½	6	286.40	264.75	257.45	254.05	250.30	247.35
0.8471 0.8780	41128h6	41328h6	41528h6	.7500	6	2 ⅝	6	299.70	278.05	270.80	267.35	263.60	260.65
0.8781 0.9090	41129h6	41329h6	41529h6	.7500	6	2 ⅝	6	315.00	293.30	286.05	282.60	278.90	275.90
0.9091 0.9410	41130h6	41330h6	41530h6	.7500	8	2 ⅝	6	327.90	306.20	298.95	295.55	291.75	288.85
0.9411 0.9720	41131h6	41331h6	41531h6	.7500	8	2 ⅝	6	328.75	307.10	299.80	296.40	292.65	289.70
0.9721 1.0030	41132h6	41332h6	41532h6	.8750	8	2 ¾	6	329.25	307.50	300.30	296.85	293.10	290.20

CENTER FED FOR BLIND HOLES RIGHT SPIRAL FLUTES STRAIGHT SHANK

TYPE 411h6 - FOR NON-FERROUS MATERIALS - METRIC
TYPE 413h6 - FOR CAST IRONS & MULTI-PURPOSE - METRIC
TYPE 415h6 - FOR STEELS & HIGH TEMP ALLOYS - METRIC

• Center coolant outlet • Polished flutes • Flute long carbide

MODIFICATIONS

MATERIAL SPECIFIC COOLANT FED

- Cut off
- End chamfer other than 45°
- End cutting or corner radius
- Increased/Decreased back taper
- Closer tool diameter tolerance (.0001")
- Cutting diameter reduced for step or pilot (Some modifications may affect the TIR)

TOOL DIAMETER RANGE	TYPE 411h6 NON FERROUS EDP NO.	TYPE 413h6 CAST IRON EDP NO.	TYPE 415h6 STEEL/ HI-TEMP EDP NO.	DIMENSIONS				FINISHED TO MODIFIED TOOL DIAMETER PRICE EACH - BASED ON QUANTITY ORDERED					
				MAX. SHANK DIAM. (mm)	NO. OF FLTS	LENGTH FLT (mm)	LENGTH OVER-ALL (mm)	1	2	3	4	5-7	8-14*
8.815 - 9.601	411095h6	413095h6	415095h6	8	4	45	127	$205.30	$183.65	$176.40	$172.95	$169.25	$166.25
9.602 - 10.389	411100h6	413100h6	415100h6	8	4	45	127	205.80	184.05	176.85	173.40	169.65	166.75
10.390 - 11.201	411110h6	413110h6	415110h6	10	6	45	127	207.45	185.75	178.50	175.05	171.35	168.40
11.202 - 12.000	411120h6	413120h6	415120h6	10	6	45	127	215.50	193.75	186.55	183.05	179.35	176.40
12.001 - 12.875	411125h6	413125h6	415125h6	10	6	51	153	221.75	200.10	192.80	189.35	185.65	182.70
12.876 - 13.565	411135h6	413135h6	415135h6	12	6	51	153	221.75	200.10	192.80	189.35	185.65	182.70
13.566 - 14.376	411140h6	413140h6	415140h6	12	6	51	153	221.75	200.10	192.80	189.35	185.65	182.70
14.377 - 15.164	411150h6	413150h6	415150h6	12	6	51	153	228.85	207.10	199.90	196.40	192.70	189.75
15.165 - 16.100	411160h6	413160h6	415160h6	14	6	57	153	252.90	231.25	224.00	220.55	216.80	213.85
16.101 - 16.740	411165h6	413165h6	415165h6	14	6	57	153	252.90	231.25	224.00	220.55	216.80	213.85
16.741 - 17.551	411175h6	413175h6	415175h6	14	6	57	153	252.90	231.25	224.00	220.55	216.80	213.85
17.552 - 18.340	411180h6	413180h6	415180h6	14	6	57	153	262.00	240.30	233.05	229.60	225.90	222.90
18.341 - 19.250	411190h6	413190h6	415190h6	16	6	64	153	279.00	257.25	250.05	246.60	242.85	239.95
19.251 - 20.126	411200h6	413200h6	415200h6	16	6	64	153	281.95	260.30	253.00	249.60	245.85	242.90
20.127 - 21.127	411210h6	413210h6	415210h6	16	6	64	153	286.40	264.75	257.45	254.05	250.30	247.35
21.128 - 22.127	411220h6	413220h6	415220h6	20	6	64	153	299.70	278.05	270.80	267.35	263.60	260.65
22.128 - 23.127	411230h6	413230h6	415230h6	20	6	67	153	327.90	306.20	298.95	295.55	291.75	288.85
23.128 - 24.127	411240h6	413240h6	415240h6	20	8	67	153	328.75	307.10	299.80	296.40	292.65	289.70
24.128 - 25.127	411250h6	413250h6	415250h6	20	8	70	153	329.25	307.50	300.30	296.85	293.10	290.20

*Quantities of 15 or more - Contact Hannibal Specials Dept.

PRECISION h6 SHANK REAMERS CARBIDE TIPPED TYPES 427h6, 428h6, 429h6 FRACTIONAL & METRIC

MATERIAL SPECIFIC COOLANT FED

FLUTE FED FOR THRU HOLES LEFT SPIRAL FLUTES

TYPE 427h6 - FOR NON-FERROUS MATERIALS
TYPE 428h6 - FOR CAST IRONS & MULTI-PURPOSE
TYPE 429h6 - FOR STEELS & HIGH TEMP ALLOYS

• Coolant outlets in each flute • Polished flutes • Flute long carbide

USE:

- Flute coolant outlets for reaming thru holes as chips are flushed ***forward*** through the hole being reamed
- Improves hole finish and permits higher feeds & speeds with longer tool life
- Use Tool Selector on page 96 to determine appropriate type

TOOL DIAMETER RANGE	TYPE 427h6 NON FERROUS EDP NO.	TYPE 428h6 CAST IRON EDP NO.	TYPE 429h6 STEEL/ HI-TEMP EDP NO.	DIMENSIONS				FINISHED TO MODIFIED TOOL DIAMETER PRICE EACH - BASED ON QUANTITY ORDERED					
				MAX. SHANK DIAM.	NO. OF FLTS	LENGTH FLT	LENGTH OVER-ALL	1	2	3	4	5-7	8-14*
0.3471 - 0.3780	42712h6	42812h6	42912h6	.3125	4	1 ¾	5	$244.35	$222.60	$215.40	$211.90	$208.20	$205.20
0.3781 - 0.4090	42713h6	42813h6	42913h6	.3125	4	1 ¾	5	245.10	223.45	216.20	212.75	209.05	206.05
0.4091 - 0.4410	42714h6	42814h6	42914h6	.3750	6	1 ¾	5	247.00	225.25	218.05	214.60	210.85	207.90
0.4411 - 0.4720	42715h6	42815h6	42915h6	.3750	6	1 ¾	5	248.85	227.10	219.90	216.40	212.70	209.70
0.4721 - 0.5030	42716h6	42816h6	42916h6	.4375	6	2	6	251.45	229.70	222.50	219.05	215.30	212.35
0.5031 - 0.5340	42717h6	42817h6	42917h6	.4375	6	2	6	255.80	234.05	226.85	223.40	219.65	216.70
0.5341 - 0.5660	42718h6	42818h6	42918h6	.4375	6	2	6	258.90	237.20	229.95	226.50	222.75	219.85
0.5661 - 0.5970	42719h6	42819h6	42919h6	.4375	6	2	6	263.40	241.70	234.45	231.05	227.25	224.35
0.5971 - 0.6280	42720h6	42820h6	42920h6	.5625	6	2 ¼	6	267.45	245.75	238.50	235.05	231.35	228.40
0.6281 - 0.6590	42721h6	42821h6	42921h6	.5625	6	2 ¼	6	291.50	269.75	262.55	259.10	255.35	252.45
0.6591 - 0.6910	42722h6	42822h6	42922h6	.5625	6	2 ¼	6	296.60	274.90	267.65	264.20	260.50	257.55
0.6911 - 0.7220	42723h6	42823h6	42923h6	.5625	6	2 ¼	6	301.95	280.25	273.00	269.55	265.85	262.90
0.7221 - 0.7530	42724h6	42824h6	42924h6	.6250	6	2 ½	6	307.45	285.80	278.50	275.05	271.35	268.40
0.7531 - 0.7840	42725h6	42825h6	42925h6	.6250	6	2 ½	6	311.95	290.30	283.00	279.60	275.85	272.90
0.7841 - 0.8160	42726h6	42826h6	42926h6	.6250	6	2 ½	6	315.25	293.55	286.30	282.85	279.15	276.20
0.8161 - 0.8470	42727h6	42827h6	42927h6	.6250	6	2 ½	6	320.15	298.45	291.25	287.80	284.05	281.10
0.8471 - 0.8780	42728h6	42828h6	42928h6	.7500	6	2 ⅝	6	335.35	313.65	306.40	302.95	299.25	296.25
0.8781 - 0.9090	42729h6	42829h6	42929h6	.7500	6	2 ⅝	6	352.60	330.90	323.65	320.25	316.45	313.55
0.9091 - 0.9410	42730h6	42830h6	42930h6	.7500	8	2 ⅝	6	367.60	345.95	338.65	335.20	331.50	328.55
0.9411 - 0.9720	42731h6	42831h6	42931h6	.7500	8	2 ⅝	6	368.40	346.75	339.45	336.00	332.30	329.35
0.9721 - 1.0030	42732h6	42832h6	42932h6	.8750	8	2 ¾	6	368.85	347.15	339.90	336.45	332.75	329.75

FLUTE FED FOR THRU HOLES LEFT SPIRAL FLUTES STRAIGHT SHANK

TYPE 427h6 - FOR NON-FERROUS MATERIALS - METRIC
TYPE 428h6 - FOR CAST IRONS & MULTI-PURPOSE - METRIC
TYPE 429h6 - FOR STEELS & HIGH TEMP ALLOYS - METRIC

• Coolant outlets in each flute • Polished flutes • Flute long carbide

MODIFICATIONS

- Cut off
- End chamfer other than 45°
- End cutting or corner radius
- Increased/Decreased back taper
- Closer tool diameter tolerance (.0001")
- Cutting diameter reduced for step or pilot (Some modifications may affect the TIR)

MATERIAL SPECIFIC COOLANT FED

TOOL DIAMETER RANGE	TYPE 427h6 NON FERROUS EDP NO.	TYPE 428h6 CAST IRON EDP NO.	TYPE 429h6 STEEL/ HI-TEMP EDP NO.	DIMENSIONS				FINISHED TO MODIFIED TOOL DIAMETER PRICE EACH - BASED ON QUANTITY ORDERED					
				MAX. SHANK DIAM. (mm)	NO. OF FLTS	LENGTH FLT (mm)	LENGTH OVER-ALL (mm)	1	2	3	4	5-7	8-14*
8.815 - 9.601	427095h6	428095h6	429095h6	8	4	45	127	$244.35	$222.60	$215.40	$211.90	$208.20	$205.20
9.602 - 10.389	427100h6	428100h6	429100h6	8	4	45	127	245.10	223.45	216.20	212.75	209.05	206.05
10.390 - 11.201	427110h6	428110h6	429110h6	10	6	45	127	247.00	225.25	218.05	214.60	210.85	207.90
11.202 - 12.000	427120h6	428120h6	429120h6	10	6	45	127	251.45	229.70	222.50	219.05	215.30	212.35
12.001 - 12.875	427125h6	428125h6	429125h6	10	6	51	153	255.80	234.05	226.85	223.40	219.65	216.70
12.876 - 13.565	427135h6	428135h6	429135h6	12	6	51	153	258.90	237.20	229.95	226.50	222.75	219.85
13.566 - 14.376	427140h6	428140h6	429140h6	12	6	51	153	258.90	237.20	229.95	226.50	222.75	219.85
14.377 - 15.164	427150h6	428150h6	429150h6	12	6	51	153	263.40	241.70	234.45	231.05	227.25	224.35
15.165 - 16.100	427160h6	428160h6	429160h6	14	6	57	153	291.50	269.75	262.55	259.10	255.35	252.45
16.101 - 16.740	427165h6	428165h6	429165h6	14	6	57	153	296.60	274.90	267.65	264.20	260.50	257.55
16.741 - 17.551	427175h6	428175h6	429175h6	14	6	57	153	296.60	274.90	267.65	264.20	260.50	257.55
17.552 - 18.340	427180h6	428180h6	429180h6	14	6	57	153	301.95	280.25	273.00	269.55	265.85	262.90
18.341 - 19.250	427190h6	428190h6	429190h6	16	6	64	153	311.95	290.30	283.00	279.60	275.85	272.90
19.251 - 20.126	427200h6	428200h6	429200h6	16	6	64	153	315.25	293.55	286.30	282.85	279.15	276.20
20.127 - 21.127	427210h6	428210h6	429210h6	16	6	64	153	320.15	298.45	291.25	287.80	284.05	281.10
21.128 - 22.127	427220h6	428220h6	429220h6	20	6	64	153	335.35	313.65	306.40	302.95	299.25	296.25
22.128 - 23.127	427230h6	428230h6	429230h6	20	6	67	153	367.60	345.95	338.65	335.20	331.50	328.55
23.128 - 24.127	427240h6	428240h6	429240h6	20	8	67	153	368.40	346.75	339.45	336.00	332.30	329.35
24.128 - 25.127	427250h6	428250h6	429250h6	20	8	70	153	368.85	347.15	339.90	336.45	332.75	329.75

*Quantities of 15 or more - Contact Hannibal Specials Dept.

EXTENDED LENGTH REAMERS
CARBIDE TIPPED TYPES 457EL, 458EL, 459EL

MATERIAL SPECIFIC

STRAIGHT FLUTE LONG CARBIDE

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	457EL
	40	NON-FERROUS - SHORT CHIPS	457EL
	60	CAST IRONS	458EL
	80	LOW STRENGTH STEELS	459EL
	100	MEDIUM STRENGTH STEELS	459EL
	120	HIGH STRENGTH STEELS	459EL
	140	HIGH TEMPERATURE ALLOYS	459EL

TYPE 457EL - FOR NON-FERROUS MATERIALS
TYPE 458EL - FOR CAST IRONS & NAS MULTI-PURPOSE
TYPE 459EL - FOR STEELS & HIGH TEMP ALLOYS

- Extended length versions of types 457, 458, and 459 found on page 78
- All extended length reamers provided with controlled shank
- Must specify overall length when ordering (centers supplied only at maximum overall length)

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Closer tool diameter tolerance - pg. 29
- Cutting diam. reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diam. back taper
- Shortened shank or reduced shank diameter
- Flat(s) or tang on shank
- Coatings available:

TITANIUM NITRIDE – TiN
TITANIUM CARBONITRIDE – TiCN
ZIRCONIUM NITRIDE – ZrN
AL TITANIUM NITRIDE – AlTiN

REAMERS

TOOL DIAMETER RANGE	TYPE 457EL NON FERROUS EDP NO.	TYPE 458EL CAST IRON EDP NO.	TYPE 459EL STEEL/ HI-TEMP EDP NO.	DIMENSIONS MAX. SHANK DIAM.	NO. OF FLTS	LENGTH FLT	LENGTH OVERALL RANGE	FINISHED TO MODIFIED TOOL DIAMETER PRICE EACH - BASED ON QUANTITY ORDERED 1	2	3	4	5-7	8-14**
* 0.1121-0.1280	45704EL	45804EL	45904EL	.1099	4	1 ½	2 9/32 -6	$232.60	$203.70	$194.00	$189.40	$184.50	$180.55
* 0.1281-0.1435	457045EL	458045EL	459045EL	.1255	4	1 ½	2 17/32 -6 ½	233.40	204.55	194.85	190.20	185.25	181.40
* 0.1436-0.1590	45705EL	45805EL	45905EL	.1411	4	1 ½	2 17/32 -7	237.25	208.35	198.65	194.05	189.10	185.20
* 0.1591-0.1750	457055EL	458055EL	459055EL	.1567	4	1 ½	2 25/32 -8	241.75	212.80	203.20	198.55	193.60	189.70
* 0.1751-0.1910	45706EL	45806EL	45906EL	.1724	4	1 ½	4 17/32 -9	248.15	219.25	209.55	205.00	200.00	196.10
* 0.1911-0.2210	45707EL	45807EL	45907EL	.1880	4	1 ½	5 1/32 -10	256.50	227.70	218.00	213.40	208.40	204.55
* 0.2211-0.2530	45708EL	45808EL	45908EL	.2193	4	1 ½	6 1/32 -12	273.10	244.15	234.60	229.95	225.00	221.10
* 0.2531-0.2840	45709EL	45809EL	45909EL	.2505	4	1 ½	6 1/32 -12	287.30	258.45	248.80	244.10	239.20	235.25
0.2841-0.3150	45710EL	45810EL	45910EL	.2792	4	1 ½	6 1/32 -12	203.90	175.00	165.35	160.70	155.75	151.90
0.3151-0.3470	45711EL	45811EL	45911EL	.2792	4	1 ½	6 1/32 -12	203.90	175.00	165.35	160.70	155.75	151.90
0.3471-0.3780	45712EL	45812EL	45912EL	.3105	4	1 ¾	7 1/32 -14	210.55	181.70	172.05	167.35	162.45	158.50
0.3781-0.4090	45713EL	45813EL	45913EL	.3105	4	1 ¾	7 1/32 -14	210.55	181.70	172.05	167.35	162.45	158.50
0.4091-0.4410	45714EL	45814EL	45914EL	.3730	6	1 ¾	7 1/32 -14	217.25	188.35	178.70	174.05	169.10	165.20
0.4411-0.4720	45715EL	45815EL	45915EL	.3730	6	1 ¾	7 1/32 -14	217.25	188.35	178.70	174.05	169.10	165.20
0.4721-0.5030	45716EL	45816EL	45916EL	.4355	6	2	8 1/32 -16	221.75	192.80	183.15	178.55	173.65	169.70
0.5031-0.5340	45717EL	45817EL	45917EL	.4355	6	2	8 1/32 -16	221.75	192.80	183.15	178.55	173.65	169.70
0.5341-0.5660	45718EL	45818EL	45918EL	.4355	6	2	8 1/32 -16	225.90	196.95	187.30	182.70	177.75	173.85
0.5661-0.5970	45719EL	45819EL	45919EL	.4355	6	2	8 1/32 -16	225.90	196.95	187.30	182.70	177.75	173.85
0.5971-0.6280	45720EL	45820EL	45920EL	.5615	6	2 ¼	9 1/32 -18	230.65	201.70	192.05	187.45	182.55	178.60
0.6281-0.6590	45721EL	45821EL	45921EL	.5615	6	2 ¼	9 1/32 -18	230.65	201.70	192.05	187.45	182.55	178.60
0.6591-0.6910	45722EL	45822EL	45922EL	.5615	6	2 ¼	9 1/32 -18	231.30	202.40	192.70	188.10	183.15	179.25
0.6911-0.7220	45723EL	45823EL	45923EL	.5615	6	2 ¼	9 1/32 -18	231.30	202.40	192.70	188.10	183.15	179.25
0.7221-0.7530	45724EL	45824EL	45924EL	.6245	6	2 ½	9 17/32 -18	248.30	219.35	209.65	205.10	200.20	196.25
0.7531-0.7840	45725EL	45825EL	45925EL	.6245	6	2 ½	9 17/32 -18	301.30	273.75	264.50	260.20	255.45	251.75
0.7841-0.8160	45726EL	45826EL	45926EL	.6245	6	2 ½	9 17/32 -18	310.90	283.35	274.10	269.75	265.05	261.35
0.8161-0.8470	45727EL	45827EL	45927EL	.6245	6	2 ½	9 17/32 -18	314.50	286.95	277.70	273.35	268.65	264.95
0.8471-0.8780	45728EL	45828EL	45928EL	.7495	6	2 ⅝	10 1/32 -18	321.15	293.55	284.35	280.00	275.30	271.55
0.8781-0.9090	45729EL	45829EL	45929EL	.7495	6	2 ⅝	10 1/32 -18	334.65	307.10	297.85	293.50	288.80	285.10
0.9091-0.9410	45730EL	45830EL	45930EL	.7495	8	2 ⅝	10 1/32 -18	338.00	310.40	301.20	296.85	292.15	288.45
0.9411-0.9720	45731EL	45831EL	45931EL	.7495	8	2 ⅝	10 1/32 -18	341.20	313.65	304.45	300.10	295.35	291.65
0.9721-1.0030	45732EL	45832EL	45932EL	.8745	8	2 ¾	10 17/32 -18	349.15	321.60	312.40	308.05	303.30	299.60

*Solid Carbide

**Quantities of 15 or more — Contact Hannibal Specials Dept.

EXTENDED LENGTH REAMERS CARBIDE TIPPED TYPES 416EL, 426EL, 435EL

MATERIAL SPECIFIC COOLANT FED

FLUTE FED FOR THRU HOLES STRAIGHT FLUTES

TYPE 416EL - FOR NON-FERROUS MATERIALS
TYPE 426EL - FOR CAST IRONS
TYPE 435EL - FOR STEELS & HIGH TEMP ALLOYS

- Coolant outlets in each flute
- Extended length versions of types 416, 426, and 435 found on page 92
- All extended length reamers provided with controlled shank
- Must specify overall length when ordering (centers supplied only at maximum overall length)

TOOL SELECTOR

CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
20	NON-FERROUS - LONG CHIPS	416EL
40	NON-FERROUS - SHORT CHIPS	416EL
60	CAST IRONS	426EL
80	LOW STRENGTH STEELS	435EL
100	MEDIUM STRENGTH STEELS	435EL
120	HIGH STRENGTH STEELS	435EL
140	HIGH TEMPERATURE ALLOYS	435EL

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Metric tool diameter
- Closer tool diameter tolerance - pg. 29
- Cutting diam. reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diam. back taper
- Shortened shank or reduced shank diameter
- Flat(s) or tang on shank
- Coatings available:

TITANIUM NITRIDE – TiN
TITANIUM CARBONITRIDE – TiCN
ZIRCONIUM NITRIDE – ZrN
AL TITANIUM NITRIDE – AlTiN

TOOL DIAMETER RANGE	TYPE 416EL NON FERROUS EDP NO.	TYPE 426EL CAST IRON EDP NO.	TYPE 435EL STEEL/ HI-TEMP EDP NO.	DIMENSIONS MAX. SHANK DIAM.	NO. OF FLTS	LENGTH FLT	LENGTH OVERALL RANGE	FINISHED TO MODIFIED TOOL DIAMETER PRICE EACH - BASED ON QUANTITY ORDERED 1	2	3	4	5-7	8-14**
* 0.1751 - 0.1910	41606EL	42606EL	43506EL	.1724	4	1 ½	4 17/32 - 9	$296.90	$268.00	$258.30	$253.70	$248.80	$244.85
* 0.1911 - 0.2210	41607EL	42607EL	43507EL	.1880	4	1 ½	5 1/32 - 10	308.35	279.40	269.70	265.15	260.25	256.30
* 0.2211 - 0.2530	41608EL	42608EL	43508EL	.2193	4	1 ½	6 1/32 - 12	342.55	313.65	303.95	299.40	294.35	290.50
* 0.2531 - 0.2840	41609EL	42609EL	43509EL	.2505	4	1 ½	6 1/32 - 12	359.15	330.25	320.55	315.95	310.95	307.10
0.2841 - 0.3150	41610EL	42610EL	43510EL	.2792	4	1 ½	6 1/32 - 12	265.60	236.70	227.00	222.40	217.40	213.55
0.3151 - 0.3470	41611EL	42611EL	43511EL	.2792	4	1 ½	6 1/32 - 12	265.60	236.70	227.00	222.40	217.40	213.55
0.3471 - 0.3780	41612EL	42612EL	43512EL	.3105	4	1 ¾	7 1/32 - 14	270.80	241.90	232.25	227.70	222.70	218.85
0.3781 - 0.4090	41613EL	42613EL	43513EL	.3105	4	1 ¾	7 1/32 - 14	270.80	241.90	232.25	227.70	222.70	218.85
0.4091 - 0.4410	41614EL	42614EL	43514EL	.3730	6	1 ¾	7 1/32 - 14	271.95	243.00	233.35	228.80	223.80	219.95
0.4411 - 0.4720	41615EL	42615EL	43515EL	.3730	6	1 ¾	7 1/32 - 14	271.95	243.00	233.35	228.80	223.80	219.95
0.4721 - 0.5030	41616EL	42616EL	43516EL	.4355	6	2	8 1/32 - 16	295.85	266.90	257.25	252.65	247.70	243.80
0.5031 - 0.5340	41617EL	42617EL	43517EL	.4355	6	2	8 1/32 - 16	295.85	266.90	257.25	252.65	247.70	243.80
0.5341 - 0.5660	41618EL	42618EL	43518EL	.4355	6	2	8 1/32 - 16	297.90	269.05	259.35	254.70	249.75	245.85
0.5661 - 0.5970	41619EL	42619EL	43519EL	.4355	6	2	8 1/32 - 16	297.90	269.05	259.35	254.70	249.75	245.85
0.5971 - 0.6280	41620EL	42620EL	43520EL	.5615	6	2 ¼	9 1/32 - 18	303.80	274.90	265.20	260.60	255.65	251.75
0.6281 - 0.6590	41621EL	42621EL	43521EL	.5615	6	2 ¼	9 1/32 - 18	303.80	274.90	265.20	260.60	255.65	251.75
0.6591 - 0.6910	41622EL	42622EL	43522EL	.5615	6	2 ¼	9 1/32 - 18	307.10	278.20	268.50	263.90	258.95	255.05
0.6911 - 0.7220	41623EL	42623EL	43523EL	.5615	6	2 ¼	9 1/32 - 18	307.10	278.20	268.50	263.90	258.95	255.05
0.7221 - 0.7530	41624EL	42624EL	43524EL	.6245	6	2 ½	9 17/32 - 18	319.70	290.80	281.15	276.50	271.55	267.65
0.7531 - 0.7840	41625EL	42625EL	43525EL	.6245	6	2 ½	9 17/32 18	364.40	336.85	327.65	323.25	318.55	314.80
0.7841 - 0.8160	41626EL	42626EL	43526EL	.6245	6	2 ½	9 17/32 18	377.45	349.95	340.75	336.35	331.60	327.90
0.8161 - 0.8470	41627EL	42627EL	43527EL	.6245	6	2 ½	9 17/32 18	380.95	353.45	344.25	339.85	335.10	331.40
0.8471 - 0.8780	41628EL	42628EL	43528EL	.7495	6	2 ⅝	10 1/32 18	383.35	355.85	346.60	342.20	337.50	333.80
0.8781 - 0.9090	41629EL	42629EL	43529EL	.7495	6	2 ⅝	10 1/32 18	398.25	370.75	361.50	357.10	352.40	348.70
0.9091 - 0.9410	41630EL	42630EL	43530EL	.7495	8	2 ⅝	10 1/32 18	405.10	377.55	368.35	363.95	359.25	355.50
0.9411 - 0.9720	41631EL	42631EL	43531EL	.7495	8	2 ⅝	10 1/32 18	407.30	379.80	370.60	366.20	361.45	357.75
0.9721 - 1.0030	41632EL	42632EL	43532EL	.8745	8	2 ¾	10 17/32 18	419.00	391.50	382.30	377.90	373.15	369.45

*Solid Carbide

**Quantities of 15 or more — Contact Hannibal Specials Dept.

EXTENDED LENGTH REAMERS
CARBIDE TIPPED TYPES 442EL, 443EL, 444EL

MATERIAL SPECIFIC

RIGHT SPIRAL FLUTES
FLUTE LONG CARBIDE

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	442EL
	40	NON-FERROUS - SHORT CHIPS	442EL
	60	CAST IRONS	443EL
	80	LOW STRENGTH STEELS	444EL
	100	MEDIUM STRENGTH STEELS	444EL
	120	HIGH STRENGTH STEELS	444EL
	140	HIGH TEMPERATURE ALLOYS	444EL

TYPE 442EL - FOR NON-FERROUS MATERIALS
TYPE 443EL - FOR CAST IRONS & NAS MULTI-PURPOSE
TYPE 444EL - FOR STEELS & HIGH TEMP ALLOYS

- Extended length versions of types 442, 443, and 444 found on page 85
- All extended length reamers provided with controlled shank
- Must specify overall length when ordering (centers supplied only at maximum overall length)

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Metric tool diameter
- Closer tool diameter tolerance - pg. 29
- Cutting diam. reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diam. back taper
- Shortened shank or reduced shank diameter
- Flat(s) or tang on shank
- Coatings available:

TITANIUM NITRIDE – TiN
TITANIUM CARBONITRIDE – TiCN
ZIRCONIUM NITRIDE – ZrN
AL TITANIUM NITRIDE – AlTiN

REAMERS

TOOL DIAMETER RANGE	TYPE 442EL NON FERROUS EDP NO.	TYPE 443EL CAST IRON EDP NO.	TYPE 444EL STEEL/ HI-TEMP EDP NO.	DIMENSIONS MAX. SHANK DIAM.	NO. OF FLTS	LENGTH FLT	LENGTH OVERALL RANGE	FINISHED TO MODIFIED TOOL DIAMETER PRICE EACH - BASED ON QUANTITY ORDERED 1	2	3	4	5-7	8-14**
*0.2211 - 0.2530	44208EL	44308EL	44408EL	.2193	4	1 ½	6 1/32 - 12	$327.70	$293.05	$281.45	$275.95	$270.05	$265.30
*0.2531 - 0.2840	44209EL	44309EL	44409EL	.2505	4	1 ½	6 1/32 - 12	344.80	310.10	298.50	293.00	287.05	282.40
0.2841 - 0.3150	44210EL	44310EL	44410EL	.2792	4	1 ½	6 1/32 - 12	244.70	210.05	198.45	192.85	186.95	182.25
0.3151 - 0.3470	44211EL	44311EL	44411EL	.2792	4	1 ½	6 1/32 - 12	244.70	210.05	198.45	192.85	186.95	182.25
0.3471 - 0.3780	44212EL	44312EL	44412EL	.3105	4	1 ¾	7 1/32 - 14	252.70	218.05	206.40	200.85	194.95	190.30
0.3781 - 0.4090	44213EL	44313EL	44413EL	.3105	4	1 ¾	7 1/32 - 14	252.70	218.05	206.40	200.85	194.95	190.30
0.4091 - 0.4410	44214EL	44314EL	44414EL	.3730	6	1 ¾	7 1/32 - 14	260.70	226.05	214.45	208.85	202.90	198.25
0.4411 - 0.4720	44215EL	44315EL	44415EL	.3730	6	1 ¾	7 1/32 - 14	260.70	226.05	214.45	208.85	202.90	198.25
0.4721 - 0.5030	44216EL	44316EL	44416EL	.4355	6	2	8 1/32 - 16	266.10	231.40	219.85	214.25	208.35	203.65
0.5031 - 0.5340	44217EL	44317EL	44417EL	.4355	6	2	8 1/32 - 16	266.10	231.40	219.85	214.25	208.35	203.65
0.5341 - 0.5660	44218EL	44318EL	44418EL	.4355	6	2	8 1/32 - 16	271.10	236.35	224.75	219.20	213.30	208.55
0.5661 - 0.5970	44219EL	44319EL	44419EL	.4355	6	2	8 1/32 - 16	271.10	236.35	224.75	219.20	213.30	208.55
0.5971 - 0.6280	44220EL	44320EL	44420EL	.5615	6	2 ¼	9 1/32 - 18	276.80	242.10	230.45	225.00	219.05	214.40
0.6281 - 0.6590	44221EL	44321EL	44421EL	.5615	6	2 ¼	9 1/32 - 18	276.80	242.10	230.45	225.00	219.05	214.40
0.6591 - 0.6910	44222EL	44322EL	44422EL	.5615	6	2 ¼	9 1/32 - 18	277.50	242.85	231.25	225.80	219.85	215.15
0.6911 - 0.7220	44223EL	44323EL	44423EL	.5615	6	2 ¼	9 1/32 - 18	277.50	242.85	231.25	225.80	219.85	215.15
0.7221 - 0.7530	44224EL	44324EL	44424EL	.6245	6	2 ½	9 17/32 - 18	297.95	263.30	251.65	246.10	240.20	235.55
0.7531 0.7840	44225EL	44325EL	44425EL	.6245	6	2 ½	9 17/32 18	343.45	310.40	299.35	294.15	288.50	284.05
0.7841 0.8160	44226EL	44326EL	44426EL	.6245	6	2 ½	9 17/32 18	353.35	320.35	309.25	304.05	298.40	293.95
0.8161 0.8470	44227EL	44327EL	44427EL	.6245	6	2 ½	9 17/32 18	356.90	323.90	312.80	307.60	301.95	297.50
0.8471 0.8780	44228EL	44328EL	44428EL	.7495	6	2 5/8	10 1/32 18	358.30	325.25	314.20	309.00	303.30	298.85
0.8781 0.9090	44229EL	44329EL	44429EL	.7495	6	2 5/8	10 1/32 18	370.25	337.25	326.15	320.95	315.30	310.85
0.9091 0.9410	44230EL	44330EL	44430EL	.7495	8	2 5/8	10 1/32 18	382.70	349.70	338.60	333.40	327.75	323.30
0.9411 0.9720	44231EL	44331EL	44431EL	.7495	8	2 5/8	10 1/32 18	385.00	351.95	340.90	335.70	330.05	325.60
0.9721 1.0030	44232EL	44332EL	44432EL	.8745	8	2 ¾	10 17/32 18	399.05	366.00	354.95	349.75	344.10	339.60

*Solid Carbide

**Quantities of 15 or more — Contact Hannibal Specials Dept.

EXTENDED LENGTH REAMERS CARBIDE TIPPED TYPES 411EL, 413EL, & 415EL

MATERIAL SPECIFIC COOLANT FED

CENTER FED FOR BLIND HOLES
RIGHT SPIRAL FLUTES

TYPE 411EL - FOR NON-FERROUS MATERIALS
TYPE 413EL - FOR CAST IRONS
TYPE 415EL - FOR STEELS & HIGH TEMP ALLOYS

- Coolant hole through the center
- Extended length versions of types 411, 413, and 415 found on page 94
- All extended length reamers provided with controlled shank
- Must specify overall length when ordering (centers supplied only at maximum overall length)

TOOL SELECTOR

CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
20	NON-FERROUS - LONG CHIPS	411EL
40	NON-FERROUS - SHORT CHIPS	411EL
60	CAST IRONS	413EL
80	LOW STRENGTH STEELS	415EL
100	MEDIUM STRENGTH STEELS	415EL
120	HIGH STRENGTH STEELS	415EL
140	HIGH TEMPERATURE ALLOYS	415EL

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Closer tool diameter tolerance - pg. 29
- Cutting diam. reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diam. back taper
- Shortened shank or reduced shank diameter
- Flat(s) or tang on shank
- Coatings available:

TITANIUM NITRIDE – TiN
TITANIUM CARBONITRIDE – TiCN
ZIRCONIUM NITRIDE – ZrN
AL TITANIUM NITRIDE – AlTiN

TOOL DIAMETER RANGE	TYPE 411EL NON FERROUS EDP NO.	TYPE 413EL CAST IRON EDP NO.	TYPE 415EL STEEL/ HI-TEMP EDP NO.	DIMENSIONS MAX. SHANK DIAM.	NO. OF FLTS	LENGTH FLT	LENGTH OVERALL RANGE	FINISHED TO MODIFIED TOOL DIAMETER PRICE EACH - BASED ON QUANTITY ORDERED 1	2	3	4	5-7	8-14**
* 0.2211 - 0.2530	41108EL	41308EL	41508EL	.2193	4	1 ½	6 1/32 - 12	$411.00	$376.35	$364.80	$359.25	$353.25	$348.65
* 0.2531 - 0.2840	41109EL	41309EL	41509EL	.2505	4	1 ½	6 1/32 - 12	430.95	396.30	384.65	379.15	373.15	368.50
0.2841 - 0.3150	41110EL	41310EL	41510EL	.2792	4	1 ½	6 1/32 - 12	318.65	283.95	272.40	266.85	260.85	256.25
0.3151 - 0.3470	41111EL	41311EL	41511EL	.2792	4	1 ½	6 1/32 - 12	318.65	283.95	272.40	266.85	260.85	256.25
0.3471 - 0.3780	41112EL	41312EL	41512EL	.3105	4	1 ¾	7 1/32 - 14	325.00	290.30	278.60	273.15	267.25	262.55
0.3781 - 0.4090	41113EL	41313EL	41513EL	.3105	4	1 ¾	7 1/32 - 14	325.00	290.30	278.60	273.15	267.25	262.55
0.4091 - 0.4410	41114EL	41314EL	41514EL	.3730	6	1 ¾	7 1/32 - 14	326.30	291.65	280.05	274.55	268.55	263.90
0.4411 - 0.4720	41115EL	41315EL	41515EL	.3730	6	1 ¾	7 1/32 - 14	326.30	291.65	280.05	274.55	268.55	263.90
0.4721 - 0.5030	41116EL	41316EL	41516EL	.4355	6	2	8 1/32 - 16	355.00	320.35	308.65	303.15	297.20	292.60
0.5031 - 0.5340	41117EL	41317EL	41517EL	.4355	6	2	8 1/32 - 16	355.00	320.35	308.65	303.15	297.20	292.60
0.5341 - 0.5660	41118EL	41318EL	41518EL	.4355	6	2	8 1/32 - 16	357.50	322.75	311.20	305.70	299.70	295.05
0.5661 - 0.5970	41119EL	41319EL	41519EL	.4355	6	2	8 1/32 - 16	357.50	322.75	311.20	305.70	299.70	295.05
0.5971 - 0.6280	41120EL	41320EL	41520EL	.5615	6	2 ¼	9 1/32 - 18	364.60	329.85	318.25	312.75	306.80	302.10
0.6281 - 0.6590	41121EL	41321EL	41521EL	.5615	6	2 ¼	9 1/32 - 18	364.60	329.85	318.25	312.75	306.80	302.10
0.6591 - 0.6910	41122EL	41322EL	41522EL	.5615	6	2 ¼	9 1/32 - 18	368.50	333.85	322.25	316.75	310.75	306.10
0.6911 - 0.7220	41123EL	41323EL	41523EL	.5615	6	2 ¼	9 1/32 - 18	368.50	333.85	322.25	316.75	310.75	306.10
0.7221 - 0.7530	41124EL	41324EL	41524EL	.6245	6	2 ½	9 17/32 - 18	383.65	349.00	337.35	331.90	325.90	321.30
0.7531 - 0.7840	41125EL	41325EL	41525EL	.6245	6	2 ½	9 17/32 - 18	387.30	354.30	343.30	338.00	332.30	327.90
0.7841 - 0.8160	41126EL	41326EL	41526EL	.6245	6	2 ½	9 17/32 - 18	400.00	366.95	355.95	350.65	345.00	340.60
0.8161 - 0.8470	41127EL	41327EL	41527EL	.6245	6	2 ½	9 17/32 - 18	403.60	370.60	359.55	354.25	348.60	344.20
0.8471 - 0.8780	41128EL	41328EL	41528EL	.7495	6	2 ⅝	10 1/32 - 18	404.90	371.90	360.90	355.60	349.90	345.50
0.8781 - 0.9090	41129EL	41329EL	41529EL	.7495	6	2 ⅝	10 1/32 - 18	419.40	386.35	375.35	370.05	364.40	360.00
0.9091 - 0.9410	41130EL	41330EL	41530EL	.7495	8	2 ⅝	10 1/32 - 18	432.20	399.20	388.15	382.85	377.20	372.80
0.9411 - 0.9720	41131EL	41331EL	41531EL	.7495	8	2 ⅝	10 1/32 - 18	434.50	401.50	390.45	385.15	379.50	375.10
0.9721 - 1.0030	41132EL	41332EL	41532EL	.8745	8	2 ¾	10 17/32 - 18	451.60	418.60	407.55	402.25	396.60	392.20

*Solid Carbide

**Quantities of 15 or more — Contact Hannibal Specials Dept.

EXTENDED LENGTH REAMERS
CARBIDE TIPPED TYPES 482EL, 483EL, 484EL

MATERIAL SPECIFIC

LEFT SPIRAL FLUTES
FLUTE LONG CARBIDE

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	482EL
	40	NON-FERROUS - SHORT CHIPS	482EL
	60	CAST IRONS	483EL
	80	LOW STRENGTH STEELS	484EL
	100	MEDIUM STRENGTH STEELS	484EL
	120	HIGH STRENGTH STEELS	484EL
	140	HIGH TEMPERATURE ALLOYS	484EL

TYPE 482EL - FOR NON-FERROUS MATERIALS
TYPE 483EL - FOR CAST IRONS & NAS MULTI-PURPOSE
TYPE 484EL - FOR STEELS & HIGH TEMP ALLOYS

- Extended length versions of types 482, 483, and 484 found on page 87
- All extended length reamers provided with controlled shank
- Must specify overall length when ordering (centers supplied only at maximum overall length)

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Metric tool diameter
- Closer tool diameter tolerance - pg. 29
- Cutting diam. reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diam. back taper
- Shortened shank or reduced shank diameter
- Flat(s) or tang on shank
- Coatings available:

TITANIUM NITRIDE – TiN
TITANIUM CARBONITRIDE – TiCN
ZIRCONIUM NITRIDE – ZrN
AL TITANIUM NITRIDE – AlTiN

REAMERS

TOOL DIAMETER RANGE	TYPE 482EL NON FERROUS EDP NO.	TYPE 483EL CAST IRON EDP NO.	TYPE 484EL STEEL/ HI-TEMP EDP NO.	DIMENSIONS MAX. SHANK DIAM.	NO. OF FLTS	LENGTH FLT	LENGTH OVERALL	FINISHED TO MODIFIED TOOL DIAMETER PRICE EACH - BASED ON QUANTITY ORDERED 1	2	3	4	5-7	8-14**
*0.2211 - 0.2530	48208EL	48308EL	48408EL	.2193	4	1 ½	6 1/32 - 12	$327.70	$293.05	$281.45	$275.95	$270.05	$265.30
*0.2531 - 0.2840	48209EL	48309EL	48409EL	.2505	4	1 ½	6 1/32 - 12	344.80	310.10	298.50	293.00	287.05	282.40
0.2841 - 0.3150	48210EL	48310EL	48410EL	.2792	4	1 ½	6 1/32 - 12	244.70	210.05	198.45	192.85	186.95	182.25
0.3151 - 0.3470	48211EL	48311EL	48411EL	.2792	4	1 ½	6 1/32 - 12	244.70	210.05	198.45	192.85	186.95	182.25
0.3471 - 0.3780	48212EL	48312EL	48412EL	.3105	4	1 ¾	7 1/32 - 14	252.70	218.05	206.40	200.85	194.95	190.30
0.3781 - 0.4090	48213EL	48313EL	48413EL	.3105	4	1 ¾	7 1/32 - 14	252.70	218.05	206.40	200.85	194.95	190.30
0.4091 - 0.4410	48214EL	48314EL	48414EL	.3730	6	1 ¾	7 1/32 - 14	260.70	226.05	214.45	208.85	202.90	198.25
0.4411 - 0.4720	48215EL	48315EL	48415EL	.3730	6	1 ¾	7 1/32 - 14	260.70	226.05	214.45	208.85	202.90	198.25
0.4721 - 0.5030	48216EL	48316EL	48416EL	.4355	6	2	8 1/32 - 16	266.10	231.40	219.85	214.25	208.35	203.65
0.5031 - 0.5340	48217EL	48317EL	48417EL	.4355	6	2	8 1/32 - 16	266.10	231.40	219.85	214.25	208.35	203.65
0.5341 - 0.5660	48218EL	48318EL	48418EL	.4355	6	2	8 1/32 - 16	271.10	236.35	224.75	219.20	213.30	208.55
0.5661 - 0.5970	48219EL	48319EL	48419EL	.4355	6	2	8 1/32 - 16	271.10	236.35	224.75	219.20	213.30	208.55
0.5971 - 0.6280	48220EL	48320EL	48420EL	.5615	6	2 ¼	9 1/32 - 18	276.80	242.10	230.45	225.00	219.05	214.40
0.6281 - 0.6590	48221EL	48321EL	48421EL	.5615	6	2 ¼	9 1/32 - 18	276.80	242.10	230.45	225.00	219.05	214.40
0.6591 - 0.6910	48222EL	48322EL	48422EL	.5615	6	2 ¼	9 1/32 - 18	277.50	242.85	231.25	225.80	219.85	215.15
0.6911 - 0.7220	48223EL	48323EL	48423EL	.5615	6	2 ¼	9 1/32 - 18	277.50	242.85	231.25	225.80	219.85	215.15
0.7221 - 0.7530	48224EL	48324EL	48424EL	.6245	6	2 ½	9 17/32 - 18	297.95	263.30	251.65	246.10	240.20	235.55
0.7531 - 0.7840	48225EL	48325EL	48425EL	.6245	6	2 ½	9 17/32 - 18	343.45	310.40	299.35	294.15	288.50	284.05
0.7841 - 0.8160	48226EL	48326EL	48426EL	.6245	6	2 ½	9 17/32 - 18	353.35	320.35	309.25	304.05	298.40	293.95
0.8161 - 0.8470	48227EL	48327EL	48427EL	.6245	6	2 ½	9 17/32 - 18	356.90	323.90	312.80	307.60	301.95	297.50
0.8471 - 0.8780	48228EL	48328EL	48428EL	.7495	6	2 ⅝	10 1/32 - 18	358.30	325.25	314.20	309.00	303.30	298.85
0.8781 - 0.9090	48229EL	48329EL	48429EL	.7495	6	2 ⅝	10 1/32 - 18	370.25	337.25	326.15	320.95	315.30	310.85
0.9091 - 0.9410	48230EL	48330EL	48430EL	.7495	8	2 ⅝	10 1/32 - 18	382.70	349.70	338.60	333.40	327.75	323.30
0.9411 - 0.9720	48231EL	48331EL	48431EL	.7495	8	2 ⅝	10 1/32 - 18	385.00	351.95	340.90	335.70	330.05	325.60
0.9721 - 1.0030	48232EL	48332EL	48432EL	.8745	8	2 ¾	10 17/32 - 18	399.05	366.00	354.95	349.75	344.10	339.60

*Solid Carbide

**Quantities of 15 or more — Contact Hannibal Specials Dept.

EXTENDED LENGTH REAMERS CARBIDE TIPPED TYPES 427EL, 428EL, 429EL

MATERIAL SPECIFIC COOLANT FED

FLUTE FED FOR THRU HOLES
LEFT SPIRAL FLUTES

TYPE 427EL - FOR NON-FERROUS MATERIALS
TYPE 428EL - FOR CAST IRONS
TYPE 429EL - FOR STEELS & HIGH TEMP ALLOYS

- Extended length versions of types 427, 428, and 429 found on page 96
- Coolant outlets in each flute
- All extended length reamers provided with controlled shank
- Must specify overall length when ordering (centers supplied only at maximum overall length)

TOOL SELECTOR

CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
20	NON-FERROUS - LONG CHIPS	427EL
40	NON-FERROUS - SHORT CHIPS	427EL
60	CAST IRONS	428EL
80	LOW STRENGTH STEELS	429EL
100	MEDIUM STRENGTH STEELS	429EL
120	HIGH STRENGTH STEELS	429EL
140	HIGH TEMPERATURE ALLOYS	429EL

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Metric tool diameter
- Closer tool diameter tolerance - pg. 29
- Cutting diam. reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diam. back taper
- Shortened shank or reduced shank diameter
- Flat(s) or tang on shank
- Coatings available:

TITANIUM NITRIDE – TiN
TITANIUM CARBONITRIDE – TiCN
ZIRCONIUM NITRIDE – ZrN
AL TITANIUM NITRIDE – AlTiN

TOOL DIAMETER RANGE	TYPE 427EL NON FERROUS EDP NO.	TYPE 428EL CAST IRON EDP NO.	TYPE 429EL STEEL/ HI-TEMP EDP NO.	DIMENSIONS MAX. SHANK DIAM.	NO. OF FLTS	LENGTH FLT	LENGTH OVERALL RANGE	FINISHED TO MODIFIED TOOL DIAMETER PRICE EACH - BASED ON QUANTITY ORDERED 1	2	3	4	5-7	8-14**
*0.2211-0.2530	42708EL	42808EL	42908EL	.2193	4	1 ½	6 1/32 -12	$411.00	$376.35	$364.80	$359.25	$353.25	$348.65
*0.2531-0.2840	42709EL	42809EL	42909EL	.2505	4	1 ½	6 1/32 -12	430.95	396.30	384.65	379.15	373.15	368.50
0.2841-0.3150	42710EL	42810EL	42910EL	.2792	4	1 ½	6 1/32 -12	318.65	283.95	272.40	266.85	260.85	256.25
0.3151-0.3470	42711EL	42811EL	42911EL	.2792	4	1 ½	6 1/32 -12	318.65	283.95	272.40	266.85	260.85	256.25
0.3471-0.3780	42712EL	42812EL	42912EL	.3105	4	1 ¾	7 1/32 -14	325.00	290.30	278.60	273.15	267.25	262.55
0.3781-0.4090	42713EL	42813EL	42913EL	.3105	4	1 ¾	7 1/32 -14	325.00	290.30	278.60	273.15	267.25	262.55
0.4091-0.4410	42714EL	42814EL	42914EL	.3730	6	1 ¾	7 1/32 -14	326.30	291.65	280.05	274.55	268.55	263.90
0.4411-0.4720	42715EL	42815EL	42915EL	.3730	6	1 ¾	7 1/32 -14	326.30	291.65	280.05	274.55	268.55	263.90
0.4721-0.5030	42716EL	42816EL	42916EL	.4355	6	2	8 1/32 -16	355.00	320.35	308.65	303.15	297.20	292.60
0.5031-0.5340	42717EL	42817EL	42917EL	.4355	6	2	8 1/32 -16	355.00	320.35	308.65	303.15	297.20	292.60
0.5341-0.5660	42718EL	42818EL	42918EL	.4355	6	2	8 1/32 -16	357.50	322.75	311.20	305.70	299.70	295.05
0.5661-0.5970	42719EL	42819EL	42919EL	.4355	6	2	8 1/32 -16	357.50	322.75	311.20	305.70	299.70	295.05
0.5971-0.6280	42720EL	42820EL	42920EL	.5615	6	2 ¼	9 1/32 -18	364.60	329.85	318.25	312.75	306.80	302.10
0.6281-0.6590	42721EL	42821EL	42921EL	.5615	6	2 ¼	9 1/32 -18	364.60	329.85	318.25	312.75	306.80	302.10
0.6591-0.6910	42722EL	42822EL	42922EL	.5615	6	2 ¼	9 1/32 -18	368.50	333.85	322.25	316.75	310.75	306.10
0.6911-0.7220	42723EL	42823EL	42923EL	.5615	6	2 ¼	9 1/32 -18	368.50	333.85	322.25	316.75	310.75	306.10
0.7221-0.7530	42724EL	42824EL	42924EL	.6245	6	2 ½	9 17/32 -18	383.65	349.00	337.35	331.90	325.90	321.30
0.7531-0.7840	42725EL	42825EL	42925EL	.6245	6	2 ½	9 17/32 -18	405.10	372.05	361.05	355.75	350.05	345.65
0.7841-0.8160	42726EL	42826EL	42926EL	.6245	6	2 ½	9 17/32 -18	418.70	385.70	374.65	369.35	363.70	359.30
0.8161-0.8470	42727EL	42827EL	42927EL	.6245	6	2 ½	9 17/32 -18	422.25	389.25	378.20	372.90	367.25	362.85
0.8471-0.8780	42728EL	42828EL	42928EL	.7495	6	2 ⅝	10 1/32 -18	423.50	390.50	379.50	374.20	368.50	364.10
0.8781-0.9090	42729EL	42829EL	42929EL	.7495	6	2 ⅝	10 1/32 -18	439.20	406.20	395.15	389.85	384.20	379.80
0.9091-0.9410	42730EL	42830EL	42930EL	.7495	8	2 ⅝	10 1/32 -18	452.10	419.05	408.05	402.75	397.10	392.70
0.9411-0.9720	42731EL	42831EL	42931EL	.7495	8	2 ⅝	10 1/32 -18	454.30	421.30	410.25	404.95	399.30	394.90
0.9721-1.0030	42732EL	42832EL	42932EL	.8745	8	2 ¾	10 17/32 -18	472.50	439.50	428.45	423.15	417.50	413.10

*Solid Carbide

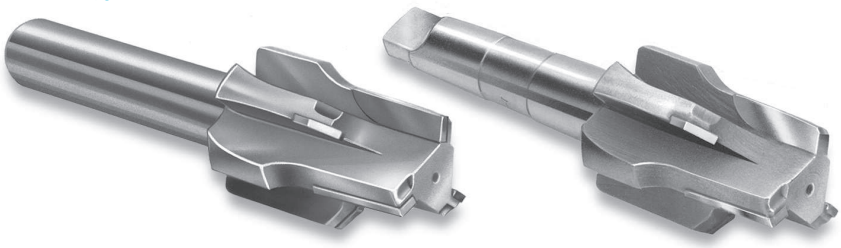
**Quantities of 15 or more — Contact Hannibal Specials Dept.

PIPE TAP REAMERS CARBIDE TIPPED TYPES 446 & 447 FRACTIONAL

GENERAL PURPOSE

STRAIGHT OR TAPER SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	446 or 447
	40	NON-FERROUS - SHORT CHIPS	446 or 447
	60	CAST IRONS	446 or 447
	80	LOW STRENGTH STEELS	446 or 447
	100	MEDIUM STRENGTH STEELS	446 or 447
	120	HIGH STRENGTH STEELS	446 or 447
	140	HIGH TEMPERATURE ALLOYS	446 or 447



TYPE 446 - STRAIGHT SHANK

TYPE 447 - TAPER SHANK

MODIFICATIONS (Prompt delivery)

- Coatings available:

TITANIUM NITRIDE – TiN

TITANIUM CARBONITRIDE – TiCN

ZIRCONIUM NITRIDE – ZrN

AL TITANIUM NITRIDE – AlTiN

BOTH TYPES:

- Three flutes on pipe tap sizes through ½-14
- Six alternate cutting flutes on pipe tap sizes ¾-14 and larger (three with pipe taper and three with chamfer angle)

USE:

- Cuts on taper and chamfer diameters - far better than high speed steel tools

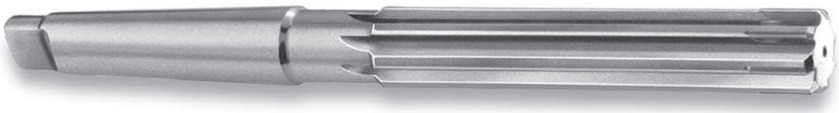
PIPE TAP SIZE	TOOL DIAM.	DIMENSIONS			STRAIGHT SHANK - TYPE 446					TAPER SHANK - TYPE 447			
		LARGE DIAM. TAPER	SMALL DIAM. TAPER	REAMER TAPER LENGTH	SHANK DIAM.	SHANK LENGTH	OVERALL LENGTH	TYPE 446 EDP NO.	PRICE	TAPER SHANK NO.	OVERALL LENGTH	TYPE 447 EDP NO.	PRICE
1/8-27	5/8	.347	.318	15/32	1/2	1 1/2	2 19/32	44601	$127.80	2	4 11/32	44701	$142.75
1/4-18	3/4	.450	.409	21/32	1/2	1 1/2	2 29/32	44602	131.85	2	4 21/32	44702	147.55
3/8-18	7/8	.586	.543	11/16	1/2	2	3 7/16	44603	151.20	2	4 11/16	44703	168.95
1/2-14	1	.725	.670	7/8	1/2	2	3 7/8	44604	160.60	2	5 1/8	44704	179.95
3/4-14	1 1/4	.937	.882	7/8	1	2 1/2	4 5/8	44606	216.95	3	6 1/8	44706	242.60
1 -11 1/2	1 1/2	1.173	1.107	1 1/16	1	2 1/2	5 1/16	44608	252.25	3	6 9/16	44708	282.45
1 -11 1/2	1 1/2	1.173	1.107	1 1/16	-	-	-	-	-	4	7 9/16	44709	289.80
1 1/4-11 1/2	1 7/8	1.518	1.448	1 1/8	1 1/2	3	5 5/8	44610	301.20	3	6 5/8	44710	336.45
1 1/4-11 1/2	1 7/8	1.518	1.448	1 1/8	-	-	-	-	-	4	7 5/8	44711	361.15
1 1/2-11 1/2	2 1/8	1.757	1.687	1 1/8	1 1/2	3	5 7/8	44612	414.55	3	6 7/8	44712	464.75
1 1/2-11 1/2	2 1/8	1.757	1.687	1 1/8	-	-	-	-	-	4	7 7/8	44713	477.40
2 -11 1/2	2 5/8	2.230	2.154	1 7/32	1 1/2	3	6 7/32	44616	469.70	3	7 3/32	44716	525.95
2 -11 1/2	2 5/8	2.230	2.154	1 7/32	-	-	-	-	-	4	8 7/32	44717	540.10
2 1/2- 8	3 1/8	2.670	2.561	1 3/4	1 1/2	3	6 3/4	44620	631.70	3	7 3/4	44720	707.35
2 1/2- 8	3 1/8	2.670	2.561	1 3/4	-	-	-	-	-	4	8 3/4	44721	726.40
3 - 8	3 3/4	3.296	3.180	1 7/8	1 1/2	3	6 7/8	44624	651.50	3	7 7/8	44724	729.70

JOBBERS REAMERS - CARBIDE TIPPED TYPE 403 FRACTIONAL

GENERAL PURPOSE

TYPE 403

- Straight polished flutes and taper shank
- Detailed specifications on page 29



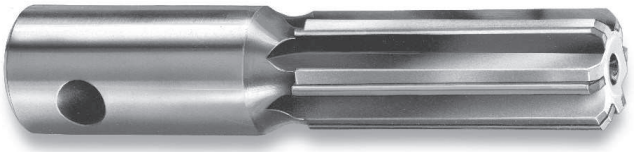
TOOL DIAMETER		TYPE 403 EDP NO.	PRICE	DIMENSIONS					FINISHED TO MODIFIED TOOL DIAMETER						
				TAPER SHANK NO.	NO. OF FLTS	LENGTH			MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DECIMAL					FLUTE	CARBIDE	OVERALL		1	2	3	4	5-7	8-14*
3/8	.3750	40312	$127.80	1	4	2 1/2	5/8	5 13/16	0.3471 - 0.3780	$160.10	$143.85	$138.50	$135.90	$133.15	$130.95
7/16	.4375	40314	133.75	1	4	2 3/4	5/8	6 1/8	0.4091 - 0.4410	166.10	149.90	144.50	141.95	139.20	136.95
1/2	.5000	40316	139.85	1	6	3	5/8	6 7/16	0.4721 - 0.5030	172.20	156.00	150.50	148.05	145.20	143.00
5/8	.6250	40320	153.15	2	6	3 1/2	5/8	7 9/16	0.5971 - 0.6280	185.50	169.25	163.90	161.30	158.45	156.30
11/16	.6875	40322	160.00	2	6	3 7/8	5/8	8	0.6591 - 0.6910	192.30	176.05	170.65	168.05	165.25	163.15
3/4	.7500	40324	166.45	2	6	4 3/16	3/4	8 3/8	0.7221 - 0.7530	198.80	182.65	177.20	174.65	171.85	169.65
13/16	.8125	40326	172.80	2	6	4 9/16	3/4	8 13/16	0.7841 - 0.8160	205.05	188.90	183.50	180.95	178.15	175.95
7/8	.8750	40328	186.10	2	6	4 7/8	3/4	9 3/16	0.8471 - 0.8780	219.60	202.80	197.15	194.50	191.60	189.30
15/16	.9375	40330	195.80	3	8	5 1/8	3/4	10	0.9091 - 0.9410	223.00	212.50	206.85	204.10	201.30	199.00
1	1.0000	40332	199.80	3	8	5 7/16	3/4	10 3/8	0.9721 - 1.0030	233.30	216.55	210.95	208.20	205.25	203.05

*Quantities of 15 or more - price of fractional size in same size range.

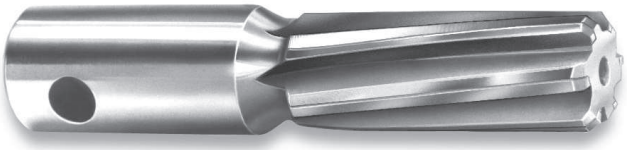
CNC STUB REAMERS CARBIDE TIPPED TYPES 430 & 440 FRACTIONAL

GENERAL PURPOSE

STRAIGHT OR LEFT SPIRAL FLUTES FLUTE LONG CARBIDE STRAIGHT SHANK



TYPE 430 - STRAIGHT FLUTES



TYPE 440 - LEFT SPIRAL FLUTES

BOTH TYPES:

- Polished flutes; flute long carbide on .2841" tool diameter and larger
- Straight shank fits into standard holders
- Pin cross hole permits use in pin drive floating holders
- Left spiral flutes should not be used on blind holes
- Detailed specifications on page 29

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	430/440
	40	NON-FERROUS - SHORT CHIPS	430/440
	60	CAST IRONS	430/440
	80	LOW STRENGTH STEELS	440/430
	100	MEDIUM STRENGTH STEELS	440/430
	120	HIGH STRENGTH STEELS	440/430
	140	HIGH TEMPERATURE ALLOYS	440/430

For material specific CNC stub with straight flutes, see page 88

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Modified metric tool diameter - priced on pg. 43
- Closer tool diameter tolerance - pg. 29
- Cutting diameter reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diam. back taper
- Reduced shank diameter
- Flat(s) on shank
- Coatings available:
  See page 44

NOTE: For semi-finished reamers, see page 53.

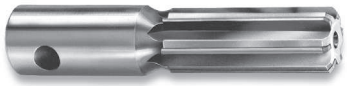
TOOL DIAMETER		TYPE 430 STRAIGHT EDP NO.	TYPE 440 LEFT EDP NO.	BOTH TYPES PRICE	DIMENSIONS						FINISHED TO MODIFIED TOOL DIAMETER						
					SHANK DIAM.	NO. OF FLTS	LENGTH			PIN HOLE DIAM.	MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DEC.						FLT	CAR-BIDE	OVER-ALL			1	2	3	4	5-7	8-14*
3/16	.1875	43006	44006	$44.00	1/4	4	1	1/2	2 1/4	3/32	0.1770-0.2040	$76.20	$60.05	$54.65	$52.10	$49.30	$47.10
7/32	.2188	43007	44007	44.00	1/4	4	1	1/2	2 1/4	3/32	0.2041-0.2210	76.20	60.05	54.65	52.10	49.30	47.10
15/64	.2344	4302344	4402344	44.00	1/4	4	1	1/2	2 1/4	3/32	0.2211-0.2380	76.20	60.05	54.65	52.10	49.30	47.10
1/4	.2500	43008	44008	44.00	1/4	4	1	1/2	2 1/4	3/32	0.2381-0.2530	76.20	60.05	54.65	52.10	49.30	47.10
9/32	.2812	43009	44009	44.00	3/8	4	1	1/2	2 1/4	1/8	0.2531-0.2840	76.20	60.05	54.65	52.10	49.30	47.10
5/16	.3125	43010	44010	51.10	3/8	4	1	1	2 1/4	1/8	0.2841-0.3150	83.35	67.15	61.80	59.20	56.40	54.25
11/32	.3438	43011	44011	51.50	3/8	4	1 1/4	1 1/4	2 1/2	1/8	0.3151-0.3470	83.80	67.70	62.20	59.70	56.85	54.70
3/8	.3750	43012	44012	55.90	3/8	4	1 1/4	1 1/4	2 1/2	1/8	0.3471-0.3780	88.20	72.05	66.60	64.00	61.20	59.05
13/32	.4062	43013	44013	56.70	1/2	4	1 1/4	1 1/4	2 1/2	3/16	0.3781-0.4090	89.05	72.75	67.40	64.80	62.05	59.90
7/16	.4375	43014	44014	67.10	1/2	4	1 1/4	1 1/4	2 1/2	3/16	0.4091-0.4410	99.45	83.25	77.80	75.30	72.50	70.35
15/32	.4688	43015	44015	67.10	1/2	4	1 1/4	1 1/4	2 1/2	3/16	0.4411-0.4720	99.45	83.25	77.80	75.30	72.50	70.35
1/2	.5000	43016	44016	73.45	1/2	4	1 1/4	1 1/4	2 1/2	3/16	0.4721-0.5030	106.65	90.05	84.50	81.85	78.95	76.75
17/32	.5312	43017	44017	73.45	5/8	6	1 1/2	1 1/2	3	1/4	0.5031-0.5340	106.65	90.05	84.50	81.85	78.95	76.75
9/16	.5625	43018	44018	77.45	5/8	6	1 1/2	1 1/2	3	1/4	0.5341-0.5660	110.50	93.95	88.35	85.75	82.85	80.60
19/32	.5938	43019	44019	77.45	5/8	6	1 1/2	1 1/2	3	1/4	0.5661-0.5970	110.50	93.95	88.35	85.75	82.85	80.60
5/8	.6250	43020	44020	79.50	5/8	6	1 1/2	1 1/2	3	1/4	0.5971-0.6280	112.70	96.05	90.45	87.80	84.95	82.75
21/32	.6562	43021	44021	79.50	5/8	6	1 1/2	1 1/2	3	1/4	0.6281-0.6590	112.70	96.05	90.45	87.80	84.95	82.75
11/16	.6875	43022	44022	83.20	5/8	6	1 1/2	1 1/2	3	1/4	0.6591-0.6910	116.30	99.70	94.20	91.50	88.65	86.45
23/32	.7188	43023	44023	83.20	3/4	6	1 1/2	1 1/2	3	5/16	0.6911-0.7220	116.30	99.70	94.20	91.50	88.65	86.45
3/4	.7500	43024	44024	85.35	3/4	6	1 1/2	1 1/2	3	5/16	0.7221-0.7530	118.40	101.85	96.25	93.60	90.80	88.55
25/32	.7812	43025	44025	85.35	3/4	6	1 1/2	1 1/2	3	5/16	0.7531-0.7840	118.40	101.85	96.25	93.60	90.80	88.55
13/16	.8125	43026	44026	92.65	3/4	6	1 1/2	1 1/2	3	5/16	0.7841-0.8160	125.80	109.25	103.60	101.00	98.15	95.95
27/32	.8438	43027	44027	92.65	3/4	6	1 1/2	1 1/2	3	5/16	0.8161-0.8470	125.80	109.25	103.60	101.00	98.15	95.95
7/8	.8750	43028	44028	101.25	3/4	6	1 1/2	1 1/2	3	5/16	0.8471-0.8780	135.70	118.35	112.60	109.85	106.95	104.60
29/32	.9062	43029	44029	101.25	3/4	6	1 1/2	1 1/2	3	5/16	0.8781-0.9090	135.70	118.35	112.60	109.85	106.95	104.60
15/16	.9375	43030	44030	111.50	3/4	6	1 1/2	1 1/2	3	5/16	0.9091-0.9410	145.90	128.70	122.90	120.15	117.20	114.90
31/32	.9688	43031	44031	111.50	3/4	8	1 1/2	1 1/2	3	5/16	0.9411-0.9720	145.90	128.70	122.90	120.15	117.20	114.90
1	1.0000	43032	44032	116.95	3/4	8	1 1/2	1 1/2	3	5/16	0.9721-1.0030	151.40	134.20	128.40	125.65	122.65	120.35
1 1/16	1.0625	43034	44034	116.95	3/4	8	1 1/2	1 1/2	3	5/16	1.0031-1.0660	151.40	134.20	128.40	125.65	122.65	120.35
1 1/8	1.1250	43036	44036	136.95	3/4	8	1 1/2	1 1/2	3	5/16	1.0661-1.1280	171.35	154.05	148.30	145.60	142.60	140.30
1 3/16	1.1875	43038	44038	142.75	3/4	8	1 1/2	1 1/2	3	5/16	1.1281-1.1905	177.20	159.95	154.10	151.40	148.45	146.10
1 1/4	1.2500	43040	44040	167.20	3/4	8	1 1/2	1 1/2	3	5/16	1.1906-1.2530	201.65	184.45	178.70	175.90	173.00	170.65
1 5/16	1.3125	43042	44042	167.20	3/4	8	1 1/2	1 1/2	3	5/16	1.2531-1.3155	201.65	184.45	178.70	175.90	173.00	170.65
1 3/8	1.3750	43044	44044	169.65	3/4	8	1 1/2	1 1/2	3	5/16	1.3156-1.3780	204.05	186.80	181.10	178.30	175.45	173.10
1 7/16	1.4375	43046	44046	197.75	3/4	8	1 1/2	1 1/2	3	5/16	1.3781-1.4405	232.20	214.90	209.20	206.40	203.45	201.20
1 1/2	1.5000	43048	44048	237.50	3/4	8	1 1/2	1 1/2	3	5/16	1.4406-1.5030	271.90	254.70	248.95	246.20	243.15	240.85

*Quantities of 15 or more - price of fractional size in same size range.

CNC STUB REAMERS CARBIDE TIPPED TYPES 430 & 440 METRIC

GENERAL PURPOSE

STRAIGHT OR LEFT SPIRAL FLUTES FLUTE LONG CARBIDE STRAIGHT SHANK



NOTE: Tool diameter in millimeters (mm); all other dimensions in inches. Also, modifications available (see list on page 42).

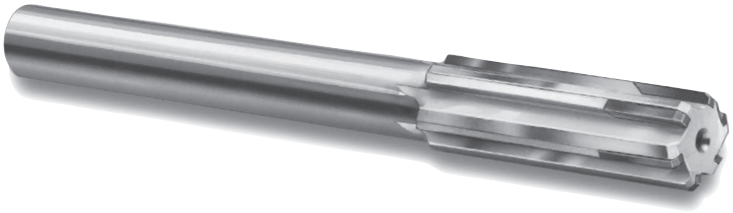
TOOL DIAMETER		TYPE 430 STRAIGHT	TYPE 440 LEFT	BOTH TYPES	DIMENSIONS					FINISHED TO MODIFIED TOOL DIAMETER							
							LENGTH				PRICE EACH - BASED ON QUANTITY ORDERED						
mm	INCH	METRIC EDP NO.	METRIC EDP NO.	METRIC PRICE	SHANK DIAM.	NO. OF FLTS	FLT & CARBIDE	OVER-ALL	PIN HOLE DIAM.	MODIFIED DIAMETER RANGE (mm)	1	2	3	4	5-7	8-14	OVER 14
4.5	.1772	430045	440045	$54.65	¼	4	*1	2 ¼	3/32	4.494 - 5.182	$78.90	$62.80	$57.40	$54.75	$52.10	$49.80	$46.75
5.0	.1969	430050	440050	54.65	¼	4	*1	2 ¼	3/32	-	-	-	-	-	-	-	-
5.5	.2165	430055	440055	54.65	¼	4	*1	2 ¼	3/32	5.183 - 5.613	78.90	62.80	57.40	54.75	52.10	49.80	46.75
6.0	.2362	430060	440060	54.65	¼	4	*1	2 ¼	3/32	5.614 - 6.045	78.90	62.80	57.40	54.75	52.10	49.80	46.75
-	-	430063	440063	-	¼	4	*1	2 ¼	3/32	6.046 - 6.426	78.90	62.80	57.40	54.75	52.10	49.80	46.75
6.5	.2559	430065	440065	54.65	⅜	4	*1	2 ¼	⅛	6.427 - 7.214	78.90	62.80	57.40	54.75	52.10	49.80	46.75
7.0	.2756	430070	440070	54.65	⅜	4	*1	2 ¼	⅛	-	-	-	-	-	-	-	-
7.5	.2953	430075	440075	61.80	⅜	4	1	2 ¼	⅛	7.215 - 8.001	86.05	69.95	64.55	61.90	59.20	56.90	53.85
8.0	.3150	430080	440080	61.80	⅜	4	1	2 ¼	⅛	-	-	-	-	-	-	-	-
8.5	.3346	430085	440085	62.20	⅜	4	1 ¼	2 ½	⅛	8.002 - 8.814	86.55	70.45	65.00	62.35	59.70	57.40	54.30
9.0	.3543	430090	440090	66.60	⅜	4	1 ¼	2 ½	⅛	8.815 - 9.601	90.90	74.80	69.40	66.75	64.00	61.80	58.70
9.5	.3740	430095	440095	66.60	⅜	4	1 ¼	2 ½	⅛	-	-	-	-	-	-	-	-
10.0	.3937	430100	440100	67.40	½	4	1 ¼	2 ½	3/16	9.602 - 10.389	91.70	75.60	70.10	67.60	64.80	62.60	59.40
10.5	.4134	430105	440105	77.80	½	4	1 ¼	2 ½	3/16	10.390 - 11.201	102.20	85.95	80.55	77.95	75.30	73.05	69.90
11.0	.4331	430110	440110	77.80	½	4	1 ¼	2 ½	3/16	-	-	-	-	-	-	-	-
11.5	.4528	430115	440115	77.80	½	4	1 ¼	2 ½	3/16	11.202 - 11.989	102.20	85.95	80.55	77.95	75.30	73.05	69.90
12.0	.4724	430120	440120	84.50	½	4	1 ¼	2 ½	3/16	11.990 - 12.776	109.40	92.80	87.30	84.60	81.85	79.50	76.35
12.5	.4921	430125	440125	84.50	½	4	1 ¼	2 ½	3/16	-	-	-	-	-	-	-	-
13.0	.5118	430130	440130	84.50	⅝	6	1 ½	3	¼	12.777 - 13.564	109.40	92.80	87.30	84.60	81.85	79.50	76.35
13.5	.5315	430135	440135	84.50	⅝	6	1 ½	3	¼	-	-	-	-	-	-	-	-
14.0	.5512	430140	440140	88.35	⅝	6	1 ½	3	¼	13.565 - 14.376	113.35	96.80	91.25	88.55	85.75	83.40	80.25
14.5	.5709	430145	440145	88.35	⅝	6	1 ½	3	¼	14.377 - 15.164	113.35	96.80	91.25	88.55	85.75	83.40	80.25
15.0	.5906	430150	440150	88.35	⅝	6	1 ½	3	¼	-	-	-	-	-	-	-	-
15.5	.6102	430155	440155	90.45	⅝	6	1 ½	3	¼	15.165 - 15.951	115.45	98.95	93.35	90.60	87.80	85.55	82.35
16.0	.6299	430160	440160	90.45	⅝	6	1 ½	3	¼	15.952 - 16.739	115.45	98.95	93.35	90.60	87.80	85.55	82.35
16.5	.6496	430165	440165	90.45	⅝	6	1 ½	3	¼	-	-	-	-	-	-	-	-
17.0	.6693	430170	440170	94.20	⅝	6	1 ½	3	¼	16.740 - 17.551	119.10	102.55	97.00	94.30	91.50	89.20	85.95
17.5	.6890	430175	440175	94.20	⅝	6	1 ½	3	¼	-	-	-	-	-	-	-	-
18.0	.7087	430180	440180	94.20	¾	6	1 ½	3	5/16	17.552 - 18.339	119.10	102.55	97.00	94.30	91.50	89.20	85.95
18.5	.7283	430185	440185	96.25	¾	6	1 ½	3	5/16	18.340 - 19.126	121.20	104.60	99.10	96.40	93.60	91.30	88.15
19.0	.7480	430190	440190	96.25	¾	6	1 ½	3	5/16	-	-	-	-	-	-	-	-
19.5	.7677	430195	440195	96.25	¾	6	1 ½	3	5/16	19.127 - 19.914	121.20	104.60	99.10	96.40	93.60	91.30	88.15
20.0	.7874	430200	440200	103.60	¾	6	1 ½	3	5/16	19.915 - 20.726	128.65	112.10	106.55	103.85	101.00	98.70	95.50
20.5	.8071	430205	440205	103.60	¾	6	1 ½	3	5/16	-	-	-	-	-	-	-	-
21.0	.8268	430210	440210	103.60	¾	6	1 ½	3	5/16	20.727 - 21.514	128.65	112.10	106.55	103.85	101.00	98.70	95.50
21.5	.8465	430215	440215	103.60	¾	6	1 ½	3	5/16	-	-	-	-	-	-	-	-
22.0	.8661	430220	440220	108.55	¾	6	1 ½	3	5/16	21.515 - 22.301	133.50	116.95	111.35	108.70	105.90	103.55	100.40
22.5	.8858	430225	440225	112.60	¾	6	1 ½	3	5/16	22.302 - 23.089	138.50	121.35	115.60	112.75	109.85	107.55	104.20
23.0	.9055	430230	440230	112.60	¾	6	1 ½	3	5/16	-	-	-	-	-	-	-	-
23.5	.9252	430235	440235	122.90	¾	6	1 ½	3	5/16	23.090 - 23.901	148.80	131.60	125.90	123.05	120.15	117.75	114.50
24.0	.9449	430240	440240	122.90	¾	8	1 ½	3	5/16	23.902 - 24.689	148.80	131.60	125.90	123.05	120.15	117.75	114.50
24.5	.9646	430245	440245	122.90	¾	8	1 ½	3	5/16	-	-	-	-	-	-	-	-
25.0	.9843	430250	440250	128.40	¾	8	1 ½	3	5/16	24.690 - 25.476	154.35	137.10	131.40	128.60	125.65	123.30	120.00
25.5	1.0039	430255	440255	128.40	¾	8	1 ½	3	5/16	25.477 - 27.076	154.35	137.10	131.40	128.60	125.65	123.30	120.00
26.0	1.0236	430260	440260	128.40	¾	8	1 ½	3	5/16	-	-	-	-	-	-	-	-
27.0	1.0630	430270	440270	128.40	¾	8	1 ½	3	5/16	-	-	-	-	-	-	-	-
28.0	1.1024	430280	440280	148.30	¾	8	1 ½	3	5/16	27.077 - 28.651	174.25	157.10	151.25	148.45	145.60	143.20	139.90
29.0	1.1417	430290	440290	154.10	¾	8	1 ½	3	5/16	28.652 - 30.239	174.25	157.10	151.25	148.45	145.60	143.20	139.90
30.0	1.1811	430300	440300	154.10	¾	8	1 ½	3	5/16	-	-	-	-	-	-	-	-
31.0	1.2205	430310	440310	178.70	¾	8	1 ½	3	5/16	30.240 - 31.826	204.60	187.35	181.65	178.80	175.90	173.50	170.25
32.0	1.2598	430320	440320	178.70	¾	8	1 ½	3	5/16	31.827 - 33.414	204.60	187.35	181.65	178.80	175.90	173.50	170.25
33.0	1.2992	430330	440330	178.70	¾	8	1 ½	3	5/16	-	-	-	-	-	-	-	-
34.0	1.3386	430340	440340	181.10	¾	8	1 ½	3	5/16	33.415 - 35.001	206.95	189.75	184.00	181.20	178.30	175.90	172.60
35.0	1.3780	430350	440350	181.10	¾	8	1 ½	3	5/16	-	-	-	-	-	-	-	-
36.0	1.4173	430360	440360	209.20	¾	8	1 ½	3	5/16	35.002 - 36.589	235.05	217.90	212.15	209.30	206.40	204.00	200.70
37.0	1.4567	430370	440370	248.95	¾	8	1 ½	3	5/16	36.590 - 38.176	274.85	257.70	251.85	249.10	246.20	243.75	240.45
38.0	1.4961	430380	440380	248.95	¾	8	1 ½	3	5/16	-	-	-	-	-	-	-	-

*½" carbide length

JOBBERS DRILL LENGTH REAMERS CARBIDE TIPPED TYPE 401 FRACTIONAL

GENERAL PURPOSE

STRAIGHT FLUTES STRAIGHT SHANK



TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	401
	40	NON-FERROUS - SHORT CHIPS	401
	60	CAST IRONS	401
	80	LOW STRENGTH STEELS	401
	100	MEDIUM STRENGTH STEELS	401
	120	HIGH STRENGTH STEELS	401
	140	HIGH TEMPERATURE ALLOYS	401

TYPE 401

- Straight polished flutes and straight shank
- Short length for extra rigidity
- Detailed specifications on pg. 29

USE:

- Production length reamers are similar in length to jobbers length drills. This reduces costly setup time, while increasing the rigidity of the reamer compared to the standard length chucking reamer. For shallow holes only (see page 27).

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Metric tool diameter
- Closer tool diameter tolerance - pg. 29
- Cutting diameter reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diam. back taper
- Shortened shank or reduced shank diameter
- Flat(s) or tang on shank
- Coatings available:

TITANIUM NITRIDE – TiN
TITANIUM CARBONITRIDE – TiCN
ZIRCONIUM NITRIDE – ZrN
AL TITANIUM NITRIDE – AlTiN

TOOL DIAMETER		TYPE 401 EDP NO.	PRICE	DIMENSIONS					FINISHED TO MODIFIED TOOL DIAMETER						
				SHANK DIAM.	NO. OF FLTS	LENGTH			MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DECIMAL					FLT	CAR-BIDE	OVER-ALL		1	2	3	4	5-7	8-14*
5/32	.1562	40105	$54.15	.151	4	1	1/2	3 1/8	0.1560 - 0.1769	$86.50	$70.35	$64.85	$62.30	$59.55	$57.35
11/64	.1719	4011719	54.15	.151	4	1	1/2	3 1/4	-	-	-	-	-	-	-
3/16	.1875	40106	52.35	11/64	4	1 1/8	1/2	3 1/2	0.1770 - 0.2040	83.80	68.05	62.80	60.25	57.65	55.50
13/64	.2031	4012031	52.75	11/64	4	1 1/8	1/2	3 5/8	-	-	-	-	-	-	-
7/32	.2188	40107	52.35	13/64	4	1 1/4	1/2	3 3/4	0.2041 - 0.2210	83.80	68.05	62.80	60.25	57.65	55.50
15/64	.2344	4012344	52.75	7/32	4	1 1/2	1/2	3 7/8	0.2211 - 0.2380	84.20	68.50	63.10	60.65	57.95	55.80
1/4	.2500	40108	52.35	15/64	4	1 1/2	1/2	4	0.2381 - 0.2530	83.80	68.05	62.80	60.25	57.65	55.50
17/64	.2656	4012656	53.40	15/64	4	1 1/2	1/2	4 1/8	-	-	-	-	-	-	-
9/32	.2812	40109	53.10	15/64	4	1 1/2	1/2	4 1/4	0.2531 - 0.2840	84.55	68.80	63.55	61.00	58.30	56.20
19/64	.2969	4012969	53.40	9/32	4	1 1/2	1/2	4 3/8	-	-	-	-	-	-	-
5/16	.3125	40110	53.10	9/32	4	1 1/2	1/2	4 1/2	0.2841 - 0.3150	84.55	68.80	63.55	61.00	58.30	56.20
21/64	.3281	4013281	55.00	9/32	4	1 1/2	5/8	4 5/8	-	-	-	-	-	-	-
11/32	.3438	40111	54.40	9/32	4	1 1/2	5/8	4 3/4	0.3151 - 0.3470	85.80	70.05	64.80	62.30	59.60	57.45
23/64	.3594	4013594	55.00	5/16	4	1 3/4	5/8	4 7/8	-	-	-	-	-	-	-
3/8	.3750	40112	49.95	5/16	4	1 3/4	5/8	5	0.3471 - 0.3780	78.75	64.30	59.40	57.15	54.70	52.75
25/64	.3906	4013906	57.10	5/16	4	1 3/4	5/8	5 1/8	-	-	-	-	-	-	-
13/32	.4062	40113	56.15	5/16	4	1 3/4	5/8	5 1/4	0.3781 - 0.4090	87.60	71.85	66.55	64.10	61.30	59.20
27/64	.4219	4014219	57.10	3/8	4	1 3/4	5/8	5 3/8	-	-	-	-	-	-	-
7/16	.4375	40114	58.60	3/8	4	1 3/4	5/8	5 1/2	0.4091 - 0.4410	90.05	74.30	69.00	66.50	63.75	61.65
29/64	.4531	4014531	60.90	3/8	4	1 3/4	5/8	5 5/8	-	-	-	-	-	-	-
15/32	.4688	40115	61.20	3/8	4	1 3/4	5/8	5 3/4	0.4411 - 0.4720	92.65	76.90	71.60	69.10	66.45	64.30
31/64	.4844	4014844	64.85	7/16	6	2	5/8	5 7/8	-	-	-	-	-	-	-
1/2	.5000	40116	68.75	7/16	6	2	5/8	6	0.4721 - 0.5030	103.35	85.95	80.25	77.50	74.45	72.15
33/64	.5156	4015156	73.05	7/16	6	2	5/8	6 5/8	-	-	-	-	-	-	-
17/32	.5312	40117	73.05	7/16	6	2	5/8	6 5/8	0.5031 - 0.5340	107.65	90.30	84.55	81.75	78.80	76.50
35/64	.5469	4015469	73.05	7/16	6	2	5/8	6 5/8	-	-	-	-	-	-	-
9/16	.5625	40118	73.05	7/16	6	2	5/8	6 5/8	0.5341 - 0.5660	107.65	90.30	84.55	81.75	78.80	76.50
37/64	.5781	4015781	75.05	7/16	6	2	5/8	6 5/8	-	-	-	-	-	-	-
19/32	.5938	40119	75.05	7/16	6	2	5/8	7 1/8	0.5661 - 0.5970	109.75	92.40	86.60	83.80	80.80	78.55
39/64	.6094	4016094	75.05	9/16	6	2 1/4	5/8	7 1/8	-	-	-	-	-	-	-
5/8	.6250	40120	75.05	9/16	6	2 1/4	5/8	7 1/8	0.5971 - 0.6280	109.75	92.40	86.60	83.80	80.80	78.55
41/64	.6406	4016406	76.00	9/16	6	2 1/4	5/8	7 1/8	-	-	-	-	-	-	-
21/32	.6562	40121	76.00	9/16	6	2 1/4	5/8	7 1/8	0.6281 - 0.6590	110.65	93.35	87.50	84.70	81.75	79.40
43/64	.6719	4016719	76.00	9/16	6	2 1/4	5/8	7 5/8	-	-	-	-	-	-	-
11/16	.6875	40122	76.00	9/16	6	2 1/4	5/8	7 5/8	0.6591 - 0.6910	110.65	93.35	87.50	84.70	81.75	79.40
45/64	.7031	4017031	78.65	9/16	6	2 1/4	5/8	7 5/8	-	-	-	-	-	-	-
23/32	.7188	40123	78.65	9/16	6	2 1/4	5/8	7 5/8	0.6911 - 0.7220	113.25	95.95	90.15	87.35	84.40	82.05
47/64	.7344	4017344	78.65	5/8	6	2 1/2	3/4	7 5/8	-	-	-	-	-	-	-
3/4	.7500	40124	78.65	5/8	6	2 1/2	3/4	8	0.7221 - 0.7530	113.25	95.95	90.15	87.35	84.40	82.05

*Quantities of 15 or more - price of fractional size in same size range.

JOBBERS DRILL LENGTH REAMERS CARBIDE TIPPED TYPES 477 & 479 FRACTIONAL

GENERAL PURPOSE

OVER & UNDER SIZE REAMERS CARBIDE TIPPED

TYPE 479 - STRAIGHT FLUTES & SHANK

- Tool diameter tolerance: plus .0002", minus .0000"
- Same specifications and available modifications as Type 401 (pg. 44)

USE:

- These precision ground carbide tipped reamers are very effective for finishing accurate holes in most materials. For shallow holes only (see page 27)

DECIMAL TOOL DIAMETER	TYPE 479 EDP NO.	PRICE	DIMENSIONS				
			SHANK DIAM.	NO. OF FLUTES	LENGTH FLUTE	LENGTH CARBIDE	LENGTH OVERALL
.1865	47918	$52.75	11/64	4	1 1/8	1/2	3 1/2
.1885	47919	52.75	11/64	4	1 1/8	1/2	3 1/2
.2490	47924	52.75	15/64	4	1 1/2	1/2	4
.2510	47925	52.75	15/64	4	1 1/2	1/2	4
.3115	47931	53.40	9/32	4	1 1/2	1/2	4 1/2
.3135	47932	53.40	9/32	4	1 1/2	1/2	4 1/2
.3740	47937	55.00	5/16	4	1 3/4	5/8	5
.3760	47938	55.00	5/16	4	1 3/4	5/8	5
.4365	47943	60.90	3/8	4	1 3/4	5/8	5 1/2
.4385	47944	60.90	3/8	4	1 3/4	5/8	5 1/2
.4990	47949	64.85	7/16	6	2	5/8	6
.5010	47950	64.85	7/16	6	2	5/8	6

DOWEL PIN SIZE REAMERS CARBIDE TIPPED

TYPE 477 - STRAIGHT FLUTES & SHANK

- Special plus .0000", minus .0002" tool diameter tolerance
- Same specifications & available modifications as Type 401 (pg. 44)

USE:

- These precision ground reamers should be used in pairs, .0005" and .0020" under the dowel pin diameter. The .0020" smaller holes assure a tighter dowel pin fit, so all the pins will remain on the same side upon disassembly. Especially useful in plastic or die cast molds and machines when assembled sections are subject to shearing stress, yet require occasional disassembly.

DECIMAL TOOL DIAMETER	TYPE 477 EDP NO.	PRICE	DIMENSIONS				
			SHANK DIAM.	NO. OF FLUTES	LENGTH FLUTE	LENGTH CARBIDE	LENGTH OVERALL
.1855	47717	$52.75	11/64	4	1 1/8	1/2	3 1/2
.1870	47718	52.75	11/64	4	1 1/8	1/2	3 1/2
.2480	47723	52.75	15/64	4	1 1/2	1/2	4
.2495	47724	52.75	15/64	4	1 1/2	1/2	4
.3105	47730	53.40	9/32	4	1 1/2	1/2	4 1/2
.3120	47731	53.40	9/32	4	1 1/2	1/2	4 1/2
.3730	47736	55.00	5/16	4	1 3/4	5/8	5
.3745	47737	55.00	5/16	4	1 3/4	5/8	5
.4355	47742	60.90	3/8	4	1 3/4	5/8	5 1/2
.4370	47743	60.90	3/8	4	1 3/4	5/8	5 1/2
.4980	47748	64.85	7/16	6	2	5/8	6
.4995	47749	64.85	7/16	6	2	5/8	6

REGULAR LENGTH CHUCKING REAMERS CARBIDE TIPPED TYPE 400 WIRE & LETTER SIZES

GENERAL PURPOSE

STRAIGHT FLUTES & SHANK

For shallow holes only (see page 27)
(See specifications & available modifications on page 44)

TOOL DIAMETER		TYPE 400 EDP NO.	PRICE	DIMENSIONS				
WIRE/ LETTER	DECIMAL EQUIV.			SHANK DIAM.	NO. OF FLTS	LENGTH FLT	LENGTH CARBIDE	LENGTH OVERALL
22	.1570	4001570	$47.45	.151	4	1	1/2	4
21	.1590	4001590	47.45	.151	4	1	1/2	4
20	.1610	4001610	47.45	.151	4	1	1/2	4
19	.1660	4001660	47.45	.151	4	1	1/2	4
18	.1695	4001695	47.45	.151	4	1	1/2	4
17	.1730	4001730	47.45	.151	4	1	1/2	4
16	.1770	4001770	44.15	11/64	4	1 1/8	1/2	4 1/2
15	.1800	4001800	44.15	11/64	4	1 1/8	1/2	4 1/2
14	.1820	4001820	44.15	11/64	4	1 1/8	1/2	4 1/2
13	.1850	400047	44.15	11/64	4	1 1/8	1/2	4 1/2
12	.1890	400048	44.15	11/64	4	1 1/8	1/2	4 1/2
11	.1910	4001910	44.15	11/64	4	1 1/8	1/2	4 1/2
10	.1935	4001935	44.15	11/64	4	1 1/8	1/2	4 1/2
9	.1960	4001960	44.15	11/64	4	1 1/8	1/2	4 1/2
8	.1990	4001990	44.15	11/64	4	1 1/8	1/2	4 1/2
7	.2010	4002010	44.15	11/64	4	1 1/8	1/2	4 1/2
6	.2040	4002040	44.15	11/64	4	1 1/8	1/2	4 1/2
5	.2055	4002055	44.15	13/64	4	1 1/4	1/2	5
4	.2090	4002090	44.15	13/64	4	1 1/4	1/2	5
3	.2130	4002130	44.15	13/64	4	1 1/4	1/2	5
2	.2210	4002210	44.15	13/64	4	1 1/4	1/2	5
1	.2280	4002280	46.20	7/32	4	1 1/2	1/2	6
A	.2340	4002340	46.20	7/32	4	1 1/2	1/2	6
B	.2380	4002380	46.20	7/32	4	1 1/2	1/2	6

TOOL DIAMETER		TYPE 400 EDP NO.	PRICE	DIMENSIONS				
LETTER	DECIMAL EQUIV.			SHANK DIAM.	NO. OF FLTS	LENGTH FLT	LENGTH CARBIDE	LENGTH OVERALL
C	.2420	4002420	$44.15	15/64	4	1 1/2	1/2	6
D	.2460	4002460	44.15	15/64	4	1 1/2	1/2	6
E	.2500	40008	33.65	15/64	4	1 1/2	1/2	6
F	.2570	4002570	44.85	15/64	4	1 1/2	1/2	6
G	.2610	4002610	44.85	15/64	4	1 1/2	1/2	6
H	.2660	4002660	44.85	15/64	4	1 1/2	1/2	6
I	.2720	4002720	44.85	15/64	4	1 1/2	1/2	6
J	.2770	4002770	44.85	15/64	4	1 1/2	1/2	6
K	.2810	4002810	44.85	15/64	4	1 1/2	1/2	6
L	.2900	4002900	44.85	9/32	4	1 1/2	1/2	6
M	.2950	4002950	44.85	9/32	4	1 1/2	1/2	6
N	.3020	4003020	44.85	9/32	4	1 1/2	1/2	6
O	.3160	4003160	46.00	9/32	4	1 1/2	1/2	6
P	.3230	4003230	46.00	9/32	4	1 1/2	1/2	6
Q	.3320	4003320	46.00	9/32	4	1 1/2	1/2	6
R	.3390	4003390	46.00	9/32	4	1 1/2	1/2	6
S	.3480	4003480	46.00	5/16	4	1 3/4	5/8	7
T	.3580	4003580	46.00	5/16	4	1 3/4	5/8	7
U	.3680	4003680	46.00	5/16	4	1 3/4	5/8	7
V	.3770	4003770	46.00	5/16	4	1 3/4	5/8	7
W	.3860	4003860	47.80	5/16	4	1 3/4	5/8	7
X	.3970	4003970	47.80	5/16	4	1 3/4	5/8	7
Y	.4040	4004040	47.80	5/16	4	1 3/4	5/8	7
Z	.4130	4004130	50.25	3/8	4	1 3/4	5/8	7

CHUCKING REAMERS CARBIDE TIPPED TYPE 400 FRACTIONAL

GENERAL PURPOSE

STRAIGHT FLUTES STRAIGHT SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	400/407[MS]
	40	NON-FERROUS - SHORT CHIPS	400/407[MS]
	60	CAST IRONS	400/408[MS]
	80	LOW STRENGTH STEELS	400/409[MS]
	100	MEDIUM STRENGTH STEELS	400/409[MS]
	120	HIGH STRENGTH STEELS	400/409[MS]
	140	HIGH TEMPERATURE ALLOYS	409[MS]

[MS]See pages 76 & 77 for material specific reamers

TYPE 400

- Straight polished flutes and straight shank
- Detailed specifications on page 29

USE:

- For all general reaming of steels, cast irons, non-ferrous materials, plastics, and non-metals

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Modified metric tool diameter - priced on pg. 52
- Closer tool diameter tolerance - pg. 29
- Cutting diameter reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diam. back taper
- Shortened shank or reduced shank diameter
- Flat(s) or tang on shank
- Coatings available: See page 41

NOTE: For stocked tool diameters in .0005 increments, see pgs. 48-51. For semi-finished reamers, see pg. 53. For smaller tool diameters, see solid carbide reamers on pgs. 58, 105-107. For shallow holes only (see page 27).

TOOL DIAMETER		TYPE 400 EDP NO.	PRICE	DIMENSIONS					FINISHED TO MODIFIED TOOL DIAMETER						
				SHANK DIAM.	NO. OF FLTS	LENGTH			MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DECIMAL					FLT	CAR-BIDE	OVER-ALL		1	2	3	4	5-7	8-14*
5/32	.1562	40005	$36.70	.151	4	1	1/2	4	0.1560 - 0.1769	$69.40	$52.80	$47.45	$44.80	$42.05	$39.85
11/64	.1719	4001719	36.70	.151	4	1	1/2	4	-	-	-	-	-	-	-
3/16	.1875	40006	33.65	11/64	4	1 1/8	1/2	4 1/2	0.1770 - 0.2040	65.10	49.35	44.15	41.55	38.90	36.75
3/16	.1875	40086	35.65	11/64	4	1 1/4	1/2	5	0.1770 - 0.2040	67.10	51.35	46.20	43.55	40.90	38.75
13/64	.2031	4002031	35.65	11/64	4	1 1/8	1/2	4 1/2	-	-	-	-	-	-	-
7/32	.2188	40007	33.65	13/64	4	1 1/4	1/2	5	0.2041 - 0.2210	65.10	49.35	44.15	41.55	38.90	36.75
15/64	.2344	4002344	35.65	7/32	4	1 1/2	1/2	6	0.2211 - 0.2380	67.10	51.35	46.20	43.55	40.90	38.75
1/4	.2500	40008	33.65	15/64	4	1 1/2	1/2	6	0.2381 - 0.2530	65.10	49.35	44.15	41.55	38.90	36.75
17/64	.2656	4002656	36.45	15/64	4	1 1/2	1/2	6	-	-	-	-	-	-	-
9/32	.2812	40009	34.40	15/64	4	1 1/2	1/2	6	0.2531 - 0.2840	65.85	50.10	44.85	42.30	39.60	37.45
19/64	.2969	4002969	36.45	9/32	4	1 1/2	1/2	6	-	-	-	-	-	-	-
5/16	.3125	40010	34.40	9/32	4	1 1/2	1/2	6	0.2841 - 0.3150	65.85	50.10	44.85	42.30	39.60	37.45
21/64	.3281	4003281	37.80	9/32	4	1 1/2	5/8	6	-	-	-	-	-	-	-
11/32	.3438	40011	35.60	9/32	4	1 1/2	5/8	6	0.3151 - 0.3470	67.05	51.30	46.00	43.50	40.85	38.70
23/64	.3594	4003594	37.80	5/16	4	1 3/4	5/8	7	-	-	-	-	-	-	-
3/8	.3750	40012	35.60	5/16	4	1 3/4	5/8	7	0.3471 - 0.3780	67.05	51.30	46.00	43.50	40.85	38.70
25/64	.3906	4003906	39.70	5/16	4	1 3/4	5/8	7	-	-	-	-	-	-	-
13/32	.4062	40013	37.35	5/16	4	1 3/4	5/8	7	0.3781 - 0.4090	68.80	53.05	47.80	45.25	42.55	40.45
27/64	.4219	4004219	42.25	3/8	4	1 3/4	5/8	7	-	-	-	-	-	-	-
7/16	.4375	40014	39.90	3/8	4	1 3/4	5/8	7	0.4091 - 0.4410	71.35	55.60	50.25	47.80	45.05	43.00
29/64	.4531	4004531	42.95	3/8	4	1 3/4	5/8	7	-	-	-	-	-	-	-
15/32	.4688	40015	40.45	3/8	4	1 3/4	5/8	7	0.4411 - 0.4720	71.90	56.15	50.90	48.35	45.65	43.50
31/64	.4844	4004844	46.40	7/16	6	2	5/8	8	-	-	-	-	-	-	-
1/2	.5000	40016	48.10	7/16	6	2	5/8	8	0.4721 - 0.5030	82.75	65.45	59.60	56.85	53.85	51.50
33/64	.5156	4005156	52.35	7/16	6	2	5/8	8	-	-	-	-	-	-	-
17/32	.5312	40017	52.35	7/16	6	2	5/8	8	0.5031 - 0.5340	87.05	69.70	63.90	61.10	58.10	55.80
35/64	.5469	4005469	52.35	7/16	6	2	5/8	8	-	-	-	-	-	-	-
9/16	.5625	40018	52.35	7/16	6	2	5/8	8	0.5341 - 0.5660	87.05	69.70	63.90	61.10	58.10	55.80
37/64	.5781	4005781	54.50	7/16	6	2	5/8	8	-	-	-	-	-	-	-
19/32	.5938	40019	54.50	7/16	6	2	5/8	8	0.5661 - 0.5970	89.15	71.75	65.95	63.25	60.20	57.95
39/64	.6094	4006094	54.50	9/16	6	2 1/4	5/8	9	-	-	-	-	-	-	-
5/8	.6250	40020	54.50	9/16	6	2 1/4	5/8	9	0.5971 - 0.6280	89.15	71.75	65.95	63.25	60.20	57.95
41/64	.6406	4006406	55.45	9/16	6	2 1/4	5/8	9	-	-	-	-	-	-	-
21/32	.6562	40021	55.45	9/16	6	2 1/4	5/8	9	0.6281 - 0.6590	90.05	72.65	66.90	64.15	61.15	58.85
43/64	.6719	4006719	55.45	9/16	6	2 1/4	5/8	9	-	-	-	-	-	-	-
11/16	.6875	40022	55.45	9/16	6	2 1/4	5/8	9	0.6591 - 0.6910	90.05	72.65	66.90	64.15	61.15	58.85
45/64	.7031	4007031	58.05	9/16	6	2 1/4	5/8	9	-	-	-	-	-	-	-
23/32	.7188	40023	58.05	9/16	6	2 1/4	5/8	9	0.6911 - 0.7220	92.65	75.35	69.50	66.80	63.75	61.50
47/64	.7344	4007344	58.05	5/8	6	2 1/2	3/4	9 1/2	-	-	-	-	-	-	-
3/4	.7500	40024	58.05	5/8	6	2 1/2	3/4	9 1/2	0.7221 - 0.7530	92.65	75.35	69.50	66.80	63.75	61.50

CONTINUED ON NEXT PAGE

*Quantities of 15 or more - price of fractional size in same size range.

CONTINUED FROM PAGE 46 - TYPE 400 FRACTIONAL

TOOL DIAMETER		TYPE 400 EDP NO.	PRICE	DIMENSIONS					FINISHED TO MODIFIED TOOL DIAMETER						
				SHANK DIAM.	NO. OF FLTS	LENGTH			MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DECIMAL					FLT	CAR-BIDE	OVER-ALL		1	2	3	4	5-7	8-14*
49/64	.7656	4007656	$59.95	5/8	6	2 1/2	3/4	9 1/2	-	-	-	-	-	-	-
25/32	.7812	40025	59.95	5/8	6	2 1/2	3/4	9 1/2	0.7531 - 0.7840	$94.55	$77.20	$71.45	$68.70	$65.70	$63.35
51/64	.7969	4007969	59.95	5/8	6	2 1/2	3/4	9 1/2	-	-	-	-	-	-	-
13/16	.8125	40026	59.95	5/8	6	2 1/2	3/4	9 1/2	0.7841 - 0.8160	94.55	77.20	71.45	68.70	65.70	63.35
53/64	.8281	4008281	62.35	5/8	6	2 1/2	3/4	9 1/2	-	-	-	-	-	-	-
27/32	.8438	40027	62.35	5/8	6	2 1/2	3/4	9 1/2	0.8161 - 0.8470	97.00	79.65	73.85	71.05	68.05	65.75
55/64	.8594	4008594	62.35	3/4	6	2 5/8	3/4	10	-	-	-	-	-	-	-
7/8	.8750	40028	64.70	3/4	6	2 5/8	3/4	10	0.8471 - 0.8780	100.60	82.65	76.65	73.80	70.60	68.20
57/64	.8906	4008906	75.35	3/4	6	2 5/8	3/4	10	-	-	-	-	-	-	-
29/32	.9062	40029	75.35	3/4	6	2 5/8	3/4	10	0.8781 - 0.9090	111.30	93.30	87.30	84.45	81.30	78.90
59/64	.9219	4009219	75.35	3/4	8	2 5/8	3/4	10	-	-	-	-	-	-	-
15/16	.9375	40030	75.35	3/4	8	2 5/8	3/4	10	0.9091 - 0.9410	111.30	93.30	87.30	84.45	81.30	78.90
61/64	.9531	4009531	79.00	3/4	8	2 5/8	3/4	10	-	-	-	-	-	-	-
31/32	.9688	40031	79.00	3/4	8	2 5/8	3/4	10	0.9411 - 0.9720	114.95	96.95	91.00	88.10	84.95	82.55
63/64	.9844	4009844	79.00	7/8	8	2 3/4	3/4	10 1/2	-	-	-	-	-	-	-
1	1.0000	40032	79.00	7/8	8	2 3/4	3/4	10 1/2	0.9721 - 1.0030	114.95	96.95	91.00	88.10	84.95	82.55
1 1/16	1.0625	40034	81.65	7/8	8	2 3/4	3/4	10 1/2	1.0031 - 1.0660	116.20	98.95	93.10	90.40	87.45	85.05
1 1/8	1.1250	40036	88.30	7/8	8	2 7/8	7/8	11	1.0661 - 1.1280	122.80	105.50	99.80	97.05	94.00	91.70
1 3/16	1.1875	40038	92.85	1	8	2 7/8	7/8	11	1.1281 - 1.1905	127.25	110.05	104.25	101.50	98.60	96.20
1 1/4	1.2500	40040	98.15	1	8	3	7/8	11 1/2	1.1906 - 1.2530	132.65	115.45	109.60	106.90	103.90	101.55
1 5/16	1.3125	40042	103.30	1	8	3	7/8	11 1/2	1.2531 - 1.3155	137.70	120.45	114.65	111.95	108.95	106.65
1 3/8	1.3750	40044	109.60	1	8	3 1/4	7/8	12	1.3156 - 1.3780	144.00	126.80	121.05	118.25	115.35	113.05
1 7/16	1.4375	40046	122.10	1 1/4	8	3 1/4	7/8	12	1.3781 - 1.4405	156.60	139.35	133.55	130.85	127.85	125.50
1 1/2	1.5000	40048	129.10	1 1/4	8	3 1/2	7/8	12 1/2	1.4406 - 1.5030	163.50	146.30	140.45	137.80	134.80	132.45
1 9/16	1.5625	40050	191.75	1 1/4	8	3 1/2	7/8	12 1/2	1.5031 - 1.5660	226.15	208.95	203.20	200.40	197.50	195.15
1 5/8	1.6250	40052	198.35	1 1/4	8	3 3/4	7/8	13	1.5661 - 1.6280	232.70	215.50	209.70	206.95	204.00	201.65
1 11/16	1.6875	40054	223.00	1 1/4	8	3 3/4	7/8	13	1.6281 - 1.6910	257.55	240.30	234.50	231.75	228.85	226.50
1 3/4	1.7500	40056	223.00	1 1/4	10	4	7/8	13 1/2	1.6911 - 1.7530	257.55	240.30	234.50	231.75	228.85	226.50
1 13/16	1.8125	40058	223.00	1 1/2	10	4	7/8	13 1/2	1.7531 - 1.8160	257.55	240.30	234.50	231.75	228.85	226.50
1 7/8	1.8750	40060	233.75	1 1/2	10	4 1/4	7/8	14	1.8161 - 1.8780	268.15	250.90	245.05	242.35	239.40	237.05
1 15/16	1.9375	40062	233.75	1 1/2	10	4 1/4	7/8	14	1.8781 - 1.9410	268.15	250.90	245.05	242.35	239.40	237.05
2	2.0000	40064	233.75	1 1/2	12	4 1/4	7/8	14	1.9411 - 2.0030	268.15	250.90	245.05	242.35	239.40	237.05

*Quantities of 15 or more - price of fractional size in same size range.

OVER & UNDER SIZE REAMERS CARBIDE TIPPED

GENERAL PURPOSE

TYPE 478 - STRAIGHT FLUTES & SHANK

- Tool diameter tolerance: plus .0002", minus .0000"
- Same specifications and available modifications as Type 400 (pg. 46)

USE:

- These precision ground carbide tipped reamers are very effective for finishing accurate holes in most materials

DECIMAL TOOL DIAMETER	TYPE 478 EDP NO.	PRICE	DIMENSIONS				
			SHANK DIAM.	NO. OF FLUTES	LENGTH		
					FLUTE	CAR-BIDE	OVER-ALL
.1865	47818	$42.35	11/64	4	1 1/8	1/2	4 1/2
.1885	47819	42.35	11/64	4	1 1/8	1/2	4 1/2
.2490	47824	42.35	15/64	4	1 1/2	1/2	6
.2510	47825	42.35	15/64	4	1 1/2	1/2	6
.3115	47831	43.30	9/32	4	1 1/2	1/2	6
.3135	47832	43.30	9/32	4	1 1/2	1/2	6
.3740	47837	44.90	5/16	4	1 3/4	5/8	7
.3760	47838	44.90	5/16	4	1 3/4	5/8	7
.4365	47843	50.20	3/8	4	1 3/4	5/8	7
.4385	47844	50.20	3/8	4	1 3/4	5/8	7
.4990	47849	55.00	7/16	6	2	5/8	8
.5010	47850	55.00	7/16	6	2	5/8	8
.6240	47862	65.95	9/16	6	2 1/4	5/8	9
.6260	47863	65.95	9/16	6	2 1/4	5/8	9
.7490	47874	69.50	5/8	6	2 1/2	3/4	9 1/2
.7510	47875	69.50	5/8	6	2 1/2	3/4	9 1/2
.8740	47886	73.85	3/4	6	2 5/8	3/4	10
.8760	47887	76.65	3/4	6	2 5/8	3/4	10
.9990	47898	91.05	7/8	8	2 3/4	3/4	10 1/2
1.0010	47899	87.25	7/8	8	2 3/4	3/4	10 1/2

DOWEL PIN SIZE REAMERS CARBIDE TIPPED

GENERAL PURPOSE

TYPE 476 - STRAIGHT FLUTES & SHANK

- Special plus .0000", minus .0002" tool diameter tolerance
- Same specifications and available modifications as Type 400 (pg. 46)

USE:

- These precision ground reamers should be used in pairs, .0005" and .0020" under the dowel pin diameter. The .0020" smaller holes assure a tighter dowel pin fit, so all the pins will remain on the same side upon disassembly. Especially useful in plastic or die cast molds and machines when assembled sections are subject to shearing stress, yet require occasional disassembly.

DECIMAL TOOL DIAMETER	TYPE 476 EDP NO.	PRICE	DIMENSIONS				
			SHANK DIAM.	NO. OF FLUTES	LENGTH		
					FLUTE	CAR-BIDE	OVER-ALL
.1855	47617	$42.35	11/64	4	1 1/8	1/2	4 1/2
.1870	47618	42.35	11/64	4	1 1/8	1/2	4 1/2
.2480	47623	42.35	15/64	4	1 1/2	1/2	6
.2495	47624	42.35	15/64	4	1 1/2	1/2	6
.3105	47630	43.30	9/32	4	1 1/2	1/2	6
.3120	47631	43.30	9/32	4	1 1/2	1/2	6
.3730	47636	44.90	5/16	4	1 3/4	5/8	7
.3745	47637	44.90	5/16	4	1 3/4	5/8	7
.4355	47642	50.20	3/8	4	1 3/4	5/8	7
.4370	47643	50.20	3/8	4	1 3/4	5/8	7
.4980	47648	55.00	7/16	6	2	5/8	8
.4995	47649	55.00	7/16	6	2	5/8	8
	47600	$528.50 - CASED SET OF ABOVE 12 REAMERS					

CHUCKING REAMERS CARBIDE TIPPED TYPE 400 .0005 INCREMENTS

GENERAL PURPOSE

STOCKED DECIMAL TOOL DIAMETERS (.1560 TO .3055) STRAIGHT FLUTES & SHANK

For shallow holes only (see page 27)

NOTE: Dimension details and available modifications listed on page 46.

TOOL DIAM.	EDP NO.	PRICE
.1560	4001560	$47.45
.1565	4001565	47.45
.1570	4001570	47.45
.1575	400040	47.45
.1580	4001580	47.45
.1585	4001585	47.45
.1590	4001590	47.45
.1595	4001595	47.45
.1600	4001600	47.45
.1605	4001605	47.45
.1610	4001610	47.45
.1615	4001615	47.45
.1620	4001620	47.45
.1625	4001625	47.45
.1630	4001630	47.45
.1635	4001635	47.45
.1640	4001640	47.45
.1645	4001645	47.45
.1650	4001650	47.45
.1655	4001655	47.45
.1660	4001660	47.45
.1665	4001665	47.45
.1670	4001670	47.45
.1675	4001675	47.45
.1680	4001680	47.45
.1685	4001685	47.45
.1690	4001690	47.45
.1695	4001695	47.45
.1700	4001700	47.45
.1705	4001705	47.45
.1710	4001710	47.45
.1715	4001715	47.45
.1720	4001720	47.45
.1725	4001725	47.45
.1730	4001730	47.45
.1735	4001735	47.45
.1740	4001740	47.45
.1745	4001745	47.45
.1750	4001750	47.45
.1755	4001755	47.45
.1760	4001760	47.45
.1765	4001765	47.45
.1770	4001770	44.15
.1775	4001775	44.15
.1780	4001780	44.15
.1785	4001785	44.15
.1790	4001790	44.15
.1795	4001795	44.15
.1800	4001800	44.15
.1805	4001805	44.15
.1810	4001810	44.15
.1815	4001815	44.15
.1820	4001820	44.15
.1825	4001825	44.15
.1830	4001830	44.15
.1835	4001835	44.15
.1840	4001840	44.15
.1845	4001845	44.15
.1850	400047	44.15
.1855	4001855	44.15

TOOL DIAM.	EDP NO.	PRICE
.1860	4001860	$44.15
.1865	47818	42.35
.1870	4001870	44.15
.1875	40006	33.65
.1880	4001880	44.15
.1885	47819	42.35
.1890	400048	44.15
.1895	4001895	44.15
.1900	4001900	44.15
.1905	4001905	44.15
.1910	4001910	44.15
.1915	4001915	44.15
.1920	4001920	44.15
.1925	4001925	44.15
.1930	4001930	44.15
.1935	4001935	44.15
.1940	4001940	44.15
.1945	4001945	44.15
.1950	4001950	44.15
.1955	4001955	44.15
.1960	4001960	44.15
.1965	4001965	44.15
.1970	4001970	44.15
.1975	4001975	44.15
.1980	4001980	44.15
.1985	4001985	44.15
.1990	4001990	44.15
.1995	4001995	44.15
.2000	4002000	44.15
.2005	4002005	44.15
.2010	4002010	44.15
.2015	4002015	44.15
.2020	4002020	44.15
.2025	4002025	44.15
.2030	4002030	44.15
.2035	4002035	44.15
.2040	4002040	44.15
.2045	4002045	44.15
.2050	4002050	44.15
.2055	4002055	44.15
.2060	4002060	44.15
.2065	4002065	44.15
.2070	4002070	44.15
.2075	4002075	44.15
.2080	4002080	44.15
.2085	4002085	44.15
.2090	4002090	44.15
.2095	4002095	44.15
.2100	4002100	44.15
.2105	4002105	44.15
.2110	4002110	44.15
.2115	4002115	44.15
.2120	4002120	44.15
.2125	4002125	44.15
.2130	4002130	44.15
.2135	4002135	44.15
.2140	4002140	44.15
.2145	4002145	44.15
.2150	4002150	44.15
.2155	4002155	44.15

TOOL DIAM.	EDP NO.	PRICE
.2160	4002160	$44.15
.2165	400055	44.15
.2170	4002170	44.15
.2175	4002175	44.15
.2180	4002180	44.15
.2185	4002185	44.15
.2190	4002190	44.15
.2195	4002195	44.15
.2200	4002200	44.15
.2205	400056	44.15
.2210	4002210	44.15
.2215	4002215	46.20
.2220	4002220	46.20
.2225	4002225	46.20
.2230	4002230	46.20
.2235	4002235	46.20
.2240	4002240	46.20
.2245	4002245	46.20
.2250	4002250	46.20
.2255	4002255	46.20
.2260	4002260	46.20
.2265	4002265	46.20
.2270	4002270	46.20
.2275	4002275	46.20
.2280	4002280	46.20
.2285	4002285	46.20
.2290	4002290	46.20
.2295	4002295	46.20
.2300	4002300	46.20
.2305	4002305	46.20
.2310	4002310	46.20
.2315	4002315	46.20
.2320	4002320	46.20
.2325	4002325	46.20
.2330	4002330	46.20
.2335	4002335	46.20
.2340	4002340	46.20
.2345	4002345	46.20
.2350	4002350	46.20
.2355	4002355	46.20
.2360	4002360	46.20
.2365	4002365	46.20
.2370	4002370	46.20
.2375	4002375	46.20
.2380	4002380	46.20
.2385	4002385	44.15
.2390	4002390	44.15
.2395	4002395	44.15
.2400	4002400	44.15
.2405	4002405	44.15
.2410	4002410	44.15
.2415	4002415	44.15
.2420	4002420	44.15
.2425	4002425	44.15
.2430	4002430	44.15
.2435	4002435	44.15
.2440	4002440	44.15
.2445	4002445	44.15
.2450	4002450	44.15
.2455	4002455	44.15

TOOL DIAM.	EDP NO.	PRICE
.2460	4002460	$44.15
.2465	4002465	44.15
.2470	4002470	44.15
.2475	4002475	44.15
.2480	400063	44.15
.2485	4002485	44.15
.2490	47824	42.35
.2495	4002495	44.15
.2500	40008	33.65
.2505	4002505	44.15
.2510	47825	42.35
.2515	4002515	44.15
.2520	400064	44.15
.2525	4002525	44.15
.2530	4002530	44.15
.2535	4002535	44.85
.2540	4002540	44.85
.2545	4002545	44.85
.2550	4002550	44.85
.2555	4002555	44.85
.2560	4002560	44.85
.2565	4002565	44.85
.2570	4002570	44.85
.2575	4002575	44.85
.2580	4002580	44.85
.2585	4002585	44.85
.2590	4002590	44.85
.2595	4002595	44.85
.2600	4002600	44.85
.2605	4002605	44.85
.2610	4002610	44.85
.2615	4002615	44.85
.2620	4002620	44.85
.2625	4002625	44.85
.2630	4002630	44.85
.2635	4002635	44.85
.2640	4002640	44.85
.2645	4002645	44.85
.2650	4002650	44.85
.2655	4002655	44.85
.2660	4002660	44.85
.2665	4002665	44.85
.2670	4002670	44.85
.2675	4002675	44.85
.2680	4002680	44.85
.2685	4002685	44.85
.2690	4002690	44.85
.2695	4002695	44.85
.2700	4002700	44.85
.2705	4002705	44.85
.2710	4002710	44.85
.2715	4002715	44.85
.2720	4002720	44.85
.2725	4002725	44.85
.2730	4002730	44.85
.2735	4002735	44.85
.2740	4002740	44.85
.2745	4002745	44.85
.2750	4002750	44.85
.2755	4002755	44.85

TOOL DIAM.	EDP NO.	PRICE
.2760	4002760	$44.85
.2765	4002765	44.85
.2770	4002770	44.85
.2775	4002775	44.85
.2780	4002780	44.85
.2785	4002785	44.85
.2790	4002790	44.85
.2795	400071	44.85
.2800	4002800	44.85
.2805	4002805	44.85
.2810	4002810	44.85
.2815	4002815	44.85
.2820	4002820	44.85
.2825	4002825	44.85
.2830	4002830	44.85
.2835	400072	44.85
.2840	4002840	44.85
.2845	4002845	44.85
.2850	4002850	44.85
.2855	4002855	44.85
.2860	4002860	44.85
.2865	4002865	44.85
.2870	4002870	44.85
.2875	4002875	44.85
.2880	4002880	44.85
.2885	4002885	44.85
.2890	4002890	44.85
.2895	4002895	44.85
.2900	4002900	44.85
.2905	4002905	44.85
.2910	4002910	44.85
.2915	4002915	44.85
.2920	4002920	44.85
.2925	4002925	44.85
.2930	4002930	44.85
.2935	4002935	44.85
.2940	4002940	44.85
.2945	4002945	44.85
.2950	4002950	44.85
.2955	4002955	44.85
.2960	4002960	44.85
.2965	4002965	44.85
.2970	4002970	44.85
.2975	4002975	44.85
.2980	4002980	44.85
.2985	4002985	44.85
.2990	4002990	44.85
.2995	4002995	44.85
.3000	4003000	44.85
.3005	4003005	44.85
.3010	4003010	44.85
.3015	4003015	44.85
.3020	4003020	44.85
.3025	4003025	44.85
.3030	4003030	44.85
.3035	4003035	44.85
.3040	4003040	44.85
.3045	4003045	44.85
.3050	4003050	44.85
.3055	4003055	44.85

CHUCKING REAMERS CARBIDE TIPPED TYPE 400 .0005 INCREMENTS

GENERAL PURPOSE

STOCKED DECIMAL TOOL DIAMETERS (.3060 TO .4555) STRAIGHT FLUTES & SHANK

For shallow holes only (see page 27)

NOTE: Dimension details and available modifications listed on page 46.

TOOL DIAM.	EDP NO.	PRICE
.3060	4003060	$44.85
.3065	4003065	44.85
.3070	4003070	44.85
.3075	4003075	44.85
.3080	4003080	44.85
.3085	4003085	44.85
.3090	4003090	44.85
.3095	4003095	44.85
.3100	4003100	44.85
.3105	4003105	44.85
.3110	400079	44.85
.3115	47831	43.30
.3120	4003120	44.85
.3125	40010	34.40
.3130	4003130	44.85
.3135	47832	43.30
.3140	4003140	44.85
.3145	4003145	44.85
.3150	400080	44.85
.3155	4003155	46.00
.3160	4003160	46.00
.3165	4003165	46.00
.3170	4003170	46.00
.3175	4003175	46.00
.3180	4003180	46.00
.3185	4003185	46.00
.3190	4003190	46.00
.3195	4003195	46.00
.3200	4003200	46.00
.3205	4003205	46.00
.3210	4003210	46.00
.3215	4003215	46.00
.3220	4003220	46.00
.3225	4003225	46.00
.3230	4003230	46.00
.3235	4003235	46.00
.3240	4003240	46.00
.3245	4003245	46.00
.3250	4003250	46.00
.3255	4003255	46.00
.3260	4003260	46.00
.3265	4003265	46.00
.3270	4003270	46.00
.3275	4003275	46.00
.3280	4003280	46.00
.3285	4003285	46.00
.3290	4003290	46.00
.3295	4003295	46.00
.3300	4003300	46.00
.3305	4003305	46.00
.3310	4003310	46.00
.3315	4003315	46.00
.3320	4003320	46.00
.3325	4003325	46.00
.3330	4003330	46.00
.3335	4003335	46.00
.3340	4003340	46.00
.3345	4003345	46.00
.3350	4003350	46.00
.3355	4003355	46.00

TOOL DIAM.	EDP NO.	PRICE
.3360	4003360	$46.00
.3365	4003365	46.00
.3370	4003370	46.00
.3375	4003375	46.00
.3380	4003380	46.00
.3385	4003385	46.00
.3390	4003390	46.00
.3395	4003395	46.00
.3400	4003400	46.00
.3405	4003405	46.00
.3410	4003410	46.00
.3415	4003415	46.00
.3420	4003420	46.00
.3425	400087	46.00
.3430	4003430	46.00
.3435	4003435	46.00
.3440	4003440	46.00
.3445	4003445	46.00
.3450	4003450	46.00
.3455	4003455	46.00
.3460	4003460	46.00
.3465	400088	46.00
.3470	4003470	46.00
.3475	4003475	46.00
.3480	4003480	46.00
.3485	4003485	46.00
.3490	4003490	46.00
.3495	4003495	46.00
.3500	4003500	46.00
.3505	4003505	46.00
.3510	4003510	46.00
.3515	4003515	46.00
.3520	4003520	46.00
.3525	4003525	46.00
.3530	4003530	46.00
.3535	4003535	46.00
.3540	4003540	46.00
.3545	4003545	46.00
.3550	4003550	46.00
.3555	4003555	46.00
.3560	4003560	46.00
.3565	4003565	46.00
.3570	4003570	46.00
.3575	4003575	46.00
.3580	4003580	46.00
.3585	4003585	46.00
.3590	4003590	46.00
.3595	4003595	46.00
.3600	4003600	46.00
.3605	4003605	46.00
.3610	4003610	46.00
.3615	4003615	46.00
.3620	4003620	46.00
.3625	4003625	46.00
.3630	4003630	46.00
.3635	4003635	46.00
.3640	4003640	46.00
.3645	4003645	46.00
.3650	4003650	46.00
.3655	4003655	46.00

TOOL DIAM.	EDP NO.	PRICE
.3660	4003660	$46.00
.3665	4003665	46.00
.3670	4003670	46.00
.3675	4003675	46.00
.3680	4003680	46.00
.3685	4003685	46.00
.3690	4003690	46.00
.3695	4003695	46.00
.3700	4003700	46.00
.3705	4003705	46.00
.3710	4003710	46.00
.3715	4003715	46.00
.3720	4003720	46.00
.3725	4003725	46.00
.3730	4003730	46.00
.3735	4003735	46.00
.3740	47837	44.90
.3745	4003745	46.00
.3750	40012	35.60
.3755	4003755	46.00
.3760	47838	44.90
.3765	4003765	46.00
.3770	4003770	46.00
.3775	4003775	46.00
.3780	400096	46.00
.3785	4003785	47.80
.3790	4003790	47.80
.3795	4003795	47.80
.3800	4003800	47.80
.3805	4003805	47.80
.3810	4003810	47.80
.3815	4003815	47.80
.3820	4003820	47.80
.3825	4003825	47.80
.3830	4003830	47.80
.3835	4003835	47.80
.3840	4003840	47.80
.3845	4003845	47.80
.3850	4003850	47.80
.3855	4003855	47.80
.3860	4003860	47.80
.3865	4003865	47.80
.3870	4003870	47.80
.3875	4003875	47.80
.3880	4003880	47.80
.3885	4003885	47.80
.3890	4003890	47.80
.3895	4003895	47.80
.3900	4003900	47.80
.3905	4003905	47.80
.3910	4003910	47.80
.3915	4003915	47.80
.3920	4003920	47.80
.3925	4003925	47.80
.3930	4003930	47.80
.3935	4003935	47.80
.3940	4003940	47.80
.3945	4003945	47.80
.3950	4003950	47.80
.3955	4003955	47.80

TOOL DIAM.	EDP NO.	PRICE
.3960	4003960	$47.80
.3965	4003965	47.80
.3970	4003970	47.80
.3975	4003975	47.80
.3980	4003980	47.80
.3985	4003985	47.80
.3990	4003990	47.80
.3995	4003995	47.80
.4000	4004000	47.80
.4005	4004005	47.80
.4010	4004010	47.80
.4015	4004015	47.80
.4020	4004020	47.80
.4025	4004025	47.80
.4030	4004030	47.80
.4035	4004035	47.80
.4040	4004040	47.80
.4045	4004045	47.80
.4050	4004050	47.80
.4055	400103	47.80
.4060	4004060	47.80
.4065	4004065	47.80
.4070	4004070	47.80
.4075	4004075	47.80
.4080	4004080	47.80
.4085	4004085	47.80
.4090	4004090	47.80
.4095	4004095	50.25
.4100	4004100	50.25
.4105	4004105	50.25
.4110	4004110	50.25
.4115	4004115	50.25
.4120	4004120	50.25
.4125	4004125	50.25
.4130	4004130	50.25
.4135	4004135	50.25
.4140	4004140	50.25
.4145	4004145	50.25
.4150	4004150	50.25
.4155	4004155	50.25
.4160	4004160	50.25
.4165	4004165	50.25
.4170	4004170	50.25
.4175	4004175	50.25
.4180	4004180	50.25
.4185	4004185	50.25
.4190	4004190	50.25
.4195	4004195	50.25
.4200	4004200	50.25
.4205	4004205	50.25
.4210	4004210	50.25
.4215	4004215	50.25
.4220	4004220	50.25
.4225	4004225	50.25
.4230	4004230	50.25
.4235	4004235	50.25
.4240	4004240	50.25
.4245	4004245	50.25
.4250	4004250	50.25
.4255	4004255	50.25

TOOL DIAM.	EDP NO.	PRICE
.4260	4004260	$50.25
.4265	4004265	50.25
.4270	4004270	50.25
.4275	4004275	50.25
.4280	4004280	50.25
.4285	4004285	50.25
.4290	4004290	50.25
.4295	4004295	50.25
.4300	4004300	50.25
.4305	4004305	50.25
.4310	4004310	50.25
.4315	4004315	50.25
.4320	4004320	50.25
.4325	4004325	50.25
.4330	4004330	50.25
.4335	4004335	50.25
.4340	4004340	50.25
.4345	4004345	50.25
.4350	4004350	50.25
.4355	4004355	50.25
.4360	4004360	50.25
.4365	47843	50.20
.4370	400111	50.25
.4375	40014	39.90
.4380	4004380	50.25
.4385	47844	50.20
.4390	4004390	50.25
.4395	4004395	50.25
.4400	4004400	50.25
.4405	4004405	50.25
.4410	4004410	50.25
.4415	4004415	50.90
.4420	4004420	50.90
.4425	4004425	50.90
.4430	4004430	50.90
.4435	4004435	50.90
.4440	4004440	50.90
.4445	4004445	50.90
.4450	4004450	50.90
.4455	4004455	50.90
.4460	4004460	50.90
.4465	4004465	50.90
.4470	4004470	50.90
.4475	4004475	50.90
.4480	4004480	50.90
.4485	4004485	50.90
.4490	4004490	50.90
.4495	4004495	50.90
.4500	4004500	50.90
.4505	4004505	50.90
.4510	4004510	50.90
.4515	4004515	50.90
.4520	4004520	50.90
.4525	4004525	50.90
.4530	4004530	50.90
.4535	4004535	50.90
.4540	4004540	50.90
.4545	4004545	50.90
.4550	4004550	50.90
.4555	4004555	50.90

CHUCKING REAMERS
CARBIDE TIPPED TYPE 400 .0005 INCREMENTS

GENERAL PURPOSE

STOCKED DECIMAL TOOL DIAMETERS (.4560 TO .6055)
STRAIGHT FLUTES & SHANK

For shallow holes only (see page 27)

NOTE: Dimension details and available modifications listed on page 46.

TOOL DIAM.	EDP NO.	PRICE
.4560	4004560	$50.90
.4565	4004565	50.90
.4570	4004570	50.90
.4575	4004575	50.90
.4580	4004580	50.90
.4585	4004585	50.90
.4590	4004590	50.90
.4595	4004595	50.90
.4600	4004600	50.90
.4605	4004605	50.90
.4610	4004610	50.90
.4615	4004615	50.90
.4620	4004620	50.90
.4625	4004625	50.90
.4630	4004630	50.90
.4635	4004635	50.90
.4640	4004640	50.90
.4645	4004645	50.90
.4650	4004650	50.90
.4655	4004655	50.90
.4660	4004660	50.90
.4665	4004665	50.90
.4670	4004670	50.90
.4675	4004675	50.90
.4680	4004680	50.90
.4685	400119	50.90
.4690	4004690	50.90
.4695	4004695	50.90
.4700	4004700	50.90
.4705	4004705	50.90
.4710	4004710	50.90
.4715	4004715	50.90
.4720	4004720	50.90
.4725	4004725	59.60
.4730	4004730	59.60
.4735	4004735	59.60
.4740	4004740	59.60
.4745	4004745	59.60
.4750	4004750	59.60
.4755	4004755	59.60
.4760	4004760	59.60
.4765	4004765	59.60
.4770	4004770	59.60
.4775	4004775	59.60
.4780	4004780	59.60
.4785	4004785	59.60
.4790	4004790	59.60
.4795	4004795	59.60
.4800	4004800	59.60
.4805	4004805	59.60
.4810	4004810	59.60
.4815	4004815	59.60
.4820	4004820	59.60
.4825	4004825	59.60
.4830	4004830	59.60
.4835	4004835	59.60
.4840	4004840	59.60
.4845	4004845	59.60
.4850	4004850	59.60
.4855	4004855	59.60

TOOL DIAM.	EDP NO.	PRICE
.4860	4004860	$59.60
.4865	4004865	59.60
.4870	4004870	59.60
.4875	4004875	59.60
.4880	4004880	59.60
.4885	4004885	59.60
.4890	4004890	59.60
.4895	4004895	59.60
.4900	4004900	59.60
.4905	4004905	59.60
.4910	4004910	59.60
.4915	4004915	59.60
.4920	4004920	59.60
.4925	4004925	59.60
.4930	4004930	59.60
.4935	4004935	59.60
.4940	4004940	59.60
.4945	4004945	59.60
.4950	4004950	59.60
.4955	4004955	59.60
.4960	4004960	59.60
.4965	4004965	59.60
.4970	4004970	59.60
.4975	4004975	59.60
.4980	4004980	59.60
.4985	4004985	59.60
.4990	47849	55.00
.4995	4004995	59.60
.5000	40016	48.10
.5005	4005005	59.60
.5010	47850	55.00
.5015	4005015	59.60
.5020	4005020	59.60
.5025	4005025	59.60
.5030	4005030	59.60
.5035	4005035	63.90
.5040	4005040	63.90
.5045	4005045	63.90
.5050	4005050	63.90
.5055	4005055	63.90
.5060	4005060	63.90
.5065	4005065	63.90
.5070	4005070	63.90
.5075	4005075	63.90
.5080	4005080	63.90
.5085	4005085	63.90
.5090	4005090	63.90
.5095	4005095	63.90
.5100	4005100	63.90
.5105	4005105	63.90
.5110	4005110	63.90
.5115	4005115	63.90
.5120	4005120	63.90
.5125	4005125	63.90
.5130	4005130	63.90
.5135	4005135	63.90
.5140	4005140	63.90
.5145	4005145	63.90
.5150	4005150	63.90
.5155	4005155	63.90

TOOL DIAM.	EDP NO.	PRICE
.5160	4005160	$63.90
.5165	4005165	63.90
.5170	4005170	63.90
.5175	4005175	63.90
.5180	4005180	63.90
.5185	4005185	63.90
.5190	4005190	63.90
.5195	4005195	63.90
.5200	4005200	63.90
.5205	4005205	63.90
.5210	4005210	63.90
.5215	4005215	63.90
.5220	4005220	63.90
.5225	4005225	63.90
.5230	4005230	63.90
.5235	4005235	63.90
.5240	4005240	63.90
.5245	4005245	63.90
.5250	4005250	63.90
.5255	4005255	63.90
.5260	4005260	63.90
.5265	4005265	63.90
.5270	4005270	63.90
.5275	4005275	63.90
.5280	4005280	63.90
.5285	4005285	63.90
.5290	4005290	63.90
.5295	4005295	63.90
.5300	4005300	63.90
.5305	4005305	63.90
.5310	4005310	63.90
.5315	400135	63.90
.5320	4005320	63.90
.5325	4005325	63.90
.5330	4005330	63.90
.5335	4005335	63.90
.5340	4005340	63.90
.5345	4005345	63.90
.5350	4005350	63.90
.5355	4005355	63.90
.5360	4005360	63.90
.5365	4005365	63.90
.5370	4005370	63.90
.5375	4005375	63.90
.5380	4005380	63.90
.5385	4005385	63.90
.5390	4005390	63.90
.5395	4005395	63.90
.5400	4005400	63.90
.5405	4005405	63.90
.5410	4005410	63.90
.5415	4005415	63.90
.5420	4005420	63.90
.5425	4005425	63.90
.5430	4005430	63.90
.5435	4005435	63.90
.5440	4005440	63.90
.5445	4005445	63.90
.5450	4005450	63.90
.5455	4005455	63.90

TOOL DIAM.	EDP NO.	PRICE
.5460	4005460	$63.90
.5465	4005465	63.90
.5470	4005470	63.90
.5475	4005475	63.90
.5480	4005480	63.90
.5485	4005485	63.90
.5490	4005490	63.90
.5495	4005495	63.90
.5500	4005500	63.90
.5505	4005505	63.90
.5510	4005510	63.90
.5515	4005515	63.90
.5520	4005520	63.90
.5525	4005525	63.90
.5530	4005530	63.90
.5535	4005535	63.90
.5540	4005540	63.90
.5545	4005545	63.90
.5550	4005550	63.90
.5555	4005555	63.90
.5560	4005560	63.90
.5565	4005565	63.90
.5570	4005570	63.90
.5575	4005575	63.90
.5580	4005580	63.90
.5585	4005585	63.90
.5590	4005590	63.90
.5595	4005595	63.90
.5600	4005600	63.90
.5605	4005605	63.90
.5610	4005610	63.90
.5615	4005615	63.90
.5620	4005620	63.90
.5625	40018	52.35
.5630	400143	63.90
.5635	4005635	63.90
.5640	4005640	63.90
.5645	4005645	63.90
.5650	4005650	63.90
.5655	4005655	63.90
.5660	4005660	63.90
.5665	4005665	65.95
.5670	4005670	65.95
.5675	4005675	65.95
.5680	4005680	65.95
.5685	4005685	65.95
.5690	4005690	65.95
.5695	4005695	65.95
.5700	4005700	65.95
.5705	4005705	65.95
.5710	4005710	65.95
.5715	4005715	65.95
.5720	4005720	65.95
.5725	4005725	65.95
.5730	4005730	65.95
.5735	4005735	65.95
.5740	4005740	65.95
.5745	4005745	65.95
.5750	4005750	65.95
.5755	4005755	65.95

TOOL DIAM.	EDP NO.	PRICE
.5760	4005760	$65.95
.5765	4005765	65.95
.5770	4005770	65.95
.5775	4005775	65.95
.5780	4005780	65.95
.5785	4005785	65.95
.5790	4005790	65.95
.5795	4005795	65.95
.5800	4005800	65.95
.5805	4005805	65.95
.5810	4005810	65.95
.5815	4005815	65.95
.5820	4005820	65.95
.5825	4005825	65.95
.5830	4005830	65.95
.5835	4005835	65.95
.5840	4005840	65.95
.5845	4005845	65.95
.5850	4005850	65.95
.5855	4005855	65.95
.5860	4005860	65.95
.5865	4005865	65.95
.5870	4005870	65.95
.5875	4005875	65.95
.5880	4005880	65.95
.5885	4005885	65.95
.5890	4005890	65.95
.5895	4005895	65.95
.5900	4005900	65.95
.5905	4005905	65.95
.5910	4005910	65.95
.5915	4005915	65.95
.5920	4005920	65.95
.5925	4005925	65.95
.5930	4005930	65.95
.5935	4005935	65.95
.5940	4005940	65.95
.5945	400151	65.95
.5950	4005950	65.95
.5955	4005955	65.95
.5960	4005960	65.95
.5965	4005965	65.95
.5970	4005970	65.95
.5975	4005975	65.95
.5980	4005980	65.95
.5985	4005985	65.95
.5990	4005990	65.95
.5995	4005995	65.95
.6000	4006000	65.95
.6005	4006005	65.95
.6010	4006010	65.95
.6015	4006015	65.95
.6020	4006020	65.95
.6025	4006025	65.95
.6030	4006030	65.95
.6035	4006035	65.95
.6040	4006040	65.95
.6045	4006045	65.95
.6050	4006050	65.95
.6055	4006055	65.95

CHUCKING REAMERS
CARBIDE TIPPED TYPE 400 .0005 INCREMENTS

GENERAL PURPOSE

STOCKED DECIMAL TOOL DIAMETERS (.6060 TO .7555)
STRAIGHT FLUTES & SHANK

For shallow holes only (see page 27)

NOTE: Dimension details and available modifications listed on page 46.

TOOL DIAM.	EDP NO.	PRICE	TOOL DIAM.	EDP NO.	PRICE	TOOL DIAM.	EDP NO.	PRICE	TOOL DIAM.	EDP NO.	PRICE	TOOL DIAM.	EDP NO.	PRICE
.6060	4006060	$65.95	.6360	4006360	$66.90	.6660	4006660	$66.90	.6960	4006960	$69.50	.7260	4007260	$69.50
.6065	4006065	65.95	.6365	4006365	66.90	.6665	4006665	66.90	.6965	4006965	69.50	.7265	4007265	69.50
.6070	4006070	65.95	.6370	4006370	66.90	.6670	4006670	66.90	.6970	4006970	69.50	.7270	4007270	69.50
.6075	4006075	65.95	.6375	4006375	66.90	.6675	4006675	66.90	.6975	4006975	69.50	.7275	4007275	69.50
.6080	4006080	65.95	.6380	4006380	66.90	.6680	4006680	66.90	.6980	4006980	69.50	.7280	4007280	69.50
.6085	4006085	65.95	.6385	4006385	66.90	.6685	4006685	66.90	.6985	4006985	69.50	.7285	4007285	69.50
.6090	4006090	65.95	.6390	4006390	66.90	.6690	4006690	66.90	.6990	4006990	69.50	.7290	4007290	69.50
.6095	4006095	65.95	.6395	4006395	66.90	.6695	4006695	66.90	.6995	4006995	69.50	.7295	4007295	69.50
.6100	4006100	65.95	.6400	4006400	66.90	.6700	4006700	66.90	.7000	4007000	69.50	.7300	4007300	69.50
.6105	4006105	65.95	.6405	4006405	66.90	.6705	4006705	66.90	.7005	4007005	69.50	.7305	4007305	69.50
.6110	4006110	65.95	.6410	4006410	66.90	.6710	4006710	66.90	.7010	4007010	69.50	.7310	4007310	69.50
.6115	4006115	65.95	.6415	4006415	66.90	.6715	4006715	66.90	.7015	4007015	69.50	.7315	4007315	69.50
.6120	4006120	65.95	.6420	4006420	66.90	.6720	4006720	66.90	.7020	4007020	69.50	.7320	4007320	69.50
.6125	4006125	65.95	.6425	4006425	66.90	.6725	4006725	66.90	.7025	4007025	69.50	.7325	4007325	69.50
.6130	4006130	65.95	.6430	4006430	66.90	.6730	4006730	66.90	.7030	4007030	69.50	.7330	4007330	69.50
.6135	4006135	65.95	.6435	4006435	66.90	.6735	4006735	66.90	.7035	4007035	69.50	.7335	4007335	69.50
.6140	4006140	65.95	.6440	4006440	66.90	.6740	4006740	66.90	.7040	4007040	69.50	.7340	4007340	69.50
.6145	4006145	65.95	.6445	4006445	66.90	.6745	4006745	66.90	.7045	4007045	69.50	.7345	4007345	69.50
.6150	4006150	65.95	.6450	4006450	66.90	.6750	4006750	66.90	.7050	4007050	69.50	.7350	4007350	69.50
.6155	4006155	65.95	.6455	4006455	66.90	.6755	4006755	66.90	.7055	4007055	69.50	.7355	4007355	69.50
.6160	4006160	65.95	.6460	4006460	66.90	.6760	4006760	66.90	.7060	4007060	69.50	.7360	4007360	69.50
.6165	4006165	65.95	.6465	4006465	66.90	.6765	4006765	66.90	.7065	4007065	69.50	.7365	4007365	69.50
.6170	4006170	65.95	.6470	4006470	66.90	.6770	4006770	66.90	.7070	4007070	69.50	.7370	4007370	69.50
.6175	4006175	65.95	.6475	4006475	66.90	.6775	4006775	66.90	.7075	4007075	69.50	.7375	4007375	69.50
.6180	4006180	65.95	.6480	4006480	66.90	.6780	4006780	66.90	.7080	4007080	69.50	.7380	4007380	69.50
.6185	4006185	65.95	.6485	4006485	66.90	.6785	4006785	66.90	.7085	4007085	69.50	.7385	4007385	69.50
.6190	4006190	65.95	.6490	4006490	66.90	.6790	4006790	66.90	.7090	4007090	69.50	.7390	4007390	69.50
.6195	4006195	65.95	.6495	4006495	66.90	.6795	4006795	66.90	.7095	4007095	69.50	.7395	4007395	69.50
.6200	4006200	65.95	.6500	4006500	66.90	.6800	4006800	66.90	.7100	4007100	69.50	.7400	4007400	69.50
.6205	4006205	65.95	.6505	4006505	66.90	.6805	4006805	66.90	.7105	4007105	69.50	.7405	4007405	69.50
.6210	4006210	65.95	.6510	4006510	66.90	.6810	4006810	66.90	.7110	4007110	69.50	.7410	4007410	69.50
.6215	4006215	65.95	.6515	4006515	66.90	.6815	4006815	66.90	.7115	4007115	69.50	.7415	4007415	69.50
.6220	400158	65.95	.6520	4006520	66.90	.6820	4006820	66.90	.7120	4007120	69.50	.7420	4007420	69.50
.6225	4006225	65.95	.6525	4006525	66.90	.6825	4006825	66.90	.7125	4007125	69.50	.7425	4007425	69.50
.6230	4006230	65.95	.6530	4006530	66.90	.6830	4006830	66.90	.7130	4007130	69.50	.7430	4007430	69.50
.6235	4006235	65.95	.6535	400166	66.90	.6835	4006835	66.90	.7135	4007135	69.50	.7435	4007435	69.50
.6240	47862	65.95	.6540	4006540	66.90	.6840	4006840	66.90	.7140	4007140	69.50	.7440	4007440	69.50
.6245	4006245	65.95	.6545	4006545	66.90	.6845	4006845	66.90	.7145	4007145	69.50	.7445	4007445	69.50
.6250	40020	54.50	.6550	4006550	66.90	.6850	400174	66.90	.7150	4007150	69.50	.7450	4007450	69.50
.6255	4006255	65.95	.6555	4006555	66.90	.6855	4006855	66.90	.7155	4007155	69.50	.7455	4007455	69.50
.6260	47863	65.95	.6560	4006560	66.90	.6860	4006860	66.90	.7160	4007160	69.50	.7460	4007460	69.50
.6265	4006265	65.95	.6565	4006565	66.90	.6865	4006865	66.90	.7165	400182	69.50	.7465	4007465	69.50
.6270	4006270	65.95	.6570	4006570	66.90	.6870	4006870	66.90	.7170	4007170	69.50	.7470	4007470	69.50
.6275	4006275	65.95	.6575	400167	66.90	.6875	40022	55.45	.7175	4007175	69.50	.7475	4007475	69.50
.6280	4006280	65.95	.6580	4006580	66.90	.6880	4006880	66.90	.7180	4007180	69.50	.7480	400190	69.50
.6285	4006285	66.90	.6585	4006585	66.90	.6885	4006885	66.90	.7185	4007185	69.50	.7485	4007485	69.50
.6290	4006290	66.90	.6590	4006590	66.90	.6890	400175	66.90	.7190	4007190	69.50	.7490	47874	69.50
.6295	4006295	66.90	.6595	4006595	66.90	.6895	4006895	66.90	.7195	4007195	69.50	.7495	4007495	69.50
.6300	4006300	66.90	.6600	4006600	66.90	.6900	4006900	66.90	.7200	4007200	69.50	.7500	40024	58.05
.6305	4006305	66.90	.6605	4006605	66.90	.6905	4006905	66.90	.7205	400183	69.50	.7505	4007505	69.50
.6310	4006310	66.90	.6610	4006610	66.90	.6910	4006910	66.90	.7210	4007210	69.50	.7510	47875	69.50
.6315	4006315	66.90	.6615	4006615	66.90	.6915	4006915	69.50	.7215	4007215	69.50	.7515	4007515	69.50
.6320	4006320	66.90	.6620	4006620	66.90	.6920	4006920	69.50	.7220	4007220	69.50	.7520	400191	69.50
.6325	4006325	66.90	.6625	4006625	66.90	.6925	4006925	69.50	.7225	4007225	69.50	.7525	4007525	69.50
.6330	4006330	66.90	.6630	4006630	66.90	.6930	4006930	69.50	.7230	4007230	69.50	.7530	4007530	69.50
.6335	4006335	66.90	.6635	4006635	66.90	.6935	4006935	69.50	.7235	4007235	69.50	.7535	4007535	71.45
.6340	4006340	66.90	.6640	4006640	66.90	.6940	4006940	69.50	.7240	4007240	69.50	.7540	4007540	71.45
.6345	4006345	66.90	.6645	4006645	66.90	.6945	4006945	69.50	.7245	4007245	69.50	.7545	4007545	71.45
.6350	4006350	66.90	.6650	4006650	66.90	.6950	4006950	69.50	.7250	4007250	69.50	.7550	4007550	71.45
.6355	4006355	66.90	.6655	4006655	66.90	.6955	4006955	69.50	.7255	4007255	69.50	.7555	4007555	71.45

CHUCKING REAMERS CARBIDE TIPPED TYPE 400 METRIC

GENERAL PURPOSE

STRAIGHT FLUTES & SHANK

For shallow holes only (see page 27)

NOTE: Tool diameter in millimeters (mm); all other dimensions in inches. Also, modifications available (see list on page 46).

TOOL DIAMETER		TYPE 400 METRIC EDP NO.	METRIC PRICE	DIMENSIONS					FINISHED TO MODIFIED TOOL DIAMETER							
				SHANK DIAM.	NO. OF FLTS	LENGTH			MODIFIED DIAMETER RANGE (mm)	PRICE EACH - BASED ON QUANTITY ORDERED						
mm	INCH					FLT	CAR-BIDE	OVER-ALL		1	2	3	4	5-7	8-14	OVER 14
4.0	.1575	400040	$47.45	.151	4	1	½	4	3.962-4.493	$71.65	$55.60	$50.15	$47.50	$44.80	$42.50	$39.45
4.5	.1772	400045	44.15	11/64	4	1 ⅛	½	4 ½	4.494-5.182	67.80	52.10	46.85	44.25	41.55	39.40	36.40
5.0	.1969	400050	44.15	11/64	4	1 ⅛	½	4 ½	-	-	-	-	-	-	-	-
5.5	.2165	400055	44.15	13/64	4	1 ¼	½	5	5.183-5.613	67.80	52.10	46.85	44.25	41.55	39.40	36.40
6.0	.2362	400060	46.20	7/32	4	1 ½	½	6	5.614-6.045	69.80	54.10	48.80	46.25	43.55	41.40	38.35
6.3	.2480	400063	44.15	15/64	4	1 ½	½	6	6.046-6.426	67.80	52.10	46.85	44.25	41.55	39.40	36.40
6.5	.2559	400065	44.85	15/64	4	1 ½	½	6	6.427-7.214	68.55	52.80	47.55	44.95	42.30	40.10	37.10
7.0	.2756	400070	44.85	15/64	4	1 ½	½	6	-	-	-	-	-	-	-	-
7.5	.2953	400075	44.85	9/32	4	1 ½	½	6	7.215-8.001	68.55	52.80	47.55	44.95	42.30	40.10	37.10
8.0	.3150	400080	44.85	9/32	4	1 ½	½	6	-	-	-	-	-	-	-	-
8.5	.3346	400085	46.00	9/32	4	1 ½	⅝	6	8.002-8.814	69.75	54.05	48.75	46.20	43.50	41.35	38.30
9.0	.3543	400090	46.00	5/16	4	1 ¾	⅝	7	8.815-9.601	69.75	54.05	48.75	46.20	43.50	41.35	38.30
9.5	.3740	400095	46.00	5/16	4	1 ¾	⅝	7	-	-	-	-	-	-	-	-
10.0	.3937	400100	47.80	5/16	4	1 ¾	⅝	7	9.602-10.389	71.45	55.75	50.45	47.90	45.25	43.10	40.05
10.5	.4134	400105	50.25	⅜	4	1 ¾	⅝	7	10.390-11.201	73.95	58.25	53.00	50.40	47.80	45.60	42.55
11.0	.4331	400110	50.25	⅜	4	1 ¾	⅝	7	-	-	-	-	-	-	-	-
11.5	.4528	400115	50.90	⅜	4	1 ¾	⅝	7	11.202-11.989	74.50	58.85	53.55	51.00	48.35	46.20	43.15
12.0	.4724	400120	59.60	7/16	6	2	⅝	8	11.990-12.776	85.65	68.35	62.60	59.80	56.85	54.45	51.10
12.5	.4921	400125	59.60	7/16	6	2	⅝	8	-	-	-	-	-	-	-	-
13.0	.5118	400130	63.90	7/16	6	2	⅝	8	12.777-13.564	89.90	72.60	66.85	64.00	61.10	58.70	55.35
13.5	.5315	400135	63.90	7/16	6	2	⅝	8	-	-	-	-	-	-	-	-
14.0	.5512	400140	63.90	7/16	6	2	⅝	8	13.565-14.376	89.90	72.60	66.85	64.00	61.10	58.70	55.35
14.5	.5709	400145	65.95	7/16	6	2	⅝	8	14.377-15.164	92.05	74.75	68.95	66.10	63.25	60.85	57.45
15.0	.5906	400150	65.95	7/16	6	2	⅝	8	-	-	-	-	-	-	-	-
15.5	.6102	400155	65.95	9/16	6	2 ¼	⅝	9	15.165-15.951	92.05	74.75	68.95	66.10	63.25	60.85	57.45
16.0	.6299	400160	66.90	9/16	6	2 ¼	⅝	9	15.952-16.739	93.00	75.70	69.85	67.00	64.15	61.70	58.35
16.5	.6496	400165	66.90	9/16	6	2 ¼	⅝	9	-	-	-	-	-	-	-	-
17.0	.6693	400170	66.90	9/16	6	2 ¼	⅝	9	16.740-17.551	93.00	75.70	69.85	67.00	64.15	61.70	58.35
17.5	.6890	400175	66.90	9/16	6	2 ¼	⅝	9	-	-	-	-	-	-	-	-
18.0	.7087	400180	69.50	9/16	6	2 ¼	⅝	9	17.552-18.339	95.55	78.30	72.50	69.70	66.80	64.35	61.00
18.5	.7283	400185	69.50	⅝	6	2 ½	¾	9 ½	18.340-19.126	95.55	78.30	72.50	69.70	66.80	64.35	61.00
19.0	.7480	400190	69.50	⅝	6	2 ½	¾	9 ½	-	-	-	-	-	-	-	-
19.5	.7677	400195	71.45	⅝	6	2 ½	¾	9 ½	19.127-19.914	97.45	80.25	74.40	71.55	68.70	66.25	62.95
20.0	.7874	400200	71.45	⅝	6	2 ½	¾	9 ½	19.915-20.726	97.45	80.25	74.40	71.55	68.70	66.25	62.95
20.5	.8071	400205	71.45	⅝	6	2 ½	¾	9 ½	-	-	-	-	-	-	-	-
21.0	.8268	400210	73.85	⅝	6	2 ½	¾	9 ½	20.727-21.514	99.90	82.55	76.80	73.95	71.05	68.70	65.35
21.5	.8465	400215	73.85	⅝	6	2 ½	¾	9 ½	-	-	-	-	-	-	-	-
22.0	.8661	400220	73.85	¾	6	2 ⅝	¾	10	21.515-22.301	99.90	82.55	76.80	73.95	71.05	68.70	65.35
22.5	.8858	400225	87.30	¾	6	2 ⅝	¾	10	22.302-23.089	114.30	96.35	90.35	87.45	84.45	81.95	78.45
23.0	.9055	400230	87.30	¾	6	2 ⅝	¾	10	-	-	-	-	-	-	-	-
23.5	.9252	400235	87.30	¾	8	2 ⅝	¾	10	23.090-23.901	114.30	96.35	90.35	87.45	84.45	81.95	78.45
24.0	.9449	400240	91.00	¾	8	2 ⅝	¾	10	23.902-24.689	118.00	100.00	94.00	91.10	88.10	85.60	82.15
24.5	.9646	400245	91.00	¾	8	2 ⅝	¾	10	-	-	-	-	-	-	-	-
25.0	.9843	400250	91.00	⅞	8	2 ¾	¾	10 ½	24.690-25.476	118.00	100.00	94.00	91.10	88.10	85.60	82.15
25.5	1.0039	400255	93.10	⅞	8	2 ¾	¾	10 ½	25.477-27.076	119.10	101.85	96.10	93.30	90.40	88.05	84.65
26.0	1.0236	400260	93.10	⅞	8	2 ¾	¾	10 ½	-	-	-	-	-	-	-	-
27.0	1.0630	400270	93.10	⅞	8	2 ¾	¾	10 ½	-	-	-	-	-	-	-	-
28.0	1.1024	400280	99.80	⅞	8	2 ⅞	⅞	11	27.077-28.651	125.65	108.45	102.70	99.90	97.05	94.65	91.30
29.0	1.1417	400290	104.25	1	8	2 ⅞	⅞	11	28.652-30.239	130.15	113.05	107.15	104.40	101.50	99.10	95.80
30.0	1.1811	400300	104.25	1	8	2 ⅞	⅞	11	-	-	-	-	-	-	-	-
31.0	1.2205	400310	109.60	1	8	3	⅞	11 ½	30.240-31.826	135.50	118.30	112.55	109.75	106.90	104.50	101.20
32.0	1.2598	400320	114.65	1	8	3	⅞	11 ½	31.827-33.414	140.60	123.45	117.65	114.85	111.95	109.50	106.15
33.0	1.2992	400330	114.65	1	8	3	⅞	11 ½	-	-	-	-	-	-	-	-
34.0	1.3386	400340	121.05	1	8	3 ¼	⅞	12	33.415-35.001	146.90	129.75	123.95	121.15	118.25	115.85	112.55
35.0	1.3780	400350	121.05	1	8	3 ¼	⅞	12	-	-	-	-	-	-	-	-
36.0	1.4173	400360	133.55	1 ¼	8	3 ¼	⅞	12	35.002-36.589	159.50	142.25	136.55	133.65	130.85	128.40	125.10
37.0	1.4567	400370	140.45	1 ¼	8	3 ½	⅞	12 ½	36.590-38.176	166.45	149.25	143.45	140.65	137.80	135.35	132.10

Modified tool diameters are available up to 50mm - contact us for price.

SEMI-FINISHED REAMERS
CARBIDE TIPPED TYPES 400, 402, 410, 430, 440, 450, 465

GENERAL PURPOSE

FINISH GRINDING OPERATIONS REQUIRED BEFORE USE


TYPE 400


TYPE 430


TYPE 440


TYPE 402


TYPE 450


TYPE 410


TYPE 465

REAMERS

NOTE:

- Before semi-finished reamers can be used, the tool diameter must be finish ground & relieved and the reamer end must be faced & chamfered
- Semi-finished reamers are purchased by regrind shops, distributors, or users with regrind capabilities
- For detailed description of each specific type, see page indicated in table below

SEMI-FINISHED TOOL DIAMETER RANGE	TYPE 400 PAGE 46		TYPE 402 PAGE 54		TYPE 410 PAGE 68		TYPE 430 PAGE 42	TYPE 440 PAGE 42	TYPE 430 OR 440 PRICE	TYPE 450 PAGE 56		TYPE 465 PAGE 64	
	EDP NO.	PRICE	EDP NO.	PRICE	EDP NO.	PRICE	EDP NO.	EDP NO.		EDP NO.	PRICE	EDP NO.	PRICE
0.1770-0.2040	40006SF	$28.65	-	-	41006SF	$40.35	43006SF	44006SF	$37.35	45006SF	$34.30	-	-
0.2041-0.2210	40007SF	28.65	-	-	41007SF	40.35	43007SF	44007SF	37.35	45007SF	34.30	-	-
0.2211-0.2380	4002344SF	30.30	-	-	4102344SF	40.35	4302344SF	4402344SF	37.35	4502344SF	34.30	-	-
0.2381-0.2530	40008SF	28.65	40208SF	$33.05	41008SF	40.35	43008SF	44008SF	37.35	45008SF	34.30	-	-
0.2531-0.2840	40009SF	29.20	40209SF	33.55	41009SF	40.45	43009SF	44009SF	37.35	45009SF	35.10	-	-
0.2841-0.3150	40010SF	29.20	40210SF	33.55	41010SF	40.45	43010SF	44010SF	43.40	45010SF	35.10	46510SF	$52.90
0.3151-0.3470	40011SF	30.25	40211SF	34.80	41011SF	44.50	43011SF	44011SF	43.85	45011SF	36.30	46511SF	52.90
0.3471-0.3780	40012SF	27.75	40212SF	32.00	41012SF	44.90	43012SF	44012SF	47.50	45012SF	36.30	46512SF	49.50
0.3781-0.4090	40013SF	31.70	40213SF	36.50	41013SF	46.95	43013SF	44013SF	48.10	45013SF	38.05	46513SF	52.50
0.4091-0.4410	40014SF	33.80	40214SF	38.90	41014SF	48.80	43014SF	44014SF	57.10	45014SF	41.20	46514SF	52.50
0.4411-0.4720	40015SF	34.40	40215SF	40.00	41015SF	51.85	43015SF	44015SF	57.10	45015SF	44.50	46515SF	55.70
0.4721-0.5030	40016SF	40.95	40216SF	47.05	41016SF	53.80	43016SF	44016SF	62.40	45016SF	47.75	46516SF	55.70
0.5031-0.5340	40017SF	44.50	40217SF	50.90	41017SF	55.45	43017SF	44017SF	62.40	45017SF	48.95	46517SF	57.10
0.5341-0.5660	40018SF	44.50	40218SF	50.90	41018SF	55.45	43018SF	44018SF	65.85	45018SF	48.95	46518SF	57.10
0.5661-0.5970	40019SF	46.30	40219SF	53.20	41019SF	57.10	43019SF	44019SF	65.85	45019SF	50.95	46519SF	59.60
0.5971-0.6280	40020SF	46.30	40220SF	53.20	41020SF	57.10	43020SF	44020SF	67.60	45020SF	50.95	46520SF	59.60
0.6281-0.6590	40021SF	47.10	40221SF	54.20	41021SF	58.70	43021SF	44021SF	67.60	45021SF	51.85	46521SF	65.20
0.6591-0.6910	40022SF	47.10	40222SF	54.20	41022SF	62.55	43022SF	44022SF	70.70	45022SF	51.85	46522SF	65.20
0.6911-0.7220	40023SF	49.30	40223SF	56.70	41023SF	63.40	43023SF	44023SF	70.70	45023SF	54.20	46523SF	67.70
0.7221-0.7530	40024SF	49.30	40224SF	56.70	41024SF	64.40	43024SF	44024SF	72.50	45024SF	54.20	46524SF	67.70
0.7531-0.7840	40025SF	51.00	40225SF	58.40	41025SF	66.00	43025SF	44025SF	72.50	45025SF	56.00	46525SF	72.95
0.7841-0.8160	40026SF	51.00	40226SF	58.40	41026SF	66.00	43026SF	44026SF	78.75	45026SF	56.00	46526SF	72.95
0.8161-0.8470	40027SF	53.05	40227SF	60.95	41027SF	69.60	43027SF	44027SF	78.75	45027SF	58.30	46527SF	75.75
0.8471-0.8780	40028SF	55.00	40228SF	63.25	41028SF	72.25	43028SF	44028SF	86.05	45028SF	60.55	46528SF	78.60
0.8781-0.9090	40029SF	64.20	40229SF	74.20	41029SF	84.20	43029SF	44029SF	86.05	45029SF	70.45	46529SF	83.65
0.9091-0.9410	40030SF	64.20	40230SF	74.20	41030SF	84.20	43030SF	44030SF	94.75	45030SF	70.45	46530SF	83.65
0.9411-0.9720	40031SF	67.20	40231SF	77.20	41031SF	88.25	43031SF	44031SF	94.75	45031SF	73.85	46531SF	86.90
0.9721-1.0030	40032SF	67.20	40232SF	77.20	41032SF	88.25	43032SF	44032SF	99.50	45032SF	73.85	46532SF	86.90
1.0031-1.0660	40034SF	69.45	40234SF	106.15	41034SF	94.70	43034SF	44034SF	99.50	45034SF	76.45	46534SF	95.30
1.0661-1.1280	40036SF	75.15	40236SF	113.10	41036SF	97.65	43036SF	44036SF	116.40	45036SF	82.65	46536SF	95.30
1.1281-1.1905	40038SF	78.90	40238SF	119.85	41038SF	102.55	43038SF	44038SF	121.35	45038SF	86.45	46538SF	103.95
1.1906-1.2530	40040SF	83.40	40240SF	133.15	41040SF	108.60	43040SF	44040SF	142.20	45040SF	100.95	46540SF	103.95
1.2531-1.3155	40042SF	87.75	40242SF	143.60	41042SF	120.10	43042SF	44042SF	142.20	45042SF	100.95	46542SF	115.30
1.3156-1.3780	40044SF	93.10	40244SF	149.35	41044SF	131.65	43044SF	44044SF	144.15	45044SF	102.40	46544SF	120.65
1.3781-1.4405	40046SF	103.85	40246SF	152.50	41046SF	139.45	43046SF	44046SF	168.10	45046SF	113.15	46546SF	142.50
1.4406-1.5030	40048SF	109.75	40248SF	160.05	41048SF	147.30	43048SF	44048SF	201.90	45048SF	135.90	46548SF	146.75

CHUCKING REAMERS CARBIDE TIPPED TYPE 402 FRACTIONAL

GENERAL PURPOSE

STRAIGHT FLUTES TAPER SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	402/472[MS]
	40	NON-FERROUS - SHORT CHIPS	402/472[MS]
	60	CAST IRONS	402/473[MS]
	80	LOW STRENGTH STEELS	402/474[MS]
	100	MEDIUM STRENGTH STEELS	402/474[MS]
	120	HIGH STRENGTH STEELS	402/474[MS]
	140	HIGH TEMPERATURE ALLOYS	474[MS]

[MS]See page 80 for material specific reamers

TYPE 402
- Straight polished flutes and taper shank
- Detailed specifications on page 29

USE:
- For general reaming of steels, cast irons, non-ferrous materials, plastics and non-metals

MODIFICATIONS (Prompt delivery)
- Modified tool diameter - priced below
- Modified metric tool diameter - priced on pg. 55
- Closer tool diameter tolerance - pg. 29
- Cutting diam. reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diam. back taper
- Shank whistle notch for set screw
- Smaller taper shank
- Coatings available:

TITANIUM NITRIDE – TiN

TITANIUM CARBONITRIDE – TiCN

ZIRCONIUM NITRIDE – ZrN

AL TITANIUM NITRIDE – AlTiN

NOTE: For semi-finished reamers, see page 53. For shallow holes only (see page 27)

TOOL DIAMETER		TYPE 402 EDP NO.	PRICE	DIMENSIONS					FINISHED TO MODIFIED TOOL DIAMETER						
				TAPER SHANK NO.	NO. OF FLTS	LENGTH			MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DECIMAL					FLUTE	CAR-BIDE	OVER-ALL		1	2	3	4	5-7	8-14*
1/4	.2500	40208	$38.80	1	4	1 1/2	1/2	6	0.2381 - 0.2530	$70.20	$54.50	$49.25	$46.75	$44.10	$42.00
9/32	.2812	40209	39.55	1	4	1 1/2	1/2	6	0.2531 - 0.2840	70.95	55.25	50.00	47.45	44.80	42.60
5/16	.3125	40210	39.55	1	4	1 1/2	1/2	6	0.2841 - 0.3150	70.95	55.25	50.00	47.45	44.80	42.60
11/32	.3438	40211	41.00	1	4	1 1/2	5/8	6	0.3151 - 0.3470	72.45	56.70	51.40	48.90	46.25	44.15
3/8	.3750	40212	37.65	1	4	1 3/4	5/8	7	0.3471 - 0.3780	66.50	52.05	47.15	44.90	42.40	40.45
13/32	.4062	40213	43.05	1	4	1 3/4	5/8	7	0.3781 - 0.4090	74.45	58.70	53.40	50.95	48.25	46.10
7/16	.4375	40214	45.80	1	4	1 3/4	5/8	7	0.4091 - 0.4410	77.20	61.50	56.20	53.70	51.00	48.85
15/32	.4688	40215	47.00	1	4	1 3/4	5/8	7	0.4411 - 0.4720	78.45	62.70	57.40	54.90	52.20	50.10
1/2	.5000	40216	55.35	1	6	2	5/8	8	0.4721 - 0.5030	89.95	72.60	66.85	64.10	61.10	58.80
17/32	.5312	40217	59.80	1	6	2	5/8	8	0.5031 - 0.5340	94.40	77.00	71.20	68.50	65.50	63.10
9/16	.5625	40218	59.80	1	6	2	5/8	8	0.5341 - 0.5660	94.40	77.00	71.20	68.50	65.50	63.10
19/32	.5938	40219	62.65	1	6	2	5/8	8	0.5661 - 0.5970	97.25	79.90	74.10	71.40	68.35	66.05
5/8	.6250	40220	62.65	2	6	2 1/4	5/8	9	0.5971 - 0.6280	97.25	79.90	74.10	71.40	68.35	66.05
21/32	.6562	40221	63.75	2	6	2 1/4	5/8	9	0.6281 - 0.6590	98.35	81.05	75.30	72.50	69.50	67.15
11/16	.6875	40222	63.75	2	6	2 1/4	5/8	9	0.6591 - 0.6910	98.35	81.05	75.30	72.50	69.50	67.15
23/32	.7188	40223	66.65	2	6	2 1/4	5/8	9	0.6911 - 0.7220	101.30	83.90	78.10	75.40	72.45	70.05
3/4	.7500	40224	66.65	2	6	2 1/2	3/4	9 1/2	0.7221 - 0.7530	101.30	83.90	78.10	75.40	72.45	70.05
25/32	.7812	40225	68.75	2	6	2 1/2	3/4	9 1/2	0.7531 - 0.7840	103.35	85.95	80.25	77.50	74.45	72.15
13/16	.8125	40226	68.75	2	6	2 1/2	3/4	9 1/2	0.7841 - 0.8160	103.35	85.95	80.25	77.50	74.45	72.15
27/32	.8438	40227	71.70	2	6	2 1/2	3/4	9 1/2	0.8161 - 0.8470	106.30	88.95	83.20	80.40	77.50	75.05
7/8	.8750	40228	74.45	2	6	2 5/8	3/4	10	0.8471 - 0.8780	110.30	92.35	86.35	83.40	80.35	77.90
29/32	.9062	40229	87.30	2	6	2 5/8	3/4	10	0.8781 - 0.9090	123.15	105.15	99.15	96.25	93.25	90.80
15/16	.9375	40230	87.30	3	8	2 5/8	3/4	10	0.9091 - 0.9410	123.15	105.15	99.15	96.25	93.25	90.80
31/32	.9688	40231	91.00	3	8	2 5/8	3/4	10	0.9411 - 0.9720	126.85	108.85	102.80	99.95	96.90	94.45
1	1.0000	40232	91.00	3	8	2 3/4	3/4	10 1/2	0.9721 - 1.0030	126.85	108.85	102.80	99.95	96.90	94.45
1 1/16	1.0625	40234	124.90	3	8	2 3/4	3/4	10 1/2	1.0031 - 1.0660	159.35	142.15	136.40	133.60	130.60	128.30
1 1/8	1.1250	40236	133.10	3	8	2 7/8	7/8	11	1.0661 - 1.1280	167.50	150.20	144.50	141.65	138.80	136.50
1 3/16	1.1875	40238	140.95	3	8	2 7/8	7/8	11	1.1281 - 1.1905	175.45	158.10	152.40	149.55	146.60	144.35
1 1/4	1.2500	40240	156.65	4	8	3	7/8	11 1/2	1.1906 - 1.2530	191.05	173.80	168.05	165.25	162.35	160.00
1 5/16	1.3125	40242	168.90	4	8	3	7/8	11 1/2	1.2531 - 1.3155	203.30	186.05	180.30	177.55	174.60	172.25
1 3/8	1.3750	40244	175.70	4	8	3 1/4	7/8	12	1.3156 - 1.3780	210.15	192.85	187.15	184.40	181.40	179.15
1 7/16	1.4375	40246	179.35	4	8	3 1/4	7/8	12	1.3781 - 1.4405	213.80	196.60	190.75	188.05	185.00	182.75
1 1/2	1.5000	40248	188.30	4	8	3 1/2	7/8	12 1/2	1.4406 - 1.5030	222.75	205.55	199.70	197.00	194.00	191.65
1 9/16	1.5625	40250	203.25	4	8	3 1/2	7/8	12 1/2	1.5031 - 1.5660	237.65	220.45	214.65	211.90	208.95	206.60
1 5/8	1.6250	40252	210.25	4	8	3 3/4	7/8	13	1.5661 - 1.6280	244.70	227.50	221.65	218.95	216.00	213.65
1 11/16	1.6875	40254	236.45	4	8	3 3/4	7/8	13	1.6281 - 1.6910	270.90	253.60	247.90	245.05	242.20	239.90
1 3/4	1.7500	40256	236.45	4	10	4	7/8	13 1/2	1.6911 - 1.7530	270.90	253.60	247.90	245.05	242.20	239.90
1 13/16	1.8125	40258	236.45	4	10	4	7/8	13 1/2	1.7531 - 1.8160	270.90	253.60	247.90	245.05	242.20	239.90
1 7/8	1.8750	40260	247.80	4	10	4 1/4	7/8	14	1.8161 - 1.8780	282.15	264.90	259.10	256.35	253.45	251.10
1 15/16	1.9375	40262	247.80	4	10	4 1/4	7/8	14	1.8781 - 1.9410	282.15	264.90	259.10	256.35	253.45	251.10
2	2.0000	40264	247.80	4	12	4 1/4	7/8	14	1.9411 - 2.0030	282.15	264.90	259.10	256.35	253.45	251.10

*Quantities of 15 or more - price of fractional size in same size range.

CHUCKING REAMERS CARBIDE TIPPED TYPE 402 METRIC

GENERAL PURPOSE

STRAIGHT FLUTES TAPER SHANK

For shallow holes only (see page 27)

NOTE: Tool diameter in millimeters (mm); all other dimensions in inches. Also, modifications available (see list on page 54).

TOOL DIAMETER		TYPE 402 METRIC EDP NO.	METRIC PRICE	DIMENSIONS					FINISHED TO MODIFIED TOOL DIAMETER							
				TAPER SHANK NO.	NO. OF FLTS	LENGTH			MODIFIED DIAMETER RANGE (mm)	PRICE EACH - BASED ON QUANTITY ORDERED						
mm	INCH					FLT	CAR-BIDE	OVER-ALL		1	2	3	4	5-7	8-14	OVER 14
6.0	.2362	402060	$49.25	1	4	1 ½	½	6	6.000-6.426	$72.95	$57.20	$52.00	$49.35	$46.75	$44.50	$41.50
6.5	.2559	402065	50.00	1	4	1 ½	½	6	6.427-7.214	73.60	57.95	52.70	50.10	47.45	45.25	42.25
7.0	.2756	402070	50.00	1	4	1 ½	½	6	-	-	-	-	-	-	-	-
7.5	.2953	402075	50.00	1	4	1 ½	½	6	7.215-8.001	73.60	57.95	52.70	50.10	47.45	45.25	42.25
8.0	.3150	402080	50.00	1	4	1 ½	½	6	-	-	-	-	-	-	-	-
8.5	.3346	402085	51.40	1	4	1 ½	⅝	6	8.002-8.814	75.05	59.35	54.15	51.50	48.90	46.75	43.65
9.0	.3543	402090	47.15	1	4	1 ¾	⅝	7	8.815-9.601	68.90	54.50	49.70	47.30	44.90	42.95	40.10
9.5	.3740	402095	47.15	1	4	1 ¾	⅝	7	-	-	-	-	-	-	-	-
10.0	.3937	402100	53.40	1	4	1 ¾	⅝	7	9.602-10.389	77.05	61.35	56.15	53.55	50.95	48.75	45.75
10.5	.4134	402105	56.20	1	4	1 ¾	⅝	7	10.390-11.201	79.85	64.20	58.90	56.35	53.70	51.45	48.50
11.0	.4331	402110	56.20	1	4	1 ¾	⅝	7	-	-	-	-	-	-	-	-
11.5	.4528	402115	57.40	1	4	1 ¾	⅝	7	11.202-11.989	81.05	65.45	60.10	57.60	54.90	52.75	49.75
12.0	.4724	402120	66.85	1	6	2	⅝	8	11.990-12.776	92.80	75.65	69.80	66.95	64.10	61.65	58.30
12.5	.4921	402125	66.85	1	6	2	⅝	8	-	-	-	-	-	-	-	-
13.0	.5118	402130	71.20	1	6	2	⅝	8	12.777-13.564	97.25	80.00	74.20	71.40	68.50	66.05	62.70
13.5	.5315	402135	71.20	1	6	2	⅝	8	-	-	-	-	-	-	-	-
14.0	.5512	402140	71.20	1	6	2	⅝	8	13.565-14.376	97.25	80.00	74.20	71.40	68.50	66.05	62.70
14.5	.5709	402145	74.10	1	6	2	⅝	8	14.377-15.164	100.15	82.85	77.05	74.30	71.40	68.95	65.60
15.0	.5906	402150	74.10	1	6	2	⅝	8	-	-	-	-	-	-	-	-
15.5	.6102	402155	74.10	2	6	2 ¼	⅝	9	15.165-15.951	100.15	82.85	77.05	74.30	71.40	68.95	65.60
16.0	.6299	402160	75.30	2	6	2 ¼	⅝	9	15.952-16.739	101.30	83.95	78.25	75.40	72.50	70.05	66.80
16.5	.6496	402165	75.30	2	6	2 ¼	⅝	9	-	-	-	-	-	-	-	-
17.0	.6693	402170	75.30	2	6	2 ¼	⅝	9	16.740-17.551	101.30	83.95	78.25	75.40	72.50	70.05	66.80
17.5	.6890	402175	75.30	2	6	2 ¼	⅝	9	-	-	-	-	-	-	-	-
18.0	.7087	402180	78.10	2	6	2 ¼	⅝	9	17.552-18.339	104.20	86.90	81.15	78.30	75.40	73.00	69.70
18.5	.7283	402185	78.10	2	6	2 ½	¾	9 ½	18.340-19.126	104.20	86.90	81.15	78.30	75.40	73.00	69.70
19.0	.7480	402190	78.10	2	6	2 ½	¾	9 ½	-	-	-	-	-	-	-	-
19.5	.7677	402195	80.25	2	6	2 ½	¾	9 ½	19.127-19.914	106.20	88.95	83.20	80.35	77.50	75.00	71.70
20.0	.7874	402200	80.25	2	6	2 ½	¾	9 ½	19.915-20.726	106.20	88.95	83.20	80.35	77.50	75.00	71.70
20.5	.8071	402205	80.25	2	6	2 ½	¾	9 ½	-	-	-	-	-	-	-	-
21.0	.8268	402210	83.20	2	6	2 ½	¾	9 ½	20.727-21.514	109.25	92.00	86.10	83.30	80.40	77.95	74.70
21.5	.8465	402215	83.20	2	6	2 ½	¾	9 ½	-	-	-	-	-	-	-	-
22.0	.8661	402220	83.20	2	6	2 ⅝	¾	10	21.515-22.301	109.25	92.00	86.10	83.30	80.40	77.95	74.70
22.5	.8858	402225	99.15	2	6	2 ⅝	¾	10	22.302-23.089	126.20	108.30	102.25	99.25	96.25	93.75	90.35
23.0	.9055	402230	99.15	2	6	2 ⅝	¾	10	-	-	-	-	-	-	-	-
23.5	.9252	402235	99.15	3	8	2 ⅝	¾	10	23.090-23.901	126.20	108.30	102.25	99.25	96.25	93.75	90.35
24.0	.9449	402240	102.80	3	8	2 ⅝	¾	10	23.902-24.689	129.90	112.00	105.90	102.95	99.95	97.45	94.00
24.5	.9646	402245	102.80	3	8	2 ⅝	¾	10	-	-	-	-	-	-	-	-
25.0	.9843	402250	102.80	3	8	2 ¾	¾	10 ½	24.690-25.476	129.90	112.00	105.90	102.95	99.95	97.45	94.00
25.5	1.0039	402255	136.40	3	8	2 ¾	¾	10 ½	25.477-27.076	162.30	145.05	139.35	136.55	133.60	131.25	127.95
26.0	1.0236	402260	136.40	3	8	2 ¾	¾	10 ½	-	-	-	-	-	-	-	-
27.0	1.0630	402270	136.40	3	8	2 ¾	¾	10 ½	-	-	-	-	-	-	-	-
28.0	1.1024	402280	144.50	3	8	2 ⅞	⅞	11	27.077-28.651	170.35	153.15	147.40	144.60	141.65	139.35	136.00
29.0	1.1417	402290	152.40	3	8	2 ⅞	⅞	11	28.652-30.239	178.25	161.05	155.35	152.50	149.55	147.25	143.90
30.0	1.1811	402300	152.40	3	8	2 ⅞	⅞	11	-	-	-	-	-	-	-	-
31.0	1.2205	402310	168.05	4	8	3	⅞	11 ½	30.240-31.826	193.95	176.80	171.00	168.15	165.25	162.85	159.60
32.0	1.2598	402320	180.30	4	8	3	⅞	11 ½	31.827-33.414	206.15	189.05	183.20	180.40	177.55	175.10	171.85
33.0	1.2992	402330	180.30	4	8	3	⅞	11 ½	-	-	-	-	-	-	-	-
34.0	1.3386	402340	187.15	4	8	3 ¼	⅞	12	33.415-35.001	213.00	195.85	190.10	187.25	184.40	182.00	178.70
35.0	1.3780	402350	187.15	4	8	3 ¼	⅞	12	-	-	-	-	-	-	-	-
36.0	1.4173	402360	190.75	4	8	3 ¼	⅞	12	35.002-36.589	216.70	199.50	193.75	190.95	188.05	185.65	182.30
37.0	1.4567	402370	199.70	4	8	3 ½	⅞	12 ½	36.590-38.176	225.65	208.45	202.65	199.90	197.00	194.60	191.35
38.0	1.4961	402380	199.70	4	8	3 ½	⅞	12 ½	-	-	-	-	-	-	-	-
39.0	1.5354	402390	214.65	4	8	3 ½	⅞	12 ½	38.177-39.776	240.55	223.40	217.60	214.80	211.90	209.45	206.15
40.0	1.5748	402400	221.65	4	8	3 ¾	⅞	13	39.777-41.351	247.60	230.40	224.65	221.80	218.95	216.55	213.20
41.0	1.6142	402410	221.65	4	8	3 ¾	⅞	13	-	-	-	-	-	-	-	-

Modified tool diameters are available up to 50mm - contact us for price.

CHUCKING REAMERS CARBIDE TIPPED TYPE 450 FRACTIONAL

GENERAL PURPOSE

STRAIGHT FLUTE LONG CARBIDE STRAIGHT SHANK

TYPE 450
- Straight polished flutes with flute long carbide
- Straight shank
- Detailed specifications on page 29

USE:
- For all general reaming - specifically designed with flute long carbide for deep hole reaming to precision tolerances and for long production runs

MODIFICATIONS (Prompt delivery)
- Modified tool diameter - priced below
- Modified metric tool diameter - priced on pg. 57
- Closer tool diameter tolerance - pg. 29
- Cutting diam. reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diam. back taper
- Shortened shank or reduced shank diameter
- Flat(s) or tang on shank
- Coatings available: See page 54

TOOL SELECTOR

CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
20	NON-FERROUS - LONG CHIPS	450/457[MS]
40	NON-FERROUS - SHORT CHIPS	450/457[MS]
60	CAST IRONS	450/458[MS]
80	LOW STRENGTH STEELS	450/459[MS]
100	MEDIUM STRENGTH STEELS	450/459[MS]
120	HIGH STRENGTH STEELS	450/459[MS]
140	HIGH TEMPERATURE ALLOYS	459[MS]

[MS]See pages 78 & 79 for material specific reamers

NOTE: For stocked tool diameters in .0005 increments, see pgs. 59-61. For semi-finished reamers, see pg. 53. For smaller tool diameters, see solid carbide reamers on pgs. 58, 105-107.

TOOL DIAMETER		TYPE 450 EDP NO.	PRICE	DIMENSIONS				FINISHED TO MODIFIED TOOL DIAMETER						
				SHANK DIAM.	NO. OF FLTS	LENGTH		MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DECIMAL					FLUTE & CARBIDE	OVER-ALL		1	2	3	4	5-7	8-14*
3/16	.1875	45006	$40.30	11/64	4	1 1/2	6	0.1770 - 0.2040	$72.60	$56.40	$51.10	$48.45	$45.65	$43.45
7/32	.2188	45007	40.30	13/64	4	1 1/2	6	0.2041 - 0.2210	72.60	56.40	51.10	48.45	45.65	43.45
15/64	.2344	4502344	40.30	7/32	4	1 1/2	6	0.2211 - 0.2380	72.60	56.40	51.10	48.45	45.65	43.45
1/4	.2500	45008	40.30	15/64	4	1 1/2	6	0.2381 - 0.2530	72.60	56.40	51.10	48.45	45.65	43.45
9/32	.2812	45009	41.20	15/64	4	1 1/2	6	0.2531 - 0.2840	73.45	57.25	51.90	49.30	46.50	44.35
5/16	.3125	45010	41.20	9/32	4	1 1/2	6	0.2841 - 0.3150	73.45	57.25	51.90	49.30	46.50	44.35
11/32	.3438	45011	42.65	9/32	4	1 1/2	6	0.3151 - 0.3470	74.95	58.85	53.35	50.85	48.00	45.85
3/8	.3750	45012	42.65	5/16	4	1 3/4	7	0.3471 - 0.3780	74.95	58.85	53.35	50.85	48.00	45.85
13/32	.4062	45013	44.80	5/16	4	1 3/4	7	0.3781 - 0.4090	77.05	60.95	55.50	52.95	50.15	47.95
7/16	.4375	45014	48.45	3/8	4	1 3/4	7	0.4091 - 0.4410	80.75	64.55	59.10	56.60	53.80	51.60
15/32	.4688	45015	52.30	3/8	4	1 3/4	7	0.4411 - 0.4720	84.65	68.50	63.00	60.40	57.70	55.50
1/2	.5000	45016	56.00	7/16	6	2	8	0.4721 - 0.5030	90.65	73.35	67.60	64.75	61.85	59.40
17/32	.5312	45017	57.65	7/16	6	2	8	0.5031 - 0.5340	92.25	74.90	69.10	66.30	63.35	61.00
9/16	.5625	45018	57.65	7/16	6	2	8	0.5341 - 0.5660	92.25	74.90	69.10	66.30	63.35	61.00
19/32	.5938	45019	59.90	7/16	6	2	8	0.5661 - 0.5970	94.50	77.10	71.40	68.65	65.60	63.30
5/8	.6250	45020	59.90	9/16	6	2	9	0.5971 - 0.6280	94.50	77.10	71.40	68.65	65.60	63.30
21/32	.6562	45021	60.95	9/16	6	2	9	0.6281 - 0.6590	95.55	78.25	72.45	69.70	66.65	64.35
11/16	.6875	45022	60.95	9/16	6	2	9	0.6591 - 0.6910	95.55	78.25	72.45	69.70	66.65	64.35
23/32	.7188	45023	63.75	9/16	6	2	9	0.6911 - 0.7220	98.35	81.05	75.30	72.50	69.50	67.15
3/4	.7500	45024	63.75	5/8	6	2	9 1/2	0.7221 - 0.7530	98.35	81.05	75.30	72.50	69.50	67.15
25/32	.7812	45025	65.95	5/8	6	2	9 1/2	0.7531 - 0.7840	100.55	83.25	77.50	74.70	71.70	69.40
13/16	.8125	45026	65.95	5/8	6	2	9 1/2	0.7841 - 0.8160	100.55	83.25	77.50	74.70	71.70	69.40
27/32	.8438	45027	68.65	5/8	6	2	9 1/2	0.8161 - 0.8470	103.25	85.85	80.05	77.25	74.35	71.95
7/8	.8750	45028	71.20	3/4	6	2 1/4	10	0.8471 - 0.8780	107.10	89.15	83.10	80.20	77.10	74.70
29/32	.9062	45029	82.85	3/4	6	2 1/4	10	0.8781 - 0.9090	118.75	100.80	94.75	91.90	88.85	86.40
15/16	.9375	45030	82.85	3/4	8	2 1/4	10	0.9091 - 0.9410	118.75	100.80	94.75	91.90	88.85	86.40
31/32	.9688	45031	86.80	3/4	8	2 1/4	10	0.9411 - 0.9720	122.75	104.75	98.75	95.90	92.80	90.35
1	1.0000	45032	86.80	7/8	8	2 1/4	10 1/2	0.9721 - 1.0030	122.75	104.75	98.75	95.90	92.80	90.35
1 1/16	1.0625	45034	89.85	7/8	8	2 1/4	10 1/2	1.0031 - 1.0660	124.30	107.00	101.25	98.45	95.55	93.25
1 1/8	1.1250	45036	97.20	7/8	8	2 1/4	11	1.0661 - 1.1280	131.60	114.45	108.60	105.90	102.85	100.55
1 3/16	1.1875	45038	101.70	1	8	2 1/4	11	1.1281 - 1.1905	136.10	118.90	113.15	110.35	107.40	105.10
1 1/4	1.2500	45040	118.75	1	8	2 1/2	11 1/2	1.1906 - 1.2530	153.15	135.95	130.15	127.40	124.45	122.10
1 5/16	1.3125	45042	118.75	1	8	2 1/2	11 1/2	1.2531 - 1.3155	153.15	135.95	130.15	127.40	124.45	122.10
1 3/8	1.3750	45044	120.50	1	8	2 1/2	12	1.3156 - 1.3780	154.90	137.70	131.85	129.15	126.20	123.85
1 7/16	1.4375	45046	133.15	1 1/4	8	2 1/2	12	1.3781 - 1.4405	167.60	150.25	144.55	141.80	138.85	136.55
1 1/2	1.5000	45048	159.80	1 1/4	8	2 1/2	12 1/2	1.4406 - 1.5030	194.20	176.95	171.25	168.45	165.50	163.25
1 9/16	1.5625	45050	210.95	1 1/4	8	2 1/2	12 1/2	1.5031 - 1.5660	245.35	228.10	222.35	219.60	216.65	214.35
1 5/8	1.6250	45052	218.15	1 1/4	8	2 3/4	13	1.5661 - 1.6280	252.60	235.25	229.55	226.85	223.85	221.55
1 11/16	1.6875	45054	239.50	1 1/4	8	2 3/4	13	1.6281 - 1.6910	274.00	256.75	251.00	248.20	245.30	242.95
1 3/4	1.7500	45056	239.50	1 1/4	10	3	13 1/2	1.6911 - 1.7530	274.00	256.75	251.00	248.20	245.30	242.95
1 13/16	1.8125	45058	245.05	1 1/2	10	3	13 1/2	1.7531 - 1.8160	279.60	262.35	256.50	253.80	250.80	248.50
1 7/8	1.8750	45060	257.05	1 1/2	10	3 1/4	14	1.8161 - 1.8780	291.45	274.15	268.45	265.70	262.70	260.40
1 15/16	1.9375	45062	272.55	1 1/2	10	3 1/4	14	1.8781 - 1.9410	306.90	289.65	283.90	281.15	278.25	275.90
2	2.0000	45064	272.55	1 1/2	12	3 1/4	14	1.9411 - 2.0030	306.90	289.65	283.90	281.15	278.25	275.90

*Quantities of 15 or more - price of fractional size in same size range.

CHUCKING REAMERS
CARBIDE TIPPED TYPE 450 METRIC

GENERAL PURPOSE

STRAIGHT FLUTE LONG CARBIDE
STRAIGHT SHANK

NOTE: Tool diameter in millimeters (mm); all other dimensions in inches. Also, modifications available (see list on page 56).

TOOL DIAMETER		TYPE 450 METRIC EDP NO.	METRIC PRICE	DIMENSIONS				FINISHED TO MODIFIED TOOL DIAMETER							
				SHANK DIAM.	NO. OF FLTS	LENGTH		MODIFIED DIAMETER RANGE (mm)	PRICE EACH - BASED ON QUANTITY ORDERED						
mm	INCH					FLUTE & CARBIDE	OVER-ALL		1	2	3	4	5-7	8-14	OVER 14
4.5	.1772	450045	$51.10	11/64	4	1 ½	6	4.494 - 5.182	$75.35	$59.20	$53.80	$51.15	$48.45	$46.20	$43.10
5.0	.1969	450050	51.10	11/64	4	1 ½	6	-	-	-	-	-	-	-	-
5.5	.2165	450055	51.10	13/64	4	1 ½	6	5.183 - 5.613	75.35	59.20	53.80	51.15	48.45	46.20	43.10
6.0	.2362	450060	51.10	7/32	4	1 ½	6	5.614 - 6.045	75.35	59.20	53.80	51.15	48.45	46.20	43.10
6.3	.2480	450063	51.10	15/64	4	1 ½	6	6.046 - 6.426	75.35	59.20	53.80	51.15	48.45	46.20	43.10
6.5	.2559	450065	51.90	15/64	4	1 ½	6	6.427 - 7.214	76.10	60.05	54.65	52.00	49.30	47.00	44.00
7.0	.2756	450070	51.90	15/64	4	1 ½	6	-	-	-	-	-	-	-	-
7.5	.2953	450075	51.90	9/32	4	1 ½	6	7.215 - 8.001	76.10	60.05	54.65	52.00	49.30	47.00	44.00
8.0	.3150	450080	51.90	9/32	4	1 ½	6	-	-	-	-	-	-	-	-
8.5	.3346	450085	53.35	9/32	4	1 ½	6	8.002 - 8.814	77.70	61.60	56.15	53.50	50.85	48.55	45.45
9.0	.3543	450090	53.35	5/16	4	1 ¾	7	8.815 - 9.601	77.70	61.60	56.15	53.50	50.85	48.55	45.45
9.5	.3740	450095	53.35	5/16	4	1 ¾	7	-	-	-	-	-	-	-	-
10.0	.3937	450100	55.50	5/16	4	1 ¾	7	9.602 - 10.389	79.80	63.70	58.25	55.65	52.95	50.70	47.55
10.5	.4134	450105	59.10	3/8	4	1 ¾	7	10.390 - 11.201	83.50	67.25	61.90	59.25	56.60	54.30	51.20
11.0	.4331	450110	59.10	3/8	4	1 ¾	7	-	-	-	-	-	-	-	-
11.5	.4528	450115	63.00	3/8	4	1 ¾	7	11.202 - 11.989	87.35	71.20	65.85	63.20	60.40	58.20	55.10
12.0	.4724	450120	67.60	7/16	6	2	8	11.990 - 12.776	93.55	76.35	70.50	67.70	64.75	62.35	59.05
12.5	.4921	450125	67.60	7/16	6	2	8	-	-	-	-	-	-	-	-
13.0	.5118	450130	69.10	7/16	6	2	8	12.777 - 13.564	95.20	77.85	72.10	69.20	66.30	63.90	60.60
13.5	.5315	450135	69.10	7/16	6	2	8	-	-	-	-	-	-	-	-
14.0	.5512	450140	69.10	7/16	6	2	8	13.565 - 14.376	95.20	77.85	72.10	69.20	66.30	63.90	60.60
14.5	.5709	450145	71.40	7/16	6	2	8	14.377 - 15.164	97.40	80.10	74.35	71.50	68.65	66.15	62.85
15.0	.5906	450150	71.40	7/16	6	2	8	-	-	-	-	-	-	-	-
15.5	.6102	450155	71.40	9/16	6	2	9	15.165 - 15.951	97.40	80.10	74.35	71.50	68.65	66.15	62.85
16.0	.6299	450160	72.45	9/16	6	2	9	15.952 - 16.739	98.40	81.20	75.40	72.55	69.70	67.20	63.90
16.5	.6496	450165	72.45	9/16	6	2	9	-	-	-	-	-	-	-	-
17.0	.6693	450170	72.45	9/16	6	2	9	16.740 - 17.551	98.40	81.20	75.40	72.55	69.70	67.20	63.90
17.5	.6890	450175	72.45	9/16	6	2	9	-	-	-	-	-	-	-	-
18.0	.7087	450180	75.30	9/16	6	2	9	17.552 - 18.339	101.30	83.95	78.25	75.40	72.50	70.05	66.80
18.5	.7283	450185	75.30	5/8	6	2	9 ½	18.340 - 19.126	101.30	83.95	78.25	75.40	72.50	70.05	66.80
19.0	.7480	450190	75.30	5/8	6	2	9 ½	-	-	-	-	-	-	-	-
19.5	.7677	450195	77.50	5/8	6	2	9 ½	19.127 - 19.914	103.45	86.30	80.40	77.60	74.70	72.25	68.95
20.0	.7874	450200	77.50	5/8	6	2	9 ½	19.915 - 20.726	103.45	86.30	80.40	77.60	74.70	72.25	68.95
20.5	.8071	450205	77.50	5/8	6	2	9 ½	-	-	-	-	-	-	-	-
21.0	.8268	450210	80.05	5/8	6	2	9 ½	20.727 - 21.514	106.10	88.85	83.05	80.25	77.25	74.90	71.55
21.5	.8465	450215	80.05	5/8	6	2	9 ½	-	-	-	-	-	-	-	-
22.0	.8661	450220	80.05	¾	6	2 ¼	10	21.515 - 22.301	106.10	88.85	83.05	80.25	77.25	74.90	71.55
22.5	.8858	450225	94.75	¾	6	2 ¼	10	22.302 - 23.089	121.80	103.90	97.85	94.85	91.90	89.35	85.90
23.0	.9055	450230	94.75	¾	6	2 ¼	10	-	-	-	-	-	-	-	-
23.5	.9252	450235	94.75	¾	8	2 ¼	10	23.090 - 23.901	121.80	103.90	97.85	94.85	91.90	89.35	85.90
24.0	.9449	450240	98.75	¾	8	2 ¼	10	23.902 - 24.689	125.70	107.85	101.75	98.85	95.90	93.40	89.95
24.5	.9646	450245	98.75	¾	8	2 ¼	10	-	-	-	-	-	-	-	-
25.0	.9843	450250	98.75	⅞	8	2 ¼	10 ½	24.690 - 25.476	125.70	107.85	101.75	98.85	95.90	93.40	89.95
25.5	1.0039	450255	101.25	⅞	8	2 ¼	10 ½	25.477 - 27.076	127.15	110.00	104.20	101.40	98.45	96.10	92.80
26.0	1.0236	450260	101.25	⅞	8	2 ¼	10 ½	-	-	-	-	-	-	-	-
27.0	1.0630	450270	101.25	⅞	8	2 ¼	10 ½	-	-	-	-	-	-	-	-
28.0	1.1024	450280	108.60	⅞	8	2 ¼	11	27.077 - 28.651	134.55	117.35	111.55	108.80	105.90	103.45	100.15
29.0	1.1417	450290	113.15	1	8	2 ¼	11	28.652 - 30.239	139.00	121.90	116.05	113.25	110.35	107.95	104.70
30.0	1.1811	450300	113.15	1	8	2 ¼	11	-	-	-	-	-	-	-	-
31.0	1.2205	450310	130.15	1	8	2 ½	11 ½	30.240 - 31.826	156.10	138.90	133.15	130.35	127.40	124.95	121.70
32.0	1.2598	450320	130.15	1	8	2 ½	11 ½	31.827 - 33.414	156.10	138.90	133.15	130.35	127.40	124.95	121.70
33.0	1.2992	450330	130.15	1	8	2 ½	11 ½	-	-	-	-	-	-	-	-
34.0	1.3386	450340	131.85	1	8	2 ½	12	33.415 - 35.001	157.85	140.65	134.85	132.10	129.15	126.80	123.50
35.0	1.3780	450350	131.85	1	8	2 ½	12	-	-	-	-	-	-	-	-
36.0	1.4173	450360	144.55	1 ¼	8	2 ½	12	35.002 - 36.589	170.40	153.30	147.45	144.65	141.80	139.40	136.05
37.0	1.4567	450370	171.25	1 ¼	8	2 ½	12 ½	36.590 - 38.176	197.10	179.95	174.15	171.35	168.45	166.05	162.75
38.0	1.4961	450380	171.25	1 ¼	8	2 ½	12 ½	-	-	-	-	-	-	-	-

Modified tool diameters are available up to 50mm - contact us for price.

CHUCKING REAMERS
SOLID CARBIDE TYPE 804 .0005 INCREMENTS

GENERAL PURPOSE

STOCKED DECIMAL TOOL DIAMETERS (.0280 TO .1765)
STRAIGHT FLUTES & SHANK - SHORT SERIES

NOTE: Dimension details on pages 104. Available modifications on page 101. Additional Type 804 sizes on page 105-109.

TOOL DIAM.	EDP NO.	PRICE	TOOL DIAM.	EDP NO.	PRICE	TOOL DIAM.	EDP NO.	PRICE	TOOL DIAM.	EDP NO.	PRICE	TOOL DIAM.	EDP NO.	PRICE
.0280	8040280	$22.00	.0580	8040580	$22.60	.0880	8040880	$23.55	.1180	8041180	$26.55	.1480	8041480	$29.25
.0285	8040285	23.20	.0585	8040585	22.60	.0885	8040885	23.55	.1185	8041185	26.65	.1485	8041485	29.25
.0290	8040290	23.20	.0590	8040590	19.65	.0890	8040890	22.80	.1190	8041190	26.65	.1490	8041490	29.25
.0295	8040295	22.00	.0595	8040595	21.45	.0895	8040895	24.10	.1195	8041195	26.65	.1495	8041495	27.85
.0300	8040300	23.20	.0600	8040600	23.20	.0900	8040900	24.10	.1200	8041200	25.35	.1500	8041500	29.25
.0305	8040305	23.20	.0605	8040605	23.20	.0905	8040905	24.10	.1205	8041205	26.65	.1505	8041505	29.25
.0310	8040310	22.00	.0610	8040610	22.00	.0910	8040910	24.20	.1210	8041210	26.65	.1510	8041510	29.25
.0315	804008	22.00	.0615	8040615	23.20	.0915	8040915	24.20	.1215	8041215	26.65	.1515	8041515	29.25
.0320	8040320	22.00	.0620	8040620	23.20	.0920	8040920	24.20	.1220	804031	25.35	.1520	8041520	27.85
.0325	8040325	23.20	.0625	80404	20.25	.0925	8040925	22.90	.1225	8041225	26.65	.1525	8041525	30.50
.0330	8040330	22.00	.0630	804016	22.00	.0930	8040930	24.20	.1230	8041230	26.65	.1530	8041530	30.50
.0335	8040335	22.00	.0635	8040635	22.00	.0935	8040935	22.90	.1235	8041235	26.65	.1535	804039	29.00
.0340	8040340	22.40	.0640	8040640	23.20	.0940	8040940	24.20	.1240	8041240	26.65	.1540	8041540	29.00
.0345	8040345	22.40	.0645	8040645	23.20	.0945	804024	22.90	.1245	8041245	26.65	.1545	8041545	30.50
.0350	8040350	21.30	.0650	8040650	23.35	.0950	8040950	24.50	.1250	80408	23.35	.1550	8041550	30.50
.0355	8040355	22.40	.0655	8040655	23.35	.0955	8040955	24.50	.1255	8041255	26.65	.1555	8041555	29.00
.0360	8040360	21.30	.0660	8040660	23.35	.0960	8040960	23.35	.1260	804032	25.35	.1560	8041560	30.50
.0365	8040365	22.40	.0665	8040665	23.35	.0965	8040965	23.35	.1265	8041265	26.75	.1565	8041565	31.60
.0370	8040370	21.30	.0670	8040670	22.25	.0970	8040970	24.50	.1270	8041270	26.75	.1570	8041570	30.00
.0375	8040375	22.40	.0675	8040675	23.35	.0975	8040975	24.50	.1275	8041275	26.75	.1575	804040	27.40
.0380	8040380	21.30	.0680	8040680	23.35	.0980	8040980	23.35	.1280	8041280	25.40	.1580	8041580	32.25
.0385	8040385	22.40	.0685	8040685	23.35	.0985	8040985	24.70	.1285	8041285	25.40	.1585	8041585	32.25
.0390	8040390	21.30	.0690	8040690	23.35	.0990	8040990	24.70	.1290	8041290	26.75	.1590	8041590	30.75
.0395	8040395	22.40	.0695	8040695	23.35	.0995	8040995	23.55	.1295	8041295	26.75	.1595	8041595	32.80
.0400	8040400	21.30	.0700	8040700	22.25	.1000	8041000	24.70	.1300	8041300	26.75	.1600	8041600	32.80
.0405	8040405	22.40	.0705	8040705	23.35	.1005	8041005	24.70	.1305	8041305	26.75	.1605	8041605	32.80
.0410	8040410	21.30	.0710	8040710	23.35	.1010	8041010	24.70	.1310	8041310	26.75	.1610	8041610	31.15
.0415	8040415	22.40	.0715	8040715	23.35	.1015	8041015	23.55	.1315	8041315	26.75	.1615	8041615	32.80
.0420	8040420	21.30	.0720	8040720	23.35	.1020	8041020	24.90	.1320	8041320	26.75	.1620	8041620	32.80
.0425	8040425	22.40	.0725	8040725	23.35	.1025	8041025	25.00	.1325	8041325	26.75	.1625	8041625	32.80
.0430	8040430	21.30	.0730	8040730	22.25	.1030	8041030	25.00	.1330	8041330	26.75	.1630	8041630	32.80
.0435	8040435	22.60	.0735	8040735	23.35	.1035	8041035	25.00	.1335	8041335	26.75	.1635	8041635	32.90
.0440	8040440	22.60	.0740	8040740	23.35	.1040	8041040	25.00	.1340	8041340	26.75	.1640	8041640	32.80
.0445	8040445	22.60	.0745	8040745	23.35	.1045	8041045	25.00	.1345	8041345	26.75	.1645	8041645	32.80
.0450	8040450	22.60	.0750	8040750	23.35	.1050	8041050	25.00	.1350	8041350	26.75	.1650	8041650	32.80
.0455	8040455	22.60	.0755	8040755	23.35	.1055	8041055	25.00	.1355	8041355	26.75	.1655	8041655	32.80
.0460	8040460	22.60	.0760	8040760	22.25	.1060	8041060	25.00	.1360	8041360	25.40	.1660	8041660	31.30
.0465	8040465	21.45	.0765	8040765	23.35	.1065	8041065	23.75	.1365	8041365	26.75	.1665	8041665	33.20
.0470	8040470	22.60	.0770	8040770	23.35	.1070	8041070	25.40	.1370	8041370	26.75	.1670	8041670	33.20
.0475	8040475	22.60	.0775	8040775	23.35	.1075	8041075	25.40	.1375	8041375	26.75	.1675	8041675	33.20
.0480	8040480	22.60	.0780	8040780	23.35	.1080	8041080	25.40	.1380	8041380	27.20	.1680	8041680	33.20
.0485	8040485	22.60	.0785	8040785	22.30	.1085	8041085	25.70	.1385	8041385	27.20	.1685	8041685	33.20
.0490	8040490	22.60	.0790	8040790	23.45	.1090	8041090	25.70	.1390	8041390	27.20	.1690	8041690	33.20
.0495	8040495	22.60	.0795	8040795	23.45	.1095	8041095	25.70	.1395	8041395	27.20	.1695	8041695	31.65
.0500	8040500	22.60	.0800	8040800	23.45	.1100	8041100	24.50	.1400	8041400	27.20	.1700	8041700	33.90
.0505	8040505	22.60	.0805	8040805	23.45	.1105	8041105	26.10	.1405	8041405	25.70	.1705	8041705	33.90
.0510	8040510	22.60	.0810	8040810	22.30	.1110	8041110	24.90	.1410	8041410	28.25	.1710	8041710	33.90
.0515	8040515	22.60	.0815	8040815	23.55	.1115	8041115	26.55	.1415	8041415	28.25	.1715	8041715	33.90
.0520	8040520	21.45	.0820	8040820	22.40	.1120	8041120	26.55	.1420	8041420	28.25	.1720	8041720	33.90
.0525	8040525	22.60	.0825	8040825	23.55	.1125	8041125	26.55	.1425	8041425	28.25	.1725	8041725	33.90
.0530	8040530	22.60	.0830	8040830	23.55	.1130	8041130	25.25	.1430	8041430	28.25	.1730	8041730	32.25
.0535	8040535	22.60	.0835	8040835	23.55	.1135	8041135	26.55	.1435	8041435	28.25	.1735	8041735	34.40
.0540	8040540	22.60	.0840	8040840	23.55	.1140	8041140	26.55	.1440	8041440	26.90	.1740	8041740	34.40
.0545	8040545	22.60	.0845	8040845	23.55	.1145	8041145	26.55	.1445	8041445	28.40	.1745	8041745	34.40
.0550	8040550	21.45	.0850	8040850	23.55	.1150	8041150	26.55	.1450	8041450	28.45	.1750	8041750	34.40
.0555	8040555	22.60	.0855	8040855	23.55	.1155	8041155	26.55	.1455	8041455	28.45	.1755	8041755	34.75
.0560	8040560	22.60	.0860	8040860	22.40	.1160	8041160	25.25	.1460	8041460	29.20	.1760	8041760	34.75
.0565	8040565	22.60	.0865	8040865	23.55	.1165	8041165	26.55	.1465	8041465	29.20	.1765	8041765	34.75
.0570	8040570	22.60	.0870	8040870	23.55	.1170	8041170	26.55	.1470	8041470	27.70	-	-	-
.0575	8040575	22.60	.0875	8040875	23.55	.1175	8041175	26.55	.1475	8041475	29.20	-	-	-

CHUCKING REAMERS
CARBIDE TIPPED TYPE 450 .0005 INCREMENTS

GENERAL PURPOSE

STOCKED DECIMAL TOOL DIAMETERS (.1770 TO .3265)
STRAIGHT FLUTE LONG CARBIDE & STRAIGHT SHANK

NOTE: Dimension details and available modifications listed on page 56.

TOOL DIAM.	EDP NO.	PRICE	TOOL DIAM.	EDP NO.	PRICE	TOOL DIAM.	EDP NO.	PRICE	TOOL DIAM.	EDP NO.	PRICE	TOOL DIAM.	EDP NO.	PRICE
.1770	4501770	$51.10	.2070	4502070	$51.10	.2370	4502370	$51.10	.2670	4502670	$51.90	.2970	4502970	$51.90
.1775	4501775	51.10	.2075	4502075	51.10	.2375	4502375	51.10	.2675	4502675	51.90	.2975	4502975	51.90
.1780	4501780	51.10	.2080	4502080	51.10	.2380	4502380	51.10	.2680	4502680	51.90	.2980	4502980	51.90
.1785	4501785	51.10	.2085	4502085	51.10	.2385	4502385	51.10	.2685	4502685	51.90	.2985	4502985	51.90
.1790	4501790	51.10	.2090	4502090	51.10	.2390	4502390	51.10	.2690	4502690	51.90	.2990	4502990	51.90
.1795	4501795	51.10	.2095	4502095	51.10	.2395	4502395	51.10	.2695	4502695	51.90	.2995	4502995	51.90
.1800	4501800	51.10	.2100	4502100	51.10	.2400	4502400	51.10	.2700	4502700	51.90	.3000	4503000	51.90
.1805	4501805	51.10	.2105	4502105	51.10	.2405	4502405	51.10	.2705	4502705	51.90	.3005	4503005	51.90
.1810	4501810	51.10	.2110	4502110	51.10	.2410	4502410	51.10	.2710	4502710	51.90	.3010	4503010	51.90
.1815	4501815	51.10	.2115	4502115	51.10	.2415	4502415	51.10	.2715	4502715	51.90	.3015	4503015	51.90
.1820	4501820	51.10	.2120	4502120	51.10	.2420	4502420	51.10	.2720	4502720	51.90	.3020	4503020	51.90
.1825	4501825	51.10	.2125	4502125	51.10	.2425	4502425	51.10	.2725	4502725	51.90	.3025	4503025	51.90
.1830	4501830	51.10	.2130	4502130	51.10	.2430	4502430	51.10	.2730	4502730	51.90	.3030	4503030	51.90
.1835	4501835	51.10	.2135	4502135	51.10	.2435	4502435	51.10	.2735	4502735	51.90	.3035	4503035	51.90
.1840	4501840	51.10	.2140	4502140	51.10	.2440	4502440	51.10	.2740	4502740	51.90	.3040	4503040	51.90
.1845	4501845	51.10	.2145	4502145	51.10	.2445	4502445	51.10	.2745	4502745	51.90	.3045	4503045	51.90
.1850	450047	51.10	.2150	4502150	51.10	.2450	4502450	51.10	.2750	4502750	51.90	.3050	4503050	51.90
.1855	4501855	51.10	.2155	4502155	51.10	.2455	4502455	51.10	.2755	4502755	51.90	.3055	4503055	51.90
.1860	4501860	51.10	.2160	4502160	51.10	.2460	4502460	51.10	.2760	4502760	51.90	.3060	4503060	51.90
.1865	4501865	51.10	.2165	450055	51.10	.2465	4502465	51.10	.2765	4502765	51.90	.3065	4503065	51.90
.1870	4501870	51.10	.2170	4502170	51.10	.2470	4502470	51.10	.2770	4502770	51.90	.3070	4503070	51.90
.1875	45006	40.30	.2175	4502175	51.10	.2475	4502475	51.10	.2775	4502775	51.90	.3075	4503075	51.90
.1880	4501880	51.10	.2180	4502180	51.10	.2480	450063	51.10	.2780	4502780	51.90	.3080	4503080	51.90
.1885	4501885	51.10	.2185	4502185	51.10	.2485	4502485	51.10	.2785	4502785	51.90	.3085	4503085	51.90
.1890	450048	51.10	.2190	4502190	51.10	.2490	4502490	51.10	.2790	4502790	51.90	.3090	4503090	51.90
.1895	4501895	51.10	.2195	4502195	51.10	.2495	4502495	51.10	.2795	450071	51.90	.3095	4503095	51.90
.1900	4501900	51.10	.2200	4502200	51.10	.2500	45008	40.30	.2800	4502800	51.90	.3100	4503100	51.90
.1905	4501905	51.10	.2205	450056	51.10	.2505	4502505	51.10	.2805	4502805	51.90	.3105	4503105	51.90
.1910	4501910	51.10	.2210	4502210	51.10	.2510	4502510	51.10	.2810	4502810	51.90	.3110	450079	51.90
.1915	4501915	51.10	.2215	4502215	51.10	.2515	4502515	51.10	.2815	4502815	51.90	.3115	4503115	51.90
.1920	4501920	51.10	.2220	4502220	51.10	.2520	450064	51.10	.2820	4502820	51.90	.3120	4503120	51.90
.1925	4501925	51.10	.2225	4502225	51.10	.2525	4502525	51.10	.2825	4502825	51.90	.3125	45010	41.20
.1930	4501930	51.10	.2230	4502230	51.10	.2530	4502530	51.10	.2830	4502830	51.90	.3130	4503130	51.90
.1935	4501935	51.10	.2235	4502235	51.10	.2535	4502535	51.90	.2835	450072	51.90	.3135	4503135	51.90
.1940	4501940	51.10	.2240	4502240	51.10	.2540	4502540	51.90	.2840	4502840	51.90	.3140	4503140	51.90
.1945	4501945	51.10	.2245	4502245	51.10	.2545	4502545	51.90	.2845	4502845	51.90	.3145	4503145	51.90
.1950	4501950	51.10	.2250	4502250	51.10	.2550	4502550	51.90	.2850	4502850	51.90	.3150	450080	51.90
.1955	4501955	51.10	.2255	4502255	51.10	.2555	4502555	51.90	.2855	4502855	51.90	.3155	4503155	53.35
.1960	4501960	51.10	.2260	4502260	51.10	.2560	4502560	51.90	.2860	4502860	51.90	.3160	4503160	53.35
.1965	4501965	51.10	.2265	4502265	51.10	.2565	4502565	51.90	.2865	4502865	51.90	.3165	4503165	53.35
.1970	4501970	51.10	.2270	4502270	51.10	.2570	4502570	51.90	.2870	4502870	51.90	.3170	4503170	53.35
.1975	4501975	51.10	.2275	4502275	51.10	.2575	4502575	51.90	.2875	4502875	51.90	.3175	4503175	53.35
.1980	4501980	51.10	.2280	4502280	51.10	.2580	4502580	51.90	.2880	4502880	51.90	.3180	4503180	53.35
.1985	4501985	51.10	.2285	4502285	51.10	.2585	4502585	51.90	.2885	4502885	51.90	.3185	4503185	53.35
.1990	4501990	51.10	.2290	4502290	51.10	.2590	4502590	51.90	.2890	4502890	51.90	.3190	4503190	53.35
.1995	4501995	51.10	.2295	4502295	51.10	.2595	4502595	51.90	.2895	4502895	51.90	.3195	4503195	53.35
.2000	4502000	51.10	.2300	4502300	51.10	.2600	4502600	51.90	.2900	4502900	51.90	.3200	4503200	53.35
.2005	4502005	51.10	.2305	4502305	51.10	.2605	4502605	51.90	.2905	4502905	51.90	.3205	4503205	53.35
.2010	4502010	51.10	.2310	4502310	51.10	.2610	4502610	51.90	.2910	4502910	51.90	.3210	4503210	53.35
.2015	4502015	51.10	.2315	4502315	51.10	.2615	4502615	51.90	.2915	4502915	51.90	.3215	4503215	53.35
.2020	4502020	51.10	.2320	4502320	51.10	.2620	4502620	51.90	.2920	4502920	51.90	.3220	4503220	53.35
.2025	4502025	51.10	.2325	4502325	51.10	.2625	4502625	51.90	.2925	4502925	51.90	.3225	4503225	53.35
.2030	4502030	51.10	.2330	4502330	51.10	.2630	4502630	51.90	.2930	4502930	51.90	.3230	4503230	53.35
.2035	4502035	51.10	.2335	4502335	51.10	.2635	4502635	51.90	.2935	4502935	51.90	.3235	4503235	53.35
.2040	4502040	51.10	.2340	4502340	51.10	.2640	4502640	51.90	.2940	4502940	51.90	.3240	4503240	53.35
.2045	4502045	51.10	.2345	4502345	51.10	.2645	4502645	51.90	.2945	4502945	51.90	.3245	4503245	53.35
.2050	4502050	51.10	.2350	4502350	51.10	.2650	4502650	51.90	.2950	4502950	51.90	.3250	4503250	53.35
.2055	4502055	51.10	.2355	4502355	51.10	.2655	4502655	51.90	.2955	4502955	51.90	.3255	4503255	53.35
.2060	4502060	51.10	.2360	4502360	51.10	.2660	4502660	51.90	.2960	4502960	51.90	.3260	4503260	53.35
.2065	4502065	51.10	.2365	4502365	51.10	.2665	4502665	51.90	.2965	4502965	51.90	.3265	4503265	53.35

CHUCKING REAMERS
CARBIDE TIPPED TYPE 450 .0005 INCREMENTS

GENERAL PURPOSE

STOCKED DECIMAL TOOL DIAMETERS (.3270 TO .4765)
STRAIGHT FLUTE LONG CARBIDE & STRAIGHT SHANK

NOTE: Dimension details and available modifications listed on page 56.

TOOL DIAM.	EDP NO.	PRICE
.3270	4503270	$53.35
.3275	4503275	53.35
.3280	4503280	53.35
.3285	4503285	53.35
.3290	4503290	53.35
.3295	4503295	53.35
.3300	4503300	53.35
.3305	4503305	53.35
.3310	4503310	53.35
.3315	4503315	53.35
.3320	4503320	53.35
.3325	4503325	53.35
.3330	4503330	53.35
.3335	4503335	53.35
.3340	4503340	53.35
.3345	4503345	53.35
.3350	4503350	53.35
.3355	4503355	53.35
.3360	4503360	53.35
.3365	4503365	53.35
.3370	4503370	53.35
.3375	4503375	53.35
.3380	4503380	53.35
.3385	4503385	53.35
.3390	4503390	53.35
.3395	4503395	53.35
.3400	4503400	53.35
.3405	4503405	53.35
.3410	4503410	53.35
.3415	4503415	53.35
.3420	4503420	53.35
.3425	450087	53.35
.3430	4503430	53.35
.3435	4503435	53.35
.3440	4503440	53.35
.3445	4503445	53.35
.3450	4503450	53.35
.3455	4503455	53.35
.3460	4503460	53.35
.3465	450088	53.35
.3470	4503470	53.35
.3475	4503475	53.35
.3480	4503480	53.35
.3485	4503485	53.35
.3490	4503490	53.35
.3495	4503495	53.35
.3500	4503500	53.35
.3505	4503505	53.35
.3510	4503510	53.35
.3515	4503515	53.35
.3520	4503520	53.35
.3525	4503525	53.35
.3530	4503530	53.35
.3535	4503535	53.35
.3540	4503540	53.35
.3545	4503545	53.35
.3550	4503550	53.35
.3555	4503555	53.35
.3560	4503560	53.35
.3565	4503565	53.35

TOOL DIAM.	EDP NO.	PRICE
.3570	4503570	$53.35
.3575	4503575	53.35
.3580	4503580	53.35
.3585	4503585	53.35
.3590	4503590	53.35
.3595	4503595	53.35
.3600	4503600	53.35
.3605	4503605	53.35
.3610	4503610	53.35
.3615	4503615	53.35
.3620	4503620	53.35
.3625	4503625	53.35
.3630	4503630	53.35
.3635	4503635	53.35
.3640	4503640	53.35
.3645	4503645	53.35
.3650	4503650	53.35
.3655	4503655	53.35
.3660	4503660	53.35
.3665	4503665	53.35
.3670	4503670	53.35
.3675	4503675	53.35
.3680	4503680	53.35
.3685	4503685	53.35
.3690	4503690	53.35
.3695	4503695	53.35
.3700	4503700	53.35
.3705	4503705	53.35
.3710	4503710	53.35
.3715	4503715	53.35
.3720	4503720	53.35
.3725	4503725	53.35
.3730	4503730	53.35
.3735	4503735	53.35
.3740	450095	53.35
.3745	4503745	53.35
.3750	45012	42.65
.3755	4503755	53.35
.3760	4503760	53.35
.3765	4503765	53.35
.3770	4503770	53.35
.3775	4503775	53.35
.3780	450096	53.35
.3785	4503785	55.50
.3790	4503790	55.50
.3795	4503795	55.50
.3800	4503800	55.50
.3805	4503805	55.50
.3810	4503810	55.50
.3815	4503815	55.50
.3820	4503820	55.50
.3825	4503825	55.50
.3830	4503830	55.50
.3835	4503835	55.50
.3840	4503840	55.50
.3845	4503845	55.50
.3850	4503850	55.50
.3855	4503855	55.50
.3860	4503860	55.50
.3865	4503865	55.50

TOOL DIAM.	EDP NO.	PRICE
.3870	4503870	$55.50
.3875	4503875	55.50
.3880	4503880	55.50
.3885	4503885	55.50
.3890	4503890	55.50
.3895	4503895	55.50
.3900	4503900	55.50
.3905	4503905	55.50
.3910	4503910	55.50
.3915	4503915	55.50
.3920	4503920	55.50
.3925	4503925	55.50
.3930	4503930	55.50
.3935	4503935	55.50
.3940	4503940	55.50
.3945	4503945	55.50
.3950	4503950	55.50
.3955	4503955	55.50
.3960	4503960	55.50
.3965	4503965	55.50
.3970	4503970	55.50
.3975	4503975	55.50
.3980	4503980	55.50
.3985	4503985	55.50
.3990	4503990	55.50
.3995	4503995	55.50
.4000	4504000	55.50
.4005	4504005	55.50
.4010	4504010	55.50
.4015	4504015	55.50
.4020	4504020	55.50
.4025	4504025	55.50
.4030	4504030	55.50
.4035	4504035	55.50
.4040	4504040	55.50
.4045	4504045	55.50
.4050	4504050	55.50
.4055	450103	55.50
.4060	4504060	55.50
.4065	4504065	55.50
.4070	4504070	55.50
.4075	4504075	55.50
.4080	4504080	55.50
.4085	4504085	55.50
.4090	4504090	55.50
.4095	4504095	59.10
.4100	4504100	59.10
.4105	4504105	59.10
.4110	4504110	59.10
.4115	4504115	59.10
.4120	4504120	59.10
.4125	4504125	59.10
.4130	4504130	59.10
.4135	4504135	59.10
.4140	4504140	59.10
.4145	4504145	59.10
.4150	4504150	59.10
.4155	4504155	59.10
.4160	4504160	59.10
.4165	4504165	59.10

TOOL DIAM.	EDP NO.	PRICE
.4170	4504170	$59.10
.4175	4504175	59.10
.4180	4504180	59.10
.4185	4504185	59.10
.4190	4504190	59.10
.4195	4504195	59.10
.4200	4504200	59.10
.4205	4504205	59.10
.4210	4504210	59.10
.4215	4504215	59.10
.4220	4504220	59.10
.4225	4504225	59.10
.4230	4504230	59.10
.4235	4504235	59.10
.4240	4504240	59.10
.4245	4504245	59.10
.4250	4504250	59.10
.4255	4504255	59.10
.4260	4504260	59.10
.4265	4504265	59.10
.4270	4504270	59.10
.4275	4504275	59.10
.4280	4504280	59.10
.4285	4504285	59.10
.4290	4504290	59.10
.4295	4504295	59.10
.4300	4504300	59.10
.4305	4504305	59.10
.4310	4504310	59.10
.4315	4504315	59.10
.4320	4504320	59.10
.4325	4504325	59.10
.4330	4504330	59.10
.4335	4504335	59.10
.4340	4504340	59.10
.4345	4504345	59.10
.4350	4504350	59.10
.4355	4504355	59.10
.4360	4504360	59.10
.4365	4504365	59.10
.4370	450111	59.10
.4375	45014	48.45
.4380	4504380	59.10
.4385	4504385	59.10
.4390	4504390	59.10
.4395	4504395	59.10
.4400	4504400	59.10
.4405	4504405	59.10
.4410	4504410	59.10
.4415	4504415	63.10
.4420	4504420	63.10
.4425	4504425	63.10
.4430	4504430	63.10
.4435	4504435	63.10
.4440	4504440	63.10
.4445	4504445	63.10
.4450	4504450	63.10
.4455	4504455	63.10
.4460	4504460	63.10
.4465	4504465	63.10

TOOL DIAM.	EDP NO.	PRICE
.4470	4504470	$63.10
.4475	4504475	63.10
.4480	4504480	63.10
.4485	4504485	63.10
.4490	4504490	63.10
.4495	4504495	63.10
.4500	4504500	63.10
.4505	4504505	63.10
.4510	4504510	63.10
.4515	4504515	63.10
.4520	4504520	63.10
.4525	4504525	63.10
.4530	4504530	63.10
.4535	4504535	63.10
.4540	4504540	63.10
.4545	4504545	63.10
.4550	4504550	63.10
.4555	4504555	63.10
.4560	4504560	63.10
.4565	4504565	63.10
.4570	4504570	63.10
.4575	4504575	63.10
.4580	4504580	63.10
.4585	4504585	63.10
.4590	4504590	63.10
.4595	4504595	63.10
.4600	4504600	63.10
.4605	4504605	63.10
.4610	4504610	63.10
.4615	4504615	63.10
.4620	4504620	63.10
.4625	4504625	63.10
.4630	4504630	63.10
.4635	4504635	63.10
.4640	4504640	63.10
.4645	4504645	63.10
.4650	4504650	63.10
.4655	4504655	63.10
.4660	4504660	63.10
.4665	4504665	63.10
.4670	4504670	63.10
.4675	4504675	63.10
.4680	4504680	63.10
.4685	450119	63.10
.4690	4504690	63.10
.4695	4504695	63.10
.4700	4504700	63.10
.4705	4504705	63.10
.4710	4504710	63.10
.4715	4504715	63.10
.4720	4504720	63.10
.4725	4504725	67.65
.4730	4504730	67.65
.4735	4504735	67.65
.4740	4504740	67.65
.4745	4504745	67.65
.4750	4504750	67.65
.4755	4504755	67.65
.4760	4504760	67.65
.4765	4504765	67.65

CHUCKING REAMERS
CARBIDE TIPPED TYPE 450 .0005 INCREMENTS

GENERAL PURPOSE

STOCKED DECIMAL TOOL DIAMETERS (.4770 TO .6265)
STRAIGHT FLUTE LONG CARBIDE & STRAIGHT SHANK

NOTE: Dimension details and available modifications listed on page 56.

TOOL DIAM.	EDP NO.	PRICE	TOOL DIAM.	EDP NO.	PRICE	TOOL DIAM.	EDP NO.	PRICE	TOOL DIAM.	EDP NO.	PRICE	TOOL DIAM.	EDP NO.	PRICE
.4770	4504770	$67.65	.5070	4505070	$69.10	.5370	4505370	$69.10	.5670	4505670	$71.40	.5970	4505970	$71.40
.4775	4504775	67.65	.5075	4505075	69.10	.5375	4505375	69.10	.5675	4505675	71.40	.5975	4505975	71.40
.4780	4504780	67.65	.5080	4505080	69.10	.5380	4505380	69.10	.5680	4505680	71.40	.5980	4505980	71.40
.4785	4504785	67.65	.5085	4505085	69.10	.5385	4505385	69.10	.5685	4505685	71.40	.5985	4505985	71.40
.4790	4504790	67.65	.5090	4505090	69.10	.5390	4505390	69.10	.5690	4505690	71.40	.5990	4505990	71.40
.4795	4504795	67.65	.5095	4505095	69.10	.5395	4505395	69.10	.5695	4505695	71.40	.5995	4505995	71.40
.4800	4504800	67.65	.5100	4505100	69.10	.5400	4505400	69.10	.5700	4505700	71.40	.6000	4506000	71.40
.4805	4504805	67.65	.5105	4505105	69.10	.5405	4505405	69.10	.5705	4505705	71.40	.6005	4506005	71.40
.4810	4504810	67.65	.5110	4505110	69.10	.5410	4505410	69.10	.5710	4505710	71.40	.6010	4506010	71.40
.4815	4504815	67.65	.5115	4505115	69.10	.5415	4505415	69.10	.5715	4505715	71.40	.6015	4506015	71.40
.4820	4504820	67.65	.5120	4505120	69.10	.5420	4505420	69.10	.5720	4505720	71.40	.6020	4506020	71.40
.4825	4504825	67.65	.5125	4505125	69.10	.5425	4505425	69.10	.5725	4505725	71.40	.6025	4506025	71.40
.4830	4504830	67.65	.5130	4505130	69.10	.5430	4505430	69.10	.5730	4505730	71.40	.6030	4506030	71.40
.4835	4504835	67.65	.5135	4505135	69.10	.5435	4505435	69.10	.5735	4505735	71.40	.6035	4506035	71.40
.4840	4504840	67.65	.5140	4505140	69.10	.5440	4505440	69.10	.5740	4505740	71.40	.6040	4506040	71.40
.4845	4504845	67.65	.5145	4505145	69.10	.5445	4505445	69.10	.5745	4505745	71.40	.6045	4506045	71.40
.4850	4504850	67.65	.5150	4505150	69.10	.5450	4505450	69.10	.5750	4505750	71.40	.6050	4506050	71.40
.4855	4504855	67.65	.5155	4505155	69.10	.5455	4505455	69.10	.5755	4505755	71.40	.6055	4506055	71.40
.4860	4504860	67.65	.5160	4505160	69.10	.5460	4505460	69.10	.5760	4505760	71.40	.6060	4506060	71.40
.4865	4504865	67.65	.5165	4505165	69.10	.5465	4505465	69.10	.5765	4505765	71.40	.6065	4506065	71.40
.4870	4504870	67.65	.5170	4505170	69.10	.5470	4505470	69.10	.5770	4505770	71.40	.6070	4506070	71.40
.4875	4504875	67.65	.5175	4505175	69.10	.5475	4505475	69.10	.5775	4505775	71.40	.6075	4506075	71.40
.4880	4504880	67.65	.5180	4505180	69.10	.5480	4505480	69.10	.5780	4505780	71.40	.6080	4506080	71.40
.4885	4504885	67.65	.5185	4505185	69.10	.5485	4505485	69.10	.5785	4505785	71.40	.6085	4506085	71.40
.4890	4504890	67.65	.5190	4505190	69.10	.5490	4505490	69.10	.5790	4505790	71.40	.6090	4506090	71.40
.4895	4504895	67.65	.5195	4505195	69.10	.5495	4505495	69.10	.5795	4505795	71.40	.6095	4506095	71.40
.4900	4504900	67.65	.5200	4505200	69.10	.5500	4505500	69.10	.5800	4505800	71.40	.6100	4506100	71.40
.4905	4504905	67.65	.5205	4505205	69.10	.5505	4505505	69.10	.5805	4505805	71.40	.6105	4506105	71.40
.4910	4504910	67.65	.5210	4505210	69.10	.5510	4505510	69.10	.5810	4505810	71.40	.6110	4506110	71.40
.4915	4504915	67.65	.5215	4505215	69.10	.5515	4505515	69.10	.5815	4505815	71.40	.6115	4506115	71.40
.4920	4504920	67.65	.5220	4505220	69.10	.5520	4505520	69.10	.5820	4505820	71.40	.6120	4506120	71.40
.4925	4504925	67.65	.5225	4505225	69.10	.5525	4505525	69.10	.5825	4505825	71.40	.6125	4506125	71.40
.4930	4504930	67.65	.5230	4505230	69.10	.5530	4505530	69.10	.5830	4505830	71.40	.6130	4506130	71.40
.4935	4504935	67.65	.5235	4505235	69.10	.5535	4505535	69.10	.5835	4505835	71.40	.6135	4506135	71.40
.4940	4504940	67.65	.5240	4505240	69.10	.5540	4505540	69.10	.5840	4505840	71.40	.6140	4506140	71.40
.4945	4504945	67.65	.5245	4505245	69.10	.5545	4505545	69.10	.5845	4505845	71.40	.6145	4506145	71.40
.4950	4504950	67.65	.5250	4505250	69.10	.5550	4505550	69.10	.5850	4505850	71.40	.6150	4506150	71.40
.4955	4504955	67.65	.5255	4505255	69.10	.5555	4505555	69.10	.5855	4505855	71.40	.6155	4506155	71.40
.4960	4504960	67.65	.5260	4505260	69.10	.5560	4505560	69.10	.5860	4505860	71.40	.6160	4506160	71.40
.4965	4504965	67.65	.5265	4505265	69.10	.5565	4505565	69.10	.5865	4505865	71.40	.6165	4506165	71.40
.4970	4504970	67.65	.5270	4505270	69.10	.5570	4505570	69.10	.5870	4505870	71.40	.6170	4506170	71.40
.4975	4504975	67.65	.5275	4505275	69.10	.5575	4505575	69.10	.5875	4505875	71.40	.6175	4506175	71.40
.4980	4504980	67.65	.5280	4505280	69.10	.5580	4505580	69.10	.5880	4505880	71.40	.6180	4506180	71.40
.4985	4504985	67.65	.5285	4505285	69.10	.5585	4505585	69.10	.5885	4505885	71.40	.6185	4506185	71.40
.4990	4504990	67.65	.5290	4505290	69.10	.5590	4505590	69.10	.5890	4505890	71.40	.6190	4506190	71.40
.4995	4504995	67.65	.5295	4505295	69.10	.5595	4505595	69.10	.5895	4505895	71.40	.6195	4506195	71.40
.5000	45016	56.00	.5300	4505300	69.10	.5600	4505600	69.10	.5900	4505900	71.40	.6200	4506200	71.40
.5005	4505005	67.65	.5305	4505305	69.10	.5605	4505605	69.10	.5905	4505905	71.40	.6205	4506205	71.40
.5010	4505010	67.65	.5310	4505310	69.10	.5610	4505610	69.10	.5910	4505910	71.40	.6210	4506210	71.40
.5015	4505015	67.65	.5315	450135	69.10	.5615	4505615	69.10	.5915	4505915	71.40	.6215	4506215	71.40
.5020	4505020	67.65	.5320	4505320	69.10	.5620	4505620	69.10	.5920	4505920	71.40	.6220	450158	71.40
.5025	4505025	67.65	.5325	4505325	69.10	.5625	45018	57.65	.5925	4505925	71.40	.6225	4506225	71.40
.5030	4505030	67.65	.5330	4505330	69.10	.5630	450143	69.10	.5930	4505930	71.40	.6230	4506230	71.40
.5035	4505035	69.10	.5335	4505335	69.10	.5635	4505635	69.10	.5935	4505935	71.40	.6235	4506235	71.40
.5040	4505040	69.10	.5340	4505340	69.10	.5640	4505640	69.10	.5940	4505940	71.40	.6240	4506240	71.40
.5045	4505045	69.10	.5345	4505345	69.10	.5645	4505645	69.10	.5945	450151	71.40	.6245	4506245	71.40
.5050	4505050	69.10	.5350	4505350	69.10	.5650	4505650	69.10	.5950	4505950	71.40	.6250	45020	59.90
.5055	4505055	69.10	.5355	4505355	69.10	.5655	4505655	69.10	.5955	4505955	71.40	.6255	4506255	71.40
.5060	4505060	69.10	.5360	4505360	69.10	.5660	4505660	69.10	.5960	4505960	71.40	.6260	450159	71.40
.5065	4505065	69.10	.5365	4505365	69.10	.5665	4505665	71.40	.5965	4505965	71.40	.6265	4506265	71.40

CHUCKING REAMERS CARBIDE TIPPED TYPE 452 FRACTIONAL

GENERAL PURPOSE

STRAIGHT FLUTE LONG CARBIDE TAPER SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	452/453[MS]
	40	NON-FERROUS - SHORT CHIPS	452/453[MS]
	60	CAST IRONS	452/454[MS]
	80	LOW STRENGTH STEELS	452/455[MS]
	100	MEDIUM STRENGTH STEELS	452/455[MS]
	120	HIGH STRENGTH STEELS	452/455[MS]
	140	HIGH TEMPERATURE ALLOYS	455[MS]

[MS]See page 81 for material specific reamers

TYPE 452

- Straight polished flutes with flute long carbide
- Taper shank
- Detailed specifications on page 29

USE:

- For all general reaming - specifically designed with flute long carbide for deep hole reaming to precision tolerances and for long production runs

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Modified metric tool diameter - priced on pg. 63
- Closer tool diameter tolerance - pg. 29
- Cutting diameter reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diam. back taper
- Shank whistle notch for set screw
- Smaller taper shank
- Coatings available:

TITANIUM NITRIDE – TiN
TITANIUM CARBONITRIDE – TiCN
ZIRCONIUM NITRIDE – ZrN
AL TITANIUM NITRIDE – AlTiN

TOOL DIAMETER		TYPE 452 EDP NO.	PRICE	DIMENSIONS				FINISHED TO MODIFIED TOOL DIAMETER						
				TAPER SHANK NO.	NO. OF FLTS	LENGTH		MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DECIMAL					FLUTE & CARBIDE	OVER-ALL		1	2	3	4	5-7	8-14*
1/4	.2500	45208	$46.40	1	4	1 1/2	6	0.2381 - 0.2530	$78.70	$62.55	$57.10	$54.50	$51.75	$49.50
9/32	.2812	45209	47.00	1	4	1 1/2	6	0.2531 - 0.2840	79.35	63.20	57.75	55.15	52.35	50.20
5/16	.3125	45210	47.00	1	4	1 1/2	6	0.2841 - 0.3150	79.35	63.20	57.75	55.15	52.35	50.20
11/32	.3438	45211	48.05	1	4	1 1/2	6	0.3151 - 0.3470	80.40	64.25	58.85	56.20	53.40	51.25
3/8	.3750	45212	48.60	1	4	1 3/4	7	0.3471 - 0.3780	80.95	64.75	59.30	56.75	53.95	51.85
13/32	.4062	45213	51.20	1	4	1 3/4	7	0.3781 - 0.4090	83.55	67.25	61.90	59.30	56.60	54.40
7/16	.4375	45214	54.55	1	4	1 3/4	7	0.4091 - 0.4410	86.85	70.70	65.30	62.70	59.95	57.75
15/32	.4688	45215	55.70	1	4	1 3/4	7	0.4411 - 0.4720	88.05	71.75	66.45	63.80	61.05	58.90
1/2	.5000	45216	60.05	1	6	2	8	0.4721 - 0.5030	94.60	77.25	71.50	68.75	65.75	63.45
17/32	.5312	45217	65.75	1	6	2	8	0.5031 - 0.5340	100.40	83.05	77.20	74.45	71.50	69.10
9/16	.5625	45218	65.75	1	6	2	8	0.5341 - 0.5660	100.40	83.05	77.20	74.45	71.50	69.10
19/32	.5938	45219	68.80	1	6	2	8	0.5661 - 0.5970	103.40	86.05	80.30	77.55	74.55	72.20
5/8	.6250	45220	68.80	2	6	2	9	0.5971 - 0.6280	103.40	86.05	80.30	77.55	74.55	72.20
21/32	.6562	45221	70.05	2	6	2	9	0.6281 - 0.6590	104.75	87.35	81.50	78.80	75.80	73.50
11/16	.6875	45222	70.05	2	6	2	9	0.6591 - 0.6910	104.75	87.35	81.50	78.80	75.80	73.50
23/32	.7188	45223	71.05	2	6	2	9	0.6911 - 0.7220	105.75	88.35	82.50	79.75	76.80	74.45
3/4	.7500	45224	73.35	2	6	2	9 1/2	0.7221 - 0.7530	107.95	90.60	84.80	82.05	79.00	76.75
25/32	.7812	45225	73.90	2	6	2	9 1/2	0.7531 - 0.7840	108.55	91.20	85.40	82.55	79.65	77.25
13/16	.8125	45226	75.65	2	6	2	9 1/2	0.7841 - 0.8160	110.20	92.80	87.10	84.30	81.35	78.95
27/32	.8438	45227	78.90	2	6	2	9 1/2	0.8161 - 0.8470	113.55	96.20	90.35	87.65	84.65	82.35
7/8	.8750	45228	81.95	2	6	2 1/4	10	0.8471 - 0.8780	117.85	99.85	93.75	91.00	87.80	85.50
29/32	.9062	45229	92.25	2	6	2 1/4	10	0.8781 - 0.9090	128.15	110.20	104.20	101.30	98.15	95.80
15/16	.9375	45230	95.95	3	8	2 1/4	10	0.9091 - 0.9410	131.80	113.85	107.85	104.95	101.85	99.50
31/32	.9688	45231	99.90	3	8	2 1/4	10	0.9411 - 0.9720	135.85	117.85	111.80	108.95	105.85	103.45
1	1.0000	45232	99.90	3	8	2 1/4	10 1/2	0.9721 - 1.0030	135.85	117.85	111.80	108.95	105.85	103.45
1 1/16	1.0625	45234	136.95	3	8	2 1/4	10 1/2	1.0031 - 1.0660	171.35	154.05	148.30	145.60	142.60	140.30
1 1/8	1.1250	45236	147.45	3	8	2 1/4	11	1.0661 - 1.1280	181.90	164.65	158.95	156.15	153.15	150.85
1 3/16	1.1875	45238	158.45	3	8	2 1/4	11	1.1281 - 1.1905	192.85	175.65	169.85	167.10	164.20	161.80
1 1/4	1.2500	45240	168.40	4	8	2 1/2	11 1/2	1.1906 - 1.2530	202.80	185.55	179.85	177.00	174.05	171.75
1 5/16	1.3125	45242	190.15	4	8	2 1/2	11 1/2	1.2531 - 1.3155	224.55	207.35	201.50	198.85	195.85	193.50
1 3/8	1.3750	45244	217.25	4	8	2 1/2	12	1.3156 - 1.3780	251.65	234.45	228.60	225.90	222.90	220.60
1 7/16	1.4375	45246	226.75	4	8	2 1/2	12	1.3781 - 1.4405	261.20	243.95	238.15	235.50	232.45	230.15
1 1/2	1.5000	45248	236.20	4	8	2 1/2	12 1/2	1.4406 - 1.5030	270.65	253.45	247.70	244.90	241.95	239.60

*Quantities of 15 or more - price of fractional size in same size range.

CHUCKING REAMERS CARBIDE TIPPED TYPE 452 METRIC

GENERAL PURPOSE

STRAIGHT FLUTE LONG CARBIDE TAPER SHANK

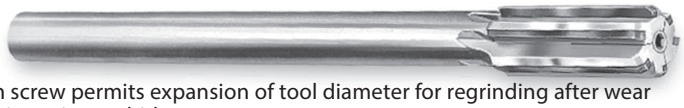
NOTE: Tool diameter in millimeters (mm); all other dimensions in inches. Also, modifications available (see list on page 62).

TOOL DIAMETER		TYPE 452 METRIC EDP NO.	METRIC PRICE	DIMENSIONS				FINISHED TO MODIFIED TOOL DIAMETER							
				TAPER SHANK NO.	NO. OF FLTS	LENGTH		MODIFIED DIAMETER RANGE (mm)	PRICE EACH - BASED ON QUANTITY ORDERED						
mm	INCH					FLUTE & CARBIDE	OVER-ALL		1	2	3	4	5-7	8-14	OVER 14
6.0	.2362	452060	$57.10	1	4	1 ½	6	6.000 - 6.426	$81.40	$65.30	$59.90	$57.20	$54.50	$52.25	$49.15
6.5	.2559	452065	57.75	1	4	1 ½	6	6.427 - 7.214	82.05	65.95	60.55	57.90	55.15	52.95	49.80
7.0	.2756	452070	57.75	1	4	1 ½	6	-	-	-	-	-	-	-	-
7.5	.2953	452075	57.75	1	4	1 ½	6	7.215 - 8.001	82.05	65.95	60.55	57.90	55.15	52.95	49.80
8.0	.3150	452080	57.75	1	4	1 ½	6	-	-	-	-	-	-	-	-
8.5	.3346	452085	58.85	1	4	1 ½	6	8.002 - 8.814	83.15	67.00	61.60	58.95	56.20	53.95	50.90
9.0	.3543	452090	59.30	1	4	1 ¾	7	8.815 - 9.601	83.65	67.60	62.10	59.40	56.75	54.50	51.35
9.5	.3740	452095	59.30	1	4	1 ¾	7	-	-	-	-	-	-	-	-
10.0	.3937	452100	61.90	1	4	1 ¾	7	9.602 - 10.389	86.30	70.05	64.65	62.05	59.30	57.10	53.95
10.5	.4134	452105	65.30	1	4	1 ¾	7	10.390 - 11.201	89.55	73.45	68.05	65.45	62.70	60.40	57.35
11.0	.4331	452110	65.30	1	4	1 ¾	7	-	-	-	-	-	-	-	-
11.5	.4528	452115	66.45	1	4	1 ¾	7	11.202 - 11.989	90.75	74.55	69.15	66.55	63.80	61.60	58.40
12.0	.4724	452120	71.50	1	6	2	8	11.990 - 12.776	97.55	80.30	74.45	71.60	68.75	66.30	63.00
12.5	.4921	452125	71.50	1	6	2	8	-	-	-	-	-	-	-	-
13.0	.5118	452130	77.20	1	6	2	8	12.777 - 13.564	103.30	85.95	80.25	77.45	74.45	72.10	68.75
13.5	.5315	452135	77.20	1	6	2	8	-	-	-	-	-	-	-	-
14.0	.5512	452140	77.20	1	6	2	8	13.565 - 14.376	103.30	85.95	80.25	77.45	74.45	72.10	68.75
14.5	.5709	452145	80.30	1	6	2	8	14.377 - 15.164	106.30	89.10	83.25	80.40	77.55	75.05	71.75
15.0	.5906	452150	80.30	1	6	2	8	-	-	-	-	-	-	-	-
15.5	.6102	452155	80.30	2	6	2	9	15.165 - 15.951	106.30	89.10	83.25	80.40	77.55	75.05	71.75
16.0	.6299	452160	81.50	2	6	2	9	15.952 - 16.739	107.60	90.30	84.55	81.65	78.80	76.45	73.05
16.5	.6496	452165	81.50	2	6	2	9	-	-	-	-	-	-	-	-
17.0	.6693	452170	81.50	2	6	2	9	16.740 - 17.551	107.60	90.30	84.55	81.65	78.80	76.45	73.05
17.5	.6890	452175	81.50	2	6	2	9	-	-	-	-	-	-	-	-
18.0	.7087	452180	82.50	2	6	2	9	17.552 - 18.339	108.60	91.30	85.55	82.70	79.75	77.45	74.00
18.5	.7283	452185	84.80	2	6	2	9 ½	18.340 - 19.126	110.90	93.55	87.75	84.90	82.05	79.65	76.35
19.0	.7480	452190	84.80	2	6	2	9 ½	-	-	-	-	-	-	-	-
19.5	.7677	452195	85.40	2	6	2	9 ½	19.127 - 19.914	111.40	94.20	88.35	85.55	82.55	80.25	76.85
20.0	.7874	452200	87.10	2	6	2	9 ½	19.915 - 20.726	113.15	95.80	90.05	87.20	84.30	81.90	78.60
20.5	.8071	452205	87.10	2	6	2	9 ½	-	-	-	-	-	-	-	-
21.0	.8268	452210	90.35	2	6	2	9 ½	20.727 - 21.514	116.45	99.15	93.40	90.50	87.65	85.30	81.90
21.5	.8465	452215	90.35	2	6	2	9 ½	-	-	-	-	-	-	-	-
22.0	.8661	452220	90.35	2	6	2 ¼	10	21.515 - 22.301	116.45	99.15	93.40	90.50	87.65	85.30	81.90
22.5	.8858	452225	104.20	2	6	2 ¼	10	22.302 - 23.089	131.20	113.25	107.20	104.30	101.30	98.80	95.40
23.0	.9055	452230	104.20	2	6	2 ¼	10	-	-	-	-	-	-	-	-
23.5	.9252	452235	107.85	3	8	2 ¼	10	23.090 - 23.901	134.85	116.90	110.95	107.95	104.95	102.45	99.05
24.0	.9449	452240	111.80	3	8	2 ¼	10	23.902 - 24.689	138.85	120.90	114.90	112.00	108.95	106.50	102.95
24.5	.9646	452245	111.80	3	8	2 ¼	10	-	-	-	-	-	-	-	-
25.0	.9843	452250	111.80	3	8	2 ¼	10 ½	24.690 - 25.476	138.85	120.90	114.90	112.00	108.95	106.50	102.95
25.5	1.0039	452255	148.30	3	8	2 ¼	10 ½	25.477 - 27.076	174.25	157.10	151.25	148.45	145.60	143.20	139.90
26.0	1.0236	452260	148.30	3	8	2 ¼	10 ½	-	-	-	-	-	-	-	-
27.0	1.0630	452270	148.30	3	8	2 ¼	10 ½	-	-	-	-	-	-	-	-
28.0	1.1024	452280	158.95	3	8	2 ¼	11	27.077 - 28.651	184.80	167.65	161.80	159.05	156.15	153.75	150.45
29.0	1.1417	452290	169.85	3	8	2 ¼	11	28.652 - 30.239	195.80	178.60	172.80	170.00	167.10	164.70	161.45
30.0	1.1811	452300	169.85	3	8	2 ¼	11	-	-	-	-	-	-	-	-
31.0	1.2205	452310	179.85	4	8	2 ½	11 ½	30.240 - 31.826	205.70	188.50	182.75	179.95	177.00	174.65	171.35
32.0	1.2598	452320	201.50	4	8	2 ½	11 ½	31.827 - 33.414	227.50	210.25	204.55	201.65	198.85	196.35	193.05
33.0	1.2992	452330	201.50	4	8	2 ½	11 ½	-	-	-	-	-	-	-	-
34.0	1.3386	452340	228.60	4	8	2 ½	12	33.415 - 35.001	254.55	237.40	231.60	228.85	225.90	223.50	220.20
35.0	1.3780	452350	228.60	4	8	2 ½	12	-	-	-	-	-	-	-	-
36.0	1.4173	452360	238.15	4	8	2 ½	12	35.002 - 36.589	264.05	246.85	241.15	238.30	235.50	233.00	229.65
37.0	1.4567	452370	247.70	4	8	2 ½	12 ½	36.590 - 38.176	273.60	256.35	250.60	247.85	244.90	242.55	239.25
38.0	1.4961	452380	247.70	4	8	2 ½	12 ½	-	-	-	-	-	-	-	-

CHUCKING REAMERS CARBIDE TIPPED TYPE 465 FRACTIONAL

GENERAL PURPOSE

EXPANSION REAMERS STRAIGHT FLUTE LONG CARBIDE STRAIGHT SHANK



TYPE 465

- Expansion screw permits expansion of tool diameter for regrinding after wear without reinserting carbide
- Straight polished flutes with flute long carbide; Straight shank
- Detailed specifications, including minimum expansion, on page 29

USE:

- Expansion reamers are recommended for reaming abrasive materials. As the diameter wears down, the reamers can be expanded many times by tightening the end expansion screw and regrinding to its original size. Expansion reamers should not be considered as adjustable for use in producing holes of different sizes.

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	465/464[MS]
	40	NON-FERROUS - SHORT CHIPS	465/464[MS]
	60	CAST IRONS	465/466[MS]
	80	LOW STRENGTH STEELS	465/468[MS]
	100	MEDIUM STRENGTH STEELS	465/468[MS]
	120	HIGH STRENGTH STEELS	465/468[MS]
	140	HIGH TEMPERATURE ALLOYS	468[MS]

[MS]See page 82 for material specific reamers

MODIFICATIONS (See list on page 68, except expansion reamers can not be coated; modified metric tool diameters priced on page 65)

NOTE: For semi-finished reamers, see page 53.

TOOL DIAMETER		TYPE 465 EDP NO.	PRICE	DIMENSIONS				FINISHED TO MODIFIED TOOL DIAMETER						
				SHANK DIAM.	NO. OF FLTS	LENGTH		MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DECIMAL					FLUTE & CARBIDE	OVER-ALL		1	2	3	4	5-7	8-14*
5/16	.3125	46510	$62.15	9/32	4	1	6	0.2841 - 0.3150	$94.50	$78.30	$72.80	$70.35	$67.60	$65.35
11/32	.3438	46511	62.15	9/32	4	1	6	0.3151 - 0.3470	94.50	78.30	72.80	70.35	67.60	65.35
3/8	.3750	46512	58.25	5/16	4	1	7	0.3471 - 0.3780	88.60	73.40	68.25	65.90	63.30	61.20
13/32	.4062	46513	61.85	5/16	4	1	7	0.3781 - 0.4090	92.10	76.90	71.85	69.45	66.85	64.75
7/16	.4375	46514	61.85	3/8	4	1	7	0.4091 - 0.4410	92.10	76.90	71.85	69.45	66.85	64.75
15/32	.4688	46515	65.55	3/8	4	1	7	0.4411 - 0.4720	95.75	80.60	75.60	73.15	70.55	68.55
1/2	.5000	46516	65.55	7/16	6	1	8	0.4721 - 0.5030	95.75	80.60	75.60	73.15	70.55	68.55
17/32	.5312	46517	67.15	7/16	6	1	8	0.5031 - 0.5340	97.50	82.30	77.20	74.80	72.20	70.15
9/16	.5625	46518	67.15	7/16	6	1 1/8	8	0.5341 - 0.5660	97.50	82.30	77.20	74.80	72.20	70.15
19/32	.5938	46519	70.10	7/16	6	1 1/8	8	0.5661 - 0.5970	100.40	85.30	80.20	77.75	75.15	73.10
5/8	.6250	46520	70.10	9/16	6	1 1/4	9	0.5971 - 0.6280	100.40	85.30	80.20	77.75	75.15	73.10
21/32	.6562	46521	76.70	9/16	6	1 1/4	9	0.6281 - 0.6590	106.95	91.75	86.70	84.30	81.65	79.65
11/16	.6875	46522	76.70	9/16	6	1 1/4	9	0.6591 - 0.6910	106.95	91.75	86.70	84.30	81.65	79.65
23/32	.7188	46523	79.50	9/16	6	1 1/4	9	0.6911 - 0.7220	109.85	94.60	89.50	87.15	84.55	82.50
3/4	.7500	46524	79.50	5/8	6	1 3/8	9 1/2	0.7221 - 0.7530	109.85	94.60	89.50	87.15	84.55	82.50
25/32	.7812	46525	85.70	5/8	6	1 3/8	9 1/2	0.7531 - 0.7840	116.00	100.85	95.70	93.35	90.75	88.70
13/16	.8125	46526	85.70	5/8	6	1 3/8	9 1/2	0.7841 - 0.8160	116.00	100.85	95.70	93.35	90.75	88.70
27/32	.8438	46527	89.10	5/8	6	1 3/8	9 1/2	0.8161 - 0.8470	119.30	104.20	99.10	96.65	94.15	92.05
7/8	.8750	46528	92.45	3/4	6	1 1/2	10	0.8471 - 0.8780	123.80	108.10	102.80	100.35	97.65	95.50
29/32	.9062	46529	98.40	3/4	6	1 1/2	10	0.8781 - 0.9090	129.85	114.05	108.85	106.35	103.60	101.50
15/16	.9375	46530	98.40	3/4	8	1 1/2	10	0.9091 - 0.9410	129.85	114.05	108.85	106.35	103.60	101.50
31/32	.9688	46531	102.25	3/4	8	1 1/2	10	0.9411 - 0.9720	133.60	117.90	112.60	110.15	107.40	105.30
1	1.0000	46532	102.25	7/8	8	1 5/8	10 1/2	0.9721 - 1.0030	133.60	117.90	112.60	110.15	107.40	105.30
1 1/32	1.0312	46533	112.05	7/8	8	1 5/8	10 1/2	-	-	-	-	-	-	-
1 1/16	1.0625	46534	112.05	7/8	8	1 5/8	10 1/2	1.0031 - 1.0660	143.45	127.75	122.45	119.95	117.20	115.10
1 3/32	1.0938	46535	112.05	7/8	8	1 3/4	11	-	-	-	-	-	-	-
1 1/8	1.1250	46536	112.05	7/8	8	1 3/4	11	1.0661 - 1.1280	143.45	127.75	122.45	119.95	117.20	115.10
1 3/16	1.1875	46538	122.25	1	8	1 3/4	11	1.1281 - 1.1905	153.70	137.90	132.65	130.15	127.40	125.40
1 1/4	1.2500	46540	122.25	1	8	1 7/8	11 1/2	1.1906 - 1.2530	153.70	137.90	132.65	130.15	127.40	125.40
1 5/16	1.3125	46542	135.50	1	8	1 7/8	11 1/2	1.2531 - 1.3155	167.00	151.25	146.00	143.45	140.75	138.70
1 3/8	1.3750	46544	141.95	1	8	2	12	1.3156 - 1.3780	173.35	157.60	152.30	149.90	147.10	145.00
1 7/16	1.4375	46546	167.75	1 1/4	8	2	12	1.3781 - 1.4405	201.25	184.45	178.80	176.10	173.25	171.00
1 1/2	1.5000	46548	172.60	1 1/4	8	2 1/8	12 1/2	1.4406 - 1.5030	206.15	189.30	183.75	181.10	178.20	175.90
1 9/16	1.5625	46550	226.70	1 1/4	8	2 1/8	12 1/2	1.5031 - 1.5660	260.20	243.45	237.75	235.05	232.20	229.95
1 5/8	1.6250	46552	226.70	1 1/4	8	2 1/4	13	1.5661 - 1.6280	260.20	243.45	237.75	235.05	232.20	229.95
1 11/16	1.6875	46554	251.05	1 1/4	8	2 1/4	13	1.6281 - 1.6910	284.60	267.80	262.20	259.50	256.65	254.30
1 3/4	1.7500	46556	251.05	1 1/4	10	2 3/8	13 1/2	1.6911 - 1.7530	284.60	267.80	262.20	259.50	256.65	254.30
1 13/16	1.8125	46558	297.30	1 1/2	10	2 3/8	13 1/2	1.7531 - 1.8160	330.75	314.00	308.40	305.70	302.85	300.55
1 7/8	1.8750	46560	297.30	1 1/2	10	2 1/2	14	1.8161 - 1.8780	330.75	314.00	308.40	305.70	302.85	300.55
1 15/16	1.9375	46562	324.80	1 1/2	10	2 1/2	14	1.8781 - 1.9410	358.30	341.55	335.90	333.15	330.35	328.05
2	2.0000	46564	324.80	1 1/2	12	2 1/2	14	1.9411 - 2.0030	358.30	341.55	335.90	333.15	330.35	328.05
2 1/8	2.1250	46568	527.55	1 1/2	12	2 3/4	14 1/2	2.0031 - 2.1280	561.10	544.30	538.70	536.05	533.15	530.85
2 1/4	2.2500	46572	566.60	1 3/4	12	2 3/4	14 1/2	2.1281 - 2.2530	600.05	583.30	577.70	575.00	572.15	569.85
2 3/8	2.3750	46576	586.35	1 3/4	12	3	15	2.2531 - 2.3780	619.90	603.10	597.45	594.75	591.90	589.60
2 1/2	2.5000	46580	586.35	1 3/4	12	3	15	2.3781 - 2.5030	619.90	603.10	597.45	594.75	591.90	589.60

*Quantities of 15 or more - price of fractional size in same size range.

CHUCKING REAMERS CARBIDE TIPPED TYPE 465 METRIC

GENERAL PURPOSE

EXPANSION REAMERS STRAIGHT FLUTE LONG CARBIDE STRAIGHT SHANK

NOTE: Tool diameter in millimeters (mm); all other dimensions in inches. Also, modifications available (see list on page 68, except no coatings).

TOOL DIAMETER		TYPE 465 METRIC EDP NO.	METRIC PRICE	DIMENSIONS				FINISHED TO MODIFIED TOOL DIAMETER							
				SHANK DIAM.	NO. OF FLTS	LENGTH		MODIFIED DIAMETER RANGE (mm)	PRICE EACH - BASED ON QUANTITY ORDERED						
						FLUTE & CARBIDE	OVER-ALL		1	2	3	4	5-7	8-14	OVER 14
mm	INCH														
7.5	.2953	465075	$72.80	9/32	4	1	6	7.215-8.001	$97.20	$81.05	$75.65	$73.05	$70.35	$68.05	$64.90
8.0	.3150	465080	72.80	9/32	4	1	6	-	-	-	-	-	-	-	-
8.5	.3346	465085	72.80	9/32	4	1	6	8.002-8.814	97.20	81.05	75.65	73.05	70.35	68.05	64.90
9.0	.3543	465090	68.25	5/16	4	1	7	8.815-9.601	91.15	75.95	70.90	68.50	65.90	63.80	60.90
9.5	.3740	465095	68.25	5/16	4	1	7	-	-	-	-	-	-	-	-
10.0	.3937	465100	71.85	5/16	4	1	7	9.602-10.389	94.60	79.50	74.45	71.95	69.45	67.25	64.45
10.5	.4134	465105	71.85	3/8	4	1	7	10.390-11.201	94.60	79.50	74.45	71.95	69.45	67.25	64.45
11.0	.4331	465110	71.85	3/8	4	1	7	-	-	-	-	-	-	-	-
11.5	.4528	465115	75.60	3/8	4	1	7	11.202-11.989	98.30	83.25	78.10	75.70	73.15	71.00	68.10
12.0	.4724	465120	75.60	7/16	6	1	8	11.990-12.776	98.30	83.25	78.10	75.70	73.15	71.00	68.10
12.5	.4921	465125	75.60	7/16	6	1	8	-	-	-	-	-	-	-	-
13.0	.5118	465130	77.20	7/16	6	1	8	12.777-13.564	100.05	84.90	79.80	77.40	74.80	72.70	69.80
13.5	.5315	465135	77.20	7/16	6	1	8	-	-	-	-	-	-	-	-
14.0	.5512	465140	77.20	7/16	6	1 1/8	8	13.565-14.376	100.05	84.90	79.80	77.40	74.80	72.70	69.80
14.5	.5709	465145	80.20	7/16	6	1 1/8	8	14.377-15.164	102.95	87.80	82.75	80.30	77.75	75.65	72.70
15.0	.5906	465150	80.20	7/16	6	1 1/8	8	-	-	-	-	-	-	-	-
15.5	.6102	465155	80.20	9/16	6	1 1/4	9	15.165-15.951	102.95	87.80	82.75	80.30	77.75	75.65	72.70
16.0	.6299	465160	86.70	9/16	6	1 1/4	9	15.952-16.739	109.45	94.40	89.30	86.80	84.30	82.20	79.30
16.5	.6496	465165	86.70	9/16	6	1 1/4	9	-	-	-	-	-	-	-	-
17.0	.6693	465170	86.70	9/16	6	1 1/4	9	16.740-17.551	109.45	94.40	89.30	86.80	84.30	82.20	79.30
17.5	.6890	465175	86.70	9/16	6	1 1/4	9	-	-	-	-	-	-	-	-
18.0	.7087	465180	89.50	9/16	6	1 1/4	9	17.552-18.339	112.35	97.20	92.15	89.70	87.15	85.05	82.15
18.5	.7283	465185	89.50	5/8	6	1 3/8	9 1/2	18.340-19.126	112.35	97.20	92.15	89.70	87.15	85.05	82.15
19.0	.7480	465190	89.50	5/8	6	1 3/8	9 1/2	-	-	-	-	-	-	-	-
19.5	.7677	465195	95.70	5/8	6	1 3/8	9 1/2	19.127-19.914	118.60	103.45	98.30	95.80	93.35	91.25	88.30
20.0	.7874	465200	95.70	5/8	6	1 3/8	9 1/2	19.915-20.726	118.60	103.45	98.30	95.80	93.35	91.25	88.30
20.5	.8071	465205	95.70	5/8	6	1 3/8	9 1/2	-	-	-	-	-	-	-	-
21.0	.8268	465210	99.10	5/8	6	1 3/8	9 1/2	20.727-21.514	121.90	106.80	101.65	99.20	96.65	94.55	91.65
21.5	.8465	465215	99.10	5/8	6	1 3/8	9 1/2	-	-	-	-	-	-	-	-
22.0	.8661	465220	99.10	3/4	6	1 1/2	10	21.515-22.301	121.90	106.80	101.65	99.20	96.65	94.55	91.65
22.5	.8858	465225	108.85	3/4	6	1 1/2	10	22.302-23.089	132.45	116.80	111.50	108.95	106.35	104.15	101.10
23.0	.9055	465230	108.85	3/4	6	1 1/2	10	-	-	-	-	-	-	-	-
23.5	.9252	465235	108.85	3/4	8	1 1/2	10	23.090-23.901	132.45	116.80	111.50	108.95	106.35	104.15	101.10
24.0	.9449	465240	112.60	3/4	8	1 1/2	10	23.902-24.689	136.25	120.60	115.35	112.75	110.15	107.90	104.90
24.5	.9646	465245	112.60	3/4	8	1 1/2	10	-	-	-	-	-	-	-	-
25.0	.9843	465250	112.60	7/8	8	1 5/8	10 1/2	24.690-25.476	136.25	120.60	115.35	112.75	110.15	107.90	104.90
25.5	1.0039	465255	122.45	7/8	8	1 5/8	10 1/2	25.477-27.076	146.10	130.40	125.10	122.55	119.95	117.75	114.70
26.0	1.0236	465260	122.45	7/8	8	1 5/8	10 1/2	-	-	-	-	-	-	-	-
27.0	1.0630	465270	122.45	7/8	8	1 5/8	10 1/2	-	-	-	-	-	-	-	-
28.0	1.1024	465280	122.45	7/8	8	1 3/4	11	27.077-28.651	146.10	130.40	125.10	122.55	119.95	117.75	114.70
29.0	1.1417	465290	132.65	1	8	1 3/4	11	28.652-30.239	156.30	140.60	135.35	132.75	130.15	128.00	124.90
30.0	1.1811	465300	132.65	1	8	1 3/4	11	-	-	-	-	-	-	-	-
31.0	1.2205	465310	132.65	1	8	1 7/8	11 1/2	30.240-31.826	156.30	140.60	135.35	132.75	130.15	128.00	124.90
32.0	1.2598	465320	146.00	1	8	1 7/8	11 1/2	31.827-33.414	169.60	153.90	148.70	146.10	143.45	141.30	138.30
33.0	1.2992	465330	146.00	1	8	1 7/8	11 1/2	-	-	-	-	-	-	-	-
34.0	1.3386	465340	152.30	1	8	2	12	33.415-35.001	175.95	160.30	155.00	152.50	149.90	147.65	144.60
35.0	1.3780	465350	152.30	1	8	2	12	-	-	-	-	-	-	-	-
36.0	1.4173	465360	178.80	1 1/4	8	2	12	35.002-36.589	204.00	187.30	181.70	178.95	176.10	173.80	170.60
37.0	1.4567	465370	183.75	1 1/4	8	2 1/8	12 1/2	36.590-38.176	209.00	192.25	186.65	183.85	181.10	178.75	175.55
38.0	1.4961	465380	183.75	1 1/4	8	2 1/8	12 1/2	-	-	-	-	-	-	-	-
39.0	1.5354	465390	237.75	1 1/4	8	2 1/8	12 1/2	38.177-39.776	263.00	246.25	240.60	237.90	235.05	232.70	229.55
40.0	1.5748	465400	237.75	1 1/4	8	2 1/4	13	39.777-41.351	263.00	246.25	240.60	237.90	235.05	232.70	229.55
41.0	1.6142	465410	237.75	1 1/4	8	2 1/4	13	-	-	-	-	-	-	-	-
42.0	1.6535	465420	262.20	1 1/4	8	2 1/4	13	41.352-42.951	287.35	270.65	265.05	262.35	259.50	257.15	253.90
43.0	1.6929	465430	262.20	1 1/4	10	2 3/8	13 1/2	42.952-44.526	287.35	270.65	265.05	262.35	259.50	257.15	253.90
44.0	1.7323	465440	262.20	1 1/4	10	2 3/8	13 1/2	-	-	-	-	-	-	-	-

Modified tool diameters are available up to 63mm - contact us for price.

CHUCKING REAMERS CARBIDE TIPPED TYPE 467 FRACTIONAL

GENERAL PURPOSE

EXPANSION REAMERS STRAIGHT FLUTE LONG CARBIDE TAPER SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	467/461[MS]
	40	NON-FERROUS - SHORT CHIPS	467/461[MS]
	60	CAST IRONS	467/462[MS]
	80	LOW STRENGTH STEELS	467/463[MS]
	100	MEDIUM STRENGTH STEELS	467/463[MS]
	120	HIGH STRENGTH STEELS	467/463[MS]
	140	HIGH TEMPERATURE ALLOYS	463[MS]

[MS]See page 83 for material specific reamers

TYPE 467

- Same as Type 465, except taper shank (see description and "USE" on page 64)

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Modified metric tool diameter - priced on pg. 67
- Closer tool diameter tolerance - pg. 29
- Cutting diameter reduced for step or pilot
- End chamfer other than 45˚
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diam. back taper
- Shank whistle notch for set screw
- Smaller taper shank
- Expansion reamers can not be coated

TOOL DIAMETER		TYPE 467 EDP NO.	PRICE	DIMENSIONS				FINISHED TO MODIFIED TOOL DIAMETER						
				TAPER SHANK NO.	NO. OF FLTS	LENGTH		MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DECIMAL					FLUTE & CARBIDE	OVER-ALL		1	2	3	4	5-7	8-14*
5/16	.3125	46710	$70.00	1	4	1	6	0.2841 - 0.3150	$102.35	$86.10	$80.75	$78.10	$75.40	$73.20
11/32	.3438	46711	70.00	1	4	1	6	0.3151 - 0.3470	102.35	86.10	80.75	78.10	75.40	73.20
3/8	.3750	46712	65.65	1	4	1	7	0.3471 - 0.3780	95.95	80.75	75.70	73.30	70.70	68.65
13/32	.4062	46713	67.70	1	4	1	7	0.3781 - 0.4090	97.95	82.75	77.70	75.30	72.65	70.60
7/16	.4375	46714	67.70	1	4	1	7	0.4091 - 0.4410	97.95	82.75	77.70	75.30	72.65	70.60
15/32	.4688	46715	70.95	1	4	1	7	0.4411 - 0.4720	101.30	86.10	81.00	78.60	75.95	73.95
1/2	.5000	46716	70.95	1	6	1	8	0.4721 - 0.5030	101.30	86.10	81.00	78.60	75.95	73.95
17/32	.5312	46717	73.15	1	6	1	8	0.5031 - 0.5340	103.45	88.25	83.20	80.75	78.10	76.05
9/16	.5625	46718	73.15	1	6	1 1/8	8	0.5341 - 0.5660	103.45	88.25	83.20	80.75	78.10	76.05
19/32	.5938	46719	76.05	1	6	1 1/8	8	0.5661 - 0.5970	106.40	91.25	86.20	83.75	81.20	79.10
5/8	.6250	46720	76.05	2	6	1 1/4	9	0.5971 - 0.6280	106.40	91.25	86.20	83.75	81.20	79.10
21/32	.6562	46721	85.65	2	6	1 1/4	9	0.6281 - 0.6590	115.95	100.70	95.65	93.30	90.65	88.65
11/16	.6875	46722	85.65	2	6	1 1/4	9	0.6591 - 0.6910	115.95	100.70	95.65	93.30	90.65	88.65
23/32	.7188	46723	85.85	2	6	1 1/4	9	0.6911 - 0.7220	116.20	101.05	95.95	93.55	90.90	88.90
3/4	.7500	46724	85.85	2	6	1 3/8	9 1/2	0.7221 - 0.7530	116.20	101.05	95.95	93.55	90.90	88.90
25/32	.7812	46725	92.20	2	6	1 3/8	9 1/2	0.7531 - 0.7840	122.55	107.30	102.30	99.90	97.20	95.25
13/16	.8125	46726	92.20	2	6	1 3/8	9 1/2	0.7841 - 0.8160	122.55	107.30	102.30	99.90	97.20	95.25
27/32	.8438	46727	96.10	2	6	1 3/8	9 1/2	0.8161 - 0.8470	126.40	111.20	106.10	103.65	101.10	99.05
7/8	.8750	46728	99.75	2	6	1 1/2	10	0.8471 - 0.8780	131.10	115.45	110.15	107.65	104.90	102.75
29/32	.9062	46729	105.45	2	6	1 1/2	10	0.8781 - 0.9090	136.90	121.15	115.85	113.35	110.65	108.55
15/16	.9375	46730	105.45	3	8	1 1/2	10	0.9091 - 0.9410	136.90	121.15	115.85	113.35	110.65	108.55
31/32	.9688	46731	109.30	3	8	1 1/2	10	0.9411 - 0.9720	140.65	124.90	119.65	117.15	114.50	112.30
1	1.0000	46732	109.30	3	8	1 5/8	10 1/2	0.9721 - 1.0030	140.65	124.90	119.65	117.15	114.50	112.30
1 1/32	1.0312	46733	119.55	3	8	1 5/8	10 1/2	-	-	-	-	-	-	-
1 1/16	1.0625	46734	119.55	3	8	1 5/8	10 1/2	1.0031 - 1.0660	151.10	135.30	130.00	127.50	124.80	122.65
1 3/32	1.0938	46735	119.55	3	8	1 3/4	11	-	-	-	-	-	-	-
1 1/8	1.1250	46736	119.55	3	8	1 3/4	11	1.0661 - 1.1280	151.10	135.30	130.00	127.50	124.80	122.65
1 3/16	1.1875	46738	134.50	3	8	1 3/4	11	1.1281 - 1.1905	165.90	150.15	144.90	142.40	139.70	137.60
1 1/4	1.2500	46740	136.30	4	8	1 7/8	11 1/2	1.1906 - 1.2530	167.75	152.00	146.75	144.25	141.50	139.40
1 5/16	1.3125	46742	149.00	4	8	1 7/8	11 1/2	1.2531 - 1.3155	180.40	164.65	159.35	156.90	154.25	152.05
1 3/8	1.3750	46744	163.25	4	8	2	12	1.3156 - 1.3780	194.60	178.90	173.65	171.10	168.40	166.25
1 7/16	1.4375	46746	183.20	4	8	2	12	1.3781 - 1.4405	216.70	199.95	194.30	191.60	188.75	186.50
1 1/2	1.5000	46748	189.70	4	8	2 1/8	12 1/2	1.4406 - 1.5030	223.30	206.40	200.75	198.15	195.25	192.95
1 9/16	1.5625	46750	260.65	4	8	2 1/8	12 1/2	1.5031 - 1.5660	294.20	277.40	271.80	269.15	266.20	263.95
1 5/8	1.6250	46752	260.65	4	8	2 1/4	13	1.5661 - 1.6280	294.20	277.40	271.80	269.15	266.20	263.95
1 11/16	1.6875	46754	288.70	4	8	2 1/4	13	1.6281 - 1.6910	322.25	305.45	299.80	297.10	294.25	292.00
1 3/4	1.7500	46756	288.70	4	10	2 3/8	13 1/2	1.6911 - 1.7530	322.25	305.45	299.80	297.10	294.25	292.00
1 13/16	1.8125	46758	341.80	4	10	2 3/8	13 1/2	1.7531 - 1.8160	375.35	358.60	353.00	350.30	347.35	345.15
1 7/8	1.8750	46760	341.80	4	10	2 1/2	14	1.8161 - 1.8780	375.35	358.60	353.00	350.30	347.35	345.15
1 15/16	1.9375	46762	373.55	4	10	2 1/2	14	1.8781 - 1.9410	407.05	390.25	384.60	381.95	379.05	376.90
2	2.0000	46764	373.55	4	12	2 1/2	14	1.9411 - 2.0030	407.05	390.25	384.60	381.95	379.05	376.90
2 1/8	2.1250	46768	559.25	5	12	2 3/4	14 1/2	2.0031 - 2.1280	592.80	576.00	570.35	567.70	564.85	562.55
2 1/4	2.2500	46772	600.60	5	12	2 3/4	14 1/2	2.1281 - 2.2530	634.15	617.30	611.75	609.00	606.15	603.95
2 3/8	2.3750	46776	621.50	5	12	3	15	2.2531 - 2.3780	654.95	638.25	632.55	629.95	627.05	624.80
2 1/2	2.5000	46780	621.50	5	12	3	15	2.3781 - 2.5030	654.95	638.25	632.55	629.95	627.05	624.80

*Quantities of 15 or more - price of fractional size in same size range.

CHUCKING REAMERS CARBIDE TIPPED TYPE 467 METRIC

GENERAL PURPOSE

EXPANSION REAMERS STRAIGHT FLUTE LONG CARBIDE TAPER SHANK

NOTE: Tool diameter in millimeters (mm); all other dimensions in inches. Also, modifications available (see list on page 66).

TOOL DIAMETER		TYPE 467 METRIC EDP NO.	METRIC PRICE	DIMENSIONS				FINISHED TO MODIFIED TOOL DIAMETER							
				TAPER SHANK NO.	NO. OF FLTS	LENGTH		MODIFIED DIAMETER RANGE (mm)	PRICE EACH - BASED ON QUANTITY ORDERED						
mm	INCH					FLUTE & CARBIDE	OVER-ALL		1	2	3	4	5-7	8-14	OVER 14
7.5	.2953	467075	$80.75	1	4	1	6	7.215-8.001	$105.05	$88.95	$83.55	$80.90	$78.10	$75.90	$72.75
8.0	.3150	467080	80.75	1	4	1	6	-	-	-	-	-	-	-	-
8.5	.3346	467085	80.75	1	4	1	6	8.002-8.814	105.05	88.95	83.55	80.90	78.10	75.90	72.75
9.0	.3543	467090	75.70	1	4	1	7	8.815-9.601	98.45	83.35	78.30	75.80	73.30	71.15	68.20
9.5	.3740	467095	75.70	1	4	1	7	-	-	-	-	-	-	-	-
10.0	.3937	467100	77.70	1	4	1	7	9.602-10.389	100.45	85.40	80.30	77.80	75.30	73.15	70.20
10.5	.4134	467105	77.70	1	4	1	7	10.390-11.201	100.45	85.40	80.30	77.80	75.30	73.15	70.20
11.0	.4331	467110	77.70	1	4	1	7	-	-	-	-	-	-	-	-
11.5	.4528	467115	81.00	1	4	1	7	11.202-11.989	103.85	88.70	83.65	81.20	78.60	76.55	73.55
12.0	.4724	467120	81.00	1	6	1	8	11.990-12.776	103.85	88.70	83.65	81.20	78.60	76.55	73.55
12.5	.4921	467125	81.00	1	6	1	8	-	-	-	-	-	-	-	-
13.0	.5118	467130	83.20	1	6	1	8	12.777-13.564	106.00	90.85	85.75	83.30	80.75	78.70	75.75
13.5	.5315	467135	83.20	1	6	1	8	-	-	-	-	-	-	-	-
14.0	.5512	467140	83.20	1	6	1 ⅛	8	13.565-14.376	106.00	90.85	85.75	83.30	80.75	78.70	75.75
14.5	.5709	467145	86.20	1	6	1 ⅛	8	14.377-15.164	108.95	93.80	88.80	86.35	83.75	81.60	78.75
15.0	.5906	467150	86.20	1	6	1 ⅛	8	-	-	-	-	-	-	-	-
15.5	.6102	467155	86.20	2	6	1 ¼	9	15.165-15.951	108.95	93.80	88.80	86.35	83.75	81.60	78.75
16.0	.6299	467160	95.65	2	6	1 ¼	9	15.952-16.739	118.50	103.35	98.25	95.75	93.30	91.20	88.25
16.5	.6496	467165	95.65	2	6	1 ¼	9	-	-	-	-	-	-	-	-
17.0	.6693	467170	95.65	2	6	1 ¼	9	16.740-17.551	118.50	103.35	98.25	95.75	93.30	91.20	88.25
17.5	.6890	467175	95.65	2	6	1 ¼	9	-	-	-	-	-	-	-	-
18.0	.7087	467180	95.95	2	6	1 ¼	9	17.552-18.339	118.75	103.60	98.60	96.10	93.55	91.40	88.50
18.5	.7283	467185	95.95	2	6	1 ⅜	9 ½	18.340-19.126	118.75	103.60	98.60	96.10	93.55	91.40	88.50
19.0	.7480	467190	95.95	2	6	1 ⅜	9 ½	-	-	-	-	-	-	-	-
19.5	.7677	467195	102.30	2	6	1 ⅜	9 ½	19.127-19.914	125.05	110.00	104.90	102.40	99.90	97.75	94.80
20.0	.7874	467200	102.30	2	6	1 ⅜	9 ½	19.915-20.726	125.05	110.00	104.90	102.40	99.90	97.75	94.80
20.5	.8071	467205	102.30	2	6	1 ⅜	9 ½	-	-	-	-	-	-	-	-
21.0	.8268	467210	106.10	2	6	1 ⅜	9 ½	20.727-21.514	128.90	113.80	108.75	106.20	103.65	101.55	98.70
21.5	.8465	467215	106.10	2	6	1 ⅜	9 ½	-	-	-	-	-	-	-	-
22.0	.8661	467220	106.10	2	6	1 ½	10	21.515-22.301	128.90	113.80	108.75	106.20	103.65	101.55	98.70
22.5	.8858	467225	115.85	2	6	1 ½	10	22.302-23.089	139.55	123.80	118.60	115.95	113.35	111.20	108.15
23.0	.9055	467230	115.85	2	6	1 ½	10	-	-	-	-	-	-	-	-
23.5	.9252	467235	115.85	3	8	1 ½	10	23.090-23.901	139.55	123.80	118.60	115.95	113.35	111.20	108.15
24.0	.9449	467240	119.65	3	8	1 ½	10	23.902-24.689	143.35	127.70	122.40	119.85	117.15	114.95	112.00
24.5	.9646	467245	119.65	3	8	1 ½	10	-	-	-	-	-	-	-	-
25.0	.9843	467250	119.65	3	8	1 ⅝	10 ½	24.690-25.476	143.35	127.70	122.40	119.85	117.15	114.95	112.00
25.5	1.0039	467255	130.00	3	8	1 ⅝	10 ½	25.477-27.076	153.70	137.95	132.70	130.15	127.50	125.40	122.30
26.0	1.0236	467260	130.00	3	8	1 ⅝	10 ½	-	-	-	-	-	-	-	-
27.0	1.0630	467270	130.00	3	8	1 ⅝	10 ½	-	-	-	-	-	-	-	-
28.0	1.1024	467280	130.00	3	8	1 ¾	11	27.077-28.651	153.70	137.95	132.70	130.15	127.50	125.40	122.30
29.0	1.1417	467290	144.90	3	8	1 ¾	11	28.652-30.239	168.50	152.85	147.60	145.00	142.40	140.20	137.15
30.0	1.1811	467300	144.90	3	8	1 ¾	11	-	-	-	-	-	-	-	-
31.0	1.2205	467310	146.75	4	8	1 ⅞	11 ½	30.240-31.826	170.40	154.70	149.40	146.85	144.25	142.05	139.00
32.0	1.2598	467320	159.35	4	8	1 ⅞	11 ½	31.827-33.414	183.00	167.30	162.15	159.55	156.90	154.70	151.70
33.0	1.2992	467330	159.35	4	8	1 ⅞	11 ½	-	-	-	-	-	-	-	-
34.0	1.3386	467340	173.65	4	8	2	12	33.415-35.001	197.20	181.60	176.30	173.75	171.10	168.90	165.90
35.0	1.3780	467350	173.65	4	8	2	12	-	-	-	-	-	-	-	-
36.0	1.4173	467360	194.30	4	8	2	12	35.002-36.589	219.55	202.80	197.15	194.45	191.60	189.25	186.10
37.0	1.4567	467370	200.75	4	8	2 ⅛	12 ½	36.590-38.176	226.05	209.30	203.75	201.00	198.15	195.85	192.60
38.0	1.4961	467380	200.75	4	8	2 ⅛	12 ½	-	-	-	-	-	-	-	-
39.0	1.5354	467390	271.80	4	8	2 ⅛	12 ½	38.177-39.776	297.00	280.30	274.70	271.90	269.15	266.80	263.55
40.0	1.5748	467400	271.80	4	8	2 ¼	13	39.777-41.351	297.00	280.30	274.70	271.90	269.15	266.80	263.55
41.0	1.6142	467410	271.80	4	8	2 ¼	13	-	-	-	-	-	-	-	-
42.0	1.6535	467420	299.80	4	8	2 ¼	13	41.352-42.951	325.05	308.35	302.75	300.00	297.10	294.85	291.55
43.0	1.6929	467430	299.80	4	10	2 ⅜	13 ½	42.952-44.526	325.05	308.35	302.75	300.00	297.10	294.85	291.55
44.0	1.7323	467440	299.80	4	10	2 ⅜	13 ½	-	-	-	-	-	-	-	-

Modified tool diameters are available up to 63mm - contact us for price.

CHUCKING REAMERS CARBIDE TIPPED TYPE 410 & 420 FRACTIONAL

GENERAL PURPOSE

RIGHT SPIRAL FLUTES STRAIGHT SHANK

TYPE 410

- Polished flutes
- Right spiral flutes have greater chip clearing ability for use with ductile materials, highly abrasive materials, or blind holes
- Finishes are much better as spiral flutes tend to bridge interruptions such as keyways, slots, or intersecting holes
- Detailed specifications on page 29

TYPE 420

- Polished flutes
- Used on thru holes for heat treated steels, hard cast irons and other hard materials
- Finishes are much better as spiral flutes tend to bridge interruptions such as keyways, slots, or intersecting holes
- Left spiral flutes should not be used on blind holes
- Detailed specifications on page 29

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	410/432[MS]
	40	NON-FERROUS - SHORT CHIPS	410/432[MS]
	60	CAST IRONS	410/436[MS]
	80	LOW STRENGTH STEELS	410/438[MS]
	100	MEDIUM STRENGTH STEELS	410/438[MS]
	120	HIGH STRENGTH STEELS	410/438[MS]
	140	HIGH TEMPERATURE ALLOYS	438[MS]

[MS]See page 84 for material specific reamers

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Modified metric tool diameter - priced on pg. 69
- Closer tool diameter tolerance - pg. 29
- Cutting diameter reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diam. back taper
- Shortened shank or reduced shank diameter
- Flat(s) or tang on shank
- Coatings available: See page 70

For shallow holes only (see page 27)

For type 410 semi-finished reamers, see pg. 53.

NOTE: For smaller tool diameters, see solid carbide reamers on pgs. 104 & 111.

TOOL DIAMETER FRAC.	TOOL DIAMETER DECIMAL	TYPE 410 RIGHT EDP NO.	TYPE 420 LEFT EDP NO.	PRICE	DIMENSIONS SHANK DIAM.	NO. OF FLTS	LENGTH FLT	LENGTH CAR-BIDE	LENGTH OVER-ALL	FINISHED TO MODIFIED TOOL DIAMETER MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED 1	2	3	4	5-7	8-14*
3/16	.1875	41006	42006	$47.45	11/64	4	1 1/8	1/2	4 1/2	0.1770 - 0.2040	$78.25	$62.80	$57.65	$55.15	$52.50	$50.45
7/32	.2188	41007	42007	47.45	13/64	4	1 1/4	1/2	5	0.2041 - 0.2210	78.25	62.80	57.65	55.15	52.50	50.45
15/64	.2344	4102344	4202344	47.45	7/32	4	1 1/2	1/2	6	0.2211 0.2380	78.25	62.80	57.65	55.15	52.50	50.45
1/4	.2500	41008	42008	47.45	15/64	4	1 1/2	1/2	6	0.2381 0.2530	78.25	62.80	57.65	55.15	52.50	50.45
9/32	.2812	41009	42009	47.60	15/64	4	1 1/2	1/2	6	0.2531 0.2840	78.35	62.90	57.75	55.30	52.65	50.55
5/16	.3125	41010	42010	47.60	9/32	4	1 1/2	1/2	6	0.2841 0.3150	78.35	62.90	57.75	55.30	52.65	50.55
11/32	.3438	41011	42011	52.35	9/32	4	1 1/2	5/8	6	0.3151 0.3470	83.15	67.70	62.55	60.10	57.45	55.40
3/8	.3750	41012	42012	52.85	5/16	4	1 3/4	5/8	7	0.3471 0.3780	83.60	68.20	63.00	60.65	58.00	55.90
13/32	.4062	41013	42013	55.25	5/16	4	1 3/4	5/8	7	0.3781 0.4090	86.00	70.60	65.45	62.95	60.30	58.25
7/16	.4375	41014	42014	57.45	3/8	4	1 3/4	5/8	7	0.4091 0.4410	88.20	72.80	67.65	65.20	62.55	60.45
15/32	.4688	41015	42015	60.95	3/8	4	1 3/4	5/8	7	0.4411 0.4720	91.75	76.35	71.20	68.70	66.10	63.95
1/2	.5000	41016	42016	63.30	7/16	6	2	5/8	8	0.4721 0.5030	94.80	78.95	73.70	71.20	68.50	66.35
17/32	.5312	41017	42017	65.20	7/16	6	2	5/8	8	0.5031 0.5340	96.80	80.95	75.70	73.15	70.45	68.30
9/16	.5625	41018	42018	65.20	7/16	6	2	5/8	8	0.5341 0.5660	96.80	80.95	75.70	73.15	70.45	68.30
19/32	.5938	41019	42019	67.15	7/16	6	2	5/8	8	0.5661 0.5970	98.70	82.90	77.60	75.05	72.35	70.20
5/8	.6250	41020	42020	67.15	9/16	6	2 1/4	5/8	9	0.5971 0.6280	98.70	82.90	77.60	75.05	72.35	70.20
21/32	.6562	41021	42021	69.05	9/16	6	2 1/4	5/8	9	0.6281 0.6590	100.70	84.85	79.55	77.00	74.25	72.20
11/16	.6875	41022	42022	73.55	9/16	6	2 1/4	5/8	9	0.6591 0.6910	105.10	89.25	84.00	81.45	78.75	76.65
23/32	.7188	41023	42023	74.55	9/16	6	2 1/4	5/8	9	0.6911 0.7220	106.10	90.30	85.00	82.50	79.75	77.65
3/4	.7500	41024	42024	75.75	5/8	6	2 1/2	3/4	9 1/2	0.7221 - 0.7530	107.30	91.50	86.20	83.65	80.95	78.80
25/32	.7812	41025	42025	77.65	5/8	6	2 1/2	3/4	9 1/2	0.7531 - 0.7840	109.30	93.45	88.15	85.60	82.90	80.75
13/16	.8125	41026	42026	77.65	5/8	6	2 1/2	3/4	9 1/2	0.7841 - 0.8160	109.30	93.45	88.15	85.60	82.90	80.75
27/32	.8438	41027	42027	81.90	5/8	6	2 1/2	3/4	9 1/2	0.8161 - 0.8470	113.55	97.70	92.40	89.90	87.15	85.00
7/8	.8750	41028	42028	85.00	3/4	6	2 5/8	3/4	10	0.8471 - 0.8780	117.80	101.40	95.80	93.30	90.40	88.20
29/32	.9062	41029	42029	99.05	3/4	6	2 5/8	3/4	10	0.8781 - 0.9090	131.80	115.40	109.90	107.25	104.45	102.25
15/16	.9375	41030	42030	99.05	3/4	8	2 5/8	3/4	10	0.9091 - 0.9410	131.80	115.40	109.90	107.25	104.45	102.25
31/32	.9688	41031	42031	103.85	3/4	8	2 5/8	3/4	10	0.9411 - 0.9720	136.65	120.20	114.75	112.10	109.25	107.10
1	1.0000	41032	42032	103.85	7/8	8	2 3/4	3/4	10 1/2	0.9721 - 1.0030	136.65	120.20	114.75	112.10	109.25	107.10
1 1/16	1.0625	41034	42034	111.40	7/8	8	2 3/4	3/4	10 1/2	1.0031 - 1.0660	144.20	127.80	122.30	119.65	116.80	114.65
1 1/8	1.1250	41036	42036	114.85	7/8	8	2 7/8	7/8	11	1.0661 - 1.1280	147.60	131.25	125.70	123.05	120.25	118.10
1 3/16	1.1875	41038	42038	120.70	1	8	2 7/8	7/8	11	1.1281 - 1.1905	153.45	137.05	131.55	128.90	126.10	123.90
1 1/4	1.2500	41040	42040	127.75	1	8	3	7/8	11 1/2	1.1906 - 1.2530	160.50	144.05	138.60	135.95	133.15	130.95
1 5/16	1.3125	41042	42042	141.30	1	8	3	7/8	11 1/2	1.2531 - 1.3155	174.15	157.75	152.15	149.60	146.75	144.55
1 3/8	1.3750	41044	42044	154.85	1	8	3 1/4	7/8	12	1.3156 - 1.3780	187.65	171.25	165.75	163.15	160.30	158.10
1 7/16	1.4375	41046	42046	164.05	1 1/4	8	3 1/4	7/8	12	1.3781 - 1.4405	196.85	180.40	174.90	172.35	169.50	167.25
1 1/2	1.5000	41048	42048	173.30	1 1/4	8	3 1/2	7/8	12 1/2	1.4406 - 1.5030	206.05	189.65	184.20	181.50	178.75	176.55

*Quantities of 15 or more - price of fractional size in same size range.

CHUCKING REAMERS
CARBIDE TIPPED TYPE 410 & 420 METRIC

GENERAL PURPOSE

RIGHT SPIRAL FLUTES
STRAIGHT SHANK


TYPE 410


TYPE 420

For shallow holes only (see page 27)

NOTE: Tool diameter in millimeters (mm); all other dimensions in inches. Also, modifications available (see list on page 68).

TOOL DIAMETER		TYPE 410 RIGHT METRIC EDP NO.	TYPE 420 LEFT METRIC EDP NO.	METRIC PRICE	DIMENSIONS					FINISHED TO MODIFIED TOOL DIAMETER							
					SHANK DIAM.	NO. OF FLTS	LENGTH			MODIFIED DIAMETER RANGE (mm)	PRICE EACH - BASED ON QUANTITY ORDERED						
mm	INCH						FLT	CAR-BIDE	OVER-ALL		1	2	3	4	5-7	8-14	OVER 14
4.5	.1772	410045	420045	$57.65	11/64	4	1 1/8	1/2	4 1/2	4.494 - 5.182	$80.75	$65.45	$60.25	$57.75	$55.15	$53.05	$50.15
5.0	.1969	410050	420050	57.65	11/64	4	1 1/8	1/2	4 1/2	-	-	-	-	-	-	-	-
5.5	.2165	410055	420055	57.65	13/64	4	1 1/4	1/2	5	5.183 - 5.613	80.75	65.45	60.25	57.75	55.15	53.05	50.15
6.0	.2362	410060	420060	57.65	7/32	4	1 1/2	1/2	6	5.614 - 6.045	80.75	65.45	60.25	57.75	55.15	53.05	50.15
-	-	410063	420063	-	15/64	4	1 1/2	1/2	6	6.046 - 6.426	80.75	65.45	60.25	57.75	55.15	53.05	50.15
6.5	.2559	410065	420065	57.75	15/64	4	1 1/2	1/2	6	6.427 - 7.214	80.90	65.55	60.40	57.90	55.30	53.15	50.25
7.0	.2756	410070	420070	57.75	15/64	4	1 1/2	1/2	6	-	-	-	-	-	-	-	-
7.5	.2953	410075	420075	57.75	9/32	4	1 1/2	1/2	6	7.215 - 8.001	80.90	65.55	60.40	57.90	55.30	53.15	50.25
8.0	.3150	410080	420080	57.75	9/32	4	1 1/2	1/2	6	-	-	-	-	-	-	-	-
8.5	.3346	410085	420085	62.55	9/32	4	1 1/2	5/8	6	8.002 - 8.814	85.65	70.35	65.20	62.70	60.10	58.00	55.00
9.0	.3543	410090	420090	63.00	5/16	4	1 3/4	5/8	7	8.815 - 9.601	86.20	70.85	65.65	63.10	60.65	58.40	55.50
9.5	.3740	410095	420095	63.00	5/16	4	1 3/4	5/8	7	-	-	-	-	-	-	-	-
10.0	.3937	410100	420100	65.45	5/16	4	1 3/4	5/8	7	9.602 - 10.389	88.60	73.25	68.10	65.55	62.95	60.85	57.90
10.5	.4134	410105	420105	67.65	3/8	4	1 3/4	5/8	7	10.390 - 11.201	90.80	75.45	70.30	67.75	65.20	63.00	60.10
11.0	.4331	410110	420110	67.65	3/8	4	1 3/4	5/8	7	-	-	-	-	-	-	-	-
11.5	.4528	410115	420115	71.20	3/8	4	1 3/4	5/8	7	11.202 - 11.989	94.35	78.95	73.85	71.30	68.70	66.55	63.60
12.0	.4724	410120	420120	73.70	7/16	6	2	5/8	8	11.990 - 12.776	97.45	81.75	76.45	73.85	71.20	69.00	65.95
12.5	.4921	410125	420125	73.70	7/16	6	2	5/8	8	-	-	-	-	-	-	-	-
13.0	.5118	410130	420130	75.70	7/16	6	2	5/8	8	12.777 - 13.564	99.45	83.65	78.40	75.80	73.15	70.95	67.95
13.5	.5315	410135	420135	75.70	7/16	6	2	5/8	8	-	-	-	-	-	-	-	-
14.0	.5512	410140	420140	75.70	7/16	6	2	5/8	8	13.565 - 14.376	99.45	83.65	78.40	75.80	73.15	70.95	67.95
14.5	.5709	410145	420145	77.60	7/16	6	2	5/8	8	14.377 - 15.164	101.35	85.60	80.30	77.70	75.05	72.90	69.85
15.0	.5906	410150	420150	77.60	7/16	6	2	5/8	8	-	-	-	-	-	-	-	-
15.5	.6102	410155	420155	77.60	9/16	6	2 1/4	5/8	9	15.165 - 15.951	101.35	85.60	80.30	77.70	75.05	72.90	69.85
16.0	.6299	410160	420160	79.55	9/16	6	2 1/4	5/8	9	15.952 - 16.739	103.30	87.50	82.25	79.65	77.00	74.85	71.80
16.5	.6496	410165	420165	79.55	9/16	6	2 1/4	5/8	9	-	-	-	-	-	-	-	-
17.0	.6693	410170	420170	84.00	9/16	6	2 1/4	5/8	9	16.740 - 17.551	107.75	92.00	86.70	84.10	81.45	79.30	76.20
17.5	.6890	410175	420175	84.00	9/16	6	2 1/4	5/8	9	-	-	-	-	-	-	-	-
18.0	.7087	410180	420180	85.00	9/16	6	2 1/4	5/8	9	17.552 - 18.339	108.80	93.00	87.75	85.15	82.50	80.30	77.25
18.5	.7283	410185	420185	86.20	5/8	6	2 1/2	3/4	9 1/2	18.340 - 19.126	109.90	94.25	88.90	86.30	83.65	81.45	78.45
19.0	.7480	410190	420190	86.20	5/8	6	2 1/2	3/4	9 1/2	-	-	-	-	-	-	-	-
19.5	.7677	410195	420195	88.15	5/8	6	2 1/2	3/4	9 1/2	19.127 - 19.914	111.95	96.15	90.85	88.25	85.60	83.40	80.40
20.0	.7874	410200	420200	88.15	5/8	6	2 1/2	3/4	9 1/2	19.915 - 20.726	111.95	96.15	90.85	88.25	85.60	83.40	80.40
20.5	.8071	410205	420205	88.15	5/8	6	2 1/2	3/4	9 1/2	-	-	-	-	-	-	-	-
21.0	.8268	410210	420210	92.40	5/8	6	2 1/2	3/4	9 1/2	20.727 - 21.514	116.20	100.40	95.15	92.55	89.90	87.70	84.60
21.5	.8465	410215	420215	92.40	5/8	6	2 1/2	3/4	9 1/2	-	-	-	-	-	-	-	-
22.0	.8661	410220	420220	92.40	3/4	6	2 5/8	3/4	10	21.515 - 22.301	116.20	100.40	95.15	92.55	89.90	87.70	84.60
22.5	.8858	410225	420225	109.90	3/4	6	2 5/8	3/4	10	22.302 - 23.089	134.55	118.20	112.70	110.05	107.25	105.00	101.85
23.0	.9055	410230	420230	109.90	3/4	6	2 5/8	3/4	10	-	-	-	-	-	-	-	-
23.5	.9252	410235	420235	109.90	3/4	8	2 5/8	3/4	10	23.090 - 23.901	134.55	118.20	112.70	110.05	107.25	105.00	101.85
24.0	.9449	410240	420240	114.75	3/4	8	2 5/8	3/4	10	23.902 - 24.689	139.40	123.00	117.55	114.85	112.10	109.80	106.70
24.5	.9646	410245	420245	114.75	3/4	8	2 5/8	3/4	10	-	-	-	-	-	-	-	-
25.0	.9843	410250	420250	114.75	7/8	8	2 3/4	3/4	10 1/2	24.690 - 25.476	139.40	123.00	117.55	114.85	112.10	109.80	106.70
25.5	1.0039	410255	420255	122.30	7/8	8	2 3/4	3/4	10 1/2	25.477 - 27.076	146.95	130.60	125.15	122.45	119.65	117.40	114.25
26.0	1.0236	410260	420260	122.30	7/8	8	2 3/4	3/4	10 1/2	-	-	-	-	-	-	-	-
27.0	1.0630	410270	420270	122.30	7/8	8	2 3/4	3/4	10 1/2	-	-	-	-	-	-	-	-
28.0	1.1024	410280	420280	125.70	7/8	8	2 7/8	7/8	11	27.077 - 28.651	150.35	134.05	128.60	125.90	123.05	120.80	117.65
29.0	1.1417	410290	420290	131.55	1	8	2 7/8	7/8	11	28.652 - 30.239	156.25	139.85	134.40	131.70	128.90	126.60	123.50
30.0	1.1811	410300	420300	131.55	1	8	2 7/8	7/8	11	-	-	-	-	-	-	-	-
31.0	1.2205	410310	420310	138.60	1	8	3	7/8	11 1/2	30.240 - 31.826	163.25	146.90	141.40	138.70	135.95	133.65	130.55
32.0	1.2598	410320	420320	152.15	1	8	3	7/8	11 1/2	31.827 - 33.414	176.85	160.50	155.00	152.30	149.60	147.35	144.10
33.0	1.2992	410330	420330	152.15	1	8	3	7/8	11 1/2	-	-	-	-	-	-	-	-
34.0	1.3386	410340	420340	165.75	1	8	3 1/4	7/8	12	33.415 - 35.001	190.45	174.05	168.55	165.90	163.15	160.85	157.75
35.0	1.3780	410350	420350	165.75	1	8	3 1/4	7/8	12	-	-	-	-	-	-	-	-
36.0	1.4173	410360	420360	174.90	1 1/4	8	3 1/4	7/8	12	35.002 - 36.589	199.60	183.20	177.75	175.05	172.35	170.00	166.85
37.0	1.4567	410370	420370	184.20	1 1/4	8	3 1/2	7/8	12 1/2	36.590 - 38.176	208.80	192.50	187.00	184.30	181.50	179.25	176.10
38.0	1.4961	410380	420380	184.20	1 1/4	8	3 1/2	7/8	12 1/2	-	-	-	-	-	-	-	-

CHUCKING REAMERS CARBIDE TIPPED TYPES 412 & 422 FRACTIONAL

GENERAL PURPOSE

RIGHT OR LEFT SPIRAL FLUTES TAPER SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	412/422
	40	NON-FERROUS - SHORT CHIPS	412/422
	60	CAST IRONS	412/422
	80	LOW STRENGTH STEELS	422/412
	100	MEDIUM STRENGTH STEELS	422/412
	120	HIGH STRENGTH STEELS	422/412
	140	HIGH TEMPERATURE ALLOYS	422/412

TYPE 412 – RIGHT SPIRAL FLUTES – TAPER SHANK

- Polished flutes
- Right spiral flutes have greater chip clearing ability for use with ductile materials, highly abrasive materials, or blind holes
- Finishes are much better as spiral flutes tend to bridge interruptions such as keyways, slots, or intersecting holes
- Detailed specifications on page 29

TYPE 422 – LEFT SPIRAL FLUTES – TAPER SHANK

- Polished flutes
- Used on thru holes for heat treated steels, hard cast irons and other hard materials
- Finishes are much better as spiral flutes tend to bridge interruptions such as keyways, slots, or intersecting holes
- Left spiral flutes should not be used on blind holes
- Detailed specifications on page 29

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Metric tool diameter
- Closer tool diameter tolerance - pg. 29
- Cutting diameter reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diam. back taper
- Shank whistle notch for set screw
- Smaller taper shank
- Coatings available:

TITANIUM NITRIDE – TiN
TITANIUM CARBONITRIDE – TiCN
ZIRCONIUM NITRIDE – ZrN
AL TITANIUM NITRIDE – AlTiN

For shallow holes only (see page 27)

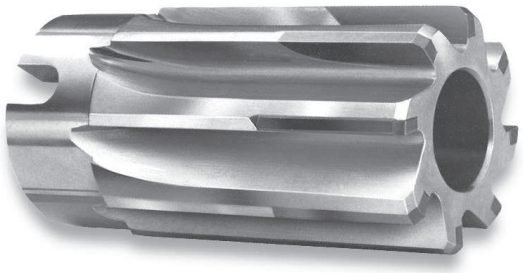
TOOL DIAMETER FRAC.	TOOL DIAMETER DEC.	TYPE 412 RIGHT EDP NO.	TYPE 422 LEFT EDP NO.	BOTH TYPES PRICE	DIMENSIONS TAPER SHANK NO.	NO. OF FLTS	LENGTH FLT	LENGTH CAR-BIDE	LENGTH OVER-ALL	FINISHED TO MODIFIED TOOL DIAMETER MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED 1	2	3	4	5-7	8-14*
1/4	.2500	41208	42208	$49.75	1	4	1 1/2	1/2	6	0.2381 - 0.2530	$80.05	$64.80	$59.80	$57.35	$54.75	$52.75
9/32	.2812	41209	42209	49.75	1	4	1 1/2	1/2	6	0.2531 - 0.2840	80.05	64.80	59.80	57.35	54.75	52.75
5/16	.3125	41210	42210	50.90	1	4	1 1/2	1/2	6	0.2841 - 0.3150	81.20	65.95	60.90	58.40	55.85	53.80
11/32	.3438	41211	42211	51.75	1	4	1 1/2	5/8	6	0.3151 - 0.3470	82.00	66.85	61.80	59.30	56.75	54.70
3/8	.3750	41212	42212	52.45	1	4	1 3/4	5/8	7	0.3471 - 0.3780	82.80	67.70	62.55	60.15	57.55	55.50
13/32	.4062	41213	42213	55.00	1	4	1 3/4	5/8	7	0.3781 - 0.4090	85.40	70.15	65.10	62.70	60.05	58.05
7/16	.4375	41214	42214	57.40	1	4	1 3/4	5/8	7	0.4091 - 0.4410	87.70	72.55	67.45	65.00	62.40	60.35
15/32	.4688	41215	42215	59.70	1	4	1 3/4	5/8	7	0.4411 - 0.4720	89.95	74.75	69.70	67.20	64.65	62.65
1/2	.5000	41216	42216	68.75	1	6	2	5/8	8	0.4721 - 0.5030	101.00	84.80	79.40	76.85	74.10	71.90
17/32	.5312	41217	42217	70.55	1	6	2	5/8	8	0.5031 - 0.5340	102.85	86.65	81.30	78.70	75.90	73.70
9/16	.5625	41218	42218	70.55	1	6	2	5/8	8	0.5341 - 0.5660	102.85	86.65	81.30	78.70	75.90	73.70
19/32	.5938	41219	42219	73.35	1	6	2	5/8	8	0.5661 - 0.5970	105.65	89.40	84.05	81.45	78.70	76.55
5/8	.6250	41220	42220	73.35	2	6	2 1/4	5/8	9	0.5971 - 0.6280	105.65	89.40	84.05	81.45	78.70	76.55
11/16	.6875	41222	42222	80.45	2	6	2 1/4	5/8	9	0.6591 - 0.6910	112.80	96.55	91.20	88.60	85.80	83.65
3/4	.7500	41224	42224	85.10	2	6	2 1/2	3/4	9 1/2	0.7221 - 0.7530	117.35	101.25	95.75	93.25	90.40	88.25
13/16	.8125	41226	42226	88.65	2	6	2 1/2	3/4	9 1/2	0.7841 - 0.8160	121.00	104.80	99.30	96.80	94.00	91.80
7/8	.8750	41228	42228	95.45	2	6	2 5/8	3/4	10	0.8471 - 0.8780	129.00	112.15	106.55	103.90	101.00	98.75
15/16	.9375	41230	42230	111.00	3	8	2 5/8	3/4	10	0.9091 - 0.9410	144.55	127.80	122.10	119.40	116.55	114.30
1	1.0000	41232	42232	114.85	3	8	2 3/4	3/4	10 1/2	0.9721 - 1.0030	148.35	131.55	125.95	123.30	120.40	118.15

*Quantities of 15 or more - price of fractional size in same size range.

SHELL REAMERS CARBIDE TIPPED TYPE 431 FRACTIONAL

GENERAL PURPOSE

STRAIGHT FLUTES



TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	431/441
	40	NON-FERROUS - SHORT CHIPS	431/441
	60	CAST IRONS	431/441
	80	LOW STRENGTH STEELS	441/431
	100	MEDIUM STRENGTH STEELS	441/431
	120	HIGH STRENGTH STEELS	441/431
	140	HIGH TEMPERATURE ALLOYS	441/431

TYPE 431

- Straight polished flutes
- Arbor hole tapered ⅛" per foot with drive slots
- Tool diameter tolerance thru 1": plus .0001", plus .0005"
  over 1": plus .0002", plus .0006"

USE:

- For thru or blind holes
- Shell reamers are used with an arbor which is tapered to fit the hole in the reamer. Drive slots in the reamer engage lugs on the arbor to supplement the rotational drive from the tapered arbor. The space between the reamer's drive end and the arbor collar permits easy removal of the shell reamer by prying.

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Metric tool diameter
- Cutting diameter reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diameter back taper

REAMERS

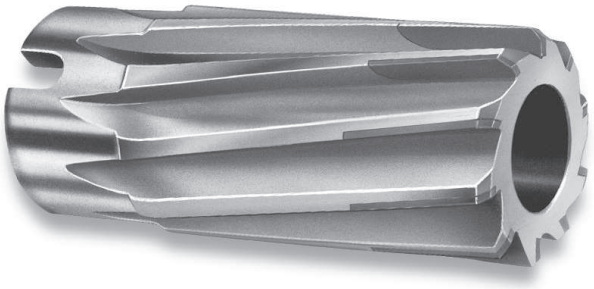
TOOL DIAMETER		TYPE 431 EDP NO.	PRICE	DIMENSIONS						FINISHED TO MODIFIED TOOL DIAMETER						
				HOLE DIAM LG. END	FITS ARBOR NO.	NO. OF FLTS	LENGTH			MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DECIMAL						FLUTE	CAR-BIDE	OVER-ALL		1	2	3	4	5-7	8-14*
¾	.7500	43124	$160.20	⅜	4	6	1 ¾	1	2 ¼	0.7221 - 0.7530	$226.60	$193.40	$182.20	$176.90	$171.25	$166.80
25/32	.7812	43125	163.35	⅜	4	6	1 ¾	1	2 ¼	0.7531 - 0.7840	229.70	196.40	185.40	180.05	174.35	169.90
13/16	.8125	43126	163.35	½	5	6	1 15/16	1	2 ½	0.7841 - 0.8160	229.70	196.40	185.40	180.05	174.35	169.90
⅞	.8750	43128	182.55	½	5	6	1 15/16	1	2 ½	0.8161 - 0.8780	251.45	216.90	205.30	199.90	193.95	189.25
15/16	.9375	43130	182.55	½	5	8	1 15/16	1	2 ½	0.8781 - 0.9410	251.45	216.90	205.30	199.90	193.95	189.25
1	1.0000	43132	185.85	½	5	8	1 15/16	1	2 ½	0.9411 - 1.0030	254.70	220.20	208.70	203.20	197.20	192.60
1 1/16	1.0625	43134	192.35	⅝	6	8	2 ⅛	1	2 ¾	1.0031 - 1.0660	261.20	226.70	215.05	209.65	203.75	199.05
1 ⅛	1.1250	43136	195.55	⅝	6	8	2 ⅛	1	2 ¾	1.0661 - 1.1280	264.40	229.95	218.35	212.90	206.95	202.35
1 3/16	1.1875	43138	198.90	⅝	6	8	2 ⅛	1 ⅛	2 ¾	1.1281 - 1.1905	267.65	233.25	221.65	216.20	210.25	205.65
1 ¼	1.2500	43140	211.90	⅝	6	8	2 ⅛	1 ⅛	2 ¾	1.1906 - 1.2530	280.75	246.25	234.70	229.15	223.35	218.60
1 5/16	1.3125	43142	215.05	¾	7	8	2 ¼	1 ⅛	3	1.2531 - 1.3155	283.95	249.50	237.95	232.45	226.60	221.90
1 ⅜	1.3750	43144	221.60	¾	7	8	2 ¼	1 ⅛	3	1.3156 - 1.3780	290.50	255.95	244.45	238.90	233.00	228.40
1 7/16	1.4375	43146	228.15	¾	7	8	2 ¼	1 ⅛	3	1.3781 - 1.4405	297.00	262.50	251.00	245.50	239.50	234.95
1 ½	1.5000	43148	237.95	¾	7	8	2 ¼	1 ⅛	3	1.4406 - 1.5030	306.80	272.30	260.75	255.25	249.30	244.70
1 9/16	1.5625	43150	275.50	¾	7	10	2 ¼	1 ⅛	3	1.5031 - 1.5660	347.30	311.40	299.30	293.50	287.30	282.50
1 ⅝	1.6250	43152	289.05	¾	7	10	2 ¼	1 ⅛	3	1.5661 - 1.6280	360.95	324.95	312.85	307.15	300.95	296.10
1 11/16	1.6875	43154	312.90	1	8	10	2 ¾	1 ⅛	3 ½	1.6281 - 1.6910	384.85	348.80	336.75	331.00	324.85	320.00
1 ¾	1.7500	43156	312.90	1	8	10	2 ¾	1 ⅛	3 ½	1.6911 - 1.7530	384.85	348.80	336.75	331.00	324.85	320.00
1 13/16	1.8125	43158	336.65	1	8	10	2 ¾	1 ⅛	3 ½	1.7531 - 1.8160	408.45	372.55	360.45	354.75	348.55	343.70
1 ⅞	1.8750	43160	336.65	1	8	10	2 ¾	1 ⅛	3 ½	1.8161 - 1.8780	408.45	372.55	360.45	354.75	348.55	343.70
1 15/16	1.9375	43162	360.55	1	8	10	2 ¾	1 ⅛	3 ½	1.8781 - 1.9410	432.30	396.35	384.30	378.65	372.45	367.60
2	2.0000	43164	360.55	1	8	10	2 ¾	1 ⅛	3 ½	1.9411 - 2.0030	432.30	396.35	384.30	378.65	372.45	367.60
2 1/16	2.0625	43166	387.70	1 ¼	9	12	2 ⅞	1 ⅛	3 ¾	2.0031 - 2.0660	459.55	423.60	411.50	405.80	399.60	394.80
2 ⅛	2.1250	43168	387.70	1 ¼	9	12	2 ⅞	1 ⅛	3 ¾	2.0661 - 2.1280	459.55	423.60	411.50	405.80	399.60	394.80
2 3/16	2.1875	43170	421.70	1 ¼	9	12	2 ⅞	1 ⅛	3 ¾	2.1281 - 2.1905	493.55	457.55	445.50	439.75	433.65	428.70
2 ¼	2.2500	43172	421.70	1 ¼	9	12	2 ⅞	1 ⅛	3 ¾	2.1906 - 2.2530	493.55	457.55	445.50	439.75	433.65	428.70
2 5/16	2.3125	43174	445.50	1 ¼	9	12	2 ⅞	1 ⅛	3 ¾	2.2531 - 2.3155	517.40	481.35	469.35	463.55	457.40	452.55
2 ⅜	2.3750	43176	445.50	1 ¼	9	12	2 ⅞	1 ⅛	3 ¾	2.3156 - 2.3780	517.40	481.35	469.35	463.55	457.40	452.55
2 7/16	2.4375	43178	469.40	1 ¼	9	12	2 ⅞	1 ⅛	3 ¾	2.3781 - 2.4405	541.25	505.25	493.20	487.45	481.25	476.40
2 ½	2.5000	43180	469.40	1 ¼	9	12	2 ⅞	1 ⅛	3 ¾	2.4406 - 2.5030	541.25	505.25	493.20	487.45	481.25	476.40
2 9/16	2.5625	43182	515.25	1 ½	10	14	3 ⅛	1 ⅛	4	2.5031 - 2.5660	587.05	551.05	539.05	533.30	527.15	522.25
2 ⅝	2.6250	43184	534.35	1 ½	10	14	3 ⅛	1 ⅛	4	2.5661 - 2.6280	606.15	570.10	558.20	552.35	546.20	541.35
2 11/16	2.6875	43186	555.10	1 ½	10	14	3 ⅛	1 ⅛	4	2.6281 - 2.6910	626.95	590.95	578.90	573.20	567.00	562.15
2 ¾	2.7500	43188	574.35	1 ½	10	14	3 ⅛	1 ⅛	4	2.6911 - 2.7530	646.25	610.20	598.15	592.45	586.30	581.40
2 13/16	2.8125	43190	594.55	1 ½	10	14	3 ⅛	1 ⅛	4	2.7531 - 2.8160	666.40	630.40	618.40	612.65	606.50	601.65
2 ⅞	2.8750	43192	618.40	1 ½	10	14	3 ⅛	1 ⅛	4	2.8161 - 2.8780	690.15	654.25	642.15	636.50	630.30	625.45
2 15/16	2.9375	43194	642.25	1 ½	10	14	3 ⅛	1 ⅛	4	2.8781 - 2.9410	714.10	678.10	666.00	660.35	654.20	649.30
3	3.0000	43196	666.10	1 ½	10	14	3 ⅛	1 ⅛	4	2.9411 - 3.0030	737.90	702.00	689.90	684.25	678.05	673.20

*Quantities of 15 or more - price of fractional size in same size range.

SHELL REAMERS AND ARBORS CARBIDE TIPPED TYPES 441 FRACTIONAL & 481

GENERAL PURPOSE

LEFT SPIRAL FLUTES



TYPE 441

- Left spiral polished flutes
- Arbor hole tapered ⅛" per foot with drive slots
- Tool diameter tolerance thru 1": plus .0001", plus .0005"
  over 1": plus .0002", plus .0006"

USE:

- See "USE" on page 71 - but used only on thru holes for heat treated steels, hard cast irons and other hard materials; left spiral flutes should not be used on blind holes
- Finishes are much better as spiral flutes tend to bridge interruptions such as keyways, slots, or intersecting holes.

TOOL SELECTOR BOX (See page 71)
MODIFICATIONS (See list on page 71)

TOOL DIAMETER		TYPE 441 EDP NO.	PRICE	DIMENSIONS						FINISHED TO MODIFIED TOOL DIAMETER						
				HOLE DIAM. LG. END	FITS ARBOR NO.	NO. OF FLTS	LENGTH			MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DECIMAL						FLUTE	CARBIDE	OVERALL		1	2	3	4	5-7	8-14*
¾	.7500	44124	$208.25	⅜	4	6	1 ¾	1	2 ¼	0.7221 - 0.7530	$274.60	$241.40	$230.25	$224.95	$219.25	$214.75
25/32	.7812	44125	212.25	⅜	4	6	1 ¾	1	2 ¼	0.7531 - 0.7840	278.55	245.40	234.20	228.95	223.30	218.85
13/16	.8125	44126	212.25	½	5	6	1 15/16	1	2 ½	0.7841 - 0.8160	278.55	245.40	234.20	228.95	223.30	218.85
⅞	.8750	44128	237.35	½	5	6	1 15/16	1	2 ½	0.8161 - 0.8780	306.15	271.70	260.10	254.65	248.70	244.05
15/16	.9375	44130	237.35	½	5	8	1 15/16	1	2 ½	0.8781 - 0.9410	306.15	271.70	260.10	254.65	248.70	244.05
1	1.0000	44132	241.55	½	5	8	1 15/16	1	2 ½	0.9411 - 1.0030	310.35	275.90	264.35	258.90	252.90	248.30
1 1/16	1.0625	44134	249.10	⅝	6	8	2 ⅛	1	2 ¾	1.0031 - 1.0660	317.90	283.45	271.85	266.40	260.45	255.85
1 ⅛	1.1250	44136	254.25	⅝	6	8	2 ⅛	1	2 ¾	1.0661 - 1.1280	323.10	288.60	277.10	271.60	265.70	260.95
1 3/16	1.1875	44138	258.50	⅝	6	8	2 ⅛	1 ⅛	2 ¾	1.1281 - 1.1905	327.40	292.80	281.25	275.85	269.90	265.20
1 ¼	1.2500	44140	275.40	⅝	6	8	2 ⅛	1 ⅛	2 ¾	1.1906 - 1.2530	344.25	309.75	298.20	292.70	286.85	282.15
1 5/16	1.3125	44142	279.70	¾	7	8	2 ¼	1 ⅛	3	1.2531 - 1.3155	348.55	314.00	302.50	297.00	291.10	286.40
1 ⅜	1.3750	44144	288.15	¾	7	8	2 ¼	1 ⅛	3	1.3156 - 1.3780	357.00	322.50	310.95	305.45	299.50	294.90
1 7/16	1.4375	44146	296.60	¾	7	8	2 ¼	1 ⅛	3	1.3781 - 1.4405	365.45	330.95	319.45	313.90	308.00	303.25
1 ½	1.5000	44148	309.30	¾	7	8	2 ¼	1 ⅛	3	1.4406 - 1.5030	378.20	343.65	332.15	326.70	320.70	316.10
1 9/16	1.5625	44150	358.15	¾	7	10	2 ¼	1 ⅛	3	1.5031 - 1.5660	430.05	394.05	381.95	376.25	370.15	365.20
1 ⅝	1.6250	44152	375.80	¾	7	10	2 ¼	1 ⅛	3	1.5661 - 1.6280	447.65	411.70	399.60	393.85	387.70	382.80
1 11/16	1.6875	44154	406.65	1	8	10	2 ¾	1 ⅛	3 ½	1.6281 - 1.6910	478.60	442.60	430.50	424.85	418.65	413.80
1 ¾	1.7500	44156	406.65	1	8	10	2 ¾	1 ⅛	3 ½	1.6911 - 1.7530	478.60	442.60	430.50	424.85	418.65	413.80
1 13/16	1.8125	44158	437.40	1	8	10	2 ¾	1 ⅛	3 ½	1.7531 - 1.8160	509.20	473.20	461.15	455.45	449.30	444.40
1 ⅞	1.8750	44160	437.40	1	8	10	2 ¾	1 ⅛	3 ½	1.8161 - 1.8780	509.20	473.20	461.15	455.45	449.30	444.40
1 15/16	1.9375	44162	468.70	1	8	10	2 ¾	1 ⅛	3 ½	1.8781 - 1.9410	540.55	504.50	492.50	486.70	480.55	475.70
2	2.0000	44164	468.70	1	8	10	2 ¾	1 ⅛	3 ½	1.9411 - 2.0030	540.55	504.50	492.50	486.70	480.55	475.70
2 1/16	2.0625	44166	504.00	1 ¼	9	12	2 ⅞	1 ⅛	3 ¾	2.0031 - 2.0660	575.85	539.85	527.75	522.05	515.95	511.05
2 ⅛	2.1250	44168	504.00	1 ¼	9	12	2 ⅞	1 ⅛	3 ¾	2.0661 - 2.1280	575.85	539.85	527.75	522.05	515.95	511.05
2 3/16	2.1875	44170	548.30	1 ¼	9	12	2 ⅞	1 ⅛	3 ¾	2.1281 - 2.1905	620.05	584.05	572.00	566.30	560.10	555.30
2 ¼	2.2500	44172	548.30	1 ¼	9	12	2 ⅞	1 ⅛	3 ¾	2.1906 - 2.2530	620.05	584.05	572.00	566.30	560.10	555.30
2 5/16	2.3125	44174	579.20	1 ¼	9	12	2 ⅞	1 ⅛	3 ¾	2.2531 - 2.3155	651.10	615.10	603.05	597.30	591.10	586.30
2 ⅜	2.3750	44176	579.20	1 ¼	9	12	2 ⅞	1 ⅛	3 ¾	2.3156 - 2.3780	651.10	615.10	603.05	597.30	591.10	586.30
2 7/16	2.4375	44178	610.15	1 ¼	9	12	2 ⅞	1 ⅛	3 ¾	2.3781 - 2.4405	682.00	645.95	634.00	628.15	622.05	617.15
2 ½	2.5000	44180	610.15	1 ¼	9	12	2 ⅞	1 ⅛	3 ¾	2.4406 - 2.5030	682.00	645.95	634.00	628.15	622.05	617.15
2 9/16	2.5625	44182	669.80	1 ½	10	14	3 ⅛	1 ⅛	4	2.5031 - 2.5660	741.60	705.65	693.55	687.90	681.70	676.85
2 ⅝	2.6250	44184	694.65	1 ½	10	14	3 ⅛	1 ⅛	4	2.5661 - 2.6280	766.55	730.50	718.50	712.75	706.60	701.70

*Quantities of 15 or more - price of fractional size in same size range.

SHELL REAMER ARBORS TYPE 481

ARBOR NO.	FITS REAMER TOOL DIAM.	OVERALL LENGTH	STRAIGHT SHANK			TAPER SHANK		
			SHANK DIAM.	TYPE 481 EDP NO.	PRICE	TAPER SHANK NO.	TYPE 481 EDP NO.	PRICE
4	0.7221 - 0.7840	9	.500	48104	$101.70	2	48114	$121.30
5	0.7841 - 1.0030	9 ½	.625	48105	113.45	2	48115	144.80
6	1.0031 - 1.2530	10	.750	48106	125.30	3	48116	156.55
7	1.2531 - 1.6280	11	.875	48107	137.00	3	48117	172.25
8	1.6281 - 2.0030	12	1.125	48108	152.65	4	48118	191.80
9	2.0031 - 2.5030	13	1.375	48109	183.95	4	48119	215.30
10	2.5031 - 3.0030	14	1.625	48110	239.15	5	48120	273.10

STRAIGHT SHANK

TAPER SHANK

Both types hardened and ground

CHUCKING REAMERS - FOR STEELS
CARBIDE TIPPED TYPE 480 METRIC

MATERIAL SPECIFIC

STRAIGHT FLUTE LONG CARBIDE
STRAIGHT SHANK

NOTE: Tool diameter in millimeters (mm); all other dimensions in inches. Also, modifications available (see list on page 74).

TOOL DIAMETER		TYPE 480 STEEL METRIC EDP NO.	METRIC PRICE	DIMENSIONS				FINISHED TO MODIFIED TOOL DIAMETER							
				MAX. SHANK DIAM.	NO. OF FLTS	LENGTH		MODIFIED DIAMETER RANGE (mm)	PRICE EACH - BASED ON QUANTITY ORDERED						
mm	INCH					FLUTE & CARBIDE	OVER-ALL		1	2	3	4	5-7	8-14	OVER 14
4.5	.1772	480045	$59.05	.1704	4	1 ⅛	4 ½	4.494 - 4.696	$83.35	$67.20	$61.85	$59.20	$56.50	$54.25	$51.15
5.0	.1969	480050	59.05	.1805	4	1 ⅛	4 ½	4.697 - 5.182	83.35	67.20	61.85	59.20	56.50	54.25	51.15
5.5	.2165	480055	59.05	.2075	4	1 ¼	5	5.183 - 5.613	83.35	67.20	61.85	59.20	56.50	54.25	51.15
6.0	.2362	480060	59.05	.2265	4	1 ½	6	5.614 - 6.045	83.35	67.20	61.85	59.20	56.50	54.25	51.15
-	-	480063	-	.2405	4	1 ½	6	6.046 - 6.426	83.35	67.20	61.85	59.20	56.50	54.25	51.15
6.5	.2559	480065	60.10	.2485	4	1 ½	6	6.427 - 7.214	84.45	68.25	62.85	60.20	57.60	55.30	52.20
7.0	.2756	480070	60.10	.2485	4	1 ½	6	-	-	-	-	-	-	-	-
7.5	.2953	480075	60.10	.2792	4	1 ½	6	7.215 - 8.001	84.45	68.25	62.85	60.20	57.60	55.30	52.20
8.0	.3150	480080	60.10	.2792	4	1 ½	6	-	-	-	-	-	-	-	-
8.5	.3346	480085	61.90	.2792	4	1 ½	6	8.002 - 8.814	86.30	70.05	64.65	62.05	59.30	57.10	53.95
9.0	.3543	480090	61.90	.3105	4	1 ¾	7	8.815 - 9.601	86.30	70.05	64.65	62.05	59.30	57.10	53.95
9.5	.3740	480095	61.90	.3105	4	1 ¾	7	-	-	-	-	-	-	-	-
10.0	.3937	480100	64.45	.3105	4	1 ¾	7	9.602 - 10.389	88.70	72.60	67.15	64.55	61.85	59.60	56.50
10.5	.4134	480105	72.95	.3730	6	1 ¾	7	10.390 - 11.201	97.25	81.15	75.75	73.10	70.40	68.10	65.00
11.0	.4331	480110	72.95	.3730	6	1 ¾	7	-	-	-	-	-	-	-	-
11.5	.4528	480115	73.55	.3730	6	1 ¾	7	11.202 - 11.989	97.90	81.65	76.35	73.65	70.95	68.75	65.60
12.0	.4724	480120	78.80	.4355	6	2	8	11.990 - 12.776	104.85	87.55	81.75	78.90	76.00	73.60	70.35
12.5	.4921	480125	78.80	.4355	6	2	8	-	-	-	-	-	-	-	-
13.0	.5118	480130	80.65	.4355	6	2	8	12.777 - 13.564	106.80	89.45	83.65	80.80	77.90	75.50	72.20
13.5	.5315	480135	80.65	.4355	6	2	8	-	-	-	-	-	-	-	-
14.0	.5512	480140	80.65	.4355	6	2	8	13.565 - 14.376	106.80	89.45	83.65	80.80	77.90	75.50	72.20
14.5	.5709	480145	83.30	.4355	6	2	8	14.377 - 15.164	109.35	92.10	86.35	83.50	80.55	78.10	74.80
15.0	.5906	480150	83.30	.4355	6	2	8	-	-	-	-	-	-	-	-
15.5	.6102	480155	83.30	.5615	6	2 ¼	9	15.165 - 15.951	109.35	92.10	86.35	83.50	80.55	78.10	74.80
16.0	.6299	480160	84.65	.5615	6	2 ¼	9	15.952 - 16.739	110.75	93.45	87.65	84.80	81.90	79.50	76.10
16.5	.6496	480165	84.65	.5615	6	2 ¼	9	-	-	-	-	-	-	-	-
17.0	.6693	480170	84.65	.5615	6	2 ¼	9	16.740 - 17.551	110.75	93.45	87.65	84.80	81.90	79.50	76.10
17.5	.6890	480175	84.65	.5615	6	2 ¼	9	-	-	-	-	-	-	-	-
18.0	.7087	480180	88.05	.5615	6	2 ¼	9	17.552 - 18.339	114.00	96.70	91.00	88.15	85.30	82.80	79.50
18.5	.7283	480185	88.05	.6245	6	2 ½	9 ½	18.340 - 19.126	114.00	96.70	91.00	88.15	85.30	82.80	79.50
19.0	.7480	480190	88.05	.6245	6	2 ½	9 ½	-	-	-	-	-	-	-	-
19.5	.7677	480195	90.60	.6245	6	2 ½	9 ½	19.127 - 19.914	116.70	99.40	93.55	90.75	87.80	85.45	82.15
20.0	.7874	480200	90.60	.6245	6	2 ½	9 ½	19.915 - 20.726	116.70	99.40	93.55	90.75	87.80	85.45	82.15
20.5	.8071	480205	90.60	.6245	6	2 ½	9 ½	-	-	-	-	-	-	-	-
21.0	.8268	480210	93.75	.6245	6	2 ½	9 ½	20.727 - 21.514	119.90	102.55	96.70	93.90	91.05	88.60	85.35
21.5	.8465	480215	93.75	.6245	6	2 ½	9 ½	-	-	-	-	-	-	-	-
22.0	.8661	480220	93.75	.7495	6	2 ⅝	10	21.515 - 22.301	119.90	102.55	96.70	93.90	91.05	88.60	85.35
22.5	.8858	480225	111.35	.7495	6	2 ⅝	10	22.302 - 23.089	138.40	120.45	114.50	111.50	108.45	106.00	102.50
23.0	.9055	480230	111.35	.7495	6	2 ⅝	10	-	-	-	-	-	-	-	-
23.5	.9252	480235	111.35	.7495	8	2 ⅝	10	23.090 - 23.901	138.40	120.45	114.50	111.50	108.45	106.00	102.50
24.0	.9449	480240	116.10	.7495	8	2 ⅝	10	23.902 - 24.689	143.20	125.30	119.25	116.30	113.25	110.80	107.25
24.5	.9646	480245	116.10	.7495	8	2 ⅝	10	-	-	-	-	-	-	-	-
25.0	.9843	480250	116.10	.8745	8	2 ¾	10 ½	24.690 - 25.476	143.20	125.30	119.25	116.30	113.25	110.80	107.25
25.5	1.0039	480255	119.20	.8745	8	2 ¾	10 ½	25.477 - 27.076	145.05	127.95	122.10	119.30	116.45	114.00	110.75
26.0	1.0236	480260	119.20	.8745	8	2 ¾	10 ½	-	-	-	-	-	-	-	-
27.0	1.0630	480270	119.20	.8745	8	2 ¾	10 ½	-	-	-	-	-	-	-	-
28.0	1.1024	480280	128.10	.8745	8	2 ⅞	11	27.077 - 28.651	154.00	136.90	131.05	128.20	125.40	122.95	119.65
29.0	1.1417	480290	139.25	.9995	8	2 ⅞	11	28.652 - 30.239	165.15	148.00	142.20	139.40	136.55	134.10	130.85
30.0	1.1811	480300	139.25	.9995	8	2 ⅞	11	-	-	-	-	-	-	-	-
31.0	1.2205	480310	153.85	.9995	8	3	11 ½	30.240 - 31.826	179.85	162.60	156.85	154.00	151.15	148.75	145.50
32.0	1.2598	480320	153.85	.9995	8	3	11 ½	31.827 - 33.414	179.85	162.60	156.85	154.00	151.15	148.75	145.50
33.0	1.2992	480330	153.85	.9995	8	3	11 ½	-	-	-	-	-	-	-	-
34.0	1.3386	480340	156.00	.9995	8	3 ¼	12	33.415 - 35.001	181.90	164.70	159.00	156.15	153.30	150.85	147.55
35.0	1.3780	480350	156.00	.9995	8	3 ¼	12	-	-	-	-	-	-	-	-
36.0	1.4173	480360	171.20	.9995	8	3 ¼	12	35.002 - 36.589	197.05	179.90	174.05	171.30	168.40	166.00	162.70
37.0	1.4567	480370	203.25	1.2495	8	3 ½	12 ½	36.590 - 38.176	229.10	211.95	206.15	203.35	200.45	198.10	194.80
38.0	1.4961	480380	203.25	1.2495	8	3 ½	12 ½	-	-	-	-	-	-	-	-

CHUCKING REAMERS - FOR STEELS CARBIDE TIPPED TYPE 480 FRACTIONAL

MATERIAL SPECIFIC

STRAIGHT FLUTE LONG CARBIDE STRAIGHT SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	457MS
	40	NON-FERROUS - SHORT CHIPS	457MS/458MS
	60	CAST IRONS	458MS
	80	LOW STRENGTH STEELS	480
	100	MEDIUM STRENGTH STEELS	480
	120	HIGH STRENGTH STEELS	480
	140	HIGH TEMPERATURE ALLOYS	459MS

TYPE 480 - FOR REAMING STEELS, TOUGH STEEL ALLOYS, & CAST STEELS

- Polished straight flutes with steel cutting grade flute long carbide
- Special steel cutting tool geometry:
  - Positive radial rake (behind center)
  - Narrow circular lands
  - Minimum back taper
- Detailed specifications on page 29
- See page 78 for other material specific reamers

MODIFICATIONS (Prompt delivery)

- Closer tool diameter tolerance - pg. 29
- Cutting diameter reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diameter back taper
- Shortened shank or reduced shank diameter
- Flat(s) or tang on shank
- Coatings available:

TITANIUM NITRIDE – TiN

TITANIUM CARBONITRIDE – TiCN

ZIRCONIUM NITRIDE – ZrN

AL TITANIUM NITRIDE – AlTiN

USE:

- This carbide tipped reamer design is based on our extensive development and design experience in manufacturing special reamers for reaming steel.
- Traditional steel reaming problems have been reduced by the following HANNIBAL features:
  1. Holds size longer because steel cutting grade carbide is utilized.
  2. Improved surface finish due to this reamer's reduced circular land minimizing possible material buildup that would reduce surface quality.
  3. Straighter holes due to longer flute length and reduced back taper.
  4. Flute long carbide allows for more regrinds.

NOTE: For smaller tool diameters, see solid carbide reamers on pages 58, 105-107.

TOOL DIAMETER		TYPE 480 STEEL EDP NO.	PRICE	DIMENSIONS				FINISHED TO MODIFIED TOOL DIAMETER						
				MAX. SHANK DIAM.	NO. OF FLTS	LENGTH		MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DECIMAL					FLUTE & CARBIDE	OVER-ALL		1	2	3	4	5-7	8-14*
3/16	.1875	48006	$48.35	.1805	4	1 1/8	4 1/2	0.1770 - 0.2040	$80.65	$64.50	$59.05	$56.50	$53.75	$51.50
13/64	.2031	4802031	48.35	.1805	4	1 1/8	4 1/2	-	-	-	-	-	-	-
7/32	.2188	48007	48.35	.2075	4	1 1/4	5	0.2041 - 0.2210	80.65	64.50	59.05	56.50	53.75	51.50
15/64	.2344	4802344	48.35	.2265	4	1 1/2	6	0.2211 - 0.2380	80.65	64.50	59.05	56.50	53.75	51.50
1/4	.2500	48008	48.35	.2405	4	1 1/2	6	0.2381 - 0.2530	80.65	64.50	59.05	56.50	53.75	51.50
17/64	.2656	4802656	49.40	.2485	4	1 1/2	6	-	-	-	-	-	-	-
9/32	.2812	48009	49.40	.2485	4	1 1/2	6	0.2531 - 0.2840	81.65	65.55	60.10	57.60	54.75	52.65
19/64	.2969	4802969	49.40	.2792	4	1 1/2	6	-	-	-	-	-	-	-
5/16	.3125	48010	49.40	.2792	4	1 1/2	6	0.2841 - 0.3150	81.65	65.55	60.10	57.60	54.75	52.65
21/64	.3281	4803281	51.20	.2792	4	1 1/2	6	-	-	-	-	-	-	-
11/32	.3438	48011	51.20	.2792	4	1 1/2	6	0.3151 - 0.3470	83.55	67.25	61.90	59.30	56.60	54.40
23/64	.3594	4803594	51.20	.3105	4	1 3/4	7	-	-	-	-	-	-	-
3/8	.3750	48012	51.20	.3105	4	1 3/4	7	0.3471 - 0.3780	83.55	67.25	61.90	59.30	56.60	54.40
25/64	.3906	4803906	53.75	.3105	4	1 3/4	7	-	-	-	-	-	-	-
13/32	.4062	48013	53.75	.3105	4	1 3/4	7	0.3781 - 0.4090	85.95	69.85	64.45	61.85	59.05	56.85
27/64	.4219	4804219	62.20	.3730	6	1 3/4	7	-	-	-	-	-	-	-
7/16	.4375	48014	62.20	.3730	6	1 3/4	7	0.4091 - 0.4410	94.55	78.35	72.95	70.40	67.65	65.45
29/64	.4531	4804531	62.80	.3730	6	1 3/4	7	-	-	-	-	-	-	-
15/32	.4688	48015	62.80	.3730	6	1 3/4	7	0.4411 - 0.4720	95.20	78.90	73.55	70.95	68.15	66.00
31/64	.4844	4804844	67.25	.4355	6	2	8	-	-	-	-	-	-	-
1/2	.5000	48016	67.25	.4355	6	2	8	0.4721 - 0.5030	101.95	84.60	78.80	76.00	73.05	70.75
33/64	.5156	4805156	69.20	.4355	6	2	8	-	-	-	-	-	-	-
17/32	.5312	48017	69.20	.4355	6	2	8	0.5031 - 0.5340	103.85	86.50	80.65	77.90	74.95	72.60
35/64	.5469	4805469	69.20	.4355	6	2	8	-	-	-	-	-	-	-
9/16	.5625	48018	69.20	.4355	6	2	8	0.5341 - 0.5660	103.85	86.50	80.65	77.90	74.95	72.60
37/64	.5781	4805781	71.85	.4355	6	2	8	-	-	-	-	-	-	-
19/32	.5938	48019	71.85	.4355	6	2	8	0.5661 - 0.5970	106.50	89.15	83.30	80.55	77.60	75.30
39/64	.6094	4806094	71.85	.5615	6	2 1/4	9	-	-	-	-	-	-	-

CONTINUED ON NEXT PAGE

*Quantities of 15 or more - price of fractional size in same size range.

CONTINUED FROM PAGE 74 - TYPE 480 FRACTIONAL

TOOL DIAMETER FRAC.	TOOL DIAMETER DECIMAL	TYPE 480 STEEL EDP NO.	PRICE	DIMENSIONS MAX. SHANK DIAM.	NO. OF FLTS	LENGTH FLUTE & CARBIDE	LENGTH OVER-ALL	FINISHED TO MODIFIED TOOL DIAMETER MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED 1	2	3	4	5-7	8-14*
5/8	.6250	48020	$71.85	.5615	6	2 1/4	9	0.5971 - 0.6280	$106.50	$89.15	$83.30	$80.55	$77.60	$75.30
41/64	.6406	4806406	73.20	.5615	6	2 1/4	9	-	-	-	-	-	-	-
21/32	.6562	48021	73.20	.5615	6	2 1/4	9	0.6281 - 0.6590	107.85	90.45	84.65	81.90	78.90	76.60
43/64	.6719	4806719	73.20	.5615	6	2 1/4	9	-	-	-	-	-	-	-
11/16	.6875	48022	73.20	.5615	6	2 1/4	9	0.6591 - 0.6910	107.85	90.45	84.65	81.90	78.90	76.60
45/64	.7031	4807031	76.55	.5615	6	2 1/4	9	-	-	-	-	-	-	-
23/32	.7188	48023	76.55	.5615	6	2 1/4	9	0.6911 - 0.7220	111.15	93.75	88.05	85.30	82.25	79.90
47/64	.7344	4807344	76.55	.6245	6	2 1/2	9 1/2	-	-	-	-	-	-	-
3/4	.7500	48024	76.55	.6245	6	2 1/2	9 1/2	0.7221 - 0.7530	111.15	93.75	88.05	85.30	82.25	79.90
49/64	.7656	4807656	79.20	.6245	6	2 1/2	9 1/2	-	-	-	-	-	-	-
25/32	.7812	48025	79.20	.6245	6	2 1/2	9 1/2	0.7531 - 0.7840	113.75	96.40	90.60	87.80	84.85	82.50
51/64	.7969	4807969	79.20	.6245	6	2 1/2	9 1/2	-	-	-	-	-	-	-
13/16	.8125	48026	79.20	.6245	6	2 1/2	9 1/2	0.7841 - 0.8160	113.75	96.40	90.60	87.80	84.85	82.50
53/64	.8281	4808281	82.35	.6245	6	2 1/2	9 1/2	-	-	-	-	-	-	-
27/32	.8438	48027	82.35	.6245	6	2 1/2	9 1/2	0.8161 - 0.8470	116.90	99.55	93.75	91.05	88.10	85.70
55/64	.8594	4808594	82.35	.7495	6	2 5/8	10	-	-	-	-	-	-	-
7/8	.8750	48028	85.50	.7495	6	2 5/8	10	0.8471 - 0.8780	121.30	103.35	97.30	94.45	91.35	88.95
57/64	.8906	4808906	99.50	.7495	6	2 5/8	10	-	-	-	-	-	-	-
29/32	.9062	48029	99.50	.7495	6	2 5/8	10	0.8781 - 0.9090	135.40	117.45	111.35	108.45	105.40	102.95
59/64	.9219	4809219	99.50	.7495	8	2 5/8	10	-	-	-	-	-	-	-
15/16	.9375	48030	99.50	.7495	8	2 5/8	10	0.9091 - 0.9410	135.40	117.45	111.35	108.45	105.40	102.95
61/64	.9531	4809531	104.25	.7495	8	2 5/8	10	-	-	-	-	-	-	-
31/32	.9688	48031	104.25	.7495	8	2 5/8	10	0.9411 - 0.9720	140.20	122.20	116.10	113.25	110.20	107.75
63/64	.9844	4809844	104.25	.8745	8	2 3/4	10 1/2	-	-	-	-	-	-	-
1	1.0000	48032	104.25	.8745	8	2 3/4	10 1/2	0.9721 - 1.0030	140.20	122.20	116.10	113.25	110.20	107.75
1 1/16	1.0625	48034	107.80	.8745	8	2 3/4	10 1/2	1.0031 - 1.0660	142.20	124.90	119.20	116.45	113.45	111.20
1 1/8	1.1250	48036	116.75	.8745	8	2 7/8	11	1.0661 - 1.1280	151.15	133.90	128.10	125.40	122.45	120.10
1 3/16	1.1875	48038	127.85	.9995	8	2 7/8	11	1.1281 - 1.1905	162.30	145.00	139.25	136.55	133.55	131.25
1 1/4	1.2500	48040	142.50	.9995	8	3	11 1/2	1.1906 - 1.2530	176.90	159.65	153.85	151.15	148.20	145.85
1 5/16	1.3125	48042	142.50	.9995	8	3	11 1/2	1.2531 - 1.3155	176.90	159.65	153.85	151.15	148.20	145.85
1 3/8	1.3750	48044	144.60	.9995	8	3 1/4	12	1.3156 - 1.3780	179.00	161.75	156.00	153.30	150.25	148.00
1 7/16	1.4375	48046	159.75	.9995	8	3 1/4	12	1.3781 - 1.4405	194.15	176.90	171.20	168.40	165.40	163.20
1 1/2	1.5000	48048	191.80	1.2495	8	3 1/2	12 1/2	1.4406 - 1.5030	226.25	209.00	203.25	200.45	197.60	195.20

*Quantities of 15 or more - price of fractional size in same size range.

OVER & UNDER SIZE REAMERS CARBIDE TIPPED - FOR STEELS

MATERIAL SPECIFIC

TYPE 488 - STRAIGHT FLUTES & SHANK

- Tool diameter tolerance: plus .0002", minus .0000"
- Same specifications & available modifications as Type 480 (page 74)

USE:

- These precision ground carbide tipped reamers are very convenient for finishing accurate holes in steels, tough steel alloys and cast steels

DECIMAL TOOL DIAMETER	TYPE 488 STEEL EDP NO.	PRICE	DIMENSIONS MAX. SHANK DIAM.	NO. OF FLUTES	LENGTH FLUTE & CARBIDE	LENGTH OVER-ALL
.1865	48818	$60.40	.1805	4	1 1/8	4 1/2
.1885	48819	60.40	.1805	4	1 1/8	4 1/2
.2490	48824	60.40	.2405	4	1 1/2	6
.2510	48825	60.40	.2405	4	1 1/2	6
.3115	48831	61.55	.2792	4	1 1/2	6
.3135	48832	61.55	.2792	4	1 1/2	6
.3740	48837	63.30	.3105	4	1 3/4	7
.3760	48838	63.30	.3105	4	1 3/4	7
.4365	48843	74.35	.3730	6	1 3/4	7
.4385	48844	74.35	.3730	6	1 3/4	7
.4990	48849	80.30	.4355	6	2	8
.5010	48850	80.30	.4355	6	2	8
	48800	$760.65 - CASED SET OF ABOVE 12 REAMERS				

DOWEL PIN SIZE REAMERS CARBIDE TIPPED - FOR STEELS

MATERIAL SPECIFIC

TYPE 486 - STRAIGHT FLUTES & SHANK

- Special plus .0000", minus .0002" tool diameter tolerance
- Same specifications & available modifications as Type 480 (page 74)

USE:

- These precision ground reamers should be used in pairs, .0005" and .0020" under the dowel pin diameter. The .0020" smaller holes assure a tighter dowel pin fit, so all the pins will remain on the same side upon disassembly. Especially useful in plastic or die cast molds and machines when assembled sections are subject to shearing stress, yet require occasional disassembly.

DECIMAL TOOL DIAMETER	TYPE 486 STEEL EDP NO.	PRICE	DIMENSIONS MAX. SHANK DIAM.	NO. OF FLUTES	LENGTH FLUTE & CARBIDE	LENGTH OVER-ALL
.1855	48617	$60.40	.1805	4	1 1/8	4 1/2
.1870	48618	60.40	.1805	4	1 1/8	4 1/2
.2480	48623	60.40	.2405	4	1 1/2	6
.2495	48624	60.40	.2405	4	1 1/2	6
.3105	48630	61.55	.2792	4	1 1/2	6
.3120	48631	61.55	.2792	4	1 1/2	6
.3730	48636	63.30	.3105	4	1 3/4	7
.3745	48637	63.30	.3105	4	1 3/4	7
.4355	48642	74.35	.3730	6	1 3/4	7
.4370	48643	74.35	.3730	6	1 3/4	7
.4980	48648	80.30	.4355	6	2	8
.4995	48649	80.30	.4355	6	2	8
	48600	$760.65 - CASED SET OF ABOVE 12 REAMERS				

MATERIAL SPECIFIC REAMERS
CARBIDE TIPPED TYPES 407, 408, 409 FRACTIONAL

STRAIGHT FLUTES
STRAIGHT SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	407
	40	NON-FERROUS - SHORT CHIPS	407/408
	60	CAST IRONS	408
	80	LOW STRENGTH STEELS	409/408
	100	MEDIUM STRENGTH STEELS	409
	120	HIGH STRENGTH STEELS	409
	140	HIGH TEMPERATURE ALLOYS	409

NATIONAL AEROSPACE STANDARDS - NAS 897
TYPE 407 - FOR NON-FERROUS MATERIALS
TYPE 408 - FOR CAST IRONS & NAS MULTI-PURPOSE
TYPE 409 - FOR STEELS & HIGH TEMP ALLOYS

- Type "C" with short carbide tip
- Straight polished flutes and straight shank
- Tool geometry and carbide grade appropriate for material being machined
- Detailed specifications on page 29

For shallow holes only (see page 27)
NOTE: For smaller tool diameters, see solid carbide reamers on pages 58, & 105-107.

MODIFICATIONS (Prompt delivery)

- Closer tool diameter tolerance - pg. 29
- Cutting diameter reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diameter back taper
- Shortened shank or reduced shank diameter
- Flat(s) or tang on shank
- Coatings available: See page 81

TOOL DIAMETER		TYPE 407 NON-FERROUS EDP NO.	TYPE 408 NAS/ CAST IRON EDP NO.	TYPE 409 STEEL/ HI-TEMP EDP NO.	ALL TYPES PRICE	DIMENSIONS					FINISHED TO MODIFIED TOOL DIAMETER						
						MAX SHANK DIAM.	NO. OF FLTS	LENGTH			MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DEC.							FLT	CAR-BIDE	OVER-ALL		1	2	3	4	5-7	8-14*
5/32	.1562	40705	40805	40905	$44.10	.1510	4	1	½	4	0.1560-0.1769	$76.45	$60.15	$54.75	$52.20	$49.40	$47.20
3/16	.1875	40706	40806	40906	40.45	.1805	4	1 ⅛	½	4 ½	0.1770-0.2040	71.90	56.15	50.90	48.35	45.65	43.50
7/32	.2188	40707	40807	40907	40.45	.2075	4	1 ¼	½	5	0.2041-0.2210	71.90	56.15	50.90	48.35	45.65	43.50
15/64	.2344	4072344	4082344	4092344	42.95	.2265	4	1 ½	½	6	0.2211-0.2380	74.35	58.60	53.30	50.85	48.05	45.95
¼	.2500	40708	40808	40908	40.70	.2405	4	1 ½	½	6	0.2381-0.2530	72.15	56.40	51.15	48.60	45.90	43.80
9/32	.2812	40709	40809	40909	41.50	.2485	4	1 ½	½	6	0.2531-0.2840	73.00	57.20	52.00	49.40	46.75	44.55
5/16	.3125	40710	40810	40910	41.50	.2792	4	1 ½	½	6	0.2841-0.3150	73.00	57.20	52.00	49.40	46.75	44.55
5/16	.3125	40790	40890	40990	45.65	.2792	6	1 ½	½	6	0.2841-0.3150	77.05	61.30	56.00	53.55	50.90	48.75
11/32	.3438	40711	40811	40911	43.10	.2792	4	1 ½	⅝	6	0.3151-0.3470	74.50	58.80	53.50	51.00	48.30	46.20
11/32	.3438	40791	40891	40991	47.30	.2792	6	1 ½	⅝	6	0.3151-0.3470	78.75	63.00	57.75	55.25	52.50	50.40
3/8	.3750	40712	40812	40912	39.55	.3105	4	1 ¾	⅝	7	0.3471-0.3780	68.35	53.90	49.10	46.80	44.30	42.35
3/8	.3750	40792	40892	40992	43.40	.3105	6	1 ¾	⅝	7	0.3471-0.3780	72.25	57.80	53.00	50.70	48.20	46.25
13/32	.4062	40713	40813	40913	45.15	.3105	4	1 ¾	⅝	7	0.3781-0.4090	76.60	60.85	55.60	53.05	50.30	48.25
13/32	.4062	40793	40893	40993	48.10	.3105	6	1 ¾	⅝	7	0.3781-0.4090	79.60	63.80	58.60	56.00	53.35	51.25
7/16	.4375	40714	40814	40914	48.10	.3730	6	1 ¾	⅝	7	0.4091-0.4410	79.60	63.80	58.60	56.00	53.35	51.25
15/32	.4688	40715	40815	40915	48.85	.3730	6	1 ¾	⅝	7	0.4411-0.4720	80.30	64.55	59.25	56.75	54.10	52.00
½	.5000	40716	40816	40916	57.75	.4355	6	2	⅝	8	0.4721-0.5030	92.40	75.00	69.20	66.50	63.50	61.15
17/32	.5312	40717	40817	40917	62.85	.4355	6	2	⅝	8	0.5031-0.5340	97.45	80.10	74.35	71.55	68.65	66.25
9/16	.5625	40718	40818	40918	62.85	.4355	6	2	⅝	8	0.5341-0.5660	97.45	80.10	74.35	71.55	68.65	66.25
19/32	.5938	40719	40819	40919	65.45	.4355	6	2	⅝	8	0.5661-0.5970	100.05	82.70	76.85	74.10	71.15	68.80
⅝	.6250	40720	40820	40920	65.45	.5615	6	2 ¼	⅝	9	0.5971-0.6280	100.05	82.70	76.85	74.10	71.15	68.80
21/32	.6562	40721	40821	40921	66.55	.5615	6	2 ¼	⅝	9	0.6281-0.6590	101.20	83.80	77.95	75.30	72.25	69.95
11/16	.6875	40722	40822	40922	66.55	.5615	6	2 ¼	⅝	9	0.6591-0.6910	101.20	83.80	77.95	75.30	72.25	69.95
23/32	.7188	40723	40823	40923	69.70	.5615	6	2 ¼	⅝	9	0.6911-0.7220	104.30	86.90	81.15	78.35	75.40	73.05
¾	.7500	40724	40824	40924	69.70	.6245	6	2 ½	¾	9 ½	0.7221-0.7530	104.30	86.90	81.15	78.35	75.40	73.05
25/32	.7812	40725	40825	40925	71.90	.6245	6	2 ½	¾	9 ½	0.7531-0.7840	106.55	89.20	83.40	80.60	77.65	75.35
13/16	.8125	40726	40826	40926	71.90	.6245	6	2 ½	¾	9 ½	0.7841-0.8160	106.55	89.20	83.40	80.60	77.65	75.35
27/32	.8438	40727	40827	40927	74.80	.6245	6	2 ½	¾	9 ½	0.8161-0.8470	109.40	92.10	86.35	83.55	80.55	78.25
⅞	.8750	40728	40828	40928	77.65	.7495	6	2 ⅝	¾	10	0.8471-0.8780	113.55	95.55	89.50	86.70	83.65	81.20
29/32	.9062	40729	40829	40929	90.40	.7495	6	2 ⅝	¾	10	0.8781-0.9090	126.35	108.35	102.35	99.50	96.35	93.90
15/16	.9375	40730	40830	40930	90.40	.7495	8	2 ⅝	¾	10	0.9091-0.9410	126.35	108.35	102.35	99.50	96.35	93.90
31/32	.9688	40731	40831	40931	94.70	.7495	8	2 ⅝	¾	10	0.9411-0.9720	130.60	112.60	106.60	103.65	100.60	98.15
1	1.0000	40732	40832	40932	94.70	.8745	8	2 ¾	¾	10 ½	0.9721-1.0030	130.60	112.60	106.60	103.65	100.60	98.15
1 1/16	1.0625	40734	40834	40934	98.05	.8745	8	2 ¾	¾	10 ½	1.0031-1.0660	132.45	115.30	109.45	106.70	103.70	101.45
1 ⅛	1.1250	40736	40836	40936	106.00	.8745	8	2 ⅞	⅞	11	1.0661-1.1280	140.40	123.15	117.45	114.65	111.70	109.40
1 3/16	1.1875	40738	40838	40938	111.40	.9995	8	2 ⅞	⅞	11	1.1281-1.1905	145.85	128.65	122.85	120.10	117.15	114.85
1 ¼	1.2500	40740	40840	40940	117.75	.9995	8	3	⅞	11 ½	1.1906-1.2530	152.20	135.00	129.15	126.45	123.50	121.15
1 5/16	1.3125	40742	40842	40942	123.95	.9995	8	3	⅞	11 ½	1.2531-1.3155	158.40	141.20	135.35	132.65	129.65	127.30
1 ⅜	1.3750	40744	40844	40944	131.50	.9995	8	3 ¼	⅞	12	1.3156-1.3780	165.95	148.70	142.85	140.20	137.15	134.85
1 7/16	1.4375	40746	40846	40946	146.55	.9995	8	3 ¼	⅞	12	1.3781-1.4405	181.05	163.70	158.00	155.30	152.25	150.00
1 ½	1.5000	40748	40848	40948	154.90	1.2495	8	3 ½	⅞	12 ½	1.4406-1.5030	189.35	172.15	166.30	163.60	160.60	158.30

*Quantities of 15 or more - price of fractional size in same size range.

MATERIAL SPECIFIC REAMERS
CARBIDE TIPPED TYPES 407, 408, 409 METRIC

STRAIGHT FLUTES
STRAIGHT SHANK

For shallow holes only (see page 27)

NOTE: Tool diameter in millimeters (mm); all other dimensions in inches. Also, modifications available (see list on page 76).

TOOL DIAMETER		TYPE 407 NON FERROUS METRIC EDP NO.	TYPE 408 NAS/ CAST IRON METRIC EDP NO.	TYPE 409 STEEL/ HI-TEMP METRIC EDP NO.	ALL TYPES METRIC PRICE	DIMENSIONS					FINISHED TO MODIFIED TOOL DIAMETER							
						MAX. SHANK DIAM.	NO. OF FLTS	LENGTH			MODIFIED DIAMETER RANGE (mm)	PRICE EACH - BASED ON QUANTITY ORDERED						
mm	INCH							FLT	CAR-BIDE	OVER-ALL		1	2	3	4	5-7	8-14	OVER 14
4.0	.1575	407040	408040	409040	$54.75	.1510	4	1	½	4	3.962-4.493	$79.10	$62.95	$57.60	$54.90	$52.20	$50.00	$46.85
4.5	.1772	407045	408045	409045	50.90	.1704	4	1 ⅛	½	4 ½	4.494-4.696	74.50	58.85	53.55	51.00	48.35	46.20	43.15
5.0	.1969	407050	408050	409050	50.90	.1805	4	1 ⅛	½	4 ½	4.697-5.182	74.50	58.85	53.55	51.00	48.35	46.20	43.15
5.5	.2165	407055	408055	409055	50.90	.2075	4	1 ¼	½	5	5.183-5.613	74.50	58.85	53.55	51.00	48.35	46.20	43.15
6.0	.2362	407060	408060	409060	53.30	.2265	4	1 ½	½	6	5.614-6.045	76.95	61.25	55.95	53.40	50.85	48.60	45.60
-	-	407063	408063	409063	-	.2405	4	1 ½	½	6	6.046-6.426	74.80	59.10	53.80	51.25	48.60	46.45	43.40
6.5	.2559	407065	408065	409065	52.00	.2485	4	1 ½	½	6	6.427-7.214	75.65	59.95	54.65	52.10	49.40	47.20	44.25
7.0	.2756	407070	408070	409070	52.00	.2485	4	1 ½	½	6	-	-	-	-	-	-	-	-
7.5	.2953	407075	408075	409075	52.00	.2792	4	1 ½	½	6	7.215-8.001	75.65	59.95	54.65	52.10	49.40	47.20	44.25
7.5	.2953	407078	408078	409078	56.00	.2792	6	1 ½	½	6	7.215-8.001	79.75	64.10	58.80	56.20	53.55	51.35	48.35
8.0	.3150	407080	408080	409080	52.00	.2792	4	1 ½	½	6	-	-	-	-	-	-	-	-
8.0	.3150	407083	408083	409083	56.00	.2792	6	1 ½	½	6	-	-	-	-	-	-	-	-
8.5	.3346	407085	408085	409085	53.50	.2792	4	1 ½	⅝	6	8.002-8.814	77.10	61.50	56.20	53.65	51.00	48.80	45.80
8.5	.3346	407088	408088	409088	57.75	.2792	6	1 ½	⅝	6	8.002-8.814	81.40	65.70	60.40	57.90	55.25	53.05	50.05
9.0	.3543	407090	408090	409090	49.10	.3105	4	1 ¾	⅝	7	8.815-9.601	70.80	56.40	51.50	49.20	46.80	44.80	42.05
9.0	.3543	407093	408093	409093	53.00	.3105	6	1 ¾	⅝	7	8.815-9.601	74.70	60.25	55.45	53.10	50.70	48.65	45.90
9.5	.3740	407095	408095	409095	49.10	.3105	4	1 ¾	⅝	7	-	-	-	-	-	-	-	-
9.5	.3740	407098	408098	409098	53.00	.3105	6	1 ¾	⅝	7	-	-	-	-	-	-	-	-
10.0	.3937	407100	408100	409100	55.60	.3105	4	1 ¾	⅝	7	9.602-10.389	79.25	63.55	58.25	55.70	53.05	50.90	47.85
10.0	.3937	407103	408103	409103	58.60	.3105	6	1 ¾	⅝	7	9.602-10.389	82.25	66.55	61.25	58.70	56.00	53.85	50.90
10.5	.4134	407105	408105	409105	58.60	.3730	6	1 ¾	⅝	7	10.390-11.201	82.25	66.55	61.25	58.70	56.00	53.85	50.90
11.0	.4331	407110	408110	409110	58.60	.3730	6	1 ¾	⅝	7	-	-	-	-	-	-	-	-
11.5	.4528	407115	408115	409115	59.25	.3730	6	1 ¾	⅝	7	11.202-11.989	82.90	67.20	62.00	59.35	56.75	54.55	51.50
12.0	.4724	407120	408120	409120	69.20	.4355	6	2	⅝	8	11.990-12.776	95.30	77.95	72.20	69.40	66.50	64.10	60.80
12.5	.4921	407125	408125	409125	69.20	.4355	6	2	⅝	8	-	-	-	-	-	-	-	-
13.0	.5118	407130	408130	409130	74.35	.4355	6	2	⅝	8	12.777-13.564	100.40	83.15	77.25	74.45	71.55	69.10	65.85
13.5	.5315	407135	408135	409135	74.35	.4355	6	2	⅝	8	-	-	-	-	-	-	-	-
14.0	.5512	407140	408140	409140	74.35	.4355	6	2	⅝	8	13.565-14.376	100.40	83.15	77.25	74.45	71.55	69.10	65.85
14.5	.5709	407145	408145	409145	76.85	.4355	6	2	⅝	8	14.377-15.164	102.95	85.65	79.85	77.00	74.10	71.70	68.35
15.0	.5906	407150	408150	409150	76.85	.4355	6	2	⅝	8	-	-	-	-	-	-	-	-
15.5	.6102	407155	408155	409155	76.85	.5615	6	2 ¼	⅝	9	15.165-15.951	102.95	85.65	79.85	77.00	74.10	71.70	68.35
16.0	.6299	407160	408160	409160	77.95	.5615	6	2 ¼	⅝	9	15.952-16.739	104.10	86.75	81.00	78.10	75.30	72.80	69.50
16.5	.6496	407165	408165	409165	77.95	.5615	6	2 ¼	⅝	9	-	-	-	-	-	-	-	-
17.0	.6693	407170	408170	409170	77.95	.5615	6	2 ¼	⅝	9	16.740-17.551	104.10	86.75	81.00	78.10	75.30	72.80	69.50
17.5	.6890	407175	408175	409175	77.95	.5615	6	2 ¼	⅝	9	-	-	-	-	-	-	-	-
18.0	.7087	407180	408180	409180	81.15	.5615	6	2 ¼	⅝	9	17.552-18.339	107.15	89.90	84.15	81.30	78.35	75.95	72.60
19.0	.7480	407190	408190	409190	81.15	.6245	6	2 ½	¾	9 ½	18.340-19.126	107.15	89.90	84.15	81.30	78.35	75.95	72.60
19.5	.7677	407195	408195	409195	83.40	.6245	6	2 ½	¾	9 ½	19.127-19.914	109.40	92.15	86.40	83.55	80.60	78.25	74.90
20.0	.7874	407200	408200	409200	83.40	.6245	6	2 ½	¾	9 ½	19.915-20.726	109.40	92.15	86.40	83.55	80.60	78.25	74.90
21.0	.8268	407210	408210	409210	86.35	.6245	6	2 ½	¾	9 ½	20.727-21.514	112.30	95.10	89.25	86.45	83.55	81.15	77.80
22.0	.8661	407220	408220	409220	86.35	.7495	6	2 ⅝	¾	10	21.515-22.301	112.30	95.10	89.25	86.45	83.55	81.15	77.80
23.0	.9055	407230	408230	409230	102.35	.7495	6	2 ⅝	¾	10	22.302-23.089	129.30	111.40	105.40	102.45	99.50	96.95	93.55
23.5	.9252	407235	408235	409235	102.35	.7495	8	2 ⅝	¾	10	23.090-23.901	129.30	111.40	105.40	102.45	99.50	96.95	93.55
24.0	.9449	407240	408240	409240	106.60	.7495	8	2 ⅝	¾	10	23.902-24.689	133.60	115.70	109.70	106.75	103.65	101.25	97.80
25.0	.9843	407250	408250	409250	106.60	.8745	8	2 ¾	¾	10 ½	24.690-25.476	133.60	115.70	109.70	106.75	103.65	101.25	97.80
26.0	1.0236	407260	408260	409260	109.45	.8745	8	2 ¾	¾	10 ½	25.477-27.076	135.35	118.20	112.45	109.60	106.70	104.30	101.00
27.0	1.0630	407270	408270	409270	109.45	.8745	8	2 ¾	¾	10 ½	-	-	-	-	-	-	-	-
28.0	1.1024	407280	408280	409280	117.45	.8745	8	2 ⅞	⅞	11	27.077-28.651	143.30	126.15	120.35	117.55	114.65	112.25	108.95
29.0	1.1417	407290	408290	409290	122.85	.9995	8	2 ⅞	⅞	11	28.652-30.239	148.75	131.55	125.75	122.95	120.10	117.70	114.45
30.0	1.1811	407300	408300	409300	122.85	.9995	8	2 ⅞	⅞	11	-	-	-	-	-	-	-	-
31.0	1.2205	407310	408310	409310	129.15	.9995	8	3	⅞	11 ½	30.240-31.826	155.00	137.90	132.20	129.30	126.45	124.00	120.70
32.0	1.2598	407320	408320	409320	135.35	.9995	8	3	⅞	11 ½	31.827-33.414	161.30	144.05	138.35	135.50	132.65	130.25	126.90
33.0	1.2992	407330	408330	409330	135.35	.9995	8	3	⅞	11 ½	-	-	-	-	-	-	-	-
34.0	1.3386	407340	408340	409340	142.85	.9995	8	3 ¼	⅞	12	33.415-35.001	168.85	151.65	145.85	143.10	140.20	137.80	134.45
35.0	1.3780	407350	408350	409350	142.85	.9995	8	3 ¼	⅞	12	-	-	-	-	-	-	-	-
36.0	1.4173	407360	408360	409360	158.00	.9995	8	3 ¼	⅞	12	35.002-36.589	183.85	166.70	160.95	158.10	155.30	152.85	149.50
37.0	1.4567	407370	408370	409370	166.30	1.2495	8	3 ½	⅞	12 ½	36.590-38.176	192.30	175.05	169.35	166.55	163.60	161.25	157.90

MATERIAL SPECIFIC REAMERS
CARBIDE TIPPED TYPES 457, 458, 459 FRACTIONAL

STRAIGHT FLUTE LONG CARBIDE STRAIGHT SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	457
	40	NON-FERROUS - SHORT CHIPS	457/458
	60	CAST IRONS	458
	80	LOW STRENGTH STEELS	459/458
	100	MEDIUM STRENGTH STEELS	459
	120	HIGH STRENGTH STEELS	459
	140	HIGH TEMPERATURE ALLOYS	459

NATIONAL AEROSPACE STANDARDS - NAS 897
TYPE 457 - FOR NON-FERROUS MATERIALS
TYPE 458 - FOR CAST IRONS & NAS MULTI-PURPOSE
TYPE 459 - FOR STEELS & HIGH TEMP ALLOYS

- Type "C" with flute long carbide
- Straight polished flutes and straight shank
- Longer flutes than Type 450 on .5971" tool diameter and larger for straight deep holes
- Tool geometry and carbide grade appropriate for material being machined
- Detailed specifications on page 29

NOTE: For step reamers, see page 98. For smaller tool diameters, see solid carbide reamers on pages 58, 105-107.

MODIFICATIONS (See list on page 76; modified metric tool diameters priced on page 79)

TOOL DIAMETER		TYPE 457 NON-FERROUS EDP NO.	TYPE 458 NAS/ CAST IRON EDP NO.	TYPE 459 STEEL/ HI-TEMP EDP NO.	ALL TYPES PRICE	DIMENSIONS				FINISHED TO MODIFIED TOOL DIAMETER						
						MAX. SHANK DIAM.	NO. OF FLTS	LENGTH		MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DEC.							FLUTE & CARBIDE	OVER-ALL		1	2	3	4	5-7	8-14*
3/16	.1875	45706	45806	45906	$48.35	.1805	4	1 1/8	4 1/2	0.1770 - 0.2040	$80.65	$64.50	$59.05	$56.50	$53.75	$51.50
7/32	.2188	45707	45807	45907	48.35	.2075	4	1 1/4	5	0.2041 - 0.2210	80.65	64.50	59.05	56.50	53.75	51.50
15/64	.2344	4572344	4582344	4592344	48.35	.2265	4	1 1/2	6	0.2211 - 0.2380	80.65	64.50	59.05	56.50	53.75	51.50
1/4	.2500	45708	45808	45908	48.35	.2405	4	1 1/2	6	0.2381 - 0.2530	80.65	64.50	59.05	56.50	53.75	51.50
9/32	.2812	45709	45809	45909	49.40	.2485	4	1 1/2	6	0.2531 - 0.2840	81.65	65.55	60.10	57.60	54.75	52.65
5/16	.3125	45710	45810	45910	49.40	.2792	4	1 1/2	6	0.2841 - 0.3150	81.65	65.55	60.10	57.60	54.75	52.65
11/32	.3438	45711	45811	45911	51.20	.2792	4	1 1/2	6	0.3151 - 0.3470	83.55	67.25	61.90	59.30	56.60	54.40
3/8	.3750	45712	45812	45912	51.20	.3105	4	1 3/4	7	0.3471 - 0.3780	83.55	67.25	61.90	59.30	56.60	54.40
13/32	.4062	45713	45813	45913	53.75	.3105	4	1 3/4	7	0.3781 - 0.4090	85.95	69.85	64.45	61.85	59.05	56.85
7/16	.4375	45714	45814	45914	58.15	.3730	6	1 3/4	7	0.4091 - 0.4410	90.40	74.30	68.85	66.25	63.50	61.25
15/32	.4688	45715	45815	45915	62.80	.3730	6	1 3/4	7	0.4411 - 0.4720	95.20	78.90	73.55	70.95	68.15	66.00
1/2	.5000	45716	45816	45916	67.25	.4355	6	2	8	0.4721 - 0.5030	101.95	84.60	78.80	76.00	73.05	70.75
17/32	.5312	45717	45817	45917	69.20	.4355	6	2	8	0.5031 - 0.5340	103.85	86.50	80.65	77.90	74.95	72.60
9/16	.5625	45718	45818	45918	69.20	.4355	6	2	8	0.5341 - 0.5660	103.85	86.50	80.65	77.90	74.95	72.60
19/32	.5938	45719	45819	45919	71.85	.4355	6	2	8	0.5661 - 0.5970	106.50	89.15	83.30	80.55	77.60	75.30
5/8	.6250	45720	45820	45920	71.85	.5615	6	2 1/4	9	0.5971 - 0.6280	106.50	89.15	83.30	80.55	77.60	75.30
21/32	.6562	45721	45821	45921	73.20	.5615	6	2 1/4	9	0.6281 - 0.6590	107.85	90.45	84.65	81.90	78.90	76.60
11/16	.6875	45722	45822	45922	73.20	.5615	6	2 1/4	9	0.6591 - 0.6910	107.85	90.45	84.65	81.90	78.90	76.60
23/32	.7188	45723	45823	45923	76.55	.5615	6	2 1/4	9	0.6911 - 0.7220	111.15	93.75	88.05	85.30	82.25	79.90
3/4	.7500	45724	45824	45924	76.55	.6245	6	2 1/2	9 1/2	0.7221 - 0.7530	111.15	93.75	88.05	85.30	82.25	79.90
25/32	.7812	45725	45825	45925	79.20	.6245	6	2 1/2	9 1/2	0.7531 - 0.7840	113.75	96.40	90.60	87.80	84.85	82.50
13/16	.8125	45726	45826	45926	79.20	.6245	6	2 1/2	9 1/2	0.7841 - 0.8160	113.75	96.40	90.60	87.80	84.85	82.50
27/32	.8438	45727	45827	45927	82.35	.6245	6	2 1/2	9 1/2	0.8161 - 0.8470	116.90	99.55	93.75	91.05	88.10	85.70
7/8	.8750	45728	45828	45928	85.50	.7495	6	2 5/8	10	0.8471 - 0.8780	121.30	103.35	97.30	94.45	91.35	88.95
29/32	.9062	45729	45829	45929	99.50	.7495	6	2 5/8	10	0.8781 - 0.9090	135.40	117.45	111.35	108.45	105.40	102.95
15/16	.9375	45730	45830	45930	99.50	.7495	8	2 5/8	10	0.9091 - 0.9410	135.40	117.45	111.35	108.45	105.40	102.95
31/32	.9688	45731	45831	45931	104.25	.7495	8	2 5/8	10	0.9411 - 0.9720	140.20	122.20	116.10	113.25	110.20	107.75
1	1.0000	45732	45832	45932	104.25	.8745	8	2 3/4	10 1/2	0.9721 - 1.0030	140.20	122.20	116.10	113.25	110.20	107.75
1 1/16	1.0625	45734	45834	45934	107.80	.8745	8	2 3/4	10 1/2	1.0031 - 1.0660	142.20	124.90	119.20	116.45	113.45	111.20
1 1/8	1.1250	45736	45836	45936	116.75	.8745	8	2 7/8	11	1.0661 - 1.1280	151.15	133.90	128.10	125.40	122.45	120.10
1 3/16	1.1875	45738	45838	45938	122.05	.9995	8	2 7/8	11	1.1281 - 1.1905	156.50	139.25	133.45	130.80	127.80	125.45
1 1/4	1.2500	45740	45840	45940	131.85	.9995	8	3	11 1/2	1.1906 - 1.2530	166.30	149.15	143.30	140.60	137.65	135.30
1 5/16	1.3125	45742	45842	45942	135.55	.9995	8	3	11 1/2	1.2531 - 1.3155	170.00	152.80	146.95	144.25	141.30	138.95
1 3/8	1.3750	45744	45844	45944	144.60	.9995	8	3 1/4	12	1.3156 - 1.3780	179.00	161.75	156.00	153.30	150.25	148.00
1 7/16	1.4375	45746	45846	45946	156.60	.9995	8	3 1/4	12	1.3781 - 1.4405	191.00	173.75	167.95	165.20	162.30	159.95
1 1/2	1.5000	45748	45848	45948	161.10	1.2495	8	3 1/2	12 1/2	1.4406 - 1.5030	195.55	178.30	172.55	169.80	166.90	164.55
1 9/16	1.5625	45750	45850	45950	253.10	1.2495	8	3 1/2	12 1/2	1.5031 - 1.5660	287.60	270.35	264.60	261.80	258.85	256.50
1 5/8	1.6250	45752	45852	45952	261.75	1.2495	8	3 1/2	13	1.5661 - 1.6280	296.25	279.05	273.25	270.50	267.50	265.20
1 11/16	1.6875	45754	45854	45954	287.40	1.2495	8	3 1/2	13	1.6281 - 1.6910	321.90	304.70	298.90	296.15	293.15	290.85
1 3/4	1.7500	45756	45856	45956	287.40	1.2495	10	3 1/2	13 1/2	1.6911 - 1.7530	321.90	304.70	298.90	296.15	293.15	290.85
1 13/16	1.8125	45758	45858	45958	294.10	1.4995	10	3 1/2	13 1/2	1.7531 - 1.8160	328.60	311.40	305.60	302.85	299.80	297.55
1 7/8	1.8750	45760	45860	45960	308.45	1.4995	10	3 1/2	14	1.8161 - 1.8780	342.95	325.75	319.90	317.20	314.20	311.90
1 15/16	1.9375	45762	45862	45962	327.00	1.4995	10	3 1/2	14	1.8781 - 1.9410	361.50	344.25	338.45	335.75	332.75	330.45
2	2.0000	45764	45864	45964	326.55	1.4995	12	3 1/2	14	1.9411 - 2.0030	361.05	343.80	338.05	335.30	332.30	330.00
2 1/8	2.1250	45768	45868	45968	606.70	1.4995	12	3 1/2	14 1/2	2.0031 - 2.1280	641.20	623.95	618.15	615.45	612.40	610.15
2 1/4	2.2500	45772	45872	45972	651.60	1.7495	12	3 1/2	14 1/2	2.1281 - 2.2530	686.10	668.85	663.10	660.35	657.35	655.10
2 3/8	2.3750	45776	45876	45976	674.25	1.7495	12	3 1/2	15	2.2531 - 2.3780	708.75	691.50	685.70	683.00	680.00	677.70
2 1/2	2.5000	45780	45880	45980	674.25	1.7495	12	3 1/2	15	2.3781 - 2.5030	708.75	691.50	685.70	683.00	680.00	677.70

*Quantities of 15 or more - price of fractional size in same size range.

MATERIAL SPECIFIC REAMERS
CARBIDE TIPPED TYPES 457, 458, 459 METRIC

STRAIGHT FLUTE LONG CARBIDE
STRAIGHT SHANK

NOTE: Tool diameter in millimeters (mm); all other dimensions in inches. Also, modifications available (see list on page 76).

TOOL DIAMETER		TYPE 457 NON FERROUS METRIC EDP NO.	TYPE 458 NAS/ CAST IRON METRIC EDP NO.	TYPE 459 STEEL/ HI-TEMP METRIC EDP NO.	ALL TYPES METRIC PRICE	DIMENSIONS				FINISHED TO MODIFIED TOOL DIAMETER							
						MAX. SHANK DIAM.	NO. OF FLTS	LENGTH		MODIFIED DIAMETER RANGE (mm)	PRICE EACH - BASED ON QUANTITY ORDERED						
mm	INCH							FLT & CARB	OVER-ALL		1	2	3	4	5-7	8-14	OVER 14
4.5	.1772	457045	458045	459045	$59.05	.1704	4	1 ⅛	4 ½	4.494-4.696	$83.35	$67.20	$61.85	$59.20	$56.50	$54.25	$51.15
5.0	.1969	457050	458050	459050	59.05	.1805	4	1 ⅛	4 ½	4.697-5.182	83.35	67.20	61.85	59.20	56.50	54.25	51.15
5.5	.2165	457055	458055	459055	59.05	.2075	4	1 ¼	5	5.183-5.613	83.35	67.20	61.85	59.20	56.50	54.25	51.15
6.0	.2362	457060	458060	459060	59.05	.2265	4	1 ½	6	5.614-6.045	83.35	67.20	61.85	59.20	56.50	54.25	51.15
-	-	457063	458063	459063	-	.2405	4	1 ½	6	6.046-6.426	83.35	67.20	61.85	59.20	56.50	54.25	51.15
6.5	.2559	457065	458065	459065	60.10	.2485	4	1 ½	6	6.427-7.214	84.45	68.25	62.85	60.20	57.60	55.30	52.20
7.0	.2756	457070	458070	459070	60.10	.2485	4	1 ½	6	-	-	-	-	-	-	-	-
7.5	.2953	457075	458075	459075	60.10	.2792	4	1 ½	6	7.215-8.001	84.45	68.25	62.85	60.20	57.60	55.30	52.20
8.0	.3150	457080	458080	459080	60.10	.2792	4	1 ½	6	-	-	-	-	-	-	-	-
8.5	.3346	457085	458085	459085	61.90	.2792	4	1 ½	6	8.002-8.814	86.30	70.05	64.65	62.05	59.30	57.10	53.95
9.0	.3543	457090	458090	459090	61.90	.3105	4	1 ¾	7	8.815-9.601	86.30	70.05	64.65	62.05	59.30	57.10	53.95
9.5	.3740	457095	458095	459095	61.90	.3105	4	1 ¾	7	-	-	-	-	-	-	-	-
10.0	.3937	457100	458100	459100	64.45	.3105	4	1 ¾	7	9.602-10.389	88.70	72.60	67.15	64.55	61.85	59.60	56.50
10.5	.4134	457105	458105	459105	68.85	.3730	6	1 ¾	7	10.390-11.201	93.15	77.00	71.60	68.95	66.25	64.00	60.95
11.0	.4331	457110	458110	459110	68.85	.3730	6	1 ¾	7	-	-	-	-	-	-	-	-
11.5	.4528	457115	458115	459115	73.55	.3730	6	1 ¾	7	11.202-11.989	97.90	81.65	76.35	73.65	70.95	68.75	65.60
12.0	.4724	457120	458120	459120	78.80	.4355	6	2	8	11.990-12.776	104.85	87.55	81.75	78.90	76.00	73.60	70.35
12.5	.4921	457125	458125	459125	78.80	.4355	6	2	8	-	-	-	-	-	-	-	-
13.0	.5118	457130	458130	459130	80.65	.4355	6	2	8	12.777-13.564	106.80	89.45	83.65	80.80	77.90	75.50	72.20
13.5	.5315	457135	458135	459135	80.65	.4355	6	2	8	-	-	-	-	-	-	-	-
14.0	.5512	457140	458140	459140	80.65	.4355	6	2	8	13.565-14.376	106.80	89.45	83.65	80.80	77.90	75.50	72.20
14.5	.5709	457145	458145	459145	83.30	.4355	6	2	8	14.377-15.164	109.35	92.10	86.35	83.50	80.55	78.10	74.80
15.0	.5906	457150	458150	459150	83.30	.4355	6	2	8	-	-	-	-	-	-	-	-
15.5	.6102	457155	458155	459155	83.30	.5615	6	2 ¼	9	15.165-15.951	109.35	92.10	86.35	83.50	80.55	78.10	74.80
16.0	.6299	457160	458160	459160	84.65	.5615	6	2 ¼	9	15.952-16.739	110.75	93.45	87.65	84.80	81.90	79.50	76.10
16.5	.6496	457165	458165	459165	84.65	.5615	6	2 ¼	9	-	-	-	-	-	-	-	-
17.0	.6693	457170	458170	459170	84.65	.5615	6	2 ¼	9	16.740-17.551	110.75	93.45	87.65	84.80	81.90	79.50	76.10
17.5	.6890	457175	458175	459175	84.65	.5615	6	2 ¼	9	-	-	-	-	-	-	-	-
18.0	.7087	457180	458180	459180	88.05	.5615	6	2 ¼	9	17.552-18.339	114.00	96.70	91.00	88.15	85.30	82.80	79.50
18.5	.7283	457185	458185	459185	88.05	.6245	6	2 ½	9 ½	18.340-19.126	114.00	96.70	91.00	88.15	85.30	82.80	79.50
19.0	.7480	457190	458190	459190	88.05	.6245	6	2 ½	9 ½	-	-	-	-	-	-	-	-
19.5	.7677	457195	458195	459195	90.60	.6245	6	2 ½	9 ½	19.127-19.914	116.70	99.40	93.55	90.75	87.80	85.45	82.15
20.0	.7874	457200	458200	459200	90.60	.6245	6	2 ½	9 ½	19.915-20.726	116.70	99.40	93.55	90.75	87.80	85.45	82.15
20.5	.8071	457205	458205	459205	90.60	.6245	6	2 ½	9 ½	-	-	-	-	-	-	-	-
21.0	.8268	457210	458210	459210	93.75	.6245	6	2 ½	9 ½	20.727-21.514	119.90	102.55	96.70	93.90	91.05	88.60	85.35
21.5	.8465	457215	458215	459215	93.75	.6245	6	2 ½	9 ½	-	-	-	-	-	-	-	-
22.0	.8661	457220	458220	459220	93.75	.7495	6	2 ⅝	10	21.515-22.301	119.90	102.55	96.70	93.90	91.05	88.60	85.35
22.5	.8858	457225	458225	459225	111.35	.7495	6	2 ⅝	10	22.302-23.089	138.40	120.45	114.50	111.50	108.45	106.00	102.50
23.0	.9055	457230	458230	459230	111.35	.7495	6	2 ⅝	10	-	-	-	-	-	-	-	-
23.5	.9252	457235	458235	459235	111.35	.7495	8	2 ⅝	10	23.090-23.901	138.40	120.45	114.50	111.50	108.45	106.00	102.50
24.0	.9449	457240	458240	459240	116.10	.7495	8	2 ⅝	10	23.902-24.689	143.20	125.30	119.25	116.30	113.25	110.80	107.25
24.5	.9646	457245	458245	459245	116.10	.7495	8	2 ⅝	10	-	-	-	-	-	-	-	-
25.0	.9843	457250	458250	459250	116.10	.8745	8	2 ¾	10 ½	24.690-25.476	143.20	125.30	119.25	116.30	113.25	110.80	107.25
25.5	1.0039	457255	458255	459255	119.20	.8745	8	2 ¾	10 ½	25.477-27.076	145.05	127.95	122.10	119.30	116.45	114.00	110.75
26.0	1.0236	457260	458260	459260	119.20	.8745	8	2 ¾	10 ½	-	-	-	-	-	-	-	-
27.0	1.0630	457270	458270	459270	119.20	.8745	8	2 ¾	10 ½	-	-	-	-	-	-	-	-
28.0	1.1024	457280	458280	459280	128.10	.8745	8	2 ⅞	11	27.077-28.651	154.00	136.90	131.05	128.20	125.40	122.95	119.65
29.0	1.1417	457290	458290	459290	133.45	.9995	8	2 ⅞	11	28.652-30.239	159.35	142.20	136.50	133.60	130.80	128.30	124.95
30.0	1.1811	457300	458300	459300	133.45	.9995	8	2 ⅞	11	-	-	-	-	-	-	-	-
31.0	1.2205	457310	458310	459310	143.30	.9995	8	3	11 ½	30.240-31.826	169.30	152.05	146.30	143.45	140.60	138.15	134.85
32.0	1.2598	457320	458320	459320	146.95	.9995	8	3	11 ½	31.827-33.414	172.85	155.70	150.00	147.15	144.25	141.85	138.50
33.0	1.2992	457330	458330	459330	146.95	.9995	8	3	11 ½	-	-	-	-	-	-	-	-
34.0	1.3386	457340	458340	459340	156.00	.9995	8	3 ¼	12	33.415-35.001	181.90	164.70	159.00	156.15	153.30	150.85	147.55
35.0	1.3780	457350	458350	459350	156.00	.9995	8	3 ¼	12	-	-	-	-	-	-	-	-
36.0	1.4173	457360	458360	459360	167.95	.9995	8	3 ¼	12	35.002-36.589	193.85	176.70	170.90	168.10	165.20	162.80	159.55
37.0	1.4567	457370	458370	459370	172.55	1.2495	8	3 ½	12 ½	36.590-38.176	198.45	181.25	175.55	172.65	169.80	167.35	164.10
38.0	1.4961	457380	458380	459380	172.55	1.2495	8	3 ½	12 ½	-	-	-	-	-	-	-	-

MATERIAL SPECIFIC REAMERS
CARBIDE TIPPED TYPES 472, 473, 474 FRACTIONAL

STRAIGHT FLUTES
TAPER SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	472
	40	NON-FERROUS - SHORT CHIPS	472/473
	60	CAST IRONS	473
	80	LOW STRENGTH STEELS	474/473
	100	MEDIUM STRENGTH STEELS	474
	120	HIGH STRENGTH STEELS	474
	140	HIGH TEMPERATURE ALLOYS	474

MODIFICATIONS (See list on page 81)

NATIONAL AEROSPACE STANDARDS - NAS 897
TYPE 472 - FOR NON-FERROUS MATERIALS
TYPE 473 - FOR CAST IRONS & NAS MULTI-PURPOSE
TYPE 474 - FOR STEELS & HIGH TEMP ALLOYS

- Type "C" with short carbide tip
- Straight polished flutes and taper shank
- Tool geometry and carbide grade appropriate for material being machined
- Detailed specifications on page 29

For shallow holes only (see page 27)

TOOL DIAMETER		TYPE 472 NON-FERROUS EDP NO.	TYPE 473 NAS/ CAST IRON EDP NO.	TYPE 474 STEEL/ HI-TEMP EDP NO.	ALL TYPES PRICE	DIMENSIONS					FINISHED TO MODIFIED TOOL DIAMETER						
						TAPER SHANK NO.	NO. OF FLTS	LENGTH			MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DEC.							FLT	CAR-BIDE	OVER-ALL		1	2	3	4	5-7	8-14*
1/4	.2500	47208	47308	47408	$46.60	1	4	1 1/2	1/2	6	0.2381-0.2530	$78.00	$62.30	$57.05	$54.50	$51.90	$49.75
9/32	.2812	47209	47309	47409	47.40	1	4	1 1/2	1/2	6	0.2531-0.2840	78.80	63.05	57.80	55.30	52.65	50.45
5/16	.3125	47210	47310	47410	47.40	1	4	1 1/2	1/2	6	0.2841-0.3150	78.80	63.05	57.80	55.30	52.65	50.45
11/32	.3438	47211	47311	47411	48.85	1	4	1 1/2	5/8	6	0.3151-0.3470	80.30	64.55	59.25	56.75	54.10	52.00
3/8	.3750	47212	47312	47412	45.15	1	4	1 3/4	5/8	7	0.3471-0.3780	73.95	59.55	54.70	52.35	49.95	47.95
13/32	.4062	47213	47313	47413	51.60	1	4	1 3/4	5/8	7	0.3781-0.4090	83.05	67.25	62.05	59.55	56.85	54.75
7/16	.4375	47214	47314	47414	54.95	1	6	1 3/4	5/8	7	0.4091-0.4410	86.45	70.70	65.45	62.85	60.15	58.05
15/32	.4688	47215	47315	47415	56.45	1	6	1 3/4	5/8	7	0.4411-0.4720	87.85	72.15	66.90	64.35	61.65	59.55
1/2	.5000	47216	47316	47416	64.65	1	6	2	5/8	8	0.4721-0.5030	99.20	81.90	76.05	73.35	70.40	68.00
17/32	.5312	47217	47317	47417	68.70	1	6	2	5/8	8	0.5031-0.5340	103.30	85.90	80.10	77.45	74.40	72.10
9/16	.5625	47218	47318	47418	68.70	1	6	2	5/8	8	0.5341-0.5660	103.30	85.90	80.10	77.45	74.40	72.10
19/32	.5938	47219	47319	47419	73.05	1	6	2	5/8	8	0.5661-0.5970	107.65	90.30	84.55	81.75	78.80	76.50
5/8	.6250	47220	47320	47420	73.05	2	6	2 1/4	5/8	9	0.5971-0.6280	107.65	90.30	84.55	81.75	78.80	76.50
21/32	.6562	47221	47321	47421	74.30	2	6	2 1/4	5/8	9	0.6281-0.6590	108.90	91.55	85.70	82.90	80.00	77.65
11/16	.6875	47222	47322	47422	74.30	2	6	2 1/4	5/8	9	0.6591-0.6910	108.90	91.55	85.70	82.90	80.00	77.65
23/32	.7188	47223	47323	47423	77.20	2	6	2 1/4	5/8	9	0.6911-0.7220	111.85	94.50	88.70	85.90	82.90	80.60
3/4	.7500	47224	47324	47424	77.20	2	6	2 1/2	3/4	9 1/2	0.7221-0.7530	111.85	94.50	88.70	85.90	82.90	80.60
25/32	.7812	47225	47325	47425	79.00	2	6	2 1/2	3/4	9 1/2	0.7531-0.7840	113.70	96.35	90.50	87.75	84.80	82.45
13/16	.8125	47226	47326	47426	79.00	2	6	2 1/2	3/4	9 1/2	0.7841-0.8160	113.70	96.35	90.50	87.75	84.80	82.45
27/32	.8438	47227	47327	47427	82.85	2	6	2 1/2	3/4	9 1/2	0.8161-0.8470	117.55	100.15	94.40	91.60	88.60	86.35
7/8	.8750	47228	47328	47428	86.00	2	6	2 5/8	3/4	10	0.8471-0.8780	121.95	103.95	97.95	95.05	91.95	89.50
29/32	.9062	47229	47329	47429	104.70	2	6	2 5/8	3/4	10	0.8781-0.9090	140.60	122.60	116.55	113.75	110.60	108.25
15/16	.9375	47230	47330	47430	104.70	3	8	2 5/8	3/4	10	0.9091-0.9410	140.60	122.60	116.55	113.75	110.60	108.25
31/32	.9688	47231	47331	47431	107.75	3	8	2 5/8	3/4	10	0.9411-0.9720	143.70	125.65	119.65	116.80	113.75	111.30
1	1.0000	47232	47332	47432	107.75	3	8	2 3/4	3/4	10 1/2	0.9721-1.0030	143.70	125.65	119.65	116.80	113.75	111.30
1 1/16	1.0625	47234	47334	47434	133.10	3	8	2 3/4	3/4	10 1/2	1.0031-1.0660	167.50	150.20	144.50	141.65	138.80	136.50
1 1/8	1.1250	47236	47336	47436	141.30	3	8	2 7/8	7/8	11	1.0661-1.1280	175.70	158.45	152.65	150.00	146.95	144.65
1 3/16	1.1875	47238	47338	47438	154.45	3	8	2 7/8	7/8	11	1.1281-1.1905	188.90	171.60	165.85	163.20	160.15	157.85
1 1/4	1.2500	47240	47340	47440	167.75	4	8	3	7/8	11 1/2	1.1906-1.2530	202.20	184.90	179.20	176.40	173.45	171.20
1 5/16	1.3125	47242	47342	47442	177.20	4	8	3	7/8	11 1/2	1.2531-1.3155	211.65	194.35	188.55	185.85	182.90	180.55
1 3/8	1.3750	47244	47344	47444	186.65	4	8	3 1/4	7/8	12	1.3156-1.3780	221.05	203.80	198.00	195.25	192.35	190.00
1 7/16	1.4375	47246	47346	47446	197.25	4	8	3 1/4	7/8	12	1.3781-1.4405	231.75	214.50	208.75	206.00	203.05	200.70
1 1/2	1.5000	47248	47348	47448	207.90	4	8	3 1/2	7/8	12 1/2	1.4406-1.5030	242.30	225.10	219.25	216.55	213.60	211.25
1 9/16	1.5625	47250	47350	47450	243.85	4	8	3 1/2	7/8	12 1/2	1.5031-1.5660	278.30	260.95	255.25	252.55	249.60	247.25
1 5/8	1.6250	47252	47352	47452	252.35	4	8	3 3/4	7/8	13	1.5661-1.6280	286.75	269.45	263.75	260.90	258.00	255.70
1 11/16	1.6875	47254	47354	47454	283.80	4	8	3 3/4	7/8	13	1.6281-1.6910	318.20	300.95	295.15	292.45	289.50	287.15
1 3/4	1.7500	47256	47356	47456	283.80	4	10	4	7/8	13 1/2	1.6911-1.7530	318.20	300.95	295.15	292.45	289.50	287.15
1 13/16	1.8125	47258	47358	47458	283.80	4	10	4	7/8	13 1/2	1.7531-1.8160	318.20	300.95	295.15	292.45	289.50	287.15
1 7/8	1.8750	47260	47360	47460	297.30	4	10	4 1/4	7/8	14	1.8161-1.8780	331.75	314.50	308.65	305.95	303.00	300.65
1 15/16	1.9375	47262	47362	47462	297.30	4	10	4 1/4	7/8	14	1.8781-1.9410	331.75	314.50	308.65	305.95	303.00	300.65
2	2.0000	47264	47364	47464	297.30	4	12	4 1/4	7/8	14	1.9411-2.0030	331.75	314.50	308.65	305.95	303.00	300.65

*Quantities of 15 or more - price of fractional size in same size range.

MATERIAL SPECIFIC REAMERS
CARBIDE TIPPED TYPES 453, 454, 455 FRACTIONAL

STRAIGHT FLUTE LONG CARBIDE TAPER SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	453
	40	NON-FERROUS - SHORT CHIPS	453/454
	60	CAST IRONS	454
	80	LOW STRENGTH STEELS	455/454
	100	MEDIUM STRENGTH STEELS	455
	120	HIGH STRENGTH STEELS	455
	140	HIGH TEMPERATURE ALLOYS	455

REAMERS

NATIONAL AEROSPACE STANDARDS - NAS 897
TYPE 453 - FOR NON-FERROUS MATERIALS
TYPE 454 - FOR CAST IRONS & NAS MULTI-PURPOSE
TYPE 455 - FOR STEELS & HIGH TEMP ALLOYS

- Type "C" with flute long carbide
- Straight polished flutes and taper shank
- Tool geometry and carbide grade appropriate for material being machined
- Detailed specifications on page 29

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Metric tool diameter
- Closer tool diameter tolerance - pg. 29
- Cutting diameter reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diameter back taper
- Shank whistle notch for set screw
- Smaller taper shank
- Coatings available:

TITANIUM NITRIDE – TiN

TITANIUM CARBONITRIDE – TiCN

ZIRCONIUM NITRIDE – ZrN

AL TITANIUM NITRIDE – AlTiN

TOOL DIAMETER		TYPE 453 NON-FERROUS EDP NO.	TYPE 454 NAS/ CAST IRON EDP NO.	TYPE 455 STEEL/ HI-TEMP EDP NO.	ALL TYPES PRICE	DIMENSIONS				FINISHED TO MODIFIED TOOL DIAMETER						
						TAPER SHANK NO.	NO. OF FLTS	LENGTH		MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DEC.							FLUTE & CARBIDE	OVER-ALL		1	2	3	4	5-7	8-14*
¼	.2500	45308	45408	45508	$55.65	1	4	1 ½	6	0.2381 - 0.2530	$87.95	$71.70	$66.30	$63.75	$61.00	$58.85
9/32	.2812	45309	45409	45509	56.50	1	4	1 ½	6	0.2531 - 0.2840	88.80	72.60	67.15	64.60	61.85	59.70
5/16	.3125	45310	45410	45510	56.50	1	4	1 ½	6	0.2841 - 0.3150	88.80	72.60	67.15	64.60	61.85	59.70
11/32	.3438	45311	45411	45511	57.75	1	4	1 ½	6	0.3151 - 0.3470	90.10	73.85	68.50	65.90	63.10	60.95
⅜	.3750	45312	45412	45512	58.35	1	4	1 ¾	7	0.3471 - 0.3780	90.75	74.50	69.10	66.55	63.75	61.60
13/32	.4062	45313	45413	45513	61.50	1	4	1 ¾	7	0.3781 - 0.4090	93.70	77.60	72.15	69.55	66.80	64.60
7/16	.4375	45314	45414	45514	65.50	1	6	1 ¾	7	0.4091 - 0.4410	97.80	81.55	76.10	73.60	70.85	68.70
15/32	.4688	45315	45415	45515	66.85	1	6	1 ¾	7	0.4411 - 0.4720	99.15	83.00	77.60	74.95	72.20	70.00
½	.5000	45316	45416	45516	71.95	1	6	2	8	0.4721 - 0.5030	106.60	89.25	83.50	80.65	77.75	75.40
17/32	.5312	45317	45417	45517	78.90	1	6	2	8	0.5031 - 0.5340	113.55	96.20	90.35	87.65	84.65	82.35
9/16	.5625	45318	45418	45518	78.90	1	6	2	8	0.5341 - 0.5660	113.55	96.20	90.35	87.65	84.65	82.35
19/32	.5938	45319	45419	45519	82.55	1	6	2	8	0.5661 - 0.5970	117.20	99.90	94.15	91.30	88.35	85.95
⅝	.6250	45320	45420	45520	82.55	2	6	2 ¼	9	0.5971 - 0.6280	117.20	99.90	94.15	91.30	88.35	85.95
21/32	.6562	45321	45421	45521	84.15	2	6	2 ¼	9	0.6281 - 0.6590	118.70	101.35	95.55	92.75	89.85	87.50
11/16	.6875	45322	45422	45522	84.15	2	6	2 ¼	9	0.6591 - 0.6910	118.70	101.35	95.55	92.75	89.85	87.50
23/32	.7188	45323	45423	45523	85.30	2	6	2 ¼	9	0.6911 - 0.7220	119.90	102.50	96.65	93.90	91.00	88.60
¾	.7500	45324	45424	45524	88.05	2	6	2 ½	9 ½	0.7221 - 0.7530	122.60	105.25	99.45	96.65	93.70	91.35
25/32	.7812	45325	45425	45525	88.70	2	6	2 ½	9 ½	0.7531 - 0.7840	123.30	105.95	100.15	97.40	94.45	92.10
13/16	.8125	45326	45426	45526	90.65	2	6	2 ½	9 ½	0.7841 - 0.8160	125.30	107.95	102.20	99.40	96.40	94.15
27/32	.8438	45327	45427	45527	94.60	2	6	2 ½	9 ½	0.8161 - 0.8470	129.20	111.95	106.10	103.35	100.40	98.05
⅞	.8750	45328	45428	45528	98.15	2	6	2 ⅝	10	0.8471 - 0.8780	134.10	116.10	110.15	107.20	104.20	101.70
29/32	.9062	45329	45429	45529	115.35	2	6	2 ⅝	10	0.8781 - 0.9090	151.25	133.30	127.20	124.40	121.25	118.90
15/16	.9375	45330	45430	45530	115.35	3	8	2 ⅝	10	0.9091 - 0.9410	151.25	133.30	127.20	124.40	121.25	118.90
31/32	.9688	45331	45431	45531	120.00	3	8	2 ⅝	10	0.9411 - 0.9720	155.85	137.85	131.80	129.00	125.95	123.50
1	1.0000	45332	45432	45532	120.00	3	8	2 ¾	10 ½	0.9721 - 1.0030	155.85	137.85	131.80	129.00	125.95	123.50
1 1/16	1.0625	45334	45434	45534	152.95	3	8	2 ¾	10 ½	1.0031 - 1.0660	187.35	170.20	164.40	161.60	158.70	156.30
1 ⅛	1.1250	45336	45436	45536	162.50	3	8	2 ⅞	11	1.0661 - 1.1280	197.00	179.80	173.95	171.25	168.20	165.95
1 3/16	1.1875	45338	45438	45538	177.70	3	8	2 ⅞	11	1.1281 - 1.1905	212.15	194.85	189.10	186.30	183.45	181.10
1 ¼	1.2500	45340	45440	45540	192.80	4	8	3	11 ½	1.1906 - 1.2530	227.20	210.00	204.25	201.45	198.50	196.20
1 5/16	1.3125	45342	45442	45542	203.75	4	8	3	11 ½	1.2531 - 1.3155	238.15	220.90	215.05	212.40	209.40	207.05
1 ⅜	1.3750	45344	45444	45544	215.50	4	8	3 ¼	12	1.3156 - 1.3780	249.85	232.65	226.90	224.15	221.15	218.85
1 7/16	1.4375	45346	45446	45546	226.85	4	8	3 ¼	12	1.3781 - 1.4405	261.30	244.00	238.25	235.55	232.50	230.20
1 ½	1.5000	45348	45448	45548	239.10	4	8	3 ½	12 ½	1.4406 - 1.5030	273.55	256.25	250.50	247.80	244.80	242.50

*Quantities of 15 or more - price of fractional size in same size range.

MATERIAL SPECIFIC REAMERS
CARBIDE TIPPED TYPES 464, 466, 468 FRACTIONAL

EXPANSION REAMERS
STRAIGHT FLUTE LONG CARBIDE
STRAIGHT SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	464
	40	NON-FERROUS - SHORT CHIPS	464/466
	60	CAST IRONS	466
	80	LOW STRENGTH STEELS	468/466
	100	MEDIUM STRENGTH STEELS	468
	120	HIGH STRENGTH STEELS	468
	140	HIGH TEMPERATURE ALLOYS	468

NATIONAL AEROSPACE STANDARDS - NAS 897
TYPE 464 - FOR NON-FERROUS MATERIALS
TYPE 466 - FOR CAST IRONS & NAS MULTI-PURPOSE
TYPE 468 - FOR STEELS & HIGH TEMP ALLOYS

- Type "C" with flute long carbide
- Straight polished flutes and straight shank
- Expansion screw permits expansion of tool diameter for regrinding after wear without reinserting carbide
- Tool geometry and carbide grade appropriate for material being machined
- Detailed specifications, including minimum expansion, on page 29

MODIFICATIONS (See list on page 84, except expansion reamers can not be coated)

USE:

- Expansion reamers are recommended for reaming abrasive materials. As the diameter wears down, the reamers can be expanded many times by tightening the end expansion screw and regrinding to its original size. Expansion reamers should not be considered as adjustable for use in producing holes of different sizes.

TOOL DIAMETER		TYPE 464 NON-FERROUS EDP NO.	TYPE 466 NAS/ CAST IRON EDP NO.	TYPE 468 STEEL/ HI-TEMP EDP NO.	ALL TYPES PRICE	DIMENSIONS				FINISHED TO MODIFIED TOOL DIAMETER						
						MAX. SHANK DIAM.	NO. OF FLTS	LENGTH		MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DEC.							FLUTE & CARBIDE	OVER-ALL		1	2	3	4	5-7	8-14*
5/16	.3125	46410	46610	46810	$74.55	.2792	4	1	6	0.2841 - 0.3150	$106.90	$90.75	$85.35	$82.70	$79.90	$77.75
11/32	.3438	46411	46611	46811	74.55	.2792	4	1	6	0.3151 - 0.3470	106.90	90.75	85.35	82.70	79.90	77.75
3/8	.3750	46412	46612	46812	70.45	.3105	4	1	7	0.3471 - 0.3780	100.65	85.55	80.45	78.00	75.45	73.40
13/32	.4062	46413	46613	46813	74.20	.3105	4	1	7	0.3781 - 0.4090	104.45	89.30	84.25	81.85	79.25	77.10
7/16	.4375	46414	46614	46814	74.20	.3730	6	1	7	0.4091 - 0.4410	104.45	89.30	84.25	81.85	79.25	77.10
15/32	.4688	46415	46615	46815	78.60	.3730	6	1	7	0.4411 - 0.4720	108.90	93.70	88.65	86.30	83.65	81.55
1/2	.5000	46416	46616	46816	78.60	.4355	6	1	8	0.4721 - 0.5030	108.90	93.70	88.65	86.30	83.65	81.55
17/32	.5312	46417	46617	46817	80.60	.4355	6	1	8	0.5031 - 0.5340	111.00	95.70	90.65	88.25	85.65	83.65
9/16	.5625	46418	46618	46818	80.60	.4355	6	1 1/8	8	0.5341 - 0.5660	111.00	95.70	90.65	88.25	85.65	83.65
19/32	.5938	46419	46619	46819	84.15	.4355	6	1 1/8	8	0.5661 - 0.5970	114.35	99.20	94.20	91.70	89.15	87.10
5/8	.6250	46420	46620	46820	84.15	.5615	6	1 1/4	9	0.5971 - 0.6280	114.35	99.20	94.20	91.70	89.15	87.10
21/32	.6562	46421	46621	46821	92.00	.5615	6	1 1/4	9	0.6281 - 0.6590	122.25	107.05	102.00	99.55	97.00	95.00
11/16	.6875	46422	46622	46822	92.00	.5615	6	1 1/4	9	0.6591 - 0.6910	122.25	107.05	102.00	99.55	97.00	95.00
23/32	.7188	46423	46623	46823	95.45	.5615	6	1 1/4	9	0.6911 - 0.7220	125.75	110.50	105.45	103.10	100.45	98.35
3/4	.7500	46424	46624	46824	95.45	.6245	6	1 3/8	9 1/2	0.7221 - 0.7530	125.75	110.50	105.45	103.10	100.45	98.35
25/32	.7812	46425	46625	46825	102.85	.6245	6	1 3/8	9 1/2	0.7531 - 0.7840	133.20	118.00	112.90	110.45	107.90	105.85
13/16	.8125	46426	46626	46826	102.85	.6245	6	1 3/8	9 1/2	0.7841 - 0.8160	133.20	118.00	112.90	110.45	107.90	105.85
27/32	.8438	46427	46627	46827	106.90	.6245	6	1 3/8	9 1/2	0.8161 - 0.8470	137.20	122.00	116.90	114.50	111.95	109.90
7/8	.8750	46428	46628	46828	110.95	.7495	6	1 1/2	10	0.8471 - 0.8780	142.40	126.60	121.30	118.85	116.10	114.00
29/32	.9062	46429	46629	46829	118.10	.7495	6	1 1/2	10	0.8781 - 0.9090	149.45	133.75	128.45	126.00	123.30	121.15
15/16	.9375	46430	46630	46830	118.10	.7495	8	1 1/2	10	0.9091 - 0.9410	149.45	133.75	128.45	126.00	123.30	121.15
31/32	.9688	46431	46631	46831	122.60	.7495	8	1 1/2	10	0.9411 - 0.9720	154.05	138.35	133.10	130.55	127.85	125.70
1	1.0000	46432	46632	46832	122.60	.8745	8	1 5/8	10 1/2	0.9721 - 1.0030	154.05	138.35	133.10	130.55	127.85	125.70
1 1/32	1.0312	46433	46633	46833	134.45	.8745	8	1 5/8	10 1/2	-	-	-	-	-	-	-
1 1/16	1.0625	46434	46634	46834	134.45	.8745	8	1 5/8	10 1/2	1.0031 - 1.0660	165.85	150.10	144.85	142.35	139.60	137.55
1 3/32	1.0938	46435	46635	46835	134.45	.8745	8	1 3/4	11	-	-	-	-	-	-	-
1 1/8	1.1250	46436	46636	46836	134.45	.8745	8	1 3/4	11	1.0661 - 1.1280	165.85	150.10	144.85	142.35	139.60	137.55
1 3/16	1.1875	46438	46638	46838	146.75	.9995	8	1 3/4	11	1.1281 - 1.1905	178.20	162.40	157.15	154.65	151.90	149.90
1 1/4	1.2500	46440	46640	46840	146.75	.9995	8	1 7/8	11 1/2	1.1906 - 1.2530	178.20	162.40	157.15	154.65	151.90	149.90
1 5/16	1.3125	46442	46642	46842	162.05	.9995	8	1 7/8	11 1/2	1.2531 - 1.3155	193.45	177.70	172.45	169.95	167.20	165.10
1 3/8	1.3750	46444	46644	46844	170.30	.9995	8	2	12	1.3156 - 1.3780	201.75	186.05	180.75	178.25	175.60	173.40
1 7/16	1.4375	46446	46646	46846	200.65	.9995	8	2	12	1.3781 - 1.4405	234.20	217.40	211.80	209.15	206.20	203.95
1 1/2	1.5000	46448	46648	46848	206.35	1.2495	8	2 1/8	12 1/2	1.4406 - 1.5030	239.95	223.00	217.45	214.80	211.90	209.65
1 9/16	1.5625	46450	46650	46850	271.10	1.2495	8	2 1/8	12 1/2	1.5031 - 1.5660	304.65	287.85	282.20	279.50	276.65	274.35
1 5/8	1.6250	46452	46652	46852	271.10	1.2495	8	2 1/4	13	1.5661 - 1.6280	304.65	287.85	282.20	279.50	276.65	274.35
1 11/16	1.6875	46454	46654	46854	300.20	1.2495	8	2 1/4	13	1.6281 - 1.6910	333.75	317.00	311.40	308.60	305.75	303.55
1 3/4	1.7500	46456	46656	46856	300.20	1.2495	10	2 3/8	13 1/2	1.6911 - 1.7530	333.75	317.00	311.40	308.60	305.75	303.55
1 13/16	1.8125	46458	46658	46858	355.45	1.4995	10	2 3/8	13 1/2	1.7531 - 1.8160	389.00	372.15	366.60	363.95	361.05	358.75
1 7/8	1.8750	46460	46660	46860	355.45	1.4995	10	2 1/2	14	1.8161 - 1.8780	389.00	372.15	366.60	363.95	361.05	358.75
1 15/16	1.9375	46462	46662	46862	388.45	1.4995	10	2 1/2	14	1.8781 - 1.9410	421.90	405.15	399.50	396.85	394.00	391.70
2	2.0000	46464	46664	46864	388.45	1.4995	12	2 1/2	14	1.9411 - 2.0030	421.90	405.15	399.50	396.85	394.00	391.70

*Quantities of 15 or more - price of fractional size in same size range.

MATERIAL SPECIFIC REAMERS
CARBIDE TIPPED TYPES 461, 462, 463 FRACTIONAL

EXPANSION REAMERS
STRAIGHT FLUTE LONG CARBIDE
TAPER SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	461
	40	NON-FERROUS - SHORT CHIPS	461/462
	60	CAST IRONS	462
	80	LOW STRENGTH STEELS	463/462
	100	MEDIUM STRENGTH STEELS	463
	120	HIGH STRENGTH STEELS	463
	140	HIGH TEMPERATURE ALLOYS	463

REAMERS

NATIONAL AEROSPACE STANDARDS - NAS 897
TYPE 461 - FOR NON-FERROUS MATERIALS
TYPE 462 - FOR CAST IRONS & NAS MULTI-PURPOSE
TYPE 463 - FOR STEELS & HIGH TEMP ALLOYS

- Type "C" with flute long carbide
- Straight polished flutes and taper shank
- Expansion screw permits expansion of tool diameter for regrinding after wear without reinserting carbide
- Tool geometry and carbide grade appropriate for material being machined
- Detailed specifications, including minimum expansion, on page 29

MODIFICATIONS (See list on page 84, except expansion reamers can not be coated)

USE:

- Expansion reamers are recommended for reaming abrasive materials. As the diameter wears down, the reamers can be expanded many times by tightening the end expansion screw and regrinding to its original size. Expansion reamers should not be considered as adjustable for use in producing holes of different sizes.

TOOL DIAMETER		TYPE 461 NON-FERROUS EDP NO.	TYPE 462 NAS/ CAST IRON EDP NO.	TYPE 463 STEEL/ HI-TEMP EDP NO.	ALL TYPES PRICE	DIMENSIONS				FINISHED TO MODIFIED TOOL DIAMETER						
						TAPER SHANK NO.	NO. OF FLTS	LENGTH		MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DEC.							FLUTE & CARBIDE	OVER-ALL		1	2	3	4	5-7	8-14*
3/8	.3750	46112	46212	46312	$78.80	1	4	1	7	0.3471 - 0.3780	$109.05	$93.90	$88.85	$86.45	$83.80	$81.75
13/32	.4062	46113	46213	46313	80.00	1	4	1	7	0.3781 - 0.4090	110.25	95.10	90.05	87.60	84.95	82.90
7/16	.4375	46114	46214	46314	81.20	1	6	1	7	0.4091 - 0.4410	111.40	96.25	91.20	88.80	86.20	84.15
15/32	.4688	46115	46215	46315	84.65	1	6	1	7	0.4411 - 0.4720	114.95	99.85	94.65	92.25	89.70	87.65
1/2	.5000	46116	46216	46316	85.20	1	6	1	8	0.4721 - 0.5030	115.45	100.30	95.25	92.75	90.20	88.15
17/32	.5312	46117	46217	46317	87.80	1	6	1	8	0.5031 - 0.5340	118.10	102.95	97.90	95.45	92.80	90.80
9/16	.5625	46118	46218	46318	87.80	1	6	1 1/8	8	0.5341 - 0.5660	118.10	102.95	97.90	95.45	92.80	90.80
19/32	.5938	46119	46219	46319	91.15	1	6	1 1/8	8	0.5661 - 0.5970	121.35	106.20	101.20	98.75	96.15	94.15
5/8	.6250	46120	46220	46320	91.35	2	6	1 1/4	9	0.5971 - 0.6280	121.65	106.50	101.40	99.00	96.40	94.35
21/32	.6562	46121	46221	46321	99.20	2	6	1 1/4	9	0.6281 - 0.6590	129.55	114.30	109.25	106.85	104.25	102.20
11/16	.6875	46122	46222	46322	99.50	2	6	1 1/4	9	0.6591 - 0.6910	129.85	114.70	109.50	107.10	104.50	102.50
23/32	.7188	46123	46223	46323	103.15	2	6	1 1/4	9	0.6911 - 0.7220	133.45	118.20	113.15	110.75	108.10	106.10
3/4	.7500	46124	46224	46324	103.15	2	6	1 3/8	9 1/2	0.7221 - 0.7530	133.45	118.20	113.15	110.75	108.10	106.10
25/32	.7812	46125	46225	46325	110.65	2	6	1 3/8	9 1/2	0.7531 - 0.7840	141.00	125.80	120.70	118.30	115.70	113.70
13/16	.8125	46126	46226	46326	110.65	2	6	1 3/8	9 1/2	0.7841 - 0.8160	141.00	125.80	120.70	118.30	115.70	113.70
27/32	.8438	46127	46227	46327	115.30	2	6	1 3/8	9 1/2	0.8161 - 0.8470	145.60	130.40	125.30	122.85	120.25	118.20
7/8	.8750	46128	46228	46328	119.55	2	6	1 1/2	10	0.8471 - 0.8780	151.10	135.30	130.00	127.50	124.80	122.65
29/32	.9062	46129	46229	46329	126.00	2	6	1 1/2	10	0.8781 - 0.9090	157.35	141.60	136.40	133.90	131.20	129.05
15/16	.9375	46130	46230	46330	126.60	3	8	1 1/2	10	0.9091 - 0.9410	158.05	142.35	137.05	134.55	131.80	129.75
31/32	.9688	46131	46231	46331	131.10	3	8	1 1/2	10	0.9411 - 0.9720	162.50	146.80	141.50	139.00	136.30	134.20
1	1.0000	46132	46232	46332	131.10	3	8	1 5/8	10 1/2	0.9721 - 1.0030	162.50	146.80	141.50	139.00	136.30	134.20
1 1/32	1.0312	46133	46233	46333	139.45	3	8	1 5/8	10 1/2	-	-	-	-	-	-	-
1 1/16	1.0625	46134	46234	46334	139.45	3	8	1 5/8	10 1/2	1.0031 - 1.0660	170.90	155.15	149.95	147.40	144.70	142.55
1 3/32	1.0938	46135	46235	46335	143.60	3	8	1 3/4	11	-	-	-	-	-	-	-
1 1/8	1.1250	46136	46236	46336	143.60	3	8	1 3/4	11	1.0661 - 1.1280	174.95	159.20	153.90	151.40	148.75	146.60
1 3/16	1.1875	46138	46238	46338	153.15	3	8	1 3/4	11	1.1281 - 1.1905	184.65	168.85	163.55	161.05	158.35	156.25
1 1/4	1.2500	46140	46240	46340	163.55	4	8	1 7/8	11 1/2	1.1906 - 1.2530	195.05	179.25	173.95	171.45	168.80	166.70
1 5/16	1.3125	46142	46242	46342	169.70	4	8	1 7/8	11 1/2	1.2531 - 1.3155	201.20	185.45	180.15	177.65	174.95	172.80
1 3/8	1.3750	46144	46244	46344	188.20	4	8	2	12	1.3156 - 1.3780	219.70	203.95	198.75	196.20	193.45	191.40
1 7/16	1.4375	46146	46246	46346	208.60	4	8	2	12	1.3781 - 1.4405	242.20	225.30	219.75	217.10	214.15	211.90
1 1/2	1.5000	46148	46248	46348	214.90	4	8	2 1/8	12 1/2	1.4406 - 1.5030	248.45	231.60	226.05	223.40	220.50	218.25
1 9/16	1.5625	46150	46250	46350	301.15	4	8	2 1/8	12 1/2	1.5031 - 1.5660	334.70	317.85	312.15	309.55	306.70	304.45
1 5/8	1.6250	46152	46252	46352	301.15	4	8	2 1/4	13	1.5661 - 1.6280	334.70	317.85	312.15	309.55	306.70	304.45
1 11/16	1.6875	46154	46254	46354	333.65	4	8	2 1/4	13	1.6281 - 1.6910	367.20	350.35	344.70	342.05	339.20	336.90
1 3/4	1.7500	46156	46256	46356	333.65	4	10	2 3/8	13 1/2	1.6911 - 1.7530	367.20	350.35	344.70	342.05	339.20	336.90
1 13/16	1.8125	46158	46258	46358	395.00	4	10	2 3/8	13 1/2	1.7531 - 1.8160	428.55	411.80	406.15	403.45	400.55	398.35
1 7/8	1.8750	46160	46260	46360	395.00	4	10	2 1/2	14	1.8161 - 1.8780	428.55	411.80	406.15	403.45	400.55	398.35
1 15/16	1.9375	46162	46262	46362	431.40	4	10	2 1/2	14	1.8781 - 1.9410	464.90	448.10	442.50	439.85	437.00	434.70
2	2.0000	46164	46264	46364	431.40	4	12	2 1/2	14	1.9411 - 2.0030	464.90	448.10	442.50	439.85	437.00	434.70

*Quantities of 15 or more - price of fractional size in same size range.

MATERIAL SPECIFIC REAMERS
CARBIDE TIPPED TYPES 432, 436, 438 FRACTIONAL

RIGHT SPIRAL FLUTES
STRAIGHT SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	432
	40	NON-FERROUS - SHORT CHIPS	432/436
	60	CAST IRONS	436
	80	LOW STRENGTH STEELS	438/436
	100	MEDIUM STRENGTH STEELS	438
	120	HIGH STRENGTH STEELS	438
	140	HIGH TEMPERATURE ALLOYS	438

NATIONAL AEROSPACE STANDARDS - NAS 897
TYPE 432 - FOR NON-FERROUS MATERIALS
TYPE 436 - FOR CAST IRONS & NAS MULTI-PURPOSE
TYPE 438 - FOR STEELS & HIGH TEMP ALLOYS

- Type "C" with short carbide tip
- Right spiral polished flutes and straight shank
- Tool geometry and carbide grade appropriate for material being machined
- Detailed specifications on page 29

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Metric tool diameter
- Closer tool diameter tolerance - pg. 29
- Cutting diameter reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diameter back taper
- Shortened shank or reduced shank diameter
- Flat(s) or tang on shank
- Coatings available:
  See page 85

NOTE: For smaller tool diameters, see solid carbide reamers on pages 104-111.

For shallow holes only (see page 27)

TOOL DIAMETER		TYPE 432 NON-FERROUS EDP NO.	TYPE 436 NAS/ CAST IRON EDP NO.	TYPE 438 STEEL/ HI-TEMP EDP NO.	ALL TYPES PRICE	DIMENSIONS					FINISHED TO MODIFIED TOOL DIAMETER						
						MAX SHANK DIAM.	NO. OF FLTS	LENGTH			MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DEC.							FLT	CAR-BIDE	OVER-ALL		1	2	3	4	5-7	8-14*
3/16	.1875	43206	43606	43806	$51.15	.1805	4	1 1/8	1/2	4 1/2	0.1770-0.2040	$81.45	$66.30	$61.15	$58.80	$56.15	$54.15
7/32	.2188	43207	43607	43807	51.15	.2075	4	1 1/4	1/2	5	0.2041-0.2210	81.45	66.30	61.15	58.80	56.15	54.15
15/64	.2344	4322344	4362344	4382344	51.15	.2265	4	1 1/2	1/2	6	0.2211-0.2380	81.45	66.30	61.15	58.80	56.15	54.15
1/4	.2500	43208	43608	43808	51.15	.2405	4	1 1/2	1/2	6	0.2381-0.2530	81.45	66.30	61.15	58.80	56.15	54.15
9/32	.2812	43209	43609	43809	51.25	.2485	4	1 1/2	1/2	6	0.2531-0.2840	81.55	66.45	61.30	58.95	56.30	54.25
5/16	.3125	43210	43610	43810	51.25	.2792	4	1 1/2	1/2	6	0.2841-0.3150	81.55	66.45	61.30	58.95	56.30	54.25
11/32	.3438	43211	43611	43811	56.50	.2792	4	1 1/2	5/8	6	0.3151-0.3470	86.75	71.60	66.55	64.15	61.55	59.40
3/8	.3750	43212	43612	43812	57.00	.3105	4	1 3/4	5/8	7	0.3471-0.3780	87.25	72.10	67.00	64.60	62.00	59.95
13/32	.4062	43213	43613	43813	59.55	.3105	4	1 3/4	5/8	7	0.3781-0.4090	89.80	74.60	69.55	67.10	64.55	62.50
7/16	.4375	43214	43614	43814	61.85	.3730	6	1 3/4	5/8	7	0.4091-0.4410	92.10	76.90	71.85	69.45	66.85	64.75
15/32	.4688	43215	43615	43815	65.75	.3730	6	1 3/4	5/8	7	0.4411-0.4720	96.10	80.90	75.80	73.40	70.80	68.80
1/2	.5000	43216	43616	43816	70.85	.4355	6	2	5/8	8	0.4721-0.5030	103.15	86.90	81.50	78.90	76.10	73.95
17/32	.5312	43217	43617	43817	72.95	.4355	6	2	5/8	8	0.5031-0.5340	105.25	89.10	83.65	81.05	78.30	76.05
9/16	.5625	43218	43618	43818	72.95	.4355	6	2	5/8	8	0.5341-0.5660	105.25	89.10	83.65	81.05	78.30	76.05
19/32	.5938	43219	43619	43819	75.25	.4355	6	2	5/8	8	0.5661-0.5970	107.50	91.30	85.85	83.30	80.50	78.35
5/8	.6250	43220	43620	43820	75.25	.5615	6	2 1/4	5/8	9	0.5971-0.6280	107.50	91.30	85.85	83.30	80.50	78.35
21/32	.6562	43221	43621	43821	77.50	.5615	6	2 1/4	5/8	9	0.6281-0.6590	109.75	93.55	88.15	85.55	82.75	80.55
11/16	.6875	43222	43622	43822	82.35	.5615	6	2 1/4	5/8	9	0.6591-0.6910	114.65	98.40	93.05	90.40	87.65	85.50
23/32	.7188	43223	43623	43823	83.60	.5615	6	2 1/4	5/8	9	0.6911-0.7220	115.85	99.70	94.30	91.70	88.95	86.75
3/4	.7500	43224	43624	43824	84.75	.6245	6	2 1/2	3/4	9 1/2	0.7221-0.7530	117.10	100.90	95.45	92.95	90.15	87.95
25/32	.7812	43225	43625	43825	87.10	.6245	6	2 1/2	3/4	9 1/2	0.7531-0.7840	119.35	103.20	97.80	95.25	92.45	90.25
13/16	.8125	43226	43626	43826	87.10	.6245	6	2 1/2	3/4	9 1/2	0.7841-0.8160	119.35	103.20	97.80	95.25	92.45	90.25
27/32	.8438	43227	43627	43827	91.70	.6245	6	2 1/2	3/4	9 1/2	0.8161-0.8470	123.95	107.85	102.40	99.85	97.05	94.80
7/8	.8750	43228	43628	43828	95.20	.7495	6	2 5/8	3/4	10	0.8471-0.8780	128.70	111.95	106.30	103.55	100.70	98.40
29/32	.9062	43229	43629	43829	110.90	.7495	6	2 5/8	3/4	10	0.8781-0.9090	144.40	127.55	121.95	119.30	116.45	114.20
15/16	.9375	43230	43630	43830	110.90	.7495	8	2 5/8	3/4	10	0.9091-0.9410	144.40	127.55	121.95	119.30	116.45	114.20
31/32	.9688	43231	43631	43831	116.30	.7495	8	2 5/8	3/4	10	0.9411-0.9720	149.85	133.05	127.35	124.70	121.80	119.50
1	1.0000	43232	43632	43832	116.30	.8745	8	2 3/4	3/4	10 1/2	0.9721-1.0030	149.85	133.05	127.35	124.70	121.80	119.50
1 1/16	1.0625	43234	43634	43834	124.75	.8745	8	2 3/4	3/4	10 1/2	1.0031-1.0660	158.30	141.50	135.90	133.25	130.35	128.05
1 1/8	1.1250	43236	43636	43836	128.65	.8745	8	2 7/8	7/8	11	1.0661-1.1280	162.20	145.35	139.75	137.05	134.20	131.85
1 3/16	1.1875	43238	43638	43838	135.15	.9995	8	2 7/8	7/8	11	1.1281-1.1905	168.65	151.85	146.25	143.60	140.65	138.40
1 1/4	1.2500	43240	43640	43840	143.10	.9995	8	3	7/8	11 1/2	1.1906-1.2530	176.65	159.85	154.25	151.45	148.65	146.40
1 5/16	1.3125	43242	43642	43842	158.30	.9995	8	3	7/8	11 1/2	1.2531-1.3155	191.80	175.00	169.45	166.75	163.90	161.60
1 3/8	1.3750	43244	43644	43844	173.35	.9995	8	3 1/4	7/8	12	1.3156-1.3780	206.90	190.15	184.50	181.80	178.95	176.70
1 7/16	1.4375	43246	43646	43846	183.75	.9995	8	3 1/4	7/8	12	1.3781-1.4405	217.25	200.45	194.85	192.20	189.25	187.00
1 1/2	1.5000	43248	43648	43848	194.10	1.2495	8	3 1/2	7/8	12 1/2	1.4406-1.5030	227.60	210.80	205.15	202.50	199.60	197.30

*Quantities of 15 or more - price of fractional size in same size range.

MATERIAL SPECIFIC REAMERS
CARBIDE TIPPED TYPES 442, 443, 444 FRACTIONAL

MATERIAL SPECIFIC

RIGHT SPIRAL FLUTES
FLUTE LONG CARBIDE
STRAIGHT SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	442
	40	NON-FERROUS - SHORT CHIPS	442/443
	60	CAST IRONS	443
	80	LOW STRENGTH STEELS	444/443
	100	MEDIUM STRENGTH STEELS	444
	120	HIGH STRENGTH STEELS	444
	140	HIGH TEMPERATURE ALLOYS	444

NATIONAL AEROSPACE STANDARDS - NAS 897
TYPE 442 - FOR NON-FERROUS MATERIALS
TYPE 443 - FOR CAST IRONS & NAS MULTI-PURPOSE
TYPE 444 - FOR STEELS & HIGH TEMP ALLOYS

- Type "C" with flute long carbide
- Right spiral polished flutes and straight shank
- Tool geometry and carbide grade appropriate for material being machined
- Detailed specifications on page 29

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Metric tool diameter
- Closer tool diameter tolerance - pg. 29
- Cutting diameter reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diameter back taper
- Shortened shank or reduced shank diameter
- Flat(s) or tang on shank
- Coatings available:

TITANIUM NITRIDE – TiN
TITANIUM CARBONITRIDE – TiCN
ZIRCONIUM NITRIDE – ZrN
AL TITANIUM NITRIDE – AlTiN

REAMERS

NOTE: For step reamers, see page 99. For smaller tool diameters, see solid carbide reamers on pages 104 & 111.

TOOL DIAMETER		TYPE 442 NON-FERROUS EDP NO.	TYPE 443 NAS/ CAST IRON EDP NO.	TYPE 444 STEEL/ HI-TEMP EDP NO.	ALL TYPES PRICE	DIMENSIONS				FINISHED TO MODIFIED TOOL DIAMETER						
						MAX. SHANK DIAM.	NO. OF FLTS	LENGTH		MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DEC.							FLUTE & CARBIDE	OVER-ALL		1	2	3	4	5-7	8-14*
5/16	.3125	44210	44310	44410	$61.55	.2792	4	1 ½	6	0.2841 - 0.3150	$91.75	$76.65	$71.55	$69.10	$66.55	$64.50
11/32	.3438	44211	44311	44411	67.80	.2792	4	1 ½	6	0.3151 - 0.3470	98.05	82.85	77.80	75.40	72.75	70.75
3/8	.3750	44212	44312	44412	68.35	.3105	4	1 ¾	7	0.3471 - 0.3780	98.70	83.50	78.40	75.95	73.40	71.40
13/32	.4062	44213	44313	44413	71.45	.3105	4	1 ¾	7	0.3781 - 0.4090	101.65	86.55	81.45	79.00	76.50	74.40
7/16	.4375	44214	44314	44414	74.20	.3730	6	1 ¾	7	0.4091 - 0.4410	104.45	89.30	84.25	81.85	79.25	77.10
15/32	.4688	44215	44315	44415	78.90	.3730	6	1 ¾	7	0.4411 - 0.4720	109.20	94.00	88.95	86.55	83.90	81.90
1/2	.5000	44216	44316	44416	85.10	.4355	6	2	8	0.4721 - 0.5030	117.35	101.25	95.75	93.25	90.40	88.25
17/32	.5312	44217	44317	44417	87.55	.4355	6	2	8	0.5031 - 0.5340	119.90	103.60	98.20	95.65	92.95	90.75
9/16	.5625	44218	44318	44418	87.55	.4355	6	2	8	0.5341 - 0.5660	119.90	103.60	98.20	95.65	92.95	90.75
19/32	.5938	44219	44319	44419	90.15	.4355	6	2	8	0.5661 - 0.5970	122.45	106.20	100.85	98.20	95.45	93.30
5/8	.6250	44220	44320	44420	90.15	.5615	6	2 ¼	9	0.5971 - 0.6280	122.45	106.20	100.85	98.20	95.45	93.30
21/32	.6562	44221	44321	44421	93.00	.5615	6	2 ¼	9	0.6281 - 0.6590	125.30	109.05	103.60	101.10	98.30	96.15
11/16	.6875	44222	44322	44422	98.70	.5615	6	2 ¼	9	0.6591 - 0.6910	131.00	114.85	109.40	106.85	104.10	101.90
23/32	.7188	44223	44323	44423	100.20	.5615	6	2 ¼	9	0.6911 - 0.7220	132.55	116.30	110.95	108.35	105.60	103.40
3/4	.7500	44224	44324	44424	101.70	.6245	6	2 ½	9 ½	0.7221 - 0.7530	134.00	117.85	112.40	109.90	107.10	104.95
25/32	.7812	44225	44325	44425	104.45	.6245	6	2 ½	9 ½	0.7531 - 0.7840	136.75	120.60	115.10	112.50	109.80	107.60
13/16	.8125	44226	44326	44426	104.45	.6245	6	2 ½	9 ½	0.7841 - 0.8160	136.75	120.60	115.10	112.50	109.80	107.60
27/32	.8438	44227	44327	44427	110.10	.6245	6	2 ½	9 ½	0.8161 - 0.8470	142.40	126.15	120.75	118.20	115.45	113.25
7/8	.8750	44228	44328	44428	114.25	.7495	6	2 ⅝	10	0.8471 - 0.8780	147.75	130.95	125.35	122.65	119.85	117.55
29/32	.9062	44229	44329	44429	133.10	.7495	6	2 ⅝	10	0.8781 - 0.9090	166.65	149.85	144.15	141.50	138.70	136.40
15/16	.9375	44230	44330	44430	133.10	.7495	8	2 ⅝	10	0.9091 - 0.9410	166.65	149.85	144.15	141.50	138.70	136.40
31/32	.9688	44231	44331	44431	139.55	.7495	8	2 ⅝	10	0.9411 - 0.9720	173.15	156.30	150.70	148.05	145.10	142.85
1	1.0000	44232	44332	44432	139.55	.8745	8	2 ¾	10 ½	0.9721 - 1.0030	173.15	156.30	150.70	148.05	145.10	142.85
1 1/16	1.0625	44234	44334	44434	164.05	.8745	8	2 ¾	10 ½	1.0031 - 1.0660	197.65	180.75	175.15	172.50	169.60	167.30
1 1/8	1.1250	44236	44336	44436	169.10	.8745	8	2 ⅞	11	1.0661 - 1.1280	202.65	185.85	180.20	177.60	174.70	172.45
1 3/16	1.1875	44238	44338	44438	177.75	.9995	8	2 ⅞	11	1.1281 - 1.1905	211.30	194.50	188.95	186.20	183.35	181.10
1 1/4	1.2500	44240	44340	44440	188.10	.9995	8	3	11 ½	1.1906 - 1.2530	221.65	204.90	199.25	196.60	193.65	191.45
1 5/16	1.3125	44242	44342	44442	208.15	.9995	8	3	11 ½	1.2531 - 1.3155	241.70	224.90	219.25	216.60	213.70	211.40
1 3/8	1.3750	44244	44344	44444	228.05	.9995	8	3 ¼	12	1.3156 - 1.3780	261.55	244.75	239.20	236.45	233.60	231.35
1 7/16	1.4375	44246	44346	44446	241.65	.9995	8	3 ¼	12	1.3781 - 1.4405	275.10	258.30	252.70	250.10	247.20	244.90
1 1/2	1.5000	44248	44348	44448	255.25	1.2495	8	3 ½	12 ½	1.4406 - 1.5030	288.75	271.95	266.30	263.75	260.75	258.55

*Quantities of 15 or more - price of fractional size in same size range.

MATERIAL SPECIFIC REAMERS
CARBIDE TIPPED TYPES 433, 437, 439 FRACTIONAL

LEFT SPIRAL FLUTES
STRAIGHT SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	433
	40	NON-FERROUS - SHORT CHIPS	433/437
	60	CAST IRONS	437
	80	LOW STRENGTH STEELS	439/437
	100	MEDIUM STRENGTH STEELS	439
	120	HIGH STRENGTH STEELS	439
	140	HIGH TEMPERATURE ALLOYS	439

NATIONAL AEROSPACE STANDARDS - NAS 897
TYPE 433 - FOR NON-FERROUS MATERIALS
TYPE 437 - FOR CAST IRONS & NAS MULTI-PURPOSE
TYPE 439 - FOR STEELS & HIGH TEMP ALLOYS

- Type "C" with short carbide tip
- Left spiral polished flutes and straight shank
- Tool geometry and carbide grade appropriate for material being machined
- Left spiral flutes should not be used on blind holes
- Detailed specifications on page 29

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Metric tool diameter
- Closer tool diameter tolerance - pg. 29
- Cutting diameter reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diameter back taper
- Shortened shank or reduced shank diameter
- Flat(s) or tang on shank
- Coatings available:
  See page 87

NOTE: For smaller tool diameters, see solid carbide reamers on pages 104 & 111.

For shallow holes only (see page 27)

TOOL DIAMETER		TYPE 433 NON-FERROUS EDP NO.	TYPE 437 NAS/ CAST IRON EDP NO.	TYPE 439 STEEL/ HI-TEMP EDP NO.	ALL TYPES PRICE	DIMENSIONS					FINISHED TO MODIFIED TOOL DIAMETER						
						MAX. SHANK DIAM.	NO. OF FLTS	LENGTH			MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DEC.							FLT	CAR-BIDE	OVER-ALL		1	2	3	4	5-7	8-14*
3/16	.1875	43306	43706	43906	$54.55	.1805	4	1 1/8	1/2	4 1/2	0.1770-0.2040	$86.85	$70.70	$65.30	$62.70	$59.95	$57.75
7/32	.2188	43307	43707	43907	54.55	.2075	4	1 1/4	1/2	5	0.2041-0.2210	86.85	70.70	65.30	62.70	59.95	57.75
15/64	.2344	4332344	4372344	4392344	54.55	.2265	4	1 1/2	1/2	6	0.2211-0.2380	86.85	70.70	65.30	62.70	59.95	57.75
1/4	.2500	43308	43708	43908	54.55	.2405	4	1 1/2	1/2	6	0.2381-0.2530	86.85	70.70	65.30	62.70	59.95	57.75
9/32	.2812	43309	43709	43909	54.70	.2485	4	1 1/2	1/2	6	0.2531-0.2840	87.05	70.85	65.45	62.80	60.05	57.90
5/16	.3125	43310	43710	43910	54.70	.2792	4	1 1/2	1/2	6	0.2841-0.3150	87.05	70.85	65.45	62.80	60.05	57.90
11/32	.3438	43311	43711	43911	60.20	.2792	4	1 1/2	5/8	6	0.3151-0.3470	92.55	76.45	70.95	68.35	65.60	63.45
3/8	.3750	43312	43712	43912	60.80	.3105	4	1 3/4	5/8	7	0.3471-0.3780	93.10	76.90	71.50	68.90	66.10	63.90
13/32	.4062	43313	43713	43913	63.50	.3105	4	1 3/4	5/8	7	0.3781-0.4090	95.75	79.65	74.20	71.60	68.85	66.65
7/16	.4375	43314	43714	43914	65.95	.3730	6	1 3/4	5/8	7	0.4091-0.4410	98.20	82.05	76.65	74.10	71.25	69.10
15/32	.4688	43315	43715	43915	70.10	.3730	6	1 3/4	5/8	7	0.4411-0.4720	102.45	86.35	80.90	78.30	75.50	73.35
1/2	.5000	43316	43716	43916	72.70	.4355	6	2	5/8	8	0.4721-0.5030	105.90	89.25	83.70	81.05	78.25	75.95
17/32	.5312	43317	43717	43917	74.90	.4355	6	2	5/8	8	0.5031-0.5340	108.05	91.40	85.85	83.25	80.40	78.10
9/16	.5625	43318	43718	43918	74.90	.4355	6	2	5/8	8	0.5341-0.5660	108.05	91.40	85.85	83.25	80.40	78.10
19/32	.5938	43319	43719	43919	77.20	.4355	6	2	5/8	8	0.5661-0.5970	110.35	93.70	88.20	85.55	82.70	80.45
5/8	.6250	43320	43720	43920	77.20	.5615	6	2 1/4	5/8	9	0.5971-0.6280	110.35	93.70	88.20	85.55	82.70	80.45
21/32	.6562	43321	43721	43921	79.50	.5615	6	2 1/4	5/8	9	0.6281-0.6590	112.70	96.05	90.45	87.80	84.95	82.75
11/16	.6875	43322	43722	43922	84.55	.5615	6	2 1/4	5/8	9	0.6591-0.6910	117.70	101.10	95.50	92.80	90.05	87.75
23/32	.7188	43323	43723	43923	85.80	.5615	6	2 1/4	5/8	9	0.6911-0.7220	119.00	102.35	96.80	94.20	91.30	89.10
3/4	.7500	43324	43724	43924	87.05	.6245	6	2 1/2	3/4	9 1/2	0.7221-0.7530	120.20	103.55	98.05	95.40	92.55	90.30
25/32	.7812	43325	43725	43925	89.40	.6245	6	2 1/2	3/4	9 1/2	0.7531-0.7840	122.60	105.95	100.40	97.75	94.90	92.65
13/16	.8125	43326	43726	43926	89.40	.6245	6	2 1/2	3/4	9 1/2	0.7841-0.8160	122.60	105.95	100.40	97.75	94.90	92.65
27/32	.8438	43327	43727	43927	94.20	.6245	6	2 1/2	3/4	9 1/2	0.8161-0.8470	127.35	110.75	105.10	102.50	99.65	97.40
7/8	.8750	43328	43728	43928	97.75	.7495	6	2 5/8	3/4	10	0.8471-0.8780	132.20	114.90	109.05	106.40	103.40	101.05
29/32	.9062	43329	43729	43929	113.85	.7495	6	2 5/8	3/4	10	0.8781-0.9090	148.25	131.00	125.30	122.50	119.50	117.20
15/16	.9375	43330	43730	43930	113.85	.7495	8	2 5/8	3/4	10	0.9091-0.9410	148.25	131.00	125.30	122.50	119.50	117.20
31/32	.9688	43331	43731	43931	119.35	.7495	8	2 5/8	3/4	10	0.9411-0.9720	153.80	136.60	130.85	128.05	125.10	122.80
1	1.0000	43332	43732	43932	119.35	.8745	8	2 3/4	3/4	10 1/2	0.9721-1.0030	153.80	136.60	130.85	128.05	125.10	122.80
1 1/16	1.0625	43334	43734	43934	128.10	.8745	8	2 3/4	3/4	10 1/2	1.0031-1.0660	162.50	145.35	139.50	136.75	133.80	131.50
1 1/8	1.1250	43336	43736	43936	132.10	.8745	8	2 7/8	7/8	11	1.0661-1.1280	166.55	149.25	143.45	140.70	137.80	135.45
1 3/16	1.1875	43338	43738	43938	138.80	.9995	8	2 7/8	7/8	11	1.1281-1.1905	173.20	155.95	150.15	147.40	144.50	142.15
1 1/4	1.2500	43340	43740	43940	146.90	.9995	8	3	7/8	11 1/2	1.1906-1.2530	181.30	164.10	158.30	155.60	152.60	150.25
1 5/16	1.3125	43342	43742	43942	162.50	.9995	8	3	7/8	11 1/2	1.2531-1.3155	197.00	179.80	173.95	171.25	168.20	165.95
1 3/8	1.3750	43344	43744	43944	178.05	.9995	8	3 1/4	7/8	12	1.3156-1.3780	212.50	195.20	189.40	186.70	183.75	181.40
1 7/16	1.4375	43346	43746	43946	188.70	.9995	8	3 1/4	7/8	12	1.3781-1.4405	223.00	205.85	200.10	197.25	194.35	192.05
1 1/2	1.5000	43348	43748	43948	199.35	1.2495	8	3 1/2	7/8	12 1/2	1.4406-1.5030	233.75	216.45	210.70	207.95	205.00	202.65

*Quantities of 15 or more - price of fractional size in same size range.

MATERIAL SPECIFIC REAMERS
CARBIDE TIPPED TYPES 482, 483, 484 FRACTIONAL

MATERIAL SPECIFIC

LEFT SPIRAL FLUTES
FLUTE LONG CARBIDE
STRAIGHT SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	482
	40	NON-FERROUS - SHORT CHIPS	482/483
	60	CAST IRONS	483
	80	LOW STRENGTH STEELS	484/483
	100	MEDIUM STRENGTH STEELS	484
	120	HIGH STRENGTH STEELS	484
	140	HIGH TEMPERATURE ALLOYS	484

NATIONAL AEROSPACE STANDARDS - NAS 897
TYPE 482 - FOR NON-FERROUS MATERIALS
TYPE 483 - FOR CAST IRONS & NAS MULTI-PURPOSE
TYPE 484 - FOR STEELS & HIGH TEMP ALLOYS

- Type "C" with flute long carbide
- Left spiral polished flutes and straight shank
- Tool geometry and carbide grade appropriate for material being machined
- Left spiral flutes should not be used on blind holes
- Detailed specifications on page 29

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Metric tool diameter
- Closer tool diameter tolerance - pg. 29
- Cutting diameter reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diameter back taper
- Shortened shank or reduced shank diameter
- Flat(s) or tang on shank
- Coatings available:

TITANIUM NITRIDE – TiN
TITANIUM CARBONITRIDE – TiCN
ZIRCONIUM NITRIDE – ZrN
AL TITANIUM NITRIDE – AlTiN

REAMERS

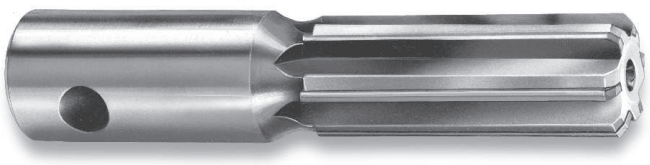
NOTE: For step reamers, see page 100. For smaller tool diameter, see solid carbide reamers on pages 104 & 111.

TOOL DIAMETER		TYPE 482 NON-FERROUS EDP NO.	TYPE 483 NAS/ CAST IRON EDP NO.	TYPE 484 STEEL/ HI-TEMP EDP NO.	ALL TYPES PRICE	DIMENSIONS				FINISHED TO MODIFIED TOOL DIAMETER						
						MAX. SHANK DIAM.	NO. OF FLTS	LENGTH		MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DEC.							FLUTE & CARBIDE	OVER-ALL		1	2	3	4	5-7	8-14*
5/16	.3125	48210	48310	48410	$65.60	.2792	4	1 1/2	6	0.2841-0.3150	$97.95	$81.65	$76.35	$73.70	$70.95	$68.80
11/32	.3438	48211	48311	48411	72.25	.2792	4	1 1/2	6	0.3151-0.3470	104.55	88.40	83.00	80.40	77.65	75.45
3/8	.3750	48212	48312	48412	72.95	.3105	4	1 3/4	7	0.3471-0.3780	105.25	89.10	83.65	81.05	78.30	76.05
13/32	.4062	48213	48313	48413	76.10	.3105	4	1 3/4	7	0.3781-0.4090	108.45	92.35	86.85	84.30	81.50	79.35
7/16	.4375	48214	48314	48414	79.20	.3730	6	1 3/4	7	0.4091-0.4410	111.40	95.30	89.85	87.30	84.50	82.35
15/32	.4688	48215	48315	48415	84.20	.3730	6	1 3/4	7	0.4411-0.4720	116.55	100.30	94.80	92.35	89.50	87.35
1/2	.5000	48216	48316	48416	87.35	.4355	6	2	8	0.4721-0.5030	120.60	103.95	98.35	95.70	92.80	90.60
17/32	.5312	48217	48317	48417	89.90	.4355	6	2	8	0.5031-0.5340	123.05	106.40	100.90	98.20	95.40	93.15
9/16	.5625	48218	48318	48418	89.90	.4355	6	2	8	0.5341-0.5660	123.05	106.40	100.90	98.20	95.40	93.15
19/32	.5938	48219	48319	48419	92.55	.4355	6	2	8	0.5661-0.5970	125.70	109.05	103.50	100.90	98.05	95.75
5/8	.6250	48220	48320	48420	92.55	.5615	6	2 1/4	9	0.5971-0.6280	125.70	109.05	103.50	100.90	98.05	95.75
21/32	.6562	48221	48321	48421	95.45	.5615	6	2 1/4	9	0.6281-0.6590	128.65	112.05	106.40	103.85	100.95	98.70
11/16	.6875	48222	48322	48422	101.35	.5615	6	2 1/4	9	0.6591-0.6910	134.50	117.90	112.30	109.75	106.85	104.55
23/32	.7188	48223	48323	48423	102.95	.5615	6	2 1/4	9	0.6911-0.7220	136.05	119.40	113.90	111.25	108.40	106.15
3/4	.7500	48224	48324	48424	104.45	.6245	6	2 1/2	9 1/2	0.7221-0.7530	137.65	121.05	115.45	112.80	110.00	107.75
25/32	.7812	48225	48325	48425	107.20	.6245	6	2 1/2	9 1/2	0.7531-0.7840	140.40	123.80	118.20	115.65	112.75	110.45
13/16	.8125	48226	48326	48426	107.20	.6245	6	2 1/2	9 1/2	0.7841-0.8160	140.40	123.80	118.20	115.65	112.75	110.45
27/32	.8438	48227	48327	48427	113.05	.6245	6	2 1/2	9 1/2	0.8161-0.8470	146.15	129.55	123.95	121.30	118.50	116.25
7/8	.8750	48228	48328	48428	117.30	.7495	6	2 5/8	10	0.8471-0.8780	151.70	134.45	128.70	125.95	122.95	120.65
29/32	.9062	48229	48329	48429	136.65	.7495	6	2 5/8	10	0.8781-0.9090	171.05	153.80	148.05	145.35	142.35	140.05
15/16	.9375	48230	48330	48430	136.65	.7495	8	2 5/8	10	0.9091-0.9410	171.05	153.80	148.05	145.35	142.35	140.05
31/32	.9688	48231	48331	48431	143.30	.7495	8	2 5/8	10	0.9411-0.9720	177.75	160.50	154.75	152.00	149.05	146.75
1	1.0000	48232	48332	48432	143.30	.8745	8	2 3/4	10 1/2	0.9721-1.0030	177.75	160.50	154.75	152.00	149.05	146.75
1 1/16	1.0625	48234	48334	48434	168.45	.8745	8	2 3/4	10 1/2	1.0031-1.0660	202.85	185.65	179.90	177.05	174.15	171.85
1 1/8	1.1250	48236	48336	48436	173.70	.8745	8	2 7/8	11	1.0661-1.1280	208.10	190.90	185.00	182.30	179.35	177.00
1 3/16	1.1875	48238	48338	48438	182.55	.9995	8	2 7/8	11	1.1281-1.1905	216.95	199.70	193.95	191.15	188.20	185.90
1 1/4	1.2500	48240	48340	48440	193.25	.9995	8	3	11 1/2	1.1906-1.2530	227.60	210.35	204.60	201.80	198.90	196.60
1 5/16	1.3125	48242	48342	48442	213.70	.9995	8	3	11 1/2	1.2531-1.3155	248.15	230.85	225.15	222.40	219.45	217.15
1 3/8	1.3750	48244	48344	48444	234.15	.9995	8	3 1/4	12	1.3156-1.3780	268.55	251.40	245.55	242.80	239.90	237.50
1 7/16	1.4375	48246	48346	48446	248.10	.9995	8	3 1/4	12	1.3781-1.4405	282.50	265.20	259.50	256.75	253.80	251.50
1 1/2	1.5000	48248	48348	48448	262.05	1.2495	8	3 1/2	12 1/2	1.4406-1.5030	296.50	279.25	273.55	270.70	267.80	265.55

*Quantities of 15 or more - price of fractional size in same size range.

MATERIAL SPECIFIC REAMERS
CARBIDE TIPPED TYPES 470, 471, 475 FRACTIONAL

CNC STUB
STRAIGHT FLUTE LONG CARBIDE
STRAIGHT SHANK



TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	470
	40	NON-FERROUS - SHORT CHIPS	470/471
	60	CAST IRONS	471
	80	LOW STRENGTH STEELS	475/471
	100	MEDIUM STRENGTH STEELS	475
	120	HIGH STRENGTH STEELS	475
	140	HIGH TEMPERATURE ALLOYS	475

TYPE 470 - FOR NON-FERROUS MATERIALS
TYPE 471 - FOR CAST IRONS & NAS MULTI-PURPOSE
TYPE 475 - FOR STEELS & HIGH TEMP ALLOYS

- Straight polished flutes
- Flute long carbide on .2841" tool diameter and larger
- Straight shank fits into standard holders
- Pin cross hole permits use in pin drive floating holders
- Tool geometry and carbide grade appropriate for material being machined
- Detailed specifications on page 29

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Metric tool diameter
- Closer tool diameter tolerance - pg. 29
- Cutting diameter reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diam. back taper
- Reduced shank diameter
- Flat(s) on shank
- Coatings available:
  See page 87

TOOL DIAMETER		TYPE 470 NON-FERROUS EDP NO.	TYPE 471 NAS/ CAST IRON EDP NO.	TYPE 475 STEEL/ HI-TEMP EDP NO.	ALL TYPES PRICES	DIMENSIONS						FINISHED TO MODIFIED TOOL DIAMETER						
						SHANK DIAM.	NO. OF FLTS	LENGTH			PIN HOLE DIAM.	MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DEC.							FLT	CAR-BIDE	OVER-ALL			1	2	3	4	5-7	8-14*
3/16	.1875	47006	47106	47506	$52.75	1/4	4	1	1/2	2 1/4	3/32	0.1770-0.2040	$84.95	$68.85	$63.45	$60.90	$58.05	$55.90
7/32	.2188	47007	47107	47507	52.75	1/4	4	1	1/2	2 1/4	3/32	0.2041-0.2210	84.95	68.85	63.45	60.90	58.05	55.90
15/64	.2344	4702344	4712344	4752344	52.75	1/4	4	1	1/2	2 1/4	3/32	0.2211-0.2380	84.95	68.85	63.45	60.90	58.05	55.90
1/4	.2500	47008	47108	47508	52.75	1/4	4	1	1/2	2 1/4	3/32	0.2381-0.2530	84.95	68.85	63.45	60.90	58.05	55.90
9/32	.2812	47009	47109	47509	52.75	3/8	4	1	1/2	2 1/4	1/8	0.2531-0.2840	84.95	68.85	63.45	60.90	58.05	55.90
5/16	.3125	47010	47110	47510	61.25	3/8	4	1	1	2 1/4	1/8	0.2841-0.3150	93.60	77.50	72.05	69.45	66.65	64.50
11/32	.3438	47011	47111	47511	61.85	3/8	4	1 1/4	1 1/4	2 1/2	1/8	0.3151-0.3470	94.20	77.95	72.55	69.95	67.15	65.00
3/8	.3750	47012	47112	47512	67.05	3/8	4	1 1/4	1 1/4	2 1/2	1/8	0.3471-0.3780	99.30	83.20	77.75	75.25	72.45	70.20
13/32	.4062	47013	47113	47513	68.05	1/2	4	1 1/4	1 1/4	2 1/2	3/16	0.3781-0.4090	100.35	84.20	78.75	76.10	73.40	71.20
7/16	.4375	47014	47114	47514	80.50	1/2	4	1 1/4	1 1/4	2 1/2	3/16	0.4091-0.4410	112.85	96.65	91.25	88.65	85.85	83.70
15/32	.4688	47015	47115	47515	80.50	1/2	4	1 1/4	1 1/4	2 1/2	3/16	0.4411-0.4720	112.85	96.65	91.25	88.65	85.85	83.70
1/2	.5000	47016	47116	47516	92.00	1/2	4	1 1/4	1 1/4	2 1/2	3/16	0.4721-0.5030	126.60	109.25	103.40	100.60	97.70	95.35
17/32	.5312	47017	47117	47517	92.00	5/8	6	1 1/2	1 1/2	3	1/4	0.5031-0.5340	126.60	109.25	103.40	100.60	97.70	95.35
9/16	.5625	47018	47118	47518	96.95	5/8	6	1 1/2	1 1/2	3	1/4	0.5341-0.5660	131.55	114.20	108.35	105.60	102.60	100.30
19/32	.5938	47019	47119	47519	96.95	5/8	6	1 1/2	1 1/2	3	1/4	0.5661-0.5970	131.55	114.20	108.35	105.60	102.60	100.30
5/8	.6250	47020	47120	47520	99.50	5/8	6	1 1/2	1 1/2	3	1/4	0.5971-0.6280	134.10	116.80	111.05	108.25	105.25	102.95
21/32	.6562	47021	47121	47521	99.50	5/8	6	1 1/2	1 1/2	3	1/4	0.6281-0.6590	134.10	116.80	111.05	108.25	105.25	102.95
11/16	.6875	47022	47122	47522	104.20	5/8	6	1 1/2	1 1/2	3	1/4	0.6591-0.6910	138.80	121.50	115.70	112.90	110.00	107.60
23/32	.7188	47023	47123	47523	104.20	3/4	6	1 1/2	1 1/2	3	5/16	0.6911-0.7220	138.80	121.50	115.70	112.90	110.00	107.60
3/4	.7500	47024	47124	47524	106.85	3/4	6	1 1/2	1 1/2	3	5/16	0.7221-0.7530	141.45	124.15	118.25	115.50	112.50	110.20
25/32	.7812	47025	47125	47525	106.85	3/4	6	1 1/2	1 1/2	3	5/16	0.7531-0.7840	141.45	124.15	118.25	115.50	112.50	110.20
13/16	.8125	47026	47126	47526	116.00	3/4	6	1 1/2	1 1/2	3	5/16	0.7841-0.8160	150.65	133.35	127.50	124.70	121.75	119.35
27/32	.8438	47027	47127	47527	116.00	3/4	6	1 1/2	1 1/2	3	5/16	0.8161-0.8470	150.65	133.35	127.50	124.70	121.75	119.35
7/8	.8750	47028	47128	47528	126.80	3/4	6	1 1/2	1 1/2	3	5/16	0.8471-0.8780	162.70	144.70	138.75	135.85	132.70	130.35
29/32	.9062	47029	47129	47529	126.80	3/4	6	1 1/2	1 1/2	3	5/16	0.8781-0.9090	162.70	144.70	138.75	135.85	132.70	130.35
15/16	.9375	47030	47130	47530	139.60	3/4	6	1 1/2	1 1/2	3	5/16	0.9091-0.9410	175.60	157.55	151.60	148.70	145.60	143.20
31/32	.9688	47031	47131	47531	139.60	3/4	8	1 1/2	1 1/2	3	5/16	0.9411-0.9720	175.60	157.55	151.60	148.70	145.60	143.20
1	1.0000	47032	47132	47532	146.55	3/4	8	1 1/2	1 1/2	3	5/16	0.9721-1.0030	182.50	164.50	158.40	155.60	152.50	150.10
1 1/16	1.0625	47034	47134	47534	140.40	3/4	8	1 1/2	1 1/2	3	5/16	1.0031-1.0660	174.90	157.60	151.85	149.15	146.10	143.80
1 1/8	1.1250	47036	47136	47536	164.30	3/4	8	1 1/2	1 1/2	3	5/16	1.0661-1.1280	198.75	181.50	175.70	173.00	170.00	167.70
1 3/16	1.1875	47038	47138	47538	171.35	3/4	8	1 1/2	1 1/2	3	5/16	1.1281-1.1905	205.75	188.50	182.75	180.05	177.00	174.70
1 1/4	1.2500	47040	47140	47540	200.75	3/4	8	1 1/2	1 1/2	3	5/16	1.1906-1.2530	235.15	217.95	212.20	209.40	206.50	204.10
1 5/16	1.3125	47042	47142	47542	200.75	3/4	8	1 1/2	1 1/2	3	5/16	1.2531-1.3155	235.15	217.95	212.20	209.40	206.50	204.10
1 3/8	1.3750	47044	47144	47544	203.55	3/4	8	1 1/2	1 1/2	3	5/16	1.3156-1.3780	237.95	220.70	214.90	212.20	209.25	206.90
1 7/16	1.4375	47046	47146	47546	237.35	3/4	8	1 1/2	1 1/2	3	5/16	1.3781-1.4405	271.75	254.50	248.70	245.95	243.00	240.65
1 1/2	1.5000	47048	47148	47548	285.05	3/4	8	1 1/2	1 1/2	3	5/16	1.4406-1.5030	319.50	302.25	296.45	293.75	290.75	288.45

*Quantities of 15 or more - price of fractional size in same size range.

COOLANT FED REAMERS
SUPERIOR HOLE FINISH, FEEDS & SPEEDS & TOOL LIFE

ADVANTAGES & APPLICATION RECOMMENDATIONS

SUPERIOR SURFACE FINISHES
- Tool's ability to flush chips away from the cutting edge prevents recutting of chips
- Coolant's constant presence at the cutting edge reduces heat in both the reamer and workpiece
- Extremely fine ground finish of the reamer's chamfer reduces buildup of material on the cutting edges

HIGHER FEEDS AND SPEEDS
- Maximum utilization of the coolant's lubricating properties
- Material specific geometries ensure optimum feed and speed capability

MAXIMUM TOOL LIFE
- Use of premium carbide grades based on material specific application

BLIND HOLE APPLICATIONS
- Select tool with center coolant outlet to flush chips out of the hole
- Available in straight and right spiral flutes (pgs. 90, 91, 94, 102, 103)

THRU HOLE APPLICATIONS
- Select tool with flute coolant outlets which enable the coolant to flush the chips ahead of the tool
- Available in straight, right spiral, and left spiral flutes (pgs. 92, 93, 95, 102, 103)

REAMING A HOLE WITH INTERRUPTIONS
- Select the proper spiral based on hole condition (blind or thru)
- Spiral flutes will help bridge the interruption (i.e., crosshole, keyway, etc.)
- Do not use straight flute reamer

STEP REAMERS
CUTTING OR NON-CUTTING PILOT

LOW COST & PROMPT DELIVERY

HANNIBAL SERVICES MARKET DEMAND FOR MATERIAL SPECIFIC STEP AND PILOT REAMERS
- 9 types available in straight, right spiral, and left spiral flute designs (pgs. 98-100)
- Reduce tooling cost and costly setup time by reaming multi-diameter holes in one operation
- Eliminate problems caused by heavy stock removal – use a step reamer to remove excess material with minor diameter, while setting up the finish diameter to remove adequate stock to obtain size and best finish
- When alignment is critical, rely on a piloted reamer; the pilot is non-cutting and acts as a guide to ensure alignment of multi-diameter holes

STEP REAMER MODIFICATIONS
- Modified tool diameter
- Metric tool diameter
- Closer tool diameter tolerance
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diameter back taper
- Shortened shank or reduced shank diameter
- Flat(s) or tang on shank
- Coatings available:
  - TITANIUM NITRIDE – TiN
  - TITANIUM CARBONITRIDE – TiCN
  - ZIRCONIUM NITRIDE – ZrN
  - AL TITANIUM NITRIDE – AlTiN

STEP REAMER SPECIFICATIONS
- Geometry and carbide grade appropriate for material being machined
- Carbide tips brazed to tough hardened alloy steel body
- Polished flutes for easy chip flow
- Reamer shanks are ground to next smallest shank diameter listed in NAS 897 if tool diameter is within .005" of shank diameter

STEP REAMER TOLERANCES
- Tool diameter tolerance:
  - Major cutting diameter: plus .0003", minus .0000"
  - Minor cutting diameter: plus .0003", minus .0000"
  - If non-cutting pilot: plus .000", minus .001"
- Shank diameter tolerance thru 23/32" tool diameter: plus .0000", minus .0010"
  over 23/32" tool diameter: plus .0000", minus .0015"
- Step or pilot length tolerance: plus .005", minus .005"

COOLANT FED REAMERS
CARBIDE TIPPED TYPES 414, 424, 434 FRACTIONAL

MATERIAL SPECIFIC COOLANT FED

CENTER FED FOR BLIND HOLES
STRAIGHT FLUTES & SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	414
	40	NON-FERROUS - SHORT CHIPS	414/424
	60	CAST IRONS	424
	80	LOW STRENGTH STEELS	434/424
	100	MEDIUM STRENGTH STEELS	434
	120	HIGH STRENGTH STEELS	434
	140	HIGH TEMPERATURE ALLOYS	434

TYPE 414 - FOR NON-FERROUS MATERIALS
TYPE 424 - FOR CAST IRONS
TYPE 434 - FOR STEELS & HIGH TEMP ALLOYS

- Center coolant outlet
- Polished flutes; flute long carbide on .2841" tool diameter and larger
- Tool geometry and carbide grade appropriate for material being machined
- Detailed specifications on page 29

USE:

- Center coolant outlet for reaming blind holes as chips are flushed ***back*** towards the shank
- Improves hole finish and permits higher feeds & speeds with longer tool life

MODIFICATIONS (See list on page 94)

TOOL DIAMETER		TYPE 414 NON-FERROUS EDP NO.	TYPE 424 CAST IRON EDP NO.	TYPE 434 STEEL/ HI-TEMP EDP NO.	ALL TYPES PRICE	DIMENSIONS					FINISHED TO MODIFIED TOOL DIAMETER						
						MAX. SHANK DIAM.	NO. OF FLTS	LENGTH			MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DEC.							FLT	CAR-BIDE	OVER-ALL		1	2	3	4	5-7	8-14*
3/16	.1875	41406	42406	43406	$110.80	.1805	4	1 1/4	1/2	5	0.1770 - 0.2040	$145.45	$128.05	$122.20	$119.50	$116.55	$114.20
13/64	.2031	4142031	4242031	4342031	110.80	.1805	4	1 1/4	1/2	5	-	-	-	-	-	-	-
7/32	.2188	41407	42407	43407	110.80	.2075	4	1 1/4	1/2	5	0.2041 - 0.2210	145.45	128.05	122.20	119.50	116.55	114.20
15/64	.2344	4142344	4242344	4342344	110.80	.2265	4	1 1/2	1/2	6	0.2211 - 0.2380	145.45	128.05	122.20	119.50	116.55	114.20
1/4	.2500	41408	42408	43408	110.80	.2405	4	1 1/2	1/2	6	0.2381 - 0.2530	145.45	128.05	122.20	119.50	116.55	114.20
17/64	.2656	4142656	4242656	4342656	117.60	.2485	4	1 1/2	1/2	6	-	-	-	-	-	-	-
9/32	.2812	41409	42409	43409	117.60	.2485	4	1 1/2	1/2	6	0.2531 - 0.2840	152.20	134.85	129.05	126.25	123.30	121.00
19/64	.2969	4142969	4242969	4342969	124.20	.2792	4	1 1/2	1 1/2	6	-	-	-	-	-	-	-
5/16	.3125	41410	42410	43410	124.20	.2792	4	1 1/2	1 1/2	6	0.2841 - 0.3150	158.85	141.45	135.65	132.80	129.90	127.55
21/64	.3281	4143281	4243281	4343281	125.15	.2792	4	1 1/2	1 1/2	6	-	-	-	-	-	-	-
11/32	.3438	41411	42411	43411	125.15	.2792	4	1 1/2	1 1/2	6	0.3151 - 0.3470	159.75	142.40	136.65	133.80	130.90	128.60
23/64	.3594	4143594	4243594	4343594	126.45	.3105	4	1 3/4	1 3/4	7	-	-	-	-	-	-	-
3/8	.3750	41412	42412	43412	126.45	.3105	4	1 3/4	1 3/4	7	0.3471 - 0.3780	161.05	143.70	137.90	135.10	132.15	129.85
25/64	.3906	4143906	4243906	4343906	126.85	.3105	4	1 3/4	1 3/4	7	-	-	-	-	-	-	-
13/32	.4062	41413	42413	43413	126.85	.3105	4	1 3/4	1 3/4	7	0.3781 - 0.4090	161.45	144.15	138.35	135.55	132.60	130.20
27/64	.4219	4144219	4244219	4344219	128.10	.3730	6	1 3/4	1 3/4	7	-	-	-	-	-	-	-
7/16	.4375	41414	42414	43414	128.10	.3730	6	1 3/4	1 3/4	7	0.4091 - 0.4410	162.75	145.45	139.55	136.85	133.80	131.55
29/64	.4531	4144531	4244531	4344531	129.20	.3730	6	1 3/4	1 3/4	7	-	-	-	-	-	-	-
15/32	.4688	41415	42415	43415	129.20	.3730	6	1 3/4	1 3/4	7	0.4411 - 0.4720	163.90	146.55	140.70	137.95	134.95	132.65
31/64	.4844	4144844	4244844	4344844	130.70	.4355	6	2	2	8	-	-	-	-	-	-	-
1/2	.5000	41416	42416	43416	130.70	.4355	6	2	2	8	0.4721 - 0.5030	165.35	148.05	142.25	139.45	136.55	134.10
33/64	.5156	4145156	4245156	4345156	133.65	.4355	6	2	2	8	-	-	-	-	-	-	-
17/32	.5312	41417	42417	43417	133.65	.4355	6	2	2	8	0.5031 - 0.5340	168.20	150.90	145.10	142.35	139.40	137.00
9/16	.5625	41418	42418	43418	135.55	.4355	6	2	2	8	0.5341 - 0.5660	170.20	152.80	147.00	144.30	141.30	138.95
19/32	.5938	41419	42419	43419	138.40	.4355	6	2	2	8	0.5661 - 0.5970	173.00	155.65	149.85	147.15	144.15	141.80
5/8	.6250	41420	42420	43420	141.00	.5615	6	2 1/4	2 1/4	9	0.5971 - 0.6280	175.65	158.25	152.50	149.65	146.75	144.40
21/32	.6562	41421	42421	43421	156.10	.5615	6	2 1/4	2 1/4	9	0.6281 - 0.6590	190.70	173.35	167.50	164.85	161.80	159.50
11/16	.6875	41422	42422	43422	159.25	.5615	6	2 1/4	2 1/4	9	0.6591 - 0.6910	193.85	176.60	170.70	168.00	165.00	162.65
23/32	.7188	41423	42423	43423	166.10	.5615	6	2 1/4	2 1/4	9	0.6911 - 0.7220	200.70	183.45	177.65	174.85	171.90	169.50
3/4	.7500	41424	42424	43424	166.10	.6245	6	2 1/2	2 1/2	9 1/2	0.7221 - 0.7530	200.70	183.45	177.65	174.85	171.90	169.50
25/32	.7812	41425	42425	43425	171.05	.6245	6	2 1/2	2 1/2	9 1/2	0.7531 - 0.7840	205.65	188.30	182.55	179.80	176.75	174.40
13/16	.8125	41426	42426	43426	171.05	.6245	6	2 1/2	2 1/2	9 1/2	0.7841 - 0.8160	205.65	188.30	182.55	179.80	176.75	174.40
27/32	.8438	41427	42427	43427	176.90	.6245	6	2 1/2	2 1/2	9 1/2	0.8161 - 0.8470	211.50	194.20	188.35	185.60	182.65	180.25
7/8	.8750	41428	42428	43428	183.60	.7495	6	2 5/8	2 5/8	10	0.8471 - 0.8780	219.55	201.50	195.45	192.60	189.55	187.10
29/32	.9062	41429	42429	43429	203.85	.7495	6	2 5/8	2 5/8	10	0.8781 - 0.9090	239.75	221.75	215.70	212.90	209.75	207.40
15/16	.9375	41430	42430	43430	203.85	.7495	8	2 5/8	2 5/8	10	0.9091 - 0.9410	239.75	221.75	215.70	212.90	209.75	207.40
31/32	.9688	41431	42431	43431	204.65	.7495	8	2 5/8	2 5/8	10	0.9411 - 0.9720	240.55	222.60	216.60	213.70	210.55	208.20
1	1.0000	41432	42432	43432	204.65	.8745	8	2 3/4	2 3/4	10 1/2	0.9721 - 1.0030	240.55	222.60	216.60	213.70	210.55	208.20
1 1/16	1.0625	41434	42434	43434	210.45	.8745	8	2 3/4	2 3/4	10 1/2	1.0031 - 1.0660	246.40	228.40	222.35	219.55	216.35	214.00
1 1/8	1.1250	41436	42436	43436	217.80	.8745	8	2 7/8	2 7/8	11	1.0661 - 1.1280	253.65	235.70	229.60	226.75	223.65	221.20
1 3/16	1.1875	41438	42438	43438	233.25	.9995	8	2 7/8	2 7/8	11	1.1281 - 1.1905	269.20	251.15	245.05	242.30	239.20	236.80
1 1/4	1.2500	41440	42440	43440	236.25	.9995	8	3	3	11 1/2	1.1906 - 1.2530	272.25	254.20	248.20	245.35	242.30	239.90
1 5/16	1.3125	41442	42442	43442	243.05	.9995	8	3	3	11 1/2	1.2531 - 1.3155	279.05	260.95	255.00	252.05	249.05	246.60
1 3/8	1.3750	41444	42444	43444	252.90	.9995	8	3 1/4	3 1/4	12	1.3156 - 1.3780	288.85	270.80	264.85	261.95	258.90	256.40
1 7/16	1.4375	41446	42446	43446	260.80	.9995	8	3 1/4	3 1/4	12	1.3781 - 1.4405	296.80	278.75	272.80	269.90	266.80	264.40
1 1/2	1.5000	41448	42448	43448	269.55	1.2495	8	3 1/2	3 1/2	12 1/2	1.4406 - 1.5030	305.50	287.50	281.50	278.60	275.55	273.10

*Quantities of 15 or more - price of fractional size in same size range.

CONTINUED FROM PAGE 90 - TYPE 414, 424, 434 FRACTIONAL

TOOL DIAMETER		TYPE 414 NON-FERROUS EDP NO.	TYPE 424 CAST IRON EDP NO.	TYPE 434 STEEL/ HI-TEMP EDP NO.	ALL TYPES PRICE	DIMENSIONS					FINISHED TO MODIFIED TOOL DIAMETER						
						MAX. SHANK DIAM.	NO. OF FLTS	LENGTH			MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DEC.							FLT	CAR-BIDE	OVER-ALL		1	2	3	4	5-7	8-14*
1 9⁄16	1.5625	41450	42450	43450	$287.00	1.2495	8	3 ½	3 ½	12 ½	1.5031 - 1.5660	$321.25	$304.10	$298.40	$295.65	$292.65	$290.40
1 5⁄8	1.6250	41452	42452	43452	314.20	1.2495	8	3 ½	3 ½	13	1.5661 - 1.6280	348.40	331.30	325.60	322.80	319.85	317.60
1 11⁄16	1.6875	41454	42454	43454	320.85	1.2495	8	3 ½	3 ½	13	1.6281 - 1.6910	355.10	338.00	332.25	329.50	326.55	324.25
1 ¾	1.7500	41456	42456	43456	351.40	1.2495	10	3 ½	3 ½	13 ½	1.6911 - 1.7530	385.65	368.50	362.80	360.05	357.05	354.80
1 13⁄16	1.8125	41458	42458	43458	365.75	1.4995	10	3 ½	3 ½	13 ½	1.7531 - 1.8160	400.00	382.85	377.15	374.40	371.40	369.15
1 7⁄8	1.8750	41460	42460	43460	386.10	1.4995	10	3 ½	3 ½	14	1.8161 - 1.8780	420.35	403.20	397.50	394.75	391.80	389.50
1 15⁄16	1.9375	41462	42462	43462	409.35	1.4995	10	3 ½	3 ½	14	1.8781 - 1.9410	443.60	426.50	420.75	418.00	415.05	412.75
2	2.0000	41464	42464	43464	425.10	1.4995	12	3 ½	3 ½	14	1.9411 - 2.0030	459.35	442.25	436.50	433.75	430.80	428.50

COOLANT FED REAMERS
CARBIDE TIPPED TYPES 414, 424, 434 METRIC

MATERIAL SPECIFIC COOLANT FED

CENTER FED FOR BLIND HOLES
STRAIGHT FLUTES & SHANK

NOTE: Tool diameter in millimeters (mm); all other dimensions in inches. Also, modifications available (see list on page 94).

TOOL DIAMETER		TYPE 414 NON-FERROUS METRIC EDP NO.	TYPE 424 CAST IRON METRIC EDP NO.	TYPE 434 STEEL/ HI-TEMP METRIC EDP NO.	ALL TYPES METRIC PRICE	DIMENSIONS				FINISHED TO MODIFIED TOOL DIAMETER							
						MAX. SHANK DIAM.	NO. OF FLTS	LENGTH		MODIFIED DIAMETER RANGE (mm)	PRICE EACH - BASED ON QUANTITY ORDERED						
mm	INCH							FLT & CARB	OVER-ALL		1	2	3	4	5-7	8-14	OVER 14
4.5	.1772	414045	424045	434045	$122.20	.1704	4	*1 ¼	5	4.494-4.696	$148.30	$131.00	$125.20	$122.45	$119.50	$117.10	$113.75
5.0	.1969	414050	424050	434050	122.20	.1805	4	*1 ¼	5	4.697-5.182	148.30	131.00	125.20	122.45	119.50	117.10	113.75
5.5	.2165	414055	424055	434055	122.20	.2075	4	*1 ¼	5	5.183-5.613	148.30	131.00	125.20	122.45	119.50	117.10	113.75
6.0	.2362	414060	424060	434060	122.20	.2265	4	*1 ½	6	5.614-6.045	148.30	131.00	125.20	122.45	119.50	117.10	113.75
-	-	414063	424063	434063	-	.2405	4	*1 ½	6	6.046-6.426	148.30	131.00	125.20	122.45	119.50	117.10	113.75
6.5	.2559	414065	424065	434065	129.05	.2485	4	*1 ½	6	6.427-7.214	155.10	137.80	132.00	129.15	126.25	123.85	120.60
7.0	.2756	414070	424070	434070	129.05	.2485	4	*1 ½	6	-	-	-	-	-	-	-	-
7.5	.2953	414075	424075	434075	135.65	.2792	4	1 ½	6	7.215-8.001	161.65	144.40	138.65	135.80	132.80	130.50	127.10
8.0	.3150	414080	424080	434080	135.65	.2792	4	1 ½	6	-	-	-	-	-	-	-	-
8.5	.3346	414085	424085	434085	136.65	.2792	4	1 ½	6	8.002-8.814	162.65	145.45	139.55	136.75	133.80	131.45	128.10
9.0	.3543	414090	424090	434090	137.90	.3105	4	1 ¾	7	8.815-9.601	163.95	146.65	140.85	138.00	135.10	132.70	129.45
9.5	.3740	414095	424095	434095	137.90	.3105	4	1 ¾	7	-	-	-	-	-	-	-	-
10.0	.3937	414100	424100	434100	138.35	.3105	4	1 ¾	7	9.602-10.389	164.35	147.15	141.30	138.45	135.55	133.15	129.85
10.5	.4134	414105	424105	434105	139.55	.3730	6	1 ¾	7	10.390-11.201	165.60	148.35	142.55	139.75	136.85	134.45	131.05
11.0	.4331	414110	424110	434110	139.55	.3730	6	1 ¾	7	-	-	-	-	-	-	-	-
11.5	.4528	414115	424115	434115	140.70	.3730	6	1 ¾	7	11.202-11.989	166.80	149.45	143.70	140.85	137.95	135.55	132.30
12.0	.4724	414120	424120	434120	142.25	.4355	6	2	8	11.990-12.776	168.20	151.05	145.15	142.35	139.45	137.00	133.70
12.5	.4921	414125	424125	434125	142.25	.4355	6	2	8	-	-	-	-	-	-	-	-
13.0	.5118	414130	424130	434130	145.10	.4355	6	2	8	12.777-13.564	171.20	153.90	148.10	145.20	142.35	139.90	136.65
13.5	.5315	414135	424135	434135	145.10	.4355	6	2	8	-	-	-	-	-	-	-	-
14.0	.5512	414140	424140	434140	147.00	.4355	6	2	8	13.565-14.376	173.10	155.75	150.05	147.20	144.30	141.85	138.50
14.5	.5709	414145	424145	434145	149.85	.4355	6	2	8	14.377-15.164	175.90	158.60	152.80	150.05	147.15	144.70	141.35
15.5	.6102	414155	424155	434155	152.50	.5615	6	2 ¼	9	15.165-15.951	178.50	161.30	155.45	152.60	149.65	147.30	143.95
16.0	.6299	414160	424160	434160	167.50	.5615	6	2 ¼	9	15.952-16.739	193.60	176.30	170.50	167.75	164.85	162.40	159.05
17.0	.6693	414170	424170	434170	170.70	.5615	6	2 ¼	9	16.740-17.551	196.80	179.50	173.75	170.90	168.00	165.55	162.25
18.0	.7087	414180	424180	434180	177.65	.5615	6	2 ¼	9	17.552-18.339	203.65	186.45	180.55	177.75	174.85	172.40	169.10
18.5	.7283	414185	424185	434185	177.65	.6245	6	2 ½	9 ½	18.340-19.126	203.65	186.45	180.55	177.75	174.85	172.40	169.10
19.5	.7677	414195	424195	434195	182.55	.6245	6	2 ½	9 ½	19.127-19.914	208.50	191.30	185.50	182.65	179.80	177.30	174.00
20.0	.7874	414200	424200	434200	182.55	.6245	6	2 ½	9 ½	19.915-20.726	208.50	191.30	185.50	182.65	179.80	177.30	174.00
21.0	.8268	414210	424210	434210	188.35	.6245	6	2 ½	9 ½	20.727-21.514	214.45	197.15	191.40	188.50	185.60	183.20	179.90
22.0	.8661	414220	424220	434220	188.35	.7495	6	2 ⅝	10	21.515-22.301	214.45	197.15	191.40	188.50	185.60	183.20	179.90
22.5	.8858	414225	424225	434225	215.70	.7495	6	2 ⅝	10	22.302-23.089	242.80	224.85	218.85	215.90	212.90	210.40	206.90
23.5	.9252	414235	424235	434235	215.70	.7495	8	2 ⅝	10	23.090-23.901	242.80	224.85	218.85	215.90	212.90	210.40	206.90
24.0	.9449	414240	424240	434240	216.60	.7495	8	2 ⅝	10	23.902-24.689	243.60	225.65	219.65	216.70	213.70	211.20	207.75
25.0	.9843	414250	424250	434250	216.60	.8745	8	2 ¾	10 ½	24.690-25.476	243.60	225.65	219.65	216.70	213.70	211.20	207.75
25.5	1.0039	414255	424255	434255	222.35	.8745	8	2 ¾	10 ½	25.477-27.076	249.35	231.45	225.45	222.50	219.55	217.05	213.55
28.0	1.1024	414280	424280	434280	229.60	.8745	8	2 ⅞	11	27.077-28.651	256.70	238.70	232.70	229.75	226.75	224.30	220.80
29.0	1.1417	414290	424290	434290	245.05	.9995	8	2 ⅞	11	28.652-30.239	272.20	254.20	248.20	245.30	242.30	239.75	236.25
31.0	1.2205	414310	424310	434310	248.20	.9995	8	3	11 ½	30.240-31.826	275.25	257.30	251.35	248.35	245.35	242.85	239.40
32.0	1.2598	414320	424320	434320	255.00	.9995	8	3	11 ½	31.827-33.414	282.00	264.05	258.10	255.15	252.05	249.65	246.15
34.0	1.3386	414340	424340	434340	264.85	.9995	8	3 ¼	12	33.415-35.001	291.85	273.90	267.90	264.95	261.95	259.45	256.00
36.0	1.4173	414360	424360	434360	272.80	.9995	8	3 ¼	12	35.002-36.589	299.75	281.80	275.85	272.90	269.90	267.40	263.95
37.0	1.4567	414370	424370	434370	281.50	1.2495	8	3 ½	12 ½	36.590-38.176	308.50	290.60	284.60	281.65	278.60	276.15	272.65

*½" carbide length

COOLANT FED REAMERS
CARBIDE TIPPED TYPES 416, 426, 435 FRACTIONAL

MATERIAL SPECIFIC COOLANT FED

FLUTE FED FOR THRU HOLES
STRAIGHT FLUTES & SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	416
	40	NON-FERROUS - SHORT CHIPS	416/426
	60	CAST IRONS	426
	80	LOW STRENGTH STEELS	435/426
	100	MEDIUM STRENGTH STEELS	435
	120	HIGH STRENGTH STEELS	435
	140	HIGH TEMPERATURE ALLOYS	435

TYPE 416 - FOR NON-FERROUS MATERIALS
TYPE 426 - FOR CAST IRONS
TYPE 435 - FOR STEELS & HIGH TEMP ALLOYS

- Coolant outlets in ***each*** flute
- Polished flutes; flute long carbide on .2841" tool diameter and larger
- Tool geometry and carbide grade appropriate for material being machined
- Detailed specifications on page 29

MODIFICATIONS (See list on page 94)

USE:

- Flute coolant outlets for reaming thru holes as chips are flushed ***forward*** through the hole being reamed
- Improves hole finish and permits higher feeds & speeds with longer tool life

TOOL DIAMETER		TYPE 416 NON-FERROUS EDP NO.	TYPE 426 CAST IRON EDP NO.	TYPE 435 STEEL/ HI-TEMP EDP NO.	ALL TYPES PRICE	DIMENSIONS					FINISHED TO MODIFIED TOOL DIAMETER						
						MAX. SHANK DIAM.	NO. OF FLTS	LENGTH			MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DEC.							FLT	CAR-BIDE	OVER-ALL		1	2	3	4	5-7	8-14*
3/16	.1875	41606	42606	43506	$114.95	.1805	4	1 1/4	1/2	5	0.1770 - 0.2040	$149.55	$132.30	$126.45	$123.65	$120.70	$118.30
13/64	.2031	4162031	4262031	4352031	114.95	.1805	4	1 1/4	1/2	5	-	-	-	-	-	-	-
7/32	.2188	41607	42607	43507	114.95	.2075	4	1 1/4	1/2	5	0.2041 - 0.2210	149.55	132.30	126.45	123.65	120.70	118.30
15/64	.2344	4162344	4262344	4352344	114.95	.2265	4	1 1/2	1/2	6	0.2211 - 0.2380	149.55	132.30	126.45	123.65	120.70	118.30
1/4	.2500	41608	42608	43508	114.95	.2405	4	1 1/2	1/2	6	0.2381 - 0.2530	149.55	132.30	126.45	123.65	120.70	118.30
17/64	.2656	4162656	4262656	4352656	117.60	.2485	4	1 1/2	1/2	6	-	-	-	-	-	-	-
9/32	.2812	41609	42609	43509	117.60	.2485	4	1 1/2	1/2	6	0.2531 - 0.2840	152.20	134.85	129.05	126.25	123.30	121.00
19/64	.2969	4162969	4262969	4352969	127.55	.2792	4	1 1/2	1 1/2	6	-	-	-	-	-	-	-
5/16	.3125	41610	42610	43510	127.55	.2792	4	1 1/2	1 1/2	6	0.2841 - 0.3150	162.20	144.80	139.00	136.25	133.35	130.95
21/64	.3281	4163281	4263281	4353281	127.55	.2792	4	1 1/2	1 1/2	6	-	-	-	-	-	-	-
11/32	.3438	41611	42611	43511	127.55	.2792	4	1 1/2	1 1/2	6	0.3151 - 0.3470	162.20	144.80	139.00	136.25	133.35	130.95
23/64	.3594	4163594	4263594	4353594	127.55	.3105	4	1 3/4	1 3/4	7	-	-	-	-	-	-	-
3/8	.3750	41612	42612	43512	127.55	.3105	4	1 3/4	1 3/4	7	0.3471 - 0.3780	162.20	144.80	139.00	136.25	133.35	130.95
25/64	.3906	4163906	4263906	4353906	130.70	.3105	4	1 3/4	1 3/4	7	-	-	-	-	-	-	-
13/32	.4062	41613	42613	43513	130.70	.3105	4	1 3/4	1 3/4	7	0.3781 - 0.4090	165.35	148.05	142.25	139.45	136.55	134.10
27/64	.4219	4164219	4264219	4354219	133.90	.3730	6	1 3/4	1 3/4	7	-	-	-	-	-	-	-
7/16	.4375	41614	42614	43514	133.90	.3730	6	1 3/4	1 3/4	7	0.4091 - 0.4410	168.50	151.20	145.45	142.60	139.70	137.30
29/64	.4531	4164531	4264531	4354531	133.90	.3730	6	1 3/4	1 3/4	7	-	-	-	-	-	-	-
15/32	.4688	41615	42615	43515	133.90	.3730	6	1 3/4	1 3/4	7	0.4411 - 0.4720	168.50	151.20	145.45	142.60	139.70	137.30
31/64	.4844	4164844	4264844	4354844	133.90	.4355	6	2	2	8	-	-	-	-	-	-	-
1/2	.5000	41616	42616	43516	133.90	.4355	6	2	2	8	0.4721 - 0.5030	168.50	151.20	145.45	142.60	139.70	137.30
33/64	.5156	4165156	4265156	4355156	141.60	.4355	6	2	2	8	-	-	-	-	-	-	-
17/32	.5312	41617	42617	43517	141.60	.4355	6	2	2	8	0.5031 - 0.5340	176.20	158.95	153.15	150.35	147.35	145.05
9/16	.5625	41618	42618	43518	143.65	.4355	6	2	2	8	0.5341 - 0.5660	178.25	160.95	155.10	152.30	149.35	147.00
19/32	.5938	41619	42619	43519	144.95	.4355	6	2	2	8	0.5661 - 0.5970	179.55	162.25	156.45	153.65	150.70	148.35
5/8	.6250	41620	42620	43520	144.95	.5615	6	2 1/4	2 1/4	9	0.5971 - 0.6280	179.55	162.25	156.45	153.65	150.70	148.35
21/32	.6562	41621	42621	43521	160.65	.5615	6	2 1/4	2 1/4	9	0.6281 - 0.6590	195.35	177.95	172.15	169.40	166.40	164.10
11/16	.6875	41622	42622	43522	160.65	.5615	6	2 1/4	2 1/4	9	0.6591 - 0.6910	195.35	177.95	172.15	169.40	166.40	164.10
23/32	.7188	41623	42623	43523	171.70	.5615	6	2 1/4	2 1/4	9	0.6911 - 0.7220	206.35	189.00	183.20	180.45	177.40	175.10
3/4	.7500	41624	42624	43524	171.70	.6245	6	2 1/2	2 1/2	9 1/2	0.7221 - 0.7530	206.35	189.00	183.20	180.45	177.40	175.10
25/32	.7812	41625	42625	43525	171.70	.6245	6	2 1/2	2 1/2	9 1/2	0.7531 - 0.7840	206.35	189.00	183.20	180.45	177.40	175.10
13/16	.8125	41626	42626	43526	171.70	.6245	6	2 1/2	2 1/2	9 1/2	0.7841 - 0.8160	206.35	189.00	183.20	180.45	177.40	175.10
27/32	.8438	41627	42627	43527	176.90	.6245	6	2 1/2	2 1/2	9 1/2	0.8161 - 0.8470	211.50	194.20	188.35	185.60	182.65	180.25
7/8	.8750	41628	42628	43528	183.60	.7495	6	2 5/8	2 5/8	10	0.8471 - 0.8780	219.55	201.50	195.45	192.60	189.55	187.10
29/32	.9062	41629	42629	43529	206.10	.7495	6	2 5/8	2 5/8	10	0.8781 - 0.9090	242.00	224.05	218.05	215.15	212.00	209.65
15/16	.9375	41630	42630	43530	210.95	.7495	8	2 5/8	2 5/8	10	0.9091 - 0.9410	246.80	228.85	222.80	219.95	216.80	214.45
31/32	.9688	41631	42631	43531	210.95	.7495	8	2 5/8	2 5/8	10	0.9411 - 0.9720	246.80	228.85	222.80	219.95	216.80	214.45
1	1.0000	41632	42632	43532	210.95	.8745	8	2 3/4	2 3/4	10 1/2	0.9721 - 1.0030	246.80	228.85	222.80	219.95	216.80	214.45
1 1/16	1.0625	41634	42634	43534	223.00	.8745	8	2 3/4	2 3/4	10 1/2	1.0031 - 1.0660	259.00	241.05	235.00	232.15	229.05	226.65
1 1/8	1.1250	41636	42636	43536	224.00	.8745	8	2 7/8	2 7/8	11	1.0661 - 1.1280	259.95	241.90	235.85	233.00	229.95	227.50
1 3/16	1.1875	41638	42638	43538	233.25	.9995	8	2 7/8	2 7/8	11	1.1281 - 1.1905	269.20	251.15	245.05	242.30	239.20	236.80
1 1/4	1.2500	41640	42640	43540	236.25	.9995	8	3	3	11 1/2	1.1906 - 1.2530	272.25	254.20	248.20	245.35	242.30	239.90
1 5/16	1.3125	41642	42642	43542	243.05	.9995	8	3	3	11 1/2	1.2531 - 1.3155	279.05	260.95	255.00	252.05	249.05	246.60
1 3/8	1.3750	41644	42644	43544	252.90	.9995	8	3 1/4	3 1/4	12	1.3156 - 1.3780	288.85	270.80	264.85	261.95	258.90	256.40
1 7/16	1.4375	41646	42646	43546	260.80	.9995	8	3 1/4	3 1/4	12	1.3781 - 1.4405	296.80	278.75	272.80	269.90	266.80	264.40
1 1/2	1.5000	41648	42648	43548	269.55	1.2495	8	3 1/2	3 1/2	12 1/2	1.4406 - 1.5030	305.50	287.50	281.50	278.60	275.55	273.10

*Quantities of 15 or more - price of fractional size in same size range.

CONTINUED FROM PAGE 92 - TYPE 416, 426, 435 FRACTIONAL

TOOL DIAMETER		TYPE 416 NON-FERROUS EDP NO.	TYPE 426 CAST IRON EDP NO.	TYPE 435 STEEL/ HI-TEMP EDP NO.	ALL TYPES PRICE	DIMENSIONS					FINISHED TO MODIFIED TOOL DIAMETER						
						MAX. SHANK DIAM.	NO. OF FLTS	LENGTH			MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DEC.							FLT	CAR-BIDE	OVER-ALL		1	2	3	4	5-7	8-14*
1 9⁄16	1.5625	41650	42650	43550	$303.05	1.2495	8	3 ½	3 ½	12 ½	1.5031 - 1.5660	$337.30	$320.15	$314.40	$311.70	$308.70	$306.45
1 5⁄8	1.6250	41652	42652	43552	333.20	1.2495	8	3 ½	3 ½	13	1.5661 - 1.6280	367.45	350.35	344.55	341.85	338.90	336.60
1 11⁄16	1.6875	41654	42654	43554	339.00	1.2495	8	3 ½	3 ½	13	1.6281 - 1.6910	373.25	356.10	350.35	347.65	344.65	342.40
1 ¾	1.7500	41656	42656	43556	370.45	1.2495	10	3 ½	3 ½	13 ½	1.6911 - 1.7530	404.70	387.60	381.80	379.10	376.15	373.85
1 13⁄16	1.8125	41658	42658	43558	385.75	1.4995	10	3 ½	3 ½	13 ½	1.7531 - 1.8160	419.95	402.85	397.10	394.35	391.40	389.15
1 7⁄8	1.8750	41660	42660	43560	406.15	1.4995	10	3 ½	3 ½	14	1.8161 - 1.8780	440.40	423.25	417.50	414.80	411.80	409.55
1 15⁄16	1.9375	41662	42662	43562	432.05	1.4995	10	3 ½	3 ½	14	1.8781 - 1.9410	466.30	449.20	443.40	440.70	437.75	435.45
2	2.0000	41664	42664	43564	447.75	1.4995	12	3 ½	3 ½	14	1.9411 - 2.0030	482.00	464.85	459.10	456.40	453.40	451.15

COOLANT FED REAMERS
CARBIDE TIPPED TYPES 416, 426, 435 METRIC

MATERIAL SPECIFIC COOLANT FED

FLUTE FED FOR THRU HOLES
STRAIGHT FLUTES & SHANK

NOTE: Tool diameter in millimeters (mm); all other dimensions in inches. Also, modifications available (see list on page 94).

TOOL DIAMETER		TYPE 416 NON FERROUS METRIC EDP NO.	TYPE 426 CAST IRON METRIC EDP NO.	TYPE 435 STEEL/ HI-TEMP METRIC EDP NO.	ALL TYPES METRIC PRICE	DIMENSIONS				FINISHED TO MODIFIED TOOL DIAMETER							
						MAX. SHANK DIAM.	NO. OF FLTS	LENGTH		MODIFIED DIAMETER RANGE (mm)	PRICE EACH - BASED ON QUANTITY ORDERED						
mm	INCH							FLT & CARB.	OVER-ALL		1	2	3	4	5-7	8-14	OVER 14
4.5	.1772	416045	426045	435045	$126.45	.1704	4	*1 ¼	5	4.494-4.696	$152.50	$135.25	$129.45	$126.60	$123.65	$121.25	$117.90
5.0	.1969	416050	426050	435050	126.45	.1805	4	*1 ¼	5	4.697-5.182	152.50	135.25	129.45	126.60	123.65	121.25	117.90
5.5	.2165	416055	426055	435055	126.45	.2075	4	*1 ¼	5	5.183-5.613	152.50	135.25	129.45	126.60	123.65	121.25	117.90
6.0	.2362	416060	426060	435060	126.45	.2265	4	*1 ½	6	5.614-6.045	152.50	135.25	129.45	126.60	123.65	121.25	117.90
-	-	416063	426063	435063	-	.2405	4	*1 ½	6	6.046-6.426	152.50	135.25	129.45	126.60	123.65	121.25	117.90
6.5	.2559	416065	426065	435065	129.05	.2485	4	*1 ½	6	6.427-7.214	155.10	137.80	132.00	129.15	126.25	123.85	120.60
7.0	.2756	416070	426070	435070	129.05	.2485	4	*1 ½	6	-	-	-	-	-	-	-	-
7.5	.2953	416075	426075	435075	139.00	.2792	4	1 ½	6	7.215-8.001	165.05	147.80	142.00	139.20	136.25	133.80	130.55
8.0	.3150	416080	426080	435080	139.00	.2792	4	1 ½	6	-	-	-	-	-	-	-	-
8.5	.3346	416085	426085	435085	139.00	.2792	4	1 ½	6	8.002-8.814	165.05	147.80	142.00	139.20	136.25	133.80	130.55
9.0	.3543	416090	426090	435090	139.00	.3105	4	1 ¾	7	8.815-9.601	165.05	147.80	142.00	139.20	136.25	133.80	130.55
9.5	.3740	416095	426095	435095	139.00	.3105	4	1 ¾	7	-	-	-	-	-	-	-	-
10.0	.3937	416100	426100	435100	142.25	.3105	4	1 ¾	7	9.602-10.389	168.20	151.05	145.15	142.35	139.45	137.00	133.70
10.5	.4134	416105	426105	435105	145.45	.3730	6	1 ¾	7	10.390-11.201	171.40	154.25	148.35	145.55	142.60	140.25	136.90
11.0	.4331	416110	426110	435110	145.45	.3730	6	1 ¾	7	-	-	-	-	-	-	-	-
11.5	.4528	416115	426115	435115	145.45	.3730	6	1 ¾	7	11.202-11.989	171.40	154.25	148.35	145.55	142.60	140.25	136.90
12.0	.4724	416120	426120	435120	145.45	.4355	6	2	8	11.990-12.776	171.40	154.25	148.35	145.55	142.60	140.25	136.90
12.5	.4921	416125	426125	435125	145.45	.4355	6	2	8	-	-	-	-	-	-	-	-
13.0	.5118	416130	426130	435130	153.15	.4355	6	2	8	12.777-13.564	179.15	161.85	156.10	153.30	150.35	147.90	144.65
13.5	.5315	416135	426135	435135	153.15	.4355	6	2	8	-	-	-	-	-	-	-	-
14.0	.5512	416140	426140	435140	155.10	.4355	6	2	8	13.565-14.376	181.15	163.90	158.10	155.30	152.30	150.00	146.60
14.5	.5709	416145	426145	435145	156.45	.4355	6	2	8	14.377-15.164	182.55	165.20	159.35	156.55	153.65	151.25	147.90
15.5	.6102	416155	426155	435155	156.45	.5615	6	2 ¼	9	15.165-15.951	182.55	165.20	159.35	156.55	153.65	151.25	147.90
16.0	.6299	416160	426160	435160	172.15	.5615	6	2 ¼	9	15.952-16.739	198.20	180.95	175.10	172.30	169.40	167.00	163.60
17.0	.6693	416170	426170	435170	172.15	.5615	6	2 ¼	9	16.740-17.551	198.20	180.95	175.10	172.30	169.40	167.00	163.60
18.0	.7087	416180	426180	435180	183.20	.5615	6	2 ¼	9	17.552-18.339	209.25	191.90	186.15	183.35	180.45	178.05	174.75
18.5	.7283	416185	426185	435185	183.20	.6245	6	2 ½	9 ½	18.340-19.126	209.25	191.90	186.15	183.35	180.45	178.05	174.75
19.5	.7677	416195	426195	435195	183.20	.6245	6	2 ½	9 ½	19.127-19.914	209.25	191.90	186.15	183.35	180.45	178.05	174.75
20.0	.7874	416200	426200	435200	183.20	.6245	6	2 ½	9 ½	19.915-20.726	209.25	191.90	186.15	183.35	180.45	178.05	174.75
21.0	.8268	416210	426210	435210	188.35	.6245	6	2 ½	9 ½	20.727-21.514	214.45	197.15	191.40	188.50	185.60	183.20	179.90
22.0	.8661	416220	426220	435220	188.35	.7495	6	2 ⅝	10	21.515-22.301	214.45	197.15	191.40	188.50	185.60	183.20	179.90
22.5	.8858	416225	426225	435225	218.05	.7495	6	2 ⅝	10	22.302-23.089	245.00	227.10	221.10	218.15	215.15	212.65	209.25
23.5	.9252	416235	426235	435235	222.80	.7495	8	2 ⅝	10	23.090-23.901	249.80	231.90	225.90	222.90	219.95	217.40	214.00
24.0	.9449	416240	426240	435240	222.80	.7495	8	2 ⅝	10	23.902-24.689	249.80	231.90	225.90	222.90	219.95	217.40	214.00
25.0	.9843	416250	426250	435250	222.80	.8745	8	2 ¾	10 ½	24.690-25.476	249.80	231.90	225.90	222.90	219.95	217.40	214.00
25.5	1.0039	416255	426255	435255	235.00	.8745	8	2 ¾	10 ½	25.477-27.076	262.00	244.10	238.10	235.10	232.15	229.60	226.15
28.0	1.1024	416280	426280	435280	235.90	.8745	8	2 ⅞	11	27.077-28.651	262.90	244.95	239.00	236.05	233.00	230.55	227.05
29.0	1.1417	416290	426290	435290	245.05	.9995	8	2 ⅞	11	28.652-30.239	272.20	254.20	248.20	245.30	242.30	239.75	236.25
31.0	1.2205	416310	426310	435310	248.20	.9995	8	3	11 ½	30.240-31.826	275.25	257.30	251.35	248.35	245.35	242.85	239.40
32.0	1.2598	416320	426320	435320	255.00	.9995	8	3	11 ½	31.827-33.414	282.00	264.05	258.10	255.15	252.05	249.65	246.15
34.0	1.3386	416340	426340	435340	264.85	.9995	8	3 ¼	12	33.415-35.001	291.85	273.90	267.90	264.95	261.95	259.45	256.00
36.0	1.4173	416360	426360	435360	272.80	.9995	8	3 ¼	12	35.002-36.589	299.75	281.80	275.85	272.90	269.90	267.40	263.95
37.0	1.4567	416370	426370	435370	281.50	1.2495	8	3 ½	12 ½	36.590-38.176	308.50	290.60	284.60	281.65	278.60	276.15	272.65

*½" carbide length

COOLANT FED REAMERS
CARBIDE TIPPED TYPES 411 413, 415 FRACTIONAL

MATERIAL SPECIFIC COOLANT FED

CENTER FED FOR BLIND HOLES
RIGHT SPIRAL FLUTES
STRAIGHT SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	411
	40	NON-FERROUS - SHORT CHIPS	411/413
	60	CAST IRONS	413
	80	LOW STRENGTH STEELS	415/413
	100	MEDIUM STRENGTH STEELS	415
	120	HIGH STRENGTH STEELS	415
	140	HIGH TEMPERATURE ALLOYS	415

TYPE 411 - FOR NON-FERROUS MATERIALS
TYPE 413 - FOR CAST IRONS
TYPE 415 - FOR STEELS & HIGH TEMP ALLOYS

- Center coolant outlet
- Polished flutes; flute long carbide on .2841" tool diameter and larger
- Tool geometry and carbide grade appropriate for material being machined
- Detailed specifications on page 29

USE:

- Center coolant outlet for reaming blind holes as chips are flushed ***back*** towards the shank
- Improves hole finish and permits higher feeds & speeds with longer tool life

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Metric tool diameter
- Closer tool diameter tolerance - pg. 29
- Cutting diameter reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diameter back taper
- Shortened shank or reduced shank diameter
- Flat(s) or tang on shank
- Coatings available:

TITANIUM NITRIDE – TiN
TITANIUM CARBONITRIDE – TiCN
ZIRCONIUM NITRIDE – ZrN
AL TITANIUM NITRIDE – AlTiN

TOOL DIAMETER		TYPE 411 NON-FERROUS EDP NO.	TYPE 413 CAST IRON EDP NO.	TYPE 415 STEEL/ HI-TEMP EDP NO.	ALL TYPES PRICE	DIMENSIONS					FINISHED TO MODIFIED TOOL DIAMETER						
						MAX. SHANK DIAM.	NO. OF FLTS	LENGTH			MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DEC.							FLT	CARBIDE	OVERALL		1	2	3	4	5-7	8-14*
¼	.2500	41108	41308	41508	$113.80	.2405	4	1 ½	½	6	0.2381 - 0.2530	$146.05	$129.90	$124.50	$121.90	$119.10	$116.90
9/32	.2812	41109	41309	41509	116.40	.2485	4	1 ½	½	6	0.2531 - 0.2840	147.55	131.95	126.70	124.25	121.60	119.40
5/16	.3125	41110	41310	41510	127.55	.2792	4	1 ½	1 ½	6	0.2841 - 0.3150	159.85	143.65	138.20	135.65	132.80	130.65
11/32	.3438	41111	41311	41511	128.45	.2792	4	1 ½	1 ½	6	0.3151 - 0.3470	160.80	144.65	139.25	136.65	133.80	131.65
⅜	.3750	41112	41312	41512	129.85	.3105	4	1 ¾	1 ¾	7	0.3471 - 0.3780	162.15	145.90	140.50	137.95	135.25	133.05
13/32	.4062	41113	41313	41513	130.20	.3105	4	1 ¾	1 ¾	7	0.3781 - 0.4090	162.50	146.40	140.95	138.35	135.55	133.40
7/16	.4375	41114	41314	41514	131.55	.3730	6	1 ¾	1 ¾	7	0.4091 - 0.4410	163.90	147.65	142.25	139.70	136.90	134.75
15/32	.4688	41115	41315	41515	132.70	.3730	6	1 ¾	1 ¾	7	0.4411 - 0.4720	165.05	148.80	143.45	140.85	138.05	135.90
½	.5000	41116	41316	41516	137.85	.4355	6	2	2	8	0.4721 - 0.5030	171.05	154.40	148.80	146.15	143.35	141.15
17/32	.5312	41117	41317	41517	142.85	.4355	6	2	2	8	0.5031 - 0.5340	176.00	159.35	153.80	151.20	148.35	146.10
9/16	.5625	41118	41318	41518	142.85	.4355	6	2	2	8	0.5341 - 0.5660	176.00	159.35	153.80	151.20	148.35	146.10
19/32	.5938	41119	41319	41519	148.50	.4355	6	2	2	8	0.5661 - 0.5970	181.75	165.10	159.55	156.95	154.05	151.80
⅝	.6250	41120	41320	41520	148.50	.5615	6	2 ¼	2 ¼	9	0.5971 - 0.6280	181.75	165.10	159.55	156.95	154.05	151.80
21/32	.6562	41121	41321	41521	167.85	.5615	6	2 ¼	2 ¼	9	0.6281 - 0.6590	201.00	184.45	178.80	176.15	173.30	171.10
11/16	.6875	41122	41322	41522	167.85	.5615	6	2 ¼	2 ¼	9	0.6591 - 0.6910	201.00	184.45	178.80	176.15	173.30	171.10
23/32	.7188	41123	41323	41523	175.10	.5615	6	2 ¼	2 ¼	9	0.6911 - 0.7220	208.35	191.70	186.15	183.55	180.60	178.35
¾	.7500	41124	41324	41524	164.50	.6245	6	2 ½	2 ½	9 ½	0.7221 - 0.7530	195.70	180.05	174.85	172.30	169.65	167.50
25/32	.7812	41125	41325	41525	188.75	.6245	6	2 ½	2 ½	9 ½	0.7531 - 0.7840	221.90	205.25	199.70	197.05	194.20	191.90
13/16	.8125	41126	41326	41526	191.00	.6245	6	2 ½	2 ½	9 ½	0.7841 - 0.8160	224.20	207.55	202.05	199.40	196.60	194.35
27/32	.8438	41127	41327	41527	194.60	.6245	6	2 ½	2 ½	9 ½	0.8161 - 0.8470	227.85	211.20	205.65	202.95	200.15	197.90
⅞	.8750	41128	41328	41528	205.10	.7495	6	2 ⅝	2 ⅝	10	0.8471 - 0.8780	239.50	222.35	216.55	213.80	210.80	208.50
29/32	.9062	41129	41329	41529	217.30	.7495	6	2 ⅝	2 ⅝	10	0.8781 - 0.9090	251.70	234.50	228.75	226.00	222.95	220.70
15/16	.9375	41130	41330	41530	227.75	.7495	8	2 ⅝	2 ⅝	10	0.9091 - 0.9410	262.20	244.90	239.20	236.40	233.40	231.10
31/32	.9688	41131	41331	41531	228.40	.7495	8	2 ⅝	2 ⅝	10	0.9411 - 0.9720	262.75	245.55	239.75	237.00	234.05	231.75
1	1.0000	41132	41332	41532	228.75	.8745	8	2 ¾	2 ¾	10 ½	0.9721 - 1.0030	263.15	245.90	240.15	237.40	234.45	232.15
1 1/16	1.0625	41134	41334	41534	235.10	.8745	8	2 ¾	2 ¾	10 ½	1.0031 - 1.0660	269.50	252.35	246.55	243.75	240.80	238.50
1 ⅛	1.1250	41136	41336	41536	243.25	.8745	8	2 ⅞	2 ⅞	11	1.0661 - 1.1280	277.75	260.45	254.70	251.95	249.05	246.70
1 3/16	1.1875	41138	41338	41538	260.60	.9995	8	2 ⅞	2 ⅞	11	1.1281 - 1.1905	295.05	277.85	272.00	269.30	266.25	263.95
1 ¼	1.2500	41140	41340	41540	263.95	.9995	8	3	3	11 ½	1.1906 - 1.2530	298.40	281.15	275.40	272.65	269.70	267.40
1 5/16	1.3125	41142	41342	41542	271.60	.9995	8	3	3	11 ½	1.2531 - 1.3155	306.00	288.75	282.95	280.25	277.30	274.95
1 ⅜	1.3750	41144	41344	41544	282.65	.9995	8	3 ¼	3 ¼	12	1.3156 - 1.3780	317.10	299.80	294.05	291.35	288.30	286.00
1 7/16	1.4375	41146	41346	41546	291.45	.9995	8	3 ¼	3 ¼	12	1.3781 - 1.4405	325.85	308.60	302.85	300.10	297.10	294.85
1 ½	1.5000	41148	41348	41548	301.30	1.2495	8	3 ½	3 ½	12 ½	1.4406 - 1.5030	335.70	318.50	312.70	309.90	307.00	304.70

*Quantities of 15 or more - price of fractional size in same size range.

COOLANT FED REAMERS
CARBIDE TIPPED TYPES 417, 418, 419 FRACTIONAL

MATERIAL SPECIFIC COOLANT FED

FLUTE FED FOR THRU HOLES
RIGHT SPIRAL FLUTES
STRAIGHT SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	417
	40	NON-FERROUS - SHORT CHIPS	417/418
	60	CAST IRONS	418
	80	LOW STRENGTH STEELS	419/418
	100	MEDIUM STRENGTH STEELS	419
	120	HIGH STRENGTH STEELS	419
	140	HIGH TEMPERATURE ALLOYS	419

REAMERS

TYPE 417 - FOR NON-FERROUS MATERIALS
TYPE 418 - FOR CAST IRONS
TYPE 419 - FOR STEELS & HIGH TEMP ALLOYS

- Coolant outlets in ***each*** flute
- Polished flutes; flute long carbide on .2841" tool diameter and larger
- Tool geometry and carbide grade appropriate for material being machined
- Detailed specifications on page 29

USE:

- Flute coolant outlets for reaming thru holes as chips are flushed ***forward*** through the hole being reamed
- Improves hole finish and permits higher feeds & speeds with longer tool life

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Metric tool diameter
- Closer tool diameter tolerance - pg. 29
- Cutting diameter reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diameter back taper
- Shortened shank or reduced shank diameter
- Flat(s) or tang on shank
- Coatings available:

TITANIUM NITRIDE – TiN
TITANIUM CARBONITRIDE – TiCN
ZIRCONIUM NITRIDE – ZrN
AL TITANIUM NITRIDE – AlTiN

TOOL DIAMETER		TYPE 417 NON-FERROUS EDP NO.	TYPE 418 CAST IRON EDP NO.	TYPE 419 STEEL/ HI-TEMP EDP NO.	ALL TYPES PRICE	DIMENSIONS					FINISHED TO MODIFIED TOOL DIAMETER						
						MAX. SHANK DIAM.	NO. OF FLTS	LENGTH			MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DEC.							FLT	CAR-BIDE	OVER-ALL		1	2	3	4	5-7	8-14*
1/4	.2500	41708	41808	41908	$121.90	.2405	4	1 1/2	1/2	6	0.2381 - 0.2530	$156.50	$139.20	$133.40	$130.60	$127.70	$125.30
9/32	.2812	41709	41809	41909	129.30	.2485	4	1 1/2	1/2	6	0.2531 - 0.2840	163.95	146.60	140.75	138.00	135.05	132.70
5/16	.3125	41710	41810	41910	136.65	.2792	4	1 1/2	1 1/2	6	0.2841 - 0.3150	171.25	153.90	148.10	145.40	142.35	140.05
11/32	.3438	41711	41811	41911	137.70	.2792	4	1 1/2	1 1/2	6	0.3151 - 0.3470	172.30	154.95	149.15	146.45	143.40	141.15
3/8	.3750	41712	41812	41912	139.05	.3105	4	1 3/4	1 3/4	7	0.3471 - 0.3780	173.75	156.35	150.50	147.80	144.80	142.50
13/32	.4062	41713	41813	41913	139.50	.3105	4	1 3/4	1 3/4	7	0.3781 - 0.4090	174.10	156.75	151.05	148.25	145.20	142.90
7/16	.4375	41714	41814	41914	140.95	.3730	6	1 3/4	1 3/4	7	0.4091 - 0.4410	175.60	158.20	152.45	149.60	146.65	144.35
15/32	.4688	41715	41815	41915	142.25	.3730	6	1 3/4	1 3/4	7	0.4411 - 0.4720	176.85	159.50	153.65	150.90	147.90	145.60
1/2	.5000	41716	41816	41916	143.80	.4355	6	2	2	8	0.4721 - 0.5030	178.40	161.10	155.35	152.55	149.55	147.25
17/32	.5312	41717	41817	41917	149.10	.4355	6	2	2	8	0.5031 - 0.5340	183.70	166.30	160.55	157.85	154.75	152.50
9/16	.5625	41718	41818	41918	149.10	.4355	6	2	2	8	0.5341 - 0.5660	183.70	166.30	160.55	157.85	154.75	152.50
19/32	.5938	41719	41819	41919	155.00	.4355	6	2	2	8	0.5661 - 0.5970	189.65	172.30	166.45	163.75	160.70	158.40
5/8	.6250	41720	41820	41920	155.00	.5615	6	2 1/4	2 1/4	9	0.5971 - 0.6280	189.65	172.30	166.45	163.75	160.70	158.40
21/32	.6562	41721	41821	41921	175.10	.5615	6	2 1/4	2 1/4	9	0.6281 - 0.6590	209.70	192.45	186.60	183.80	180.85	178.50
11/16	.6875	41722	41822	41922	175.10	.5615	6	2 1/4	2 1/4	9	0.6591 - 0.6910	209.70	192.45	186.60	183.80	180.85	178.50
23/32	.7188	41723	41823	41923	182.75	.5615	6	2 1/4	2 1/4	9	0.6911 - 0.7220	217.35	200.00	194.30	191.50	188.50	186.15
3/4	.7500	41724	41824	41924	182.75	.6245	6	2 1/2	2 1/2	9 1/2	0.7221 - 0.7530	217.35	200.00	194.30	191.50	188.50	186.15
25/32	.7812	41725	41825	41925	196.90	.6245	6	2 1/2	2 1/2	9 1/2	0.7531 - 0.7840	231.50	214.15	208.40	205.65	202.65	200.35
13/16	.8125	41726	41826	41926	199.35	.6245	6	2 1/2	2 1/2	9 1/2	0.7841 - 0.8160	233.95	216.60	210.80	208.10	205.05	202.70
27/32	.8438	41727	41827	41927	203.10	.6245	6	2 1/2	2 1/2	9 1/2	0.8161 - 0.8470	237.75	220.35	214.55	211.75	208.80	206.50
7/8	.8750	41728	41828	41928	214.05	.7495	6	2 5/8	2 5/8	10	0.8471 - 0.8780	250.00	232.00	225.95	223.00	220.00	217.50
29/32	.9062	41729	41829	41929	226.75	.7495	6	2 5/8	2 5/8	10	0.8781 - 0.9090	262.65	244.70	238.65	235.80	232.70	230.30
15/16	.9375	41730	41830	41930	237.65	.7495	8	2 5/8	2 5/8	10	0.9091 - 0.9410	273.60	255.55	249.50	246.70	243.60	241.20
31/32	.9688	41731	41831	41931	238.30	.7495	8	2 5/8	2 5/8	10	0.9411 - 0.9720	274.20	256.25	250.20	247.30	244.20	241.80
1	1.0000	41732	41832	41932	238.65	.8745	8	2 3/4	2 3/4	10 1/2	0.9721 - 1.0030	274.65	256.65	250.55	247.70	244.65	242.20
1 1/16	1.0625	41734	41834	41934	275.25	.8745	8	2 3/4	2 3/4	10 1/2	1.0031 - 1.0660	311.15	293.15	287.15	284.25	281.20	278.75
1 1/8	1.1250	41736	41836	41936	276.45	.8745	8	2 7/8	2 7/8	11	1.0661 - 1.1280	312.35	294.30	288.30	285.40	282.40	279.95
1 3/16	1.1875	41738	41838	41938	287.85	.9995	8	2 7/8	2 7/8	11	1.1281 - 1.1905	323.70	305.70	299.70	296.85	293.80	291.35
1 1/4	1.2500	41740	41840	41940	291.60	.9995	8	3	3	11 1/2	1.1906 - 1.2530	327.55	309.55	303.55	300.65	297.55	295.15
1 5/16	1.3125	41742	41842	41942	300.05	.9995	8	3	3	11 1/2	1.2531 - 1.3155	335.95	317.95	311.85	309.05	305.95	303.55
1 3/8	1.3750	41744	41844	41944	312.10	.9995	8	3 1/4	3 1/4	12	1.3156 - 1.3780	348.10	330.10	324.00	321.20	318.10	315.65
1 7/16	1.4375	41746	41846	41946	321.85	.9995	8	3 1/4	3 1/4	12	1.3781 - 1.4405	357.85	339.80	333.80	330.95	327.90	325.40
1 1/2	1.5000	41748	41848	41948	332.70	1.2495	8	3 1/2	3 1/2	12 1/2	1.4406 - 1.5030	368.60	350.65	344.60	341.70	338.60	336.20

*Quantities of 15 or more - price of fractional size in same size range.

COOLANT FED REAMERS
CARBIDE TIPPED TYPES 427, 428, 429 FRACTIONAL

MATERIAL SPECIFIC COOLANT FED

FLUTE FED FOR THRU HOLES
LEFT SPIRAL FLUTES
STRAIGHT SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	427
	40	NON-FERROUS - SHORT CHIPS	427/428
	60	CAST IRONS	428
	80	LOW STRENGTH STEELS	429/428
	100	MEDIUM STRENGTH STEELS	429
	120	HIGH STRENGTH STEELS	429
	140	HIGH TEMPERATURE ALLOYS	429

TYPE 427 - FOR NON-FERROUS MATERIALS
TYPE 428 - FOR CAST IRONS
TYPE 429 - FOR STEELS & HIGH TEMP ALLOYS

- Coolant outlets in ***each*** flute
- Polished flutes; flute long carbide on .2841" tool diameter and larger
- Left spiral flutes should not be used on blind holes
- Tool geometry and carbide grade appropriate for material being machined
- Detailed specifications on page 29

USE:

- Flute coolant outlets for reaming thru holes as chips are flushed ***forward*** through the hole being reamed
- Improves hole finish and permits higher feeds & speeds with longer tool life

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Metric tool diameter
- Closer tool diameter tolerance - pg. 29
- Cutting diameter reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diameter back taper
- Shortened shank or reduced shank diameter
- Flat(s) or tang on shank
- Coatings available:

TITANIUM NITRIDE – TiN
TITANIUM CARBONITRIDE – TiCN
ZIRCONIUM NITRIDE – ZrN
AL TITANIUM NITRIDE – AlTiN

TOOL DIAMETER		TYPE 427 NON-FERROUS EDP NO.	TYPE 428 CAST IRON EDP NO.	TYPE 429 STEEL/ HI-TEMP EDP NO.	ALL TYPES PRICE	DIMENSIONS					FINISHED TO MODIFIED TOOL DIAMETER						
						MAX. SHANK DIAM.	NO. OF FLTS	LENGTH			MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DEC.							FLT	CAR-BIDE	OVER-ALL		1	2	3	4	5-7	8-14*
¼	.2500	42708	42808	42908	$140.95	.2405	4	1 ½	½	6	0.2381 - 0.2530	$175.60	$158.20	$152.45	$149.60	$146.65	$144.35
9/32	.2812	42709	42809	42909	149.45	.2485	4	1 ½	½	6	0.2531 - 0.2840	184.05	166.80	161.00	158.20	155.30	152.90
5/16	.3125	42710	42810	42910	157.95	.2792	4	1 ½	1 ½	6	0.2841 - 0.3150	192.55	175.15	169.40	166.65	163.60	161.35
11/32	.3438	42711	42811	42911	159.15	.2792	4	1 ½	1 ½	6	0.3151 - 0.3470	193.70	176.35	170.60	167.85	164.90	162.50
⅜	.3750	42712	42812	42912	160.70	.3105	4	1 ¾	1 ¾	7	0.3471 - 0.3780	195.40	178.05	172.25	169.45	166.45	164.20
13/32	.4062	42713	42813	42913	161.40	.3105	4	1 ¾	1 ¾	7	0.3781 - 0.4090	196.00	178.70	172.85	170.15	167.10	164.85
7/16	.4375	42714	42814	42914	162.90	.3730	6	1 ¾	1 ¾	7	0.4091 - 0.4410	197.60	180.20	174.40	171.65	168.75	166.30
15/32	.4688	42715	42815	42915	164.35	.3730	6	1 ¾	1 ¾	7	0.4411 - 0.4720	198.95	181.65	175.85	173.10	170.15	167.80
½	.5000	42716	42816	42916	166.45	.4355	6	2	2	8	0.4721 - 0.5030	201.15	183.75	177.95	175.15	172.25	169.90
17/32	.5312	42717	42817	42917	169.95	.4355	6	2	2	8	0.5031 - 0.5340	204.60	187.20	181.45	178.70	175.70	173.35
9/16	.5625	42718	42818	42918	172.40	.4355	6	2	2	8	0.5341 - 0.5660	207.05	189.70	183.90	181.15	178.15	175.85
19/32	.5938	42719	42819	42919	176.00	.4355	6	2	2	8	0.5661 - 0.5970	210.60	193.35	187.50	184.75	181.80	179.45
⅝	.6250	42720	42820	42920	179.30	.5615	6	2 ¼	2 ¼	9	0.5971 - 0.6280	213.90	196.60	190.75	188.00	185.00	182.70
21/32	.6562	42721	42821	42921	198.55	.5615	6	2 ¼	2 ¼	9	0.6281 - 0.6590	233.20	215.85	210.05	207.30	204.30	201.95
11/16	.6875	42722	42822	42922	202.55	.5615	6	2 ¼	2 ¼	9	0.6591 - 0.6910	237.20	219.90	214.05	211.30	208.35	206.00
23/32	.7188	42723	42823	42923	206.90	.5615	6	2 ¼	2 ¼	9	0.6911 - 0.7220	241.50	224.15	218.35	215.60	212.65	210.30
¾	.7500	42724	42824	42924	211.30	.6245	6	2 ½	2 ½	9 ½	0.7221 - 0.7530	245.90	228.60	222.75	220.05	217.05	214.70
25/32	.7812	42725	42825	42925	214.90	.6245	6	2 ½	2 ½	9 ½	0.7531 - 0.7840	249.50	232.20	226.35	223.60	220.60	218.30
13/16	.8125	42726	42826	42926	217.50	.6245	6	2 ½	2 ½	9 ½	0.7841 - 0.8160	252.05	234.80	229.00	226.20	223.30	220.90
27/32	.8438	42727	42827	42927	221.50	.6245	6	2 ½	2 ½	9 ½	0.8161 - 0.8470	256.15	238.80	232.95	230.20	227.20	224.90
⅞	.8750	42728	42828	42928	233.50	.7495	6	2 ⅝	2 ⅝	10	0.8471 - 0.8780	269.45	251.50	245.40	242.55	239.45	237.00
29/32	.9062	42729	42829	42929	247.25	.7495	6	2 ⅝	2 ⅝	10	0.8781 - 0.9090	283.20	265.15	259.15	256.30	253.25	250.80
15/16	.9375	42730	42830	42930	259.35	.7495	8	2 ⅝	2 ⅝	10	0.9091 - 0.9410	295.20	277.25	271.20	268.35	265.20	262.85
31/32	.9688	42731	42831	42931	260.00	.7495	8	2 ⅝	2 ⅝	10	0.9411 - 0.9720	295.90	277.95	271.85	269.00	265.90	263.45
1	1.0000	42732	42832	42932	260.35	.8745	8	2 ¾	2 ¾	10 ½	0.9721 - 1.0030	296.25	278.30	272.25	269.35	266.25	263.85
1 1/16	1.0625	42734	42834	42934	275.25	.8745	8	2 ¾	2 ¾	10 ½	1.0031 - 1.0660	311.15	293.15	287.15	284.25	281.20	278.75
1 ⅛	1.1250	42736	42836	42936	276.45	.8745	8	2 ⅞	2 ⅞	11	1.0661 - 1.1280	312.35	294.30	288.30	285.40	282.40	279.95
1 3/16	1.1875	42738	42838	42938	287.85	.9995	8	2 ⅞	2 ⅞	11	1.1281 - 1.1905	323.70	305.70	299.70	296.85	293.80	291.35
1 ¼	1.2500	42740	42840	42940	291.60	.9995	8	3	3	11 ½	1.1906 - 1.2530	327.55	309.55	303.55	300.65	297.55	295.15
1 5/16	1.3125	42742	42842	42942	300.05	.9995	8	3	3	11 ½	1.2531 - 1.3155	335.95	317.95	311.85	309.05	305.95	303.55
1 ⅜	1.3750	42744	42844	42944	312.10	.9995	8	3 ¼	3 ¼	12	1.3156 - 1.3780	348.10	330.10	324.00	321.20	318.10	315.65
1 7/16	1.4375	42746	42846	42946	321.85	.9995	8	3 ¼	3 ¼	12	1.3781 - 1.4405	357.85	339.80	333.80	330.95	327.90	325.40
1 ½	1.5000	42748	42848	42948	332.70	1.2495	8	3 ½	3 ½	12 ½	1.4406 - 1.5030	368.60	350.65	344.60	341.70	338.60	336.20

*Quantities of 15 or more - price of fractional size in same size range.

COOLANT FED REAMERS
CARBIDE TIPPED TYPE 490 FRACTIONAL

SIMILAR TO BARBER-COLMAN AND METCUT OFC REAMER

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	490
	40	NON-FERROUS - SHORT CHIPS	490
	60	CAST IRONS	490
	80	LOW STRENGTH STEELS	490
	100	MEDIUM STRENGTH STEELS	490
	120	HIGH STRENGTH STEELS	490
	140	HIGH TEMPERATURE ALLOYS	490

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Metric tool diameter
- Cutting diameter reduced for step or pilot
- End chamfer other than 45° included
- End cutting or corner radius
- Increased circular margin
- Increased/decreased tool diameter back taper
- Coatings available:

TITANIUM NITRIDE – TiN
TITANIUM CARBONITRIDE – TiCN
ZIRCONIUM NITRIDE – ZrN
AL TITANIUM NITRIDE – AlTiN

TYPE 490

- Center coolant outlet
- Flute long carbide
- Right spiral polished flutes: 2° to 5°
- Positive face rake angles (behind center)
- Tool diameter tolerance: plus .0003", minus .0000"
- Pin cross hole
- Radial edged for cutting smooth, accurate holes while maximizing tool life

TOOL DIAMETER		TYPE 490 EDP NO.	PRICE	DIMENSIONS					FINISHED TO MODIFIED TOOL DIAMETER						
				SHANK DIAM.	SHANK LENGTH	NO. OF FLTS	LENGTH		MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DEC.						FLUTE & CARBIDE	OVER-ALL		1	2	3	4	5-7	8-14*
3/8	.3750	49012	$107.65	3/8	3/4	6	1/2	2 1/2	0.3181 - 0.3800	$174.00	$140.70	$129.65	$124.35	$118.65	$114.15
13/32	.4062	49013	109.25	3/8	3/4	6	1/2	2 5/8	0.3801 - 0.4090	175.60	142.35	131.20	125.90	120.20	115.75
7/16	.4375	49014	109.25	3/8	3/4	6	1/2	2 5/8	0.4091 - 0.4410	175.60	142.35	131.20	125.90	120.20	115.75
15/32	.4688	49015	112.20	5/8	1	6	5/8	3 1/2	0.4411 - 0.4720	178.55	145.35	134.25	128.90	123.15	118.70
1/2	.5000	49016	112.20	5/8	1	6	5/8	3 1/2	0.4721 - 0.5050	178.55	145.35	134.25	128.90	123.15	118.70
9/16	.5625	49018	122.65	5/8	1	6	3/4	3 3/4	0.5051 - 0.5660	189.00	155.70	144.65	139.35	133.65	129.15
5/8	.6250	49020	122.65	5/8	1	6	3/4	3 3/4	0.5661 - 0.6300	189.00	155.70	144.65	139.35	133.65	129.15
11/16	.6875	49022	136.05	5/8	1	6	3/4	4 1/4	0.6301 - 0.6910	202.45	169.20	158.10	152.75	147.10	142.55
3/4	.7500	49024	136.05	5/8	1	6	3/4	4 1/4	0.6911 - 0.7550	202.45	169.20	158.10	152.75	147.10	142.55
13/16	.8125	49026	143.50	5/8	1	6	7/8	4 3/4	0.7551 - 0.8160	209.90	176.70	165.50	160.20	154.55	150.10
7/8	.8750	49028	148.95	5/8	1	6	7/8	4 3/4	0.8161 - 0.8800	217.85	183.35	171.75	166.25	160.40	155.70
15/16	.9375	49030	178.50	1	1 1/2	8	1	5 1/2	0.8801 - 0.9410	247.35	212.90	201.35	195.85	189.95	185.30
1	1.0000	49032	178.50	1	1 1/2	8	1	5 1/2	0.9411 - 1.0050	247.35	212.90	201.35	195.85	189.95	185.30
1 1/16	1.0625	49034	197.60	1	1 1/2	8	1 1/4	6	1.0051 - 1.0660	269.35	233.35	221.40	215.60	209.40	204.60
1 1/8	1.1250	49036	197.60	1	1 1/2	8	1 1/4	6	1.0661 - 1.1300	269.35	233.35	221.40	215.60	209.40	204.60
1 3/16	1.1875	49038	202.45	1	1 1/2	8	1 1/4	6	1.1301 - 1.1900	274.30	238.30	226.25	220.50	214.40	209.45
1 1/4	1.2500	49040	202.45	1	1 1/2	8	1 1/4	6	1.1901 - 1.2550	274.30	238.30	226.25	220.50	214.40	209.45
1 5/16	1.3125	49042	217.10	1	1 1/2	8	1 1/4	6	1.2551 - 1.3155	288.95	252.90	240.85	235.10	228.95	224.10
1 3/8	1.3750	49044	217.10	1	1 1/2	8	1 1/4	6	1.3156 - 1.3800	288.95	252.90	240.85	235.10	228.95	224.10
1 7/16	1.4375	49046	231.60	1	1 1/2	8	1 1/4	6	1.3801 - 1.4405	303.50	267.45	255.35	249.70	243.55	238.65
1 1/2	1.5000	49048	231.60	1	1 1/2	8	1 1/4	6	1.4406 - 1.5050	303.50	267.45	255.35	249.70	243.55	238.65
1 9/16	1.5625	49050	242.90	1	1 1/2	10	1 1/4	6	1.5051 - 1.5660	314.75	278.75	266.75	260.95	254.80	250.00
1 5/8	1.6250	49052	242.90	1	1 1/2	10	1 1/4	6	1.5661 - 1.6300	314.75	278.75	266.75	260.95	254.80	250.00
1 11/16	1.6875	49054	257.55	1	1 1/2	10	1 1/4	6	1.6301 - 1.6910	329.40	293.40	281.40	275.60	269.45	264.60
1 3/4	1.7500	49056	257.55	1	1 1/2	10	1 1/4	6	1.6911 - 1.7550	329.40	293.40	281.40	275.60	269.45	264.60
1 13/16	1.8125	49058	270.45	1	1 1/2	10	1 1/4	6	1.7551 - 1.8160	342.35	306.30	294.25	288.55	282.40	277.50
1 7/8	1.8750	49060	270.45	1	1 1/2	10	1 1/4	6	1.8161 - 1.8800	342.35	306.30	294.25	288.55	282.40	277.50
1 15/16	1.9375	49062	283.45	1	1 1/2	10	1 1/4	6	1.8801 - 1.9410	355.20	319.20	307.20	301.50	295.25	290.50
2	2.0000	49064	283.45	1	1 1/2	10	1 1/4	6	1.9411 - 2.0150	355.20	319.20	307.20	301.50	295.25	290.50

*Quantities of 15 or more - price of fractional size in same size range.

MATERIAL SPECIFIC STEP REAMERS CARBIDE TIPPED TYPES 457ST, 458ST, 459ST

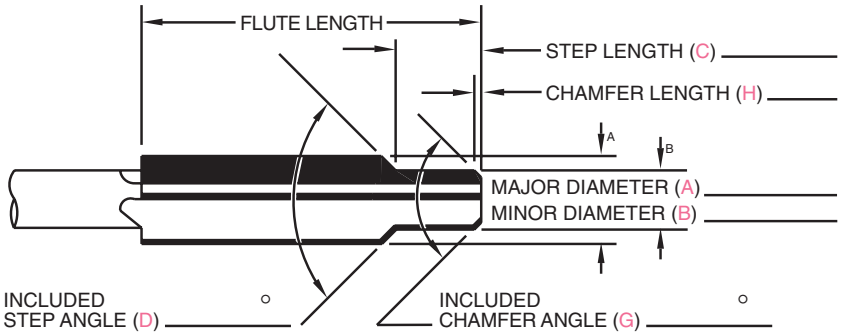
STRAIGHT FLUTES
FLUTE LONG CARBIDE
CUTTING OR NON-CUTTING PILOT

TYPE 457ST - FOR NON-FERROUS MATERIALS
TYPE 458ST - FOR CAST IRONS
TYPE 459ST - FOR STEELS & HIGH TEMP ALLOYS

- Polished flutes; straight flute long carbide and straight shank
- Tool geometry & carbide grade appropriate for material being machined
- Detailed specifications and available modifications on page 89

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	457ST
	40	NON-FERROUS - SHORT CHIPS	457ST/458ST
	60	CAST IRONS	458ST
	80	LOW STRENGTH STEELS	459ST/458ST
	100	MEDIUM STRENGTH STEELS	459ST
	120	HIGH STRENGTH STEELS	459ST
	140	HIGH TEMPERATURE ALLOYS	459ST

NOTE: See pgs. 78 & 79 for non-step reamers (457/458/459)



ORDERING INSTRUCTIONS:

Specify dimensions according to the letters (A, B, C, D, G & H) indicated on line drawing. Also, indicate if pilot is cutting or non-cutting and describe material being machined.

NOTE: Recommended stock removal is 3% per cutting diameter. Maximum between major and minor diameter (cutting or non-cutting pilot) should not exceed 6%. Both major and minor cutting diameter must be within cutting diameter range listed. Non-cutting pilot diameter can be smaller than cutting diameter range as indicated in the "non-cutting pilot minimum diameter" column.

MAJOR & MINOR CUTTING DIAMETER RANGE	DIMENSIONS					TYPE 457ST NON-FERROUS EDP NO.	TYPE 458ST CAST IRON EDP NO.	TYPE 459ST STEEL/ HI-TEMP EDP NO.	FINISHED TO MODIFIED TOOL DIAMETER PRICE EACH - BASED ON QUANTITY ORDERED						
	NON-CUT PILOT MIN. DIAM.	MAX. SHANK DIAM.	NO. OF FLTS	LENGTH FLUTE & CARB.	LENGTH OVER-ALL				1	2	3	4	5-7	8-14	OVER 14
0.1770-0.2040	.1660	.1805	4	1 ⅛	4 ½	45706ST	45806ST	45906ST	$129.90	$97.50	$86.65	$81.50	$75.95	$71.60	$65.30
0.2041-0.2210	.1920	.2075	4	1 ¼	5	45707ST	45807ST	45907ST	129.90	97.50	86.65	81.50	75.95	71.60	65.30
0.2211-0.2380	.2080	.2265	4	1 ½	6	4572344ST	4582344ST	4592344ST	129.90	97.50	86.65	81.50	75.95	71.60	65.30
0.2381-0.2530	.2240	.2405	4	1 ½	6	45708ST	45808ST	45908ST	129.90	97.50	86.65	81.50	75.95	71.60	65.30
0.2531-0.2840	.2380	.2485	4	1 ½	6	45709ST	45809ST	45909ST	131.40	99.00	88.15	83.00	77.50	73.10	66.75
0.2841-0.3150	.2670	.2792	4	1 ½	6	45710ST	45810ST	45910ST	131.40	99.00	88.15	83.00	77.50	73.10	66.75
0.3151-0.3470	.2960	.2792	4	1 ½	6	45711ST	45811ST	45911ST	133.70	101.35	90.45	85.40	79.80	75.45	69.10
0.3471-0.3780	.3260	.3105	4	1 ¾	7	45712ST	45812ST	45912ST	133.70	101.35	90.45	85.40	79.80	75.45	69.10
0.3781-0.4090	.3550	.3105	4	1 ¾	7	45713ST	45813ST	45913ST	137.10	104.80	93.95	88.80	83.25	78.85	72.55
0.4091-0.4410	.3850	.3730	6	1 ¾	7	45714ST	45814ST	45914ST	143.15	110.75	99.90	94.70	89.20	84.80	78.55
0.4411-0.4720	.4150	.3730	6	1 ¾	7	45715ST	45815ST	45915ST	149.35	117.00	106.15	101.00	95.45	91.10	84.75
0.4721-0.5030	.4440	.4355	6	2	8	45716ST	45816ST	45916ST	160.05	125.35	113.75	108.25	102.30	97.65	90.85
0.5031-0.5340	.4730	.4355	6	2	8	45717ST	45817ST	45917ST	162.65	128.00	116.40	110.90	104.90	100.20	93.45
0.5341-0.5660	.5020	.4355	6	2	8	45718ST	45818ST	45918ST	162.65	128.00	116.40	110.90	104.90	100.20	93.45
0.5661-0.5970	.5320	.4355	6	2	8	45719ST	45819ST	45919ST	166.25	131.60	120.00	114.45	108.55	103.85	97.05
0.5971-0.6280	.5610	.5615	6	2 ¼	9	45720ST	45820ST	45920ST	166.25	131.60	120.00	114.45	108.55	103.85	97.05
0.6281-0.6590	.5900	.5615	6	2 ¼	9	45721ST	45821ST	45921ST	168.05	133.40	121.75	116.20	110.30	105.60	98.85
0.6591-0.6910	.6200	.5615	6	2 ¼	9	45722ST	45822ST	45922ST	168.05	133.40	121.75	116.20	110.30	105.60	98.85
0.6911-0.7220	.6500	.5615	6	2 ¼	9	45723ST	45823ST	45923ST	172.45	137.80	126.20	120.70	114.75	110.10	103.30
0.7221-0.7530	.6790	.6245	6	2 ½	9 ½	45724ST	45824ST	45924ST	172.45	137.80	126.20	120.70	114.75	110.10	103.30
0.7531-0.7840	.7080	.6245	6	2 ½	9 ½	45725ST	45825ST	45925ST	176.00	141.35	129.80	124.25	118.25	113.65	106.85
0.7841-0.8160	.7370	.6245	6	2 ½	9 ½	45726ST	45826ST	45926ST	176.00	141.35	129.80	124.25	118.25	113.65	106.85
0.8161-0.8470	.7670	.6245	6	2 ½	9 ½	45727ST	45827ST	45927ST	180.25	145.60	134.00	128.45	122.55	117.85	111.10
0.8471-0.8780	.7970	.7495	6	2 ⅝	10	45728ST	45828ST	45928ST	187.10	151.10	139.05	133.35	127.15	122.30	115.30
0.8781-0.9090	.8260	.7495	6	2 ⅝	10	45729ST	45829ST	45929ST	206.10	170.15	158.05	152.40	146.15	141.35	134.30
0.9091-0.9410	.8550	.7495	8	2 ⅝	10	45730ST	45830ST	45930ST	206.10	170.15	158.05	152.40	146.15	141.35	134.30
0.9411-0.9720	.8850	.7495	8	2 ⅝	10	45731ST	45831ST	45931ST	212.55	176.55	164.50	158.75	152.55	147.70	140.65
0.9721-1.0030	.9140	.8745	8	2 ¾	10 ½	45732ST	45832ST	45932ST	212.55	176.55	164.50	158.75	152.55	147.70	140.65
1.0031-1.0660	.9430	.8745	8	2 ¾	10 ½	45734ST	45834ST	45934ST	214.35	179.85	168.20	162.75	156.85	152.20	145.50
1.0661-1.1280	1.0020	.8745	8	2 ⅞	11	45736ST	45836ST	45936ST	226.35	191.85	180.35	174.90	168.95	164.30	157.55
1.1281-1.1905	1.0610	.9995	8	2 ⅞	11	45738ST	45838ST	45938ST	233.60	199.05	187.50	182.05	176.10	171.45	164.70
1.1906-1.2530	1.1200	.9995	8	3	11 ½	45740ST	45840ST	45940ST	246.95	212.50	200.85	195.40	189.55	184.85	178.15
1.2531-1.3155	1.1780	.9995	8	3	11 ½	45742ST	45842ST	45942ST	251.85	217.35	205.85	200.35	194.45	189.75	183.00
1.3156-1.3780	1.2370	.9995	8	3 ¼	12	45744ST	45844ST	45944ST	264.05	229.55	218.05	212.55	206.60	201.95	195.20
1.3781-1.4405	1.2960	.9995	8	3 ¼	12	45746ST	45846ST	45946ST	280.15	245.60	234.05	228.55	222.65	218.05	211.25
1.4406-1.5030	1.3550	1.2495	8	3 ½	12 ½	45748ST	45848ST	45948ST	286.35	251.85	240.35	234.85	228.95	224.30	217.50

MATERIAL SPECIFIC STEP REAMERS CARBIDE TIPPED TYPES 442ST, 443ST, 444ST

MATERIAL SPECIFIC

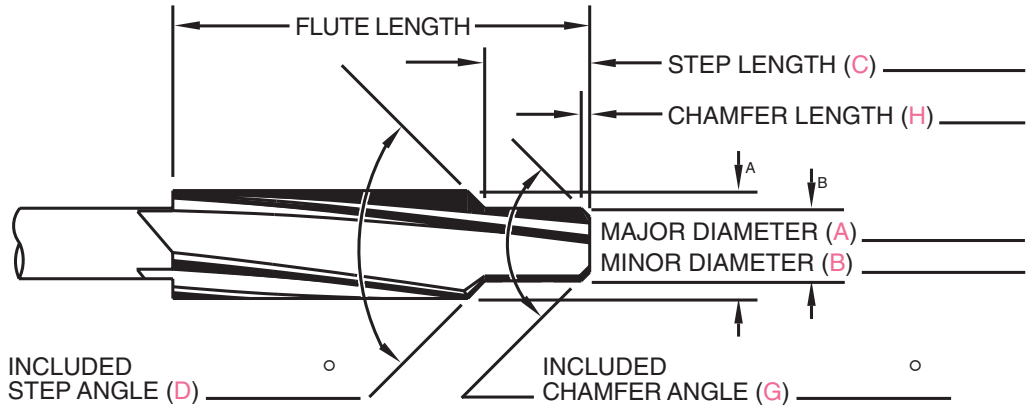
RIGHT SPIRAL FLUTES
FLUTE LONG CARBIDE
CUTTING OR NON-CUTTING PILOT

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	442ST
	40	NON-FERROUS - SHORT CHIPS	442ST/443ST
	60	CAST IRONS	443ST
	80	LOW STRENGTH STEELS	444ST/443ST
	100	MEDIUM STRENGTH STEELS	444ST
	120	HIGH STRENGTH STEELS	444ST
	140	HIGH TEMPERATURE ALLOYS	444ST

TYPE 442ST - FOR NON-FERROUS MATERIALS
TYPE 443ST - FOR CAST IRONS
TYPE 444ST - FOR STEELS & HIGH TEMP ALLOYS

- Polished flutes; right spiral flute long carbide and straight shank
- Tool geometry & carbide grade appropriate for material being machined
- Detailed specifications and available modifications on page 89

NOTE: See page 85 for non-step reamers (442/443/444)



ORDERING INSTRUCTIONS:

Specify dimensions according to the letters (A, B, C, D, G & H) indicated on line drawing. Also, indicate if pilot is cutting or non-cutting and describe material being machined.

NOTE: Recommended stock removal is 3% per cutting diameter. Maximum between major and minor diameter (cutting or non-cutting pilot) should not exceed 6%. Both major and minor cutting diameter must be within cutting diameter range listed. Non-cutting pilot diameter can be smaller than cutting diameter range as indicated in the "non-cutting pilot minimum diameter" column.

MAJOR & MINOR CUTTING DIAMETER RANGE	DIMENSIONS					TYPE 442ST NON-FERROUS EDP NO.	TYPE 443ST CAST IRON EDP NO.	TYPE 444ST STEEL/ HI-TEMP EDP NO.	FINISHED TO MODIFIED TOOL DIAMETER PRICE EACH - BASED ON QUANTITY ORDERED						
	NON-CUT PILOT MIN. DIAM.	MAX. SHANK DIAM.	NO. OF FLTS	LENGTH FLT & CARB.	LENGTH OVER-ALL				1	2	3	4	5-7	8-14	OVER 14
0.2841 - 0.3150	.2670	.2792	4	1 ½	6	44210ST	44310ST	44410ST	$143.65	$113.25	$103.15	$98.25	$93.10	$89.05	$83.05
0.3151 - 0.3470	.2960	.2792	4	1 ½	6	44211ST	44311ST	44411ST	152.10	121.70	111.50	106.75	101.50	97.45	91.50
0.3471 - 0.3780	.3260	.3105	4	1 ¾	7	44212ST	44312ST	44412ST	152.90	122.60	112.40	107.60	102.40	98.25	92.40
0.3781 - 0.4090	.3550	.3105	4	1 ¾	7	44213ST	44313ST	44413ST	157.05	126.65	116.55	111.65	106.50	102.40	96.45
0.4091 - 0.4410	.3850	.3730	6	1 ¾	7	44214ST	44314ST	44414ST	160.70	130.40	120.20	115.40	110.20	106.10	100.15
0.4411 - 0.4720	.4150	.3730	6	1 ¾	7	44215ST	44315ST	44415ST	167.10	136.75	126.60	121.75	116.60	112.45	106.55
0.4721 - 0.5030	.4440	.4355	6	2	8	44216ST	44316ST	44416ST	179.45	147.10	136.20	131.05	125.55	121.15	114.85
0.5031 - 0.5340	.4730	.4355	6	2	8	44217ST	44317ST	44417ST	182.80	150.40	139.60	134.45	128.90	124.55	118.20
0.5341 - 0.5660	.5020	.4355	6	2	8	44218ST	44318ST	44418ST	182.80	150.40	139.60	134.45	128.90	124.55	118.20
0.5661 - 0.5970	.5320	.4355	6	2	8	44219ST	44319ST	44419ST	186.25	153.95	143.15	137.95	132.40	128.05	121.70
0.5971 - 0.6280	.5610	.5615	6	2 ¼	9	44220ST	44320ST	44420ST	186.25	153.95	143.15	137.95	132.40	128.05	121.70
0.6281 - 0.6590	.5900	.5615	6	2 ¼	9	44221ST	44321ST	44421ST	190.10	157.85	146.90	141.80	136.20	131.85	125.55
0.6591 - 0.6910	.6200	.5615	6	2 ¼	9	44222ST	44322ST	44422ST	197.95	165.55	154.70	149.55	144.05	139.70	133.35
0.6911 - 0.7220	.6500	.5615	6	2 ¼	9	44223ST	44323ST	44423ST	199.95	167.60	156.75	151.60	146.05	141.65	135.40
0.7221 - 0.7530	.6790	.6245	6	2 ½	9 ½	44224ST	44324ST	44424ST	201.95	169.60	158.75	153.60	148.10	143.70	137.30
0.7531 - 0.7840	.7080	.6245	6	2 ½	9 ½	44225ST	44325ST	44425ST	205.60	173.25	162.40	157.25	151.70	147.35	141.00
0.7841 - 0.8160	.7370	.6245	6	2 ½	9 ½	44226ST	44326ST	44426ST	205.60	173.25	162.40	157.25	151.70	147.35	141.00
0.8161 - 0.8470	.7670	.6245	6	2 ½	9 ½	44227ST	44327ST	44427ST	213.25	180.95	170.10	164.95	159.30	155.00	148.65
0.8471 - 0.8780	.7970	.7495	6	2 ⅝	10	44228ST	44328ST	44428ST	221.30	187.80	176.50	171.20	165.35	160.90	154.30
0.8781 - 0.9090	.8260	.7495	6	2 ⅝	10	44229ST	44329ST	44429ST	246.70	213.05	201.80	196.50	190.75	186.20	179.55
0.9091 - 0.9410	.8550	.7495	8	2 ⅝	10	44230ST	44330ST	44430ST	246.70	213.05	201.80	196.50	190.75	186.20	179.55
0.9411 - 0.9720	.8850	.7495	8	2 ⅝	10	44231ST	44331ST	44431ST	255.50	221.90	210.70	205.25	199.55	195.05	188.45
0.9721 - 1.0030	.9140	.8745	8	2 ¾	10 ½	44232ST	44332ST	44432ST	255.50	221.90	210.70	205.25	199.55	195.05	188.45
1.0031 - 1.0660	.9430	.8745	8	2 ¾	10 ½	44234ST	44334ST	44434ST	288.50	254.90	243.65	238.30	232.55	228.05	221.50
1.0661 - 1.1280	1.0020	.8745	8	2 ⅞	11	44236ST	44336ST	44436ST	295.35	261.75	250.50	245.20	239.40	234.90	228.30
1.1281 - 1.1905	1.0610	.9995	8	2 ⅞	11	44238ST	44338ST	44438ST	307.10	273.55	262.25	256.95	251.15	246.65	240.05
1.1906 - 1.2530	1.1200	.9995	8	3	11 ½	44240ST	44340ST	44440ST	320.90	287.30	276.10	270.70	265.00	260.45	253.85
1.2531 - 1.3155	1.1780	.9995	8	3	11 ½	44242ST	44342ST	44442ST	348.10	314.50	303.20	297.90	292.10	287.60	281.00
1.3156 - 1.3780	1.2370	.9995	8	3 ¼	12	44244ST	44344ST	44444ST	374.85	341.25	330.10	324.70	318.95	314.40	307.90
1.3781 - 1.4405	1.2960	.9995	8	3 ¼	12	44246ST	44346ST	44446ST	393.15	359.55	348.35	342.95	337.25	332.70	326.15
1.4406 - 1.5030	1.3550	1.2495	8	3 ½	12 ½	44248ST	44348ST	44448ST	411.60	378.10	366.80	361.50	355.75	351.25	344.60

MATERIAL SPECIFIC STEP REAMERS CARBIDE TIPPED TYPES 482ST, 483ST, 484ST

LEFT SPIRAL FLUTES
FLUTE LONG CARBIDE
CUTTING OR NON-CUTTING PILOT

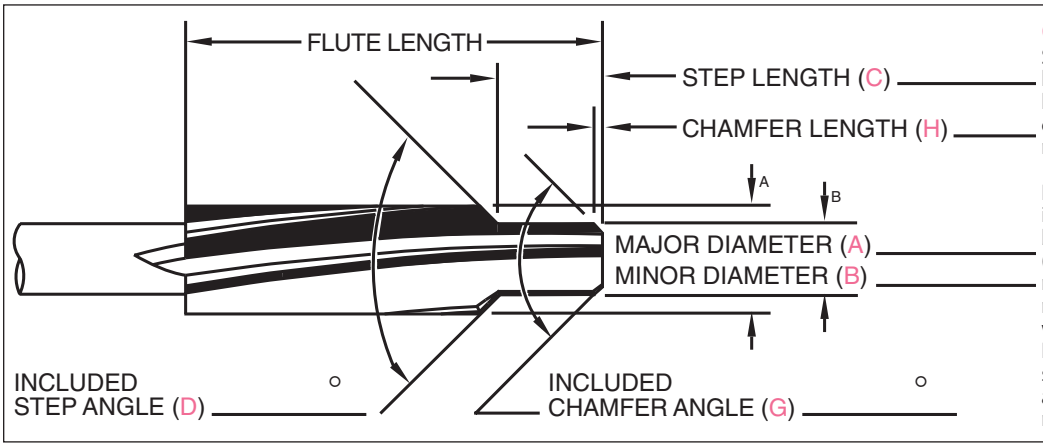
TYPE 482ST - FOR NON-FERROUS MATERIALS
TYPE 483ST - FOR CAST IRONS
TYPE 484ST - FOR STEELS & HIGH TEMP ALLOYS

- Polished flutes; left spiral flute long carbide and straight shank
- Left spiral flutes should not be used on blind holes
- Tool geometry & carbide grade appropriate for material being machined
- Detailed specifications and available modifications on page 89

TOOL SELECTOR

CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
20	NON-FERROUS - LONG CHIPS	482ST
40	NON-FERROUS - SHORT CHIPS	482ST/483ST
60	CAST IRONS	483ST
80	LOW STRENGTH STEELS	484ST/483ST
100	MEDIUM STRENGTH STEELS	484ST
120	HIGH STRENGTH STEELS	484ST
140	HIGH TEMPERATURE ALLOYS	484ST

NOTE: See page 87 for non-step reamers (482/483/484)



ORDERING INSTRUCTIONS:

Specify dimensions according to the letters (A, B, C, D, G & H) indicated on line drawing. Also, indicate if pilot is cutting or non-cutting and describe material being machined.

NOTE: Recommended stock removal is 3% per cutting diameter. Maximum between major and minor diameter (cutting or non-cutting pilot) should not exceed 6%. Both major and minor cutting diameter must be within cutting diameter range listed. Non-cutting pilot diameter can be smaller than cutting diameter range as indicated in the "non-cutting pilot minimum diameter" column.

MAJOR & MINOR CUTTING DIAMETER RANGE	DIMENSIONS					TYPE 482ST NON-FERROUS EDP NO.	TYPE 483ST CAST IRON EDP NO.	TYPE 484ST STEEL/ HI-TEMP EDP NO.	FINISHED TO MODIFIED TOOL DIAMETER						
	NON-CUT PILOT MIN. DIAM.	MAX. SHANK DIAM.	NO. OF FLTS	LENGTH FLT & CARB.	LENGTH OVER-ALL				PRICE EACH - BASED ON QUANTITY ORDERED						
									1	2	3	4	5-7	8-14	OVER 14
0.2841 - 0.3150	.2670	.2792	4	1 ½	6	48210ST	48310ST	48410ST	$153.20	$120.85	$110.05	$104.85	$99.25	$94.90	$88.60
0.3151 - 0.3470	.2960	.2792	4	1 ½	6	48211ST	48311ST	48411ST	162.25	129.85	119.00	113.85	108.30	103.95	97.55
0.3471 - 0.3780	.3260	.3105	4	1 ¾	7	48212ST	48312ST	48412ST	163.15	130.70	119.95	114.75	109.20	104.85	98.45
0.3781 - 0.4090	.3550	.3105	4	1 ¾	7	48213ST	48313ST	48413ST	167.45	135.05	124.30	119.10	113.55	109.20	102.85
0.4091 - 0.4410	.3850	.3730	6	1 ¾	7	48214ST	48314ST	48414ST	171.40	139.05	128.20	123.10	117.55	113.20	106.85
0.4411 - 0.4720	.4150	.3730	6	1 ¾	7	48215ST	48315ST	48415ST	178.25	145.85	135.00	129.90	124.35	120.00	113.65
0.4721 - 0.5030	.4440	.4355	6	2	8	48216ST	48316ST	48416ST	184.25	151.05	139.85	134.60	128.90	124.45	117.90
0.5031 - 0.5340	.4730	.4355	6	2	8	48217ST	48317ST	48417ST	187.75	154.50	143.35	138.00	132.40	127.90	121.30
0.5341 - 0.5660	.5020	.4355	6	2	8	48218ST	48318ST	48418ST	187.75	154.50	143.35	138.00	132.40	127.90	121.30
0.5661 - 0.5970	.5320	.4355	6	2	8	48219ST	48319ST	48419ST	191.35	158.10	146.90	141.60	135.95	131.50	124.90
0.5971 - 0.6280	.5610	.5615	6	2 ¼	9	48220ST	48320ST	48420ST	191.35	158.10	146.90	141.60	135.95	131.50	124.90
0.6281 - 0.6590	.5900	.5615	6	2 ¼	9	48221ST	48321ST	48421ST	195.25	162.00	150.90	145.60	139.85	135.40	128.90
0.6591 - 0.6910	.6200	.5615	6	2 ¼	9	48222ST	48322ST	48422ST	203.25	170.00	158.90	153.60	147.85	143.40	136.90
0.6911 - 0.7220	.6500	.5615	6	2 ¼	9	48223ST	48323ST	48423ST	205.30	172.15	161.00	155.65	150.05	145.55	138.95
0.7221 - 0.7530	.6790	.6245	6	2 ½	9 ½	48224ST	48324ST	48424ST	207.40	174.10	163.00	157.75	152.05	147.55	141.05
0.7531 - 0.7840	.7080	.6245	6	2 ½	9 ½	48225ST	48325ST	48425ST	211.15	177.85	166.80	161.45	155.70	151.25	144.75
0.7841 - 0.8160	.7370	.6245	6	2 ½	9 ½	48226ST	48326ST	48426ST	211.15	177.85	166.80	161.45	155.70	151.25	144.75
0.8161 - 0.8470	.7670	.6245	6	2 ½	9 ½	48227ST	48327ST	48427ST	219.00	185.75	174.65	169.30	163.60	159.15	152.65
0.8471 - 0.8780	.7970	.7495	6	2 ⅝	10	48228ST	48328ST	48428ST	227.20	192.75	181.20	175.70	169.80	165.15	158.40
0.8781 - 0.9090	.8260	.7495	6	2 ⅝	10	48229ST	48329ST	48429ST	253.35	218.80	207.30	201.75	195.85	191.15	184.45
0.9091 - 0.9410	.8550	.7495	8	2 ⅝	10	48230ST	48330ST	48430ST	253.35	218.80	207.30	201.75	195.85	191.15	184.45
0.9411 - 0.9720	.8850	.7495	8	2 ⅝	10	48231ST	48331ST	48431ST	262.40	227.90	216.30	210.80	204.95	200.30	193.50
0.9721 - 1.0030	.9140	.8745	8	2 ¾	10 ½	48232ST	48332ST	48432ST	262.40	227.90	216.30	210.80	204.95	200.30	193.50
1.0031 - 1.0660	.9430	.8745	8	2 ¾	10 ½	48234ST	48334ST	48434ST	296.20	261.75	250.20	244.70	238.80	234.15	227.30
1.0661 - 1.1280	1.0020	.8745	8	2 ⅞	11	48236ST	48336ST	48436ST	303.20	268.80	257.20	251.70	245.85	241.20	234.45
1.1281 - 1.1905	1.0610	.9995	8	2 ⅞	11	48238ST	48338ST	48438ST	315.30	280.80	269.30	263.80	257.85	253.30	246.45
1.1906 - 1.2530	1.1200	.9995	8	3	11 ½	48240ST	48340ST	48440ST	329.50	295.05	283.50	278.00	272.10	267.45	260.65
1.2531 - 1.3155	1.1780	.9995	8	3	11 ½	48242ST	48342ST	48442ST	357.45	322.90	311.40	305.90	300.00	295.25	288.55
1.3156 - 1.3780	1.2370	.9995	8	3 ¼	12	48244ST	48344ST	48444ST	384.95	350.50	338.90	333.40	327.50	322.80	316.10
1.3781 - 1.4405	1.2960	.9995	8	3 ¼	12	48246ST	48346ST	48446ST	403.70	369.25	357.65	352.15	346.30	341.65	334.90
1.4406 - 1.5030	1.3550	1.2495	8	3 ½	12 ½	48248ST	48348ST	48448ST	422.75	388.15	376.55	371.10	365.20	360.55	353.85

SOLID CARBIDE REAMERS

MATERIAL SPECIFIC COOLANT FED

INDEX

SOLID CARBIDE REAMERS TECHNICAL INFORMATION

REAMER BASICS

- The reamer is used to finish machine a previously formed hole to an exact diameter with a smooth finish. It should **not** be used to significantly enlarge a hole (max. 5% – depending on material and hardness).
- Carbide reamers are especially appropriate for close tolerance reaming. Because carbide is very highly resistant to wear, the reamer will produce accurate hole size and a smooth finish far longer than high speed steel or cobalt.
- The reamer is an end cutting tool, cutting only on the chamfer's edge at the outside diameter of the preformed hole. The standard 45° chamfer angle provides effective cutting action for most materials.
- Reamer Types:
  General Purpose – Superior performance over high speed steel and cobalt; good in a wide variety of materials
  Material Specific – Excellent in large production runs due to material specific tool geometry
  Coolant Fed – Exceptional performance and tool life using material specific reamer technology and coolant fed capabilities; maximizes feeds & speeds

TECHNICAL REAMING GUIDE INFORMATION PAGES 23-29
Contact us for a PDF copy of "HANNIBAL'S Guide to Cost Effective Reaming." It includes:

Reamer Expedite Fees: Order must be recieved by 2:00 PM CST
18 pieces max per diameter
Does NOT require air shipment of the product

Reamer Diameter	Service	Fee
Up to 1.0000"	24 Hour	75.00
Up to 1.0000"	48 Hour	50.00
Over 1.0000"	48 Hour	75.00
Over 1.0000"	72 Hour	50.00

MODIFICATIONS (Prompt delivery)
- Modified tool diameter - priced below
- Metric tool diameter
- Closer tool diameter tolerance
- Cutting diameter reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diameter back taper
- Shortened shank or reduced shank diameter
- Flat(s) or tang on shank

- Coatings available:
  - TITANIUM NITRIDE – TiN
  - TITANIUM CARBONITRIDE – TiCN
  - ZIRCONIUM NITRIDE – ZrN
  - AL TITANIUM NITRIDE – AlTiN
- Solid carbide head and straight shank
- Tool diameter tolerance - thru .2500": plus .0002", minus .0000"
  over .2500": plus .0003", minus 0000"
- Shank diameter tolerance: plus .0000", minus .0010"

COOLANT FED MATERIAL SPECIFIC REAMERS
SOLID CARBIDE TYPES 806, 807, 808, & 809

MATERIAL SPECIFIC COOLANT FED

SHORT SERIES
CENTER AND FLUTE FED COOLANT
STRAIGHT FLUTES

Center Fed Coolant Holes

Flute Fed Coolant Holes

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	807/809
	40	NON-FERROUS - SHORT CHIPS	807/809
	60	CAST IRONS	806/808
	80	LOW STRENGTH STEELS	806/808
	100	MEDIUM STRENGTH STEELS	806/808
	120	HIGH STRENGTH STEELS	806/808
	140	HIGH TEMPERATURE ALLOYS	806/808

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Metric tool diameter
- Closer tool diameter tolerance - pg. 29
- Cutting diameter reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diameter back taper
- Shortened shank or reduced shank diameter
- Flat(s) or tang on shank
- Coatings available: See page 101

TYPE 806 - STRAIGHT FLUTES - FOR CAST IRONS & STEELS
TYPE 807 - STRAIGHT FLUTES - FOR NON-FERROUS MATERIALS

- Solid carbide head and straight shank
- Tool diameter tolerance - thru .2500": plus .0002", minus .0000"
  over .2500": plus .0003", minus 0000"
- Shank diameter tolerance: plus .0000", minus .0010"
- Tool geometry appropriate for material being machined

CENTER FED COOLANT

TOOL DIAMETER RANGE	DIMENSIONS				STRAIGHT - CENTER FED		FINISHED TO MODIFIED TOOL DIAMETER						
	MAX. SHANK DIAM.	NO. OF FLUTES	LENGTH		TYPE 807 NON-FERROUS	TYPE 806 CAST IRON/ STEEL	PRICE EACH - BASED ON QUANTITY ORDERED						
			FLT	OVER-ALL			1	2	3	4	5-7	8-14	OVER 14
.1121 - .1280	.1099	4	5/8	2 1/4	80708	80608	$122.40	$106.00	$100.55	$97.95	$95.05	$92.85	$89.65
.1281 - .1435	.1255	4	3/4	2 1/2	80709	80609	123.30	106.80	101.50	98.75	95.95	93.75	90.50
.1436 - .1590	.1411	4	3/4	2 1/2	80710	80610	123.75	107.40	101.95	99.30	96.45	94.25	91.05
.1591 - .1750	.1567	4	7/8	2 3/4	80711	80611	124.95	108.60	103.15	100.50	97.65	95.45	92.25
.1751 - .1910	.1724	4	7/8	2 3/4	80712	80612	130.00	113.50	108.15	105.45	102.70	100.45	97.25
.1911 - .2210	.1880	6	1	3	80714	80614	131.90	115.50	110.05	107.40	104.60	102.35	99.20
.2211 - .2530	.2193	6	1	3	80716	80616	134.25	117.85	112.40	109.75	106.85	104.75	101.55
.2531 - .2840	.2505	6	1 1/8	3 1/4	80718	80618	138.10	121.65	116.25	113.50	110.75	108.55	105.30
.2841 - .3150	.2817	6	1 1/8	3 1/4	80720	80620	141.25	124.85	119.40	116.75	113.95	111.80	108.55
.3151 - .3470	.3130	6	1 1/4	3 1/2	80722	80622	145.20	128.75	123.35	120.60	117.85	115.65	112.40
.3471 - .3780	.3443	6	1 1/4	3 1/2	80724	80624	149.60	133.15	127.75	125.10	122.25	120.05	116.85
.3781 - .4090	.3755	6	1 3/8	3 3/4	80726	80626	156.50	140.10	134.70	132.00	129.20	127.00	123.75

TYPE 808 - STRAIGHT FLUTES - FOR CAST IRONS & STEELS
TYPE 809 - STRAIGHT FLUTES - FOR NON-FERROUS MATERIALS

FLUTE FED COOLANT

TOOL DIAMETER RANGE	DIMENSIONS				STRAIGHT - FLUTE FED		FINISHED TO MODIFIED TOOL DIAMETER						
	MAX. SHANK DIAM.	NO. OF FLUTES	LENGTH		TYPE 809 NON-FERROUS	TYPE 808 CAST IRON/ STEEL	PRICE EACH - BASED ON QUANTITY ORDERED						
			FLT	OVER-ALL			1	2	3	4	5-7	8-14	OVER 14
.1121 - .1280	.1099	4	5/8	2 1/4	80908	80808	$173.20	$156.80	$151.35	$148.75	$145.85	$143.70	$140.50
.1281 - .1435	.1255	4	3/4	2 1/2	80909	80809	164.55	148.10	142.70	139.95	137.20	135.00	131.80
.1436 - .1590	.1411	4	3/4	2 1/2	80910	80810	174.90	158.45	153.10	150.35	147.60	145.35	142.15
.1591 - .1750	.1567	4	7/8	2 3/4	80911	80811	176.40	160.00	154.60	151.95	149.10	146.90	143.70
.1751 - .1910	.1724	4	7/8	2 3/4	80912	80812	177.50	161.10	155.65	153.00	150.15	147.95	144.75
.1911 - .2210	.1880	6	1	3	80914	80814	213.30	196.90	191.45	188.80	185.95	183.85	180.55
.2211 - .2530	.2193	6	1	3	80916	80816	215.95	199.50	194.15	191.40	188.60	186.40	183.15
.2531 - .2840	.2505	6	1 1/8	3 1/4	80918	80818	220.55	204.10	198.75	196.05	193.25	191.00	187.80
.2841 - .3150	.2817	6	1 1/8	3 1/4	80920	80820	224.20	207.85	202.40	199.70	196.90	194.65	191.45
.3151 - .3470	.3130	6	1 1/4	3 1/2	80922	80822	238.50	222.10	216.65	213.95	211.15	209.00	205.75
.3471 - .3780	.3443	6	1 1/4	3 1/2	80924	80824	243.55	227.15	221.75	219.05	216.25	214.00	210.80
.3781 - .4090	.3755	6	1 3/8	3 3/4	80926	80826	251.90	235.50	230.05	227.35	224.55	222.35	219.10

COOLANT FED MATERIAL SPECIFIC REAMERS
SOLID CARBIDE TYPES 816, 817, 828, & 829

MATERIAL SPECIFIC COOLANT FED

SHORT SERIES
CENTER AND FLUTE FED COOLANT
RIGHT OR LEFT SPIRAL FLUTES

Right Spiral Flutes for Blind Holes

Left Spiral Flutes for Through Holes

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	817/829
	40	NON-FERROUS - SHORT CHIPS	817/829
	60	CAST IRONS	816/828
	80	LOW STRENGTH STEELS	816/828
	100	MEDIUM STRENGTH STEELS	816/828
	120	HIGH STRENGTH STEELS	816/828
	140	HIGH TEMPERATURE ALLOYS	816/828

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Metric tool diameter
- Closer tool diameter tolerance - pg. 29
- Cutting diameter reduced for step or pilot
- End chamfer other than 45°
- End cutting or corner radius
- Increased/decreased circular margin
- Increased/decreased tool diameter back taper
- Shortened shank or reduced shank diameter
- Flat(s) or tang on shank
- Coatings available: See page 101

REAMERS

TYPE 816 - RIGHT SPIRAL FLUTES - FOR CAST IRONS & STEELS
TYPE 817 - RIGHT SPIRAL FLUTES - FOR NON-FERROUS MATERIALS
CENTER FED COOLANT

TOOL DIAMETER RANGE	DIMENSIONS				RIGHT - CENTER FED		FINISHED TO MODIFIED TOOL DIAMETER						
	MAX. SHANK DIAM.	NO. OF FLUTES	LENGTH		TYPE 817 NON-FERROUS	TYPE 816 CAST IRON/ STEEL	PRICE EACH - BASED ON QUANTITY ORDERED						
			FLT	OVER-ALL			1	2	3	4	5-7	8-14	OVER 14
.1121 - .1280	.1099	4	5/8	2 1/4	81708	81608	$125.50	$109.05	$103.65	$100.95	$98.15	$95.95	$92.70
.1281 - .1435	.1255	4	3/4	2 1/2	81709	81609	126.35	109.95	104.50	101.85	98.95	96.85	93.65
.1436 - .1590	.1411	4	3/4	2 1/2	81710	81610	126.90	110.40	105.10	102.35	99.55	97.35	94.10
.1591 - .1750	.1567	4	7/8	2 3/4	81711	81611	128.10	111.70	106.30	103.55	100.75	98.55	95.30
.1751 - .1910	.1724	4	7/8	2 3/4	81712	81612	133.05	116.65	111.20	108.55	105.70	103.50	100.35
.1911 - .2210	.1880	6	1	3	81714	81614	134.95	118.55	113.10	110.35	107.60	105.40	102.15
.2211 - .2530	.2193	6	1	3	81716	81616	137.25	120.90	115.45	112.70	109.95	107.75	104.50
.2531 - .2840	.2505	6	1 1/8	3 1/4	81718	81618	141.05	124.70	119.25	116.60	113.75	111.50	108.35
.2841 - .3150	.2817	6	1 1/8	3 1/4	81720	81620	144.25	127.90	122.45	119.80	116.95	114.70	111.50
.3151 - .3470	.3130	6	1 1/4	3 1/2	81722	81622	148.25	131.85	126.40	123.70	120.95	118.70	115.50
.3471 - .3780	.3443	6	1 1/4	3 1/2	81724	81624	153.55	137.10	131.65	129.05	126.15	124.00	120.85
.3781 - .4090	.3755	6	1 3/8	3 3/4	81726	81626	160.55	144.15	138.70	136.05	133.20	131.00	127.85

TYPE 828 - LEFT SPIRAL FLUTES - FOR CAST IRONS & STEELS
TYPE 829 - LEFT SPIRAL FLUTES - FOR NON-FERROUS MATERIALS
FLUTE FED COOLANT

TOOL DIAMETER RANGE	DIMENSIONS				LEFT - FLUTE FED		FINISHED TO MODIFIED TOOL DIAMETER						
	MAX. SHANK DIAM.	NO. OF FLUTES	LENGTH		TYPE 829 NON-FERROUS	TYPE 828 CAST IRON/ STEEL	PRICE EACH - BASED ON QUANTITY ORDERED						
			FLT	OVER-ALL			1	2	3	4	5-7	8-14	OVER 14
.1121 - .1280	.1099	4	5/8	2 1/4	82908	82808	$198.10	$181.70	$176.30	$173.65	$170.80	$168.55	$165.35
.1281 - .1435	.1255	4	3/4	2 1/2	82909	82809	199.20	182.80	177.35	174.75	171.85	169.65	166.45
.1436 - .1590	.1411	4	3/4	2 1/2	82910	82810	199.80	183.40	178.00	175.25	172.50	170.30	167.05
.1591 - .1750	.1567	4	7/8	2 3/4	82911	82811	201.20	184.75	179.35	176.70	173.85	171.70	168.45
.1751 - .1910	.1724	4	7/8	2 3/4	82912	82812	202.15	185.75	180.35	177.60	174.85	172.60	169.40
.1911 - .2210	.1880	6	1	3	82914	82814	261.40	245.00	239.55	236.85	234.00	231.90	228.70
.2211 - .2530	.2193	6	1	3	82916	82816	261.15	244.80	239.35	236.70	233.85	231.60	228.45
.2531 - .2840	.2505	6	1 1/8	3 1/4	82918	82818	265.75	249.35	243.90	241.25	238.40	236.20	233.05
.2841 - .3150	.2817	6	1 1/8	3 1/4	82920	82820	269.45	253.10	247.65	245.00	242.20	239.95	236.75
.3151 - .3470	.3130	6	1 1/4	3 1/2	82922	82822	283.65	267.30	261.85	259.15	256.35	254.15	250.90
.3471 - .3780	.3443	6	1 1/4	3 1/2	82924	82824	288.80	272.45	267.00	264.30	261.50	259.30	256.10
.3781 - .4090	.3755	6	1 3/8	3 3/4	82926	82826	297.30	280.85	275.45	272.75	269.95	267.75	264.55

MATERIAL SPECIFIC REAMERS
SOLID CARBIDE TYPES 802, 803, 812, 813, 822, 823

SHORT SERIES
STRAIGHT, RIGHT SPIRAL, OR LEFT SPIRAL FLUTES
STRAIGHT SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	803/813/823
	40	NON-FERROUS - SHORT CHIPS	803/813/823
	60	CAST IRONS	802/812/822
	80	LOW STRENGTH STEELS	802/812/822
	100	MEDIUM STRENGTH STEELS	802/812/822
	120	HIGH STRENGTH STEELS	802/812/822
	140	HIGH TEMPERATURE ALLOYS	802/812/822

TYPE 803 - STRAIGHT FLUTES - FOR NON-FERROUS MATERIALS
TYPE 802 - STRAIGHT FLUTES - FOR CAST IRONS & STEELS

- Solid carbide head and straight shank
- Tool diameter tolerance thru .2500": plus .0002", minus .0000"
  over .2500": plus .0003", minus .0000"

MODIFICATIONS (See list on page 101)

- Shank diameter tolerance: plus .0000", minus .0010"
- Tool geometry appropriate for material being machined

TOOL DIAMETER RANGE	DIMENSIONS				EDP NO. - STRAIGHT		FINISHED TO MODIFIED TOOL DIAMETER						
	MAX. SHANK DIAM.	NO. OF FLUTES	LENGTH		TYPE 803 NON-FERROUS	TYPE 802 CAST IRON/ STEEL	PRICE EACH - BASED ON QUANTITY ORDERED						
			FLT	OVER-ALL			1	2	3	4	5-7	8-14	OVER 14
*0.0591 - 0.0660	.0580	4	3/8	1 1/2	-	80204	$67.90	$42.25	$33.70	$29.65	$25.30	$21.80	$16.80
*0.0661 - 0.0740	.0650	4	1/2	1 3/4	-	80245	68.10	42.45	33.90	29.80	25.45	22.00	17.00
*0.0741 - 0.0810	.0730	4	1/2	1 3/4	-	80205	68.20	42.55	33.95	30.00	25.50	22.15	17.05
*0.0811 - 0.0890	.0800	4	1/2	2	-	80255	68.60	43.00	34.45	30.40	26.05	22.55	17.55
*0.0891 - 0.0970	.0880	4	1/2	2	-	80206	69.05	43.40	34.85	30.80	26.45	22.90	17.95
*0.0971 - 0.1120	.0943	4	5/8	2 1/4	80307	80207	69.30	43.65	35.10	31.05	26.65	23.20	18.20
0.1121 - 0.1280	.1099	4	5/8	2 1/4	80308	80208	70.50	44.85	36.30	32.25	27.85	24.40	19.40
0.1281 - 0.1435	.1255	4	3/4	2 1/2	80309	80209	71.00	45.40	36.80	32.80	28.40	24.95	19.90
0.1436 - 0.1590	.1411	4	3/4	2 1/2	80310	80210	72.20	46.55	38.00	33.95	29.60	26.10	21.10
0.1591 - 0.1750	.1567	4	7/8	2 3/4	80311	80211	74.95	49.25	40.70	36.70	32.30	28.85	23.80
0.1751 - 0.1910	.1724	4	7/8	2 3/4	80312	80212	76.75	51.10	42.55	38.55	34.05	30.70	25.60
0.1911 - 0.2210	.1880	6	1	3	80314	80214	79.90	54.30	45.75	41.70	37.35	33.85	28.85
0.2211 - 0.2530	.2193	6	1	3	80316	80216	85.35	59.75	51.20	47.15	42.80	39.30	34.30
0.2531 - 0.2840	.2505	6	1 1/8	3 1/4	80318	80218	91.70	66.05	57.50	53.45	49.10	45.60	40.60
0.2841 - 0.3150	.2817	6	1 1/8	3 1/4	80320	80220	98.70	73.05	64.40	60.45	56.10	52.60	47.60
0.3151 - 0.3470	.3130	6	1 1/4	3 1/2	80322	80222	109.00	83.45	74.90	70.85	66.45	62.90	58.00
0.3471 - 0.3780	.3443	6	1 1/4	3 1/2	80324	80224	110.40	84.80	76.30	72.20	67.85	64.30	59.35
0.3781 - 0.4090	.3755	6	1 3/8	3 3/4	80326	80226	119.55	93.90	85.35	81.25	76.90	73.45	68.40
0.4091 - 0.4410	.4067	6	1 3/8	3 3/4	80328	80228	120.55	94.90	86.35	82.30	77.95	74.45	69.45
0.4411 - 0.4720	.4380	6	1 1/2	4	80330	80230	127.90	102.25	93.70	89.65	85.30	81.85	76.80
0.4721 - 0.5150	.4693	6	1 1/2	4	80332	80232	135.00	109.40	100.75	96.80	92.40	88.95	83.90

TYPE 813 - RIGHT SPIRAL FLUTES - FOR NON-FERROUS MATERIALS
TYPE 812 - RIGHT SPIRAL FLUTES - FOR CAST IRONS & STEELS
TYPE 823 - LEFT SPIRAL FLUTES - FOR NON-FERROUS MATERIALS
TYPE 822 - LEFT SPIRAL FLUTES - FOR CAST IRONS & STEELS

- See description under Type 802-803 above • Left spiral flutes should not be used on blind holes

TOOL DIAMETER RANGE	DIMENSIONS				EDP NO. - R SPIRAL		EDP NO. - L SPIRAL		FINISHED TO MODIFIED TOOL DIAMETER						
	MAX. SHANK DIAM.	NO. OF FLTS	LENGTH		TYPE 813 NON-FERROUS	TYPE 812 CAST IRON/ STEEL	TYPE 823 NON-FERROUS	TYPE 822 CAST IRON/ STEEL	PRICE EACH - BASED ON QUANTITY ORDERED						
			FLT	OVER-ALL					1	2	3	4	5-7	8-14	OVER 14
*0.0971 - 0.1120	.0943	4	5/8	2 1/4	81307	81207	82307	82207	$68.35	$43.75	$35.50	$31.60	$27.35	$24.05	$19.20
0.1121 - 0.1280	.1099	4	5/8	2 1/4	81308	81208	82308	82208	69.65	45.00	36.75	32.90	28.60	25.30	20.50
0.1281 - 0.1435	.1255	4	3/4	2 1/2	81309	81209	82309	82209	73.70	47.90	39.25	35.15	30.75	27.20	22.15
0.1436 - 0.1590	.1411	4	3/4	2 1/2	81310	81210	82310	82210	75.10	49.20	40.55	36.50	32.05	28.50	23.55
0.1591 - 0.1750	.1567	4	7/8	2 3/4	81311	81211	82311	82211	78.10	52.25	43.60	39.45	35.10	31.55	26.50
0.1751 - 0.1910	.1724	4	7/8	2 3/4	81312	81212	82312	82212	80.05	54.25	45.55	41.45	37.00	33.50	28.45
0.1911 - 0.2210	.1880	6	1	3	81314	81214	82314	82214	87.55	60.50	51.45	47.15	42.50	38.80	33.50
0.2211 - 0.2530	.2193	6	1	3	81316	81216	82316	82216	94.00	66.80	57.75	53.50	48.85	45.25	39.95
0.2531 - 0.2840	.2505	6	1 1/8	3 1/4	81318	81218	82318	82218	101.35	74.25	65.20	60.95	56.25	52.65	47.30
0.2841 - 0.3150	.2817	6	1 1/8	3 1/4	81320	81220	82320	82220	109.35	82.25	73.20	68.95	64.30	60.60	55.30
0.3151 - 0.3470	.3130	6	1 1/4	3 1/2	81322	81222	82322	82222	121.45	94.35	85.30	81.00	76.35	72.65	67.35
0.3471 - 0.3780	.3443	6	1 1/4	3 1/2	81324	81224	82324	82224	123.05	95.95	86.95	82.60	78.00	74.30	69.00
0.3781 - 0.4090	.3755	6	1 3/8	3 3/4	81326	81226	82326	82226	126.50	99.35	90.30	85.95	81.35	77.70	72.40
0.4091 - 0.4410	.4067	6	1 3/8	3 3/4	81328	81228	82328	82228	127.55	100.35	91.30	87.05	82.40	78.70	73.45
0.4411 - 0.4720	.4380	6	1 1/2	4	81330	81230	82330	82230	135.30	108.15	99.10	94.85	90.25	86.55	81.20
0.4721 - 0.5150	.4693	6	1 1/2	4	81332	81232	82332	82232	142.80	115.70	106.60	102.40	97.70	94.05	88.75

*Designed with male centers

CHUCKING REAMERS
SOLID CARBIDE TYPE 804 FRACTIONAL, WIRE/LETTER & METRIC

GENERAL PURPOSE

SHORT SERIES
STRAIGHT FLUTES & SHANK

NOTE: Dimension details (.0591" and larger) on pg. 104. Available modifications on pg. 101. Additional Type 804 sizes on pg. 58, including Wire #52-70.

TOOL DIAMETER					TOOL DIAMETER					TOOL DIAMETER					TOOL DIAMETER				
FRAC/ WIRE	(mm)	DEC.	TYPE 804 EDP NO.	PRICE	FRAC/ WIRE	(mm)	DEC.	TYPE 804 EDP NO.	PRICE	FRAC/ LETTER	(mm)	DEC.	TYPE 804 EDP NO.	PRICE	FRAC/ LETTER	(mm)	DEC.	TYPE 804 EDP NO.	PRICE
*1/32		.0312	80402	$20.25	9/64		.1406	80409	$26.55		6.0	.2362	804060	$42.45	23/64		.3594	80423	$77.50
	*1.0	.0394	804010	19.40		3.6	.1417	804036	26.90	B		.2380	8042380	46.70		9.2	.3622	804092	82.40
	*1.1	.0433	804011	21.30	27		.1440	8041440	26.90		6.1	.2402	804061	46.70		9.3	.3661	804093	82.40
*3/64		.0469	80403	21.45		3.7	.1457	804037	27.20	C		.2420	8042420	46.70	U		.3680	8043680	78.50
	*1.2	.0472	804012	21.45	26		.1470	8041470	27.70		6.2	.2441	804062	46.70		9.4	.3701	804094	82.85
	*1.3	.0512	804013	21.45	25		.1495	8041495	27.85	D		.2460	8042460	46.70		9.5	.3740	804095	78.95
	*1.4	.0551	804014	21.45		3.8	.1496	804038	29.25		6.3	.2480	804063	46.70	3/8		.3750	80424	72.25
	1.5	.0591	804015	19.65	24		.1520	8041520	27.85	1/4 , E		.2500	80416	42.45	V		.3770	8043770	93.75
1/16		.0625	80404	20.25		3.9	.1535	804039	29.00		6.4	.2520	804064	51.45		9.6	.3780	804096	98.60
	1.6	.0630	804016	22.00	23		.1540	8041540	29.00		6.5	.2559	804065	51.40		9.7	.3819	804097	98.60
	1.7	.0669	804017	22.25	9/32		.1562	80410	27.40	F		.2570	8042570	51.40		9.8	.3858	804098	98.60
51		.0670	8040670	22.25	22		.1570	8041570	30.00		6.6	.2598	804066	53.90	W		.3860	8043860	94.00
50		.0700	8040700	22.25		4.0	.1575	804040	27.40	G		.2610	8042610	51.40		9.9	.3898	804099	103.80
	1.8	.0709	804018	22.25	21		.1590	8041590	30.75		6.7	.2638	804067	53.90	25/64		.3906	80425	98.85
49		.0730	8040730	22.25	20		.1610	8041610	31.15	17/64		.2656	80417	51.40		10.0	.3937	804100	98.85
	1.9	.0748	804019	22.25		4.1	.1614	804041	31.15	H		.2660	8042660	51.40	X		.3970	8043970	98.85
48		.0760	8040760	22.25		4.2	.1654	804042	31.30		6.8	.2677	804068	53.90		10.1	.3976	804101	103.80
5/64		.0781	80405	22.25	19		.1660	8041660	31.30		6.9	.2717	804069	53.90		10.2	.4016	804102	103.80
47		.0785	8040785	22.30		4.3	.1693	804043	31.65	I		.2720	8042720	51.40	Y		.4040	8044040	98.85
	2.0	.0787	804020	20.50	18		.1695	8041695	31.65		7.0	.2756	804070	46.90		10.3	.4055	804103	103.80
46		.0810	8040810	22.30	11/64		.1719	80411	32.25	J		.2770	8042770	51.40	13/32		.4062	80426	98.85
45		.0820	8040820	22.40	17		.1730	8041730	32.25		7.1	.2795	804071	58.55		10.4	.4094	804104	103.80
	2.1	.0827	804021	22.40		4.4	.1732	804044	32.25	K		.2810	8042810	55.70	Z		.4130	8044130	98.85
44		.0860	8040860	22.40	16		.1770	8041770	33.05	9/32		.2812	80418	50.95		10.5	.4134	804105	98.85
	2.2	.0866	804022	22.40		4.5	.1772	804045	30.00		7.2	.2835	804072	63.25		10.6	.4173	804106	106.55
43		.0890	8040890	22.80	15		.1800	8041800	33.20		7.3	.2874	804073	63.25		10.7	.4213	804107	106.55
	2.3	.0906	804023	22.80		4.6	.1811	804046	33.65	L		.2900	8042900	60.35	27/64		.4219	80427	101.50
42		.0935	8040935	22.90	14		.1820	8041820	33.70		7.4	.2913	804074	63.25		10.8	.4252	804108	106.55
3/32		.0938	80406	21.10	13	4.7	.1850	804047	33.90	M		.2950	8042950	60.35		10.9	.4291	804109	106.55
	2.4	.0945	804024	22.90	3/16		.1875	80412	32.55		7.5	.2953	804075	60.35		11.0	.4331	804110	101.50
41		.0960	8040960	23.35	12	4.8	.1890	804048	35.75	19/64		.2969	80419	60.35		11.1	.4370	804111	106.60
40		.0980	8040980	23.35	11		.1910	8041910	36.20		7.6	.2992	804076	66.00	7/16		.4375	80428	101.50
	2.5	.0984	804025	21.30		4.9	.1929	804049	36.20	N		.3020	8043020	62.85		11.2	.4409	804112	115.75
39		.0995	8040995	23.55	10		.1935	8041935	36.40		7.7	.3031	804077	66.00		11.3	.4449	804113	115.75
38		.1015	8041015	23.55	9		.1960	8041960	37.70		7.8	.3071	804078	66.00		11.4	.4488	804114	115.75
	2.6	.1024	804026	23.65		5.0	.1969	804050	34.40		7.9	.3110	804079	66.00		11.5	.4528	804115	110.25
37		.1040	8041040	25.00	8		.1990	8041990	37.90	5/16		.3125	80420	57.45	29/64		.4531	80429	110.25
	2.7	.1063	804027	23.75		5.1	.2008	804051	39.10		8.0	.3150	804080	57.45		11.6	.4567	804116	115.75
36		.1065	8041065	23.75	7		.2010	8042010	39.10	O		.3160	8043160	66.00		11.7	.4606	804117	115.75
7/64		.1094	80407	24.50	13/64		.2031	80413	39.10		8.1	.3189	804081	70.25		11.8	.4646	804118	115.75
35		.1100	8041100	24.50	6		.2040	8042040	39.10		8.2	.3228	804082	70.25		11.9	.4685	804119	116.75
	2.8	.1102	804028	24.50		5.2	.2047	804052	39.10	P		.3230	8043230	66.80	15/32		.4688	80430	110.25
34		.1110	8041110	24.90	5		.2055	8042055	39.10		8.3	.3268	804083	80.35		12.0	.4724	804120	110.25
33		.1130	8041130	25.25		5.3	.2087	804053	39.10	21/64		.3281	80421	76.45		12.1	.4764	804121	126.20
	2.9	.1142	804029	25.25	4		.2090	8042090	41.10		8.4	.3307	804084	80.35		12.2	.4803	804122	126.20
32		.1160	8041160	25.25		5.4	.2126	804054	39.10	Q		.3320	8043320	76.45		12.3	.4843	804123	126.20
	3.0	.1181	804030	23.35	3		.2130	8042130	39.10		8.5	.3346	804085	76.45	31/64		.4844	80431	120.15
31		.1200	8041200	25.35		5.5	.2165	804055	35.75		8.6	.3386	804086	80.35		12.4	.4882	804124	126.20
	3.1	.1220	804031	25.35	7/32		.2188	80414	35.65	R		.3390	8043390	76.45		12.5	.4921	804125	120.15
1/8		.1250	80408	23.35		5.6	.2205	804056	43.60		8.7	.3425	804087	80.35		12.6	.4961	804126	126.20
	3.2	.1260	804032	25.35	2		.2210	8042210	43.60	11/32		.3438	80422	76.45	1/2		.5000	80432	120.15
30		.1285	8041285	25.40		5.7	.2244	804057	45.25		8.8	.3465	804088	80.65		12.8	.5039	804128	126.20
	3.3	.1299	804033	25.40	1		.2280	8042280	45.80	S		.3480	8043480	76.80		12.9	.5079	804129	126.20
	3.4	.1339	804034	25.40		5.8	.2283	804058	45.80		8.9	.3504	804089	80.65		13.0	.5118	804130	142.90
29		.1360	8041360	25.40		5.9	.2323	804059	45.80		9.0	.3543	804090	70.60					
	3.5	.1378	804035	23.65	A		.2340	8042340	45.80	T		.3580	8043580	77.10					
28		.1405	8041405	25.70	15/64		.2344	80415	45.80		9.1	.3583	804091	81.40					

*Dimensions thru .0590" tool diameter: # of flutes = 4; flute length = 3/8" (except for .0312" & .0394" tool diameters, flute = 1/4"); overall length = 1 1/2"

CHUCKING REAMERS
SOLID CARBIDE TYPE 804 .0005 INCREMENTS

GENERAL PURPOSE

SHORT SERIES
STRAIGHT FLUTES
STRAIGHT SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	804
	40	NON-FERROUS - SHORT CHIPS	804
	60	CAST IRONS	804
	80	LOW STRENGTH STEELS	804
	100	MEDIUM STRENGTH STEELS	804
	120	HIGH STRENGTH STEELS	804
	140	HIGH TEMPERATURE ALLOYS	804

REAMERS

TYPE 804 - STRAIGHT FLUTES

- Solid carbide head and straight shank
- Tool diameter tolerance thru .2500": plus .0002"/minus .0000"
  over .2500": plus.0003"/minus .0000"
- Shank diameter tolerance: plus .0000"/minus .0010"
- Tool geometry appropriate for material being machined

MODIFICATIONS (See list on page 101)

TOOL DIAM.	EDP NO.	PRICE	TOOL DIAM.	EDP NO.	PRICE	TOOL DIAM.	EDP NO.	PRICE	TOOL DIAM.	EDP NO.	PRICE	TOOL DIAM.	EDP NO.	PRICE
.0280	8040280	$22.00	.0520	8040520	$21.45	.0760	8040760	$22.25	.1000	8041000	$24.70	.1240	8041240	$26.65
.0285	8040285	23.20	.0525	8040525	22.60	.0765	8040765	23.35	.1005	8041005	24.70	.1245	8041245	26.65
.0290	8040290	23.20	.0530	8040530	22.60	.0770	8040770	23.35	.1010	8041010	24.70	.1250	80408	23.35
.0295	8040295	22.00	.0535	8040535	22.60	.0775	8040775	23.35	.1015	8041015	23.55	.1255	8041255	26.65
.0300	8040300	23.20	.0540	8040540	22.60	.0780	8040780	23.35	.1020	8041020	24.90	.1260	804032	25.35
.0305	8040305	23.20	.0545	8040545	22.60	.0785	8040785	22.30	.1025	8041025	25.00	.1265	8041265	26.75
.0310	8040310	22.00	.0550	8040550	21.45	.0790	8040790	23.45	.1030	8041030	25.00	.1270	8041270	26.75
.0315	804008	22.00	.0555	8040555	22.60	.0795	8040795	23.45	.1035	8041035	25.00	.1275	8041275	26.75
.0320	8040320	22.00	.0560	8040560	22.60	.0800	8040800	23.45	.1040	8041040	25.00	.1280	8041280	25.40
.0325	8040325	23.20	.0565	8040565	22.60	.0805	8040805	23.45	.1045	8041045	25.00	.1285	8041285	25.40
.0330	8040330	22.00	.0570	8040570	22.60	.0810	8040810	22.30	.1050	8041050	25.00	.1290	8041290	26.75
.0335	8040335	22.00	.0575	8040575	22.60	.0815	8040815	23.55	.1055	8041055	25.00	.1295	8041295	26.75
.0340	8040340	22.40	.0580	8040580	22.60	.0820	8040820	22.40	.1060	8041060	25.00	.1300	8041300	26.75
.0345	8040345	22.40	.0585	8040585	22.60	.0825	8040825	23.55	.1065	8041065	23.75	.1305	8041305	26.75
.0350	8040350	21.30	.0590	8040590	19.65	.0830	8040830	23.55	.1070	8041070	25.40	.1310	8041310	26.75
.0355	8040355	22.40	.0595	8040595	21.45	.0835	8040835	23.55	.1075	8041075	25.40	.1315	8041315	26.75
.0360	8040360	21.30	.0600	8040600	23.20	.0840	8040840	23.55	.1080	8041080	25.40	.1320	8041320	26.75
.0365	8040365	22.40	.0605	8040605	23.20	.0845	8040845	23.55	.1085	8041085	25.70	.1325	8041325	26.75
.0370	8040370	21.30	.0610	8040610	22.00	.0850	8040850	23.55	.1090	8041090	25.70	.1330	8041330	26.75
.0375	8040375	22.40	.0615	8040615	23.20	.0855	8040855	23.55	.1095	8041095	25.70	.1335	8041335	26.75
.0380	8040380	21.30	.0620	8040620	23.20	.0860	8040860	22.40	.1100	8041100	24.50	.1340	8041340	26.75
.0385	8040385	22.40	.0625	80404	20.25	.0865	8040865	23.55	.1105	8041105	26.10	.1345	8041345	26.75
.0390	8040390	21.30	.0630	804016	22.00	.0870	8040870	23.55	.1110	8041110	24.90	.1350	8041350	26.75
.0395	8040395	22.40	.0635	8040635	22.00	.0875	8040875	23.55	.1115	8041115	26.55	.1355	8041355	26.75
.0400	8040400	21.30	.0640	8040640	23.20	.0880	8040880	23.55	.1120	8041120	26.55	.1360	8041360	25.40
.0405	8040405	22.40	.0645	8040645	23.20	.0885	8040885	23.55	.1125	8041125	26.55	.1365	8041365	26.75
.0410	8040410	21.30	.0650	8040650	23.35	.0890	8040890	22.80	.1130	8041130	25.25	.1370	8041370	26.75
.0415	8040415	22.40	.0655	8040655	23.35	.0895	8040895	24.10	.1135	8041135	26.55	.1375	8041375	26.75
.0420	8040420	21.30	.0660	8040660	23.35	.0900	8040900	24.10	.1140	8041140	26.55	.1380	8041380	27.20
.0425	8040425	22.40	.0665	8040665	23.35	.0905	8040905	24.10	.1145	8041145	26.55	.1385	8041385	27.20
.0430	8040430	21.30	.0670	8040670	22.25	.0910	8040910	24.20	.1150	8041150	26.55	.1390	8041390	27.20
.0435	8040435	22.60	.0675	8040675	23.35	.0915	8040915	24.20	.1155	8041155	26.55	.1395	8041395	27.20
.0440	8040440	22.60	.0680	8040680	23.35	.0920	8040920	24.20	.1160	8041160	25.25	.1400	8041400	27.20
.0445	8040445	22.60	.0685	8040685	23.35	.0925	8040925	22.90	.1165	8041165	26.55	.1405	8041405	25.70
.0450	8040450	22.60	.0690	8040690	23.35	.0930	8040930	24.20	.1170	8041170	26.55	.1410	8041410	28.25
.0455	8040455	22.60	.0695	8040695	23.35	.0935	8040935	22.90	.1175	8041175	26.55	.1415	8041415	28.25
.0460	8040460	22.60	.0700	8040700	22.25	.0940	8040940	24.20	.1180	8041180	26.55	.1420	8041420	28.25
.0465	8040465	21.45	.0705	8040705	23.35	.0945	804024	22.90	.1185	8041185	26.65	.1425	8041425	28.25
.0470	8040470	22.60	.0710	8040710	23.35	.0950	8040950	24.50	.1190	8041190	26.65	.1430	8041430	28.25
.0475	8040475	22.60	.0715	8040715	23.35	.0955	8040955	24.50	.1195	8041195	26.65	.1435	8041435	28.25
.0480	8040480	22.60	.0720	8040720	23.35	.0960	8040960	23.35	.1200	8041200	25.35	.1440	8041440	26.90
.0485	8040485	22.60	.0725	8040725	23.35	.0965	8040965	23.35	.1205	8041205	26.65	.1445	8041445	28.40
.0490	8040490	22.60	.0730	8040730	22.25	.0970	8040970	24.50	.1210	8041210	26.65	.1450	8041450	28.45
.0495	8040495	22.60	.0735	8040735	23.35	.0975	8040975	24.50	.1215	8041215	26.65	.1455	8041455	28.45
.0500	8040500	22.60	.0740	8040740	23.35	.0980	8040980	23.35	.1220	804031	25.35	.1460	8041460	29.20
.0505	8040505	22.60	.0745	8040745	23.35	.0985	8040985	24.70	.1225	8041225	26.65	.1465	8041465	29.20
.0510	8040510	22.60	.0750	8040750	23.35	.0990	8040990	24.70	.1230	8041230	26.65	.1470	8041470	27.70
.0515	8040515	22.60	.0755	8040755	23.35	.0995	8040995	23.55	.1235	8041235	26.65	.1475	8041475	29.20

CHUCKING REAMERS
SOLID CARBIDE TYPE 804 .0005 INCREMENTS

GENERAL PURPOSE

SHORT SERIES
STRAIGHT FLUTES
STRAIGHT SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	804
	40	NON-FERROUS - SHORT CHIPS	804
	60	CAST IRONS	804
	80	LOW STRENGTH STEELS	804
	100	MEDIUM STRENGTH STEELS	804
	120	HIGH STRENGTH STEELS	804
	140	HIGH TEMPERATURE ALLOYS	804

MODIFICATIONS (See list on page 101)

REAMERS

TYPE 804 - STRAIGHT FLUTES

- Solid carbide head and straight shank
- Tool diameter tolerance thru .2500": plus .0002"/minus .0000"
  over .2500": plus.0003"/minus .0000"
- Shank diameter tolerance: plus .0000"/minus .0010"
- Tool geometry appropriate for material being machined

TOOL DIAM.	EDP NO.	PRICE	TOOL DIAM.	EDP NO.	PRICE	TOOL DIAM.	EDP NO.	PRICE	TOOL DIAM.	EDP NO.	PRICE	TOOL DIAM.	EDP NO.	PRICE
.1480	8041480	$29.25	.1720	8041720	$33.90	.1960	8041960	$37.70	.2200	8042200	$45.95	.2440	8042440	$49.05
.1485	8041485	29.25	.1725	8041725	33.90	.1965	8041965	39.50	.2205	804056	43.60	.2445	8042445	49.05
.1490	8041490	29.25	.1730	8041730	32.25	.1970	8041970	39.90	.2210	8042210	43.60	.2450	8042450	49.05
.1495	8041495	27.85	.1735	8041735	34.40	.1975	8041975	39.90	.2215	8042215	47.75	.2455	8042455	49.05
.1500	8041500	29.25	.1740	8041740	34.40	.1980	8041980	39.90	.2220	8042220	47.75	.2460	8042460	46.70
.1505	8041505	29.25	.1745	8041745	34.40	.1985	8041985	39.90	.2225	8042225	47.75	.2465	8042465	49.05
.1510	8041510	29.25	.1750	8041750	34.40	.1990	8041990	37.90	.2230	8042230	47.75	.2470	8042470	49.05
.1515	8041515	29.25	.1755	8041755	34.75	.1995	8041995	41.10	.2235	8042235	47.75	.2475	8042475	49.05
.1520	8041520	27.85	.1760	8041760	34.75	.2000	8042000	41.10	.2240	8042240	47.75	.2480	804063	46.70
.1525	8041525	30.50	.1765	8041765	34.75	.2005	8042005	41.10	.2245	8042245	47.75	.2485	8042485	49.05
.1530	8041530	30.50	.1770	8041770	33.05	.2010	8042010	39.10	.2250	8042250	47.75	.2490	8042490	49.05
.1535	804039	29.00	.1775	8041775	34.85	.2015	8042015	41.10	.2255	8042255	47.75	.2495	8042495	49.05
.1540	8041540	29.00	.1780	8041780	34.85	.2020	8042020	41.10	.2260	8042260	47.75	.2500	80416	42.45
.1545	8041545	30.50	.1785	8041785	34.85	.2025	8042025	41.10	.2265	8042265	48.25	.2505	8042505	49.05
.1550	8041550	30.50	.1790	8041790	34.85	.2030	8042030	41.10	.2270	8042270	48.25	.2510	8042510	49.05
.1555	8041555	29.00	.1795	8041795	34.85	.2035	8042035	41.10	.2275	8042275	48.25	.2515	8042515	49.05
.1560	8041560	30.50	.1800	8041800	33.20	.2040	8042040	39.10	.2280	8042280	45.80	.2520	804064	51.45
.1565	8041565	31.60	.1805	8041805	35.10	.2045	8042045	41.10	.2285	8042285	48.25	.2525	8042525	51.45
.1570	8041570	30.00	.1810	8041810	35.15	.2050	8042050	41.10	.2290	8042290	48.25	.2530	8042530	49.05
.1575	804040	27.40	.1815	8041815	35.35	.2055	8042055	39.10	.2295	8042295	48.25	.2535	8042535	54.15
.1580	8041580	32.25	.1820	8041820	33.70	.2060	8042060	41.10	.2300	8042300	48.25	.2540	8042540	54.15
.1585	8041585	32.25	.1825	8041825	35.55	.2065	8042065	41.10	.2305	8042305	48.25	.2545	8042545	54.15
.1590	8041590	30.75	.1830	8041830	35.55	.2070	8042070	41.10	.2310	8042310	48.25	.2550	8042550	54.15
.1595	8041595	32.80	.1835	8041835	35.65	.2075	8042075	41.10	.2315	8042315	48.25	.2555	8042555	54.15
.1600	8041600	32.80	.1840	8041840	35.65	.2080	8042080	41.10	.2320	8042320	48.25	.2560	8042560	54.15
.1605	8041605	32.80	.1845	8041845	35.65	.2085	8042085	41.10	.2325	8042325	48.25	.2565	8042565	54.15
.1610	8041610	31.15	.1850	804047	33.90	.2090	8042090	41.10	.2330	8042330	48.25	.2570	8042570	51.40
.1615	8041615	32.80	.1855	8041855	37.50	.2095	8042095	41.10	.2335	8042335	48.25	.2575	8042575	54.15
.1620	8041620	32.80	.1860	8041860	37.50	.2100	8042100	41.10	.2340	8042340	45.80	.2580	8042580	54.15
.1625	8041625	32.80	.1865	8041865	37.50	.2105	8042105	41.10	.2345	8042345	48.25	.2585	8042585	54.15
.1630	8041630	32.80	.1870	8041870	35.75	.2110	8042110	41.10	.2350	8042350	48.25	.2590	8042590	54.15
.1635	8041635	32.90	.1875	80412	32.55	.2115	8042115	41.10	.2355	8042355	48.25	.2595	8042595	54.15
.1640	8041640	32.80	.1880	8041880	37.60	.2120	8042120	41.10	.2360	8042360	48.25	.2600	8042600	54.15
.1645	8041645	32.80	.1885	8041885	37.60	.2125	8042125	41.10	.2365	8042365	49.05	.2605	8042605	54.15
.1650	8041650	32.80	.1890	804048	35.75	.2130	8042130	39.10	.2370	8042370	49.05	.2610	8042610	51.40
.1655	8041655	32.80	.1895	8041895	38.00	.2135	8042135	41.10	.2375	8042375	49.05	.2615	8042615	54.15
.1660	8041660	31.30	.1900	8041900	38.00	.2140	8042140	41.10	.2380	8042380	46.70	.2620	8042620	54.15
.1665	8041665	33.20	.1905	8041905	38.00	.2145	8042145	41.10	.2385	8042385	49.05	.2625	8042625	54.15
.1670	8041670	33.20	.1910	8041910	36.20	.2150	8042150	41.10	.2390	8042390	49.05	.2630	8042630	54.15
.1675	8041675	33.20	.1915	8041915	38.10	.2155	8042155	41.10	.2395	8042395	49.05	.2635	8042635	54.15
.1680	8041680	33.20	.1920	8041920	38.10	.2160	8042160	41.10	.2400	8042400	49.05	.2640	8042640	54.15
.1685	8041685	33.20	.1925	8041925	38.10	.2165	804055	35.75	.2405	8042405	49.05	.2645	8042645	54.15
.1690	8041690	33.20	.1930	8041930	38.50	.2170	8042170	41.10	.2410	8042410	49.05	.2650	8042650	54.15
.1695	8041695	31.65	.1935	8041935	36.40	.2175	8042175	41.10	.2415	8042415	49.05	.2655	8042655	54.15
.1700	8041700	33.90	.1940	8041940	38.50	.2180	8042180	41.10	.2420	8042420	46.70	.2660	8042660	51.40
.1705	8041705	33.90	.1945	8041945	38.50	.2185	8042185	39.10	.2425	8042425	49.05	.2665	8042665	54.15
.1710	8041710	33.90	.1950	8041950	39.50	.2190	8042190	45.95	.2430	8042430	49.05	.2670	8042670	54.15
.1715	8041715	33.90	.1955	8041955	39.50	.2195	8042195	45.95	.2435	8042435	49.05	.2675	8042675	54.15

CHUCKING REAMERS
SOLID CARBIDE TYPE 804 .0005 INCREMENTS

GENERAL PURPOSE

SHORT SERIES
STRAIGHT FLUTES
STRAIGHT SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	804
	40	NON-FERROUS - SHORT CHIPS	804
	60	CAST IRONS	804
	80	LOW STRENGTH STEELS	804
	100	MEDIUM STRENGTH STEELS	804
	120	HIGH STRENGTH STEELS	804
	140	HIGH TEMPERATURE ALLOYS	804

TYPE 804 - STRAIGHT FLUTES

- Solid carbide head and straight shank
- Tool diameter tolerance thru .2500": plus .0002"/minus .0000"
  over .2500": plus.0003"/minus .0000"
- Shank diameter tolerance: plus .0000"/minus .0010"
- Tool geometry appropriate for material being machined

MODIFICATIONS (See list on page 101)

TOOL DIAM.	EDP NO.	PRICE	TOOL DIAM.	EDP NO.	PRICE	TOOL DIAM.	EDP NO.	PRICE	TOOL DIAM.	EDP NO.	PRICE	TOOL DIAM.	EDP NO.	PRICE
.2680	8042680	$54.15	.2920	8042920	$63.45	.3160	8043160	$66.00	.3400	8043400	$80.50	.3640	8043640	$82.55
.2685	8042685	54.15	.2925	8042925	63.45	.3165	8043165	70.30	.3405	8043405	80.50	.3645	8043645	82.55
.2690	8042690	54.15	.2930	8042930	63.45	.3170	8043170	70.30	.3410	8043410	80.50	.3650	8043650	82.55
.2695	8042695	54.15	.2935	8042935	63.45	.3175	8043175	70.30	.3415	8043415	80.50	.3655	8043655	82.55
.2700	8042700	54.15	.2940	8042940	63.45	.3180	8043180	70.30	.3420	8043420	80.50	.3660	8043660	82.55
.2705	8042705	54.15	.2945	8042945	63.45	.3185	8043185	70.30	.3425	804087	80.35	.3665	8043665	82.55
.2710	8042710	54.15	.2950	8042950	60.35	.3190	8043190	70.30	.3430	8043430	80.50	.3670	8043670	82.55
.2715	8042715	54.15	.2955	8042955	63.45	.3195	8043195	70.30	.3435	8043435	80.50	.3675	8043675	82.55
.2720	8042720	51.40	.2960	8042960	63.45	.3200	8043200	70.30	.3440	8043440	80.65	.3680	8043680	78.50
.2725	8042725	54.15	.2965	8042965	63.45	.3205	8043205	70.30	.3445	8043445	80.65	.3685	8043685	83.35
.2730	8042730	54.15	.2970	8042970	66.00	.3210	8043210	70.30	.3450	8043450	80.65	.3690	8043690	83.55
.2735	8042735	54.15	.2975	8042975	66.00	.3215	8043215	70.30	.3455	8043455	80.65	.3695	8043695	83.35
.2740	8042740	54.15	.2980	8042980	66.00	.3220	8043220	70.30	.3460	8043460	80.65	.3700	8043700	83.35
.2745	8042745	54.15	.2985	8042985	66.00	.3225	8043225	70.30	.3465	804088	80.65	.3705	8043705	83.35
.2750	8042750	54.15	.2990	8042990	66.00	.3230	8043230	66.80	.3470	8043470	80.65	.3710	8043710	83.35
.2755	8042755	54.15	.2995	8042995	66.00	.3235	8043235	70.30	.3475	8043475	80.65	.3715	8043715	83.35
.2760	8042760	54.15	.3000	8043000	66.00	.3240	8043240	80.50	.3480	8043480	76.80	.3720	8043720	83.35
.2765	8042765	54.15	.3005	8043005	66.00	.3245	8043245	80.50	.3485	8043485	80.65	.3725	8043725	83.35
.2770	8042770	51.40	.3010	8043010	66.00	.3250	8043250	80.50	.3490	8043490	80.65	.3730	8043730	83.35
.2775	8042775	54.15	.3015	8043015	66.00	.3255	8043255	80.50	.3495	8043495	80.65	.3735	8043735	83.35
.2780	8042780	58.60	.3020	8043020	62.85	.3260	8043260	80.50	.3500	8043500	80.65	.3740	804095	78.95
.2785	8042785	58.60	.3025	8043025	66.00	.3265	8043265	80.50	.3505	8043505	80.65	.3745	8043745	83.35
.2790	8042790	58.60	.3030	8043030	66.00	.3270	8043270	80.50	.3510	8043510	80.65	.3750	80424	72.25
.2795	804071	58.55	.3035	8043035	66.00	.3275	8043275	80.50	.3515	8043515	80.65	.3755	8043755	98.75
.2800	8042800	58.60	.3040	8043040	66.00	.3280	8043280	80.50	.3520	8043520	80.65	.3760	8043760	98.85
.2805	8042805	58.60	.3045	8043045	66.00	.3285	8043285	80.50	.3525	8043525	80.65	.3765	8043765	98.75
.2810	8042810	55.70	.3050	8043050	66.00	.3290	8043290	80.50	.3530	8043530	80.65	.3770	8043770	93.75
.2815	8042815	58.60	.3055	8043055	66.00	.3295	8043295	80.50	.3535	8043535	80.65	.3775	8043775	98.75
.2820	8042820	63.45	.3060	8043060	66.00	.3300	8043300	80.50	.3540	8043540	80.65	.3780	804096	98.60
.2825	8042825	63.45	.3065	8043065	66.00	.3305	8043305	80.50	.3545	8043545	80.65	.3785	8043785	98.75
.2830	8042830	63.45	.3070	8043070	66.00	.3310	8043310	77.70	.3550	8043550	81.05	.3790	8043790	98.75
.2835	804072	63.25	.3075	8043075	66.00	.3315	8043315	80.50	.3555	8043555	81.05	.3795	8043795	98.75
.2840	8042840	63.45	.3080	8043080	66.00	.3320	8043320	76.45	.3560	8043560	81.05	.3800	8043800	98.75
.2845	8042845	63.45	.3085	8043085	66.00	.3325	8043325	80.50	.3565	8043565	81.05	.3805	8043805	98.75
.2850	8042850	63.45	.3090	8043090	66.00	.3330	8043330	80.50	.3570	8043570	81.05	.3810	8043810	98.75
.2855	8042855	63.45	.3095	8043095	66.00	.3335	8043335	80.50	.3575	8043575	81.05	.3815	8043815	98.75
.2860	8042860	63.45	.3100	8043100	66.00	.3340	8043340	80.50	.3580	8043580	77.10	.3820	8043820	98.75
.2865	8042865	63.45	.3105	8043105	66.00	.3345	8043345	80.50	.3585	8043585	81.05	.3825	8043825	98.75
.2870	8042870	63.45	.3110	804079	66.00	.3350	8043350	80.50	.3590	8043590	81.65	.3830	8043830	98.75
.2875	8042875	63.45	.3115	8043115	66.00	.3355	8043355	80.50	.3595	8043595	82.55	.3835	8043835	98.75
.2880	8042880	63.45	.3120	8043120	66.00	.3360	8043360	80.50	.3600	8043600	82.55	.3840	8043840	98.75
.2885	8042885	63.45	.3125	80420	57.45	.3365	8043365	80.50	.3605	8043605	82.55	.3845	8043845	98.75
.2890	8042890	63.45	.3130	8043130	66.00	.3370	8043370	80.50	.3610	8043610	82.55	.3850	8043850	98.75
.2895	8042895	63.45	.3135	8043135	66.00	.3375	8043375	80.50	.3615	8043615	82.55	.3855	8043855	98.75
.2900	8042900	60.35	.3140	8043140	66.00	.3380	8043380	80.50	.3620	8043620	82.55	.3860	8043860	94.00
.2905	8042905	63.45	.3145	8043145	66.00	.3385	8043385	80.50	.3625	8043625	82.55	.3865	8043865	103.80
.2910	8042910	63.45	.3150	804080	57.45	.3390	8043390	76.45	.3630	8043630	82.55	.3870	8043870	103.80
.2915	8042915	63.45	.3155	8043155	66.00	.3395	8043395	80.50	.3635	8043635	82.55	.3875	8043875	103.80

CHUCKING REAMERS
SOLID CARBIDE TYPE 804 .0005 INCREMENTS

GENERAL PURPOSE

SHORT SERIES
STRAIGHT FLUTES
STRAIGHT SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	804
	40	NON-FERROUS - SHORT CHIPS	804
	60	CAST IRONS	804
	80	LOW STRENGTH STEELS	804
	100	MEDIUM STRENGTH STEELS	804
	120	HIGH STRENGTH STEELS	804
	140	HIGH TEMPERATURE ALLOYS	804

TYPE 804 - STRAIGHT FLUTES

- Solid carbide head and straight shank
- Tool diameter tolerance thru .2500": plus .0002"/minus .0000"
  over .2500": plus.0003"/minus .0000"
- Shank diameter tolerance: plus .0000"/minus .0010"
- Tool geometry appropriate for material being machined

MODIFICATIONS (See list on page 101)

TOOL DIAM.	EDP NO.	PRICE
.3880	8043880	$103.80
.3885	8043885	103.80
.3890	8043890	103.80
.3895	8043895	103.80
.3900	8043900	103.80
.3905	8043905	103.80
.3910	8043910	103.80
.3915	8043915	103.80
.3920	8043920	103.80
.3925	8043925	103.80
.3930	8043930	103.80
.3935	8043935	103.80
.3940	8043940	103.80
.3945	8043945	103.80
.3950	8043950	103.80
.3955	8043955	103.80
.3960	8043960	103.80
.3965	8043965	103.80
.3970	8043970	98.85
.3975	8043975	103.80
.3980	8043980	103.80
.3985	8043985	103.80
.3990	8043990	103.80
.3995	8043995	103.80
.4000	8044000	103.80
.4005	8044005	103.80
.4010	8044010	103.80
.4015	8044015	103.80
.4020	8044020	103.80
.4025	8044025	103.80
.4030	8044030	103.80
.4035	8044035	103.80
.4040	8044040	98.85
.4045	8044045	103.80
.4050	8044050	103.80
.4055	804103	103.80
.4060	8044060	103.80
.4065	8044065	103.80
.4070	8044070	103.80
.4075	8044075	103.80
.4080	8044080	103.80
.4085	8044085	103.80
.4090	8044090	103.80
.4095	8044095	103.80
.4100	8044100	103.80
.4105	8044105	103.80
.4110	8044110	103.80
.4115	8044115	103.80
.4120	8044120	103.80
.4125	8044125	103.80
.4130	8044130	98.85
.4135	8044135	$106.60
.4140	8044140	106.60
.4145	8044145	106.60
.4150	8044150	106.60
.4155	8044155	106.60
.4160	8044160	106.60
.4165	8044165	106.60
.4170	8044170	106.60
.4175	8044175	106.60
.4180	8044180	106.60
.4185	8044185	106.60
.4190	8044190	106.60
.4195	8044195	106.60
.4200	8044200	106.60
.4205	8044205	106.60
.4210	8044210	106.60
.4215	8044215	106.60
.4220	8044220	106.60
.4225	8044225	106.60
.4230	8044230	106.60
.4235	8044235	106.60
.4240	8044240	106.60
.4245	8044245	106.60
.4250	8044250	106.60
.4255	8044255	106.60
.4260	8044260	106.60
.4265	8044265	106.60
.4270	8044270	106.60
.4275	8044275	106.60
.4280	8044280	106.60
.4285	8044285	106.60
.4290	8044290	106.60
.4295	8044295	106.60
.4300	8044300	106.60
.4305	8044305	106.60
.4310	8044310	106.60
.4315	8044315	106.60
.4320	8044320	106.60
.4325	8044325	106.60
.4330	8044330	106.60
.4335	8044335	106.60
.4340	8044340	106.60
.4345	8044345	106.60
.4350	8044350	106.60
.4355	8044355	106.60
.4360	8044360	106.60
.4365	8044365	106.60
.4370	804111	106.60
.4375	80428	101.50
.4380	8044380	116.75
.4385	8044385	116.75
.4390	8044390	$116.75
.4395	8044395	116.75
.4400	8044400	116.75
.4405	8044405	116.75
.4410	8044410	116.75
.4415	8044415	116.75
.4420	8044420	116.75
.4425	8044425	116.75
.4430	8044430	116.75
.4435	8044435	116.75
.4440	8044440	116.75
.4445	8044445	116.75
.4450	8044450	116.75
.4455	8044455	116.75
.4460	8044460	116.75
.4465	8044465	116.75
.4470	8044470	116.75
.4475	8044475	116.75
.4480	8044480	116.75
.4485	8044485	116.75
.4490	8044490	116.75
.4495	8044495	116.75
.4500	8044500	116.75
.4505	8044505	116.75
.4510	8044510	116.75
.4515	8044515	116.75
.4520	8044520	116.75
.4525	8044525	116.75
.4530	8044530	116.75
.4535	8044535	116.75
.4540	8044540	116.75
.4545	8044545	116.75
.4550	8044550	116.75
.4555	8044555	116.75
.4560	8044560	116.75
.4565	8044565	116.75
.4570	8044570	116.75
.4575	8044575	116.75
.4580	8044580	116.75
.4585	8044585	116.75
.4590	8044590	116.75
.4595	8044595	116.75
.4600	8044600	116.75
.4605	8044605	116.75
.4610	8044610	116.75
.4615	8044615	116.75
.4620	8044620	116.75
.4625	8044625	116.75
.4630	8044630	116.75
.4635	8044635	116.75
.4640	8044640	116.75
.4645	8044645	$116.75
.4650	8044650	116.75
.4655	8044655	116.75
.4660	8044660	116.75
.4665	8044665	116.75
.4670	8044670	116.75
.4675	8044675	116.75
.4680	8044680	116.75
.4685	804119	116.75
.4690	8044690	116.75
.4695	8044695	116.75
.4700	8044700	116.75
.4705	8044705	116.75
.4710	8044710	116.75
.4715	8044715	116.75
.4720	8044720	116.75
.4725	8044725	127.05
.4730	8044730	127.05
.4735	8044735	127.05
.4740	8044740	127.05
.4745	8044745	127.05
.4750	8044750	127.05
.4755	8044755	127.05
.4760	8044760	127.05
.4765	8044765	127.05
.4770	8044770	127.05
.4775	8044775	127.05
.4780	8044780	127.05
.4785	8044785	127.05
.4790	8044790	127.05
.4795	8044795	127.05
.4800	8044800	127.05
.4805	8044805	127.05
.4810	8044810	127.05
.4815	8044815	127.05
.4820	8044820	127.05
.4825	8044825	127.05
.4830	8044830	127.05
.4835	8044835	127.05
.4840	8044840	127.05
.4845	8044845	127.05
.4850	8044850	127.05
.4855	8044855	127.05
.4860	8044860	127.05
.4865	8044865	127.05
.4870	8044870	127.05
.4875	8044875	127.05
.4880	8044880	127.05
.4885	8044885	127.05
.4890	8044890	127.05
.4895	8044895	127.05
.4900	8044900	$127.05
.4905	8044905	127.05
.4910	8044910	127.05
.4915	8044915	127.05
.4920	8044920	127.05
.4925	8044925	127.05
.4930	8044930	127.05
.4935	8044935	127.05
.4940	8044940	127.05
.4945	8044945	127.05
.4950	8044950	127.05
.4955	8044955	127.05
.4960	8044960	127.05
.4965	8044965	127.05
.4970	8044970	127.05
.4975	8044975	127.05
.4980	8044980	127.05
.4985	8044985	127.05
.4990	8044990	127.05
.4995	8044995	120.15
.5000	80432	120.15
.5005	8045005	150.80
.5010	8045010	150.80
.5015	8045015	150.80
.5020	8045020	150.80
.5025	8045025	150.80
.5030	8045030	150.80
.5035	8045035	150.80
.5040	8045040	150.80
.5045	8045045	150.80
.5050	8045050	150.80
.5055	8045055	150.80
.5060	8045060	150.80
.5065	8045065	150.80
.5070	8045070	150.80
.5075	8045075	150.80
.5080	8045080	150.80
.5085	8045085	150.80
.5090	8045090	150.80
.5095	8045095	150.80
.5100	8045100	150.80
.5105	8045105	150.80
.5110	8045110	150.80
.5115	8045115	150.80
.5120	8045120	150.80
.5125	8045125	150.80
.5130	8045130	150.80
.5135	8045135	150.80
.5140	8045140	150.80
.5145	8045145	150.80
.5150	8045150	150.80

MATERIAL SPECIFIC REAMERS
SOLID CARBIDE HEAD TYPES 800 & 801 FRACTIONAL

STRAIGHT FLUTES
STRAIGHT STEEL SHANK

TYPE 801 - STRAIGHT FLUTES - FOR NON-FERROUS MATERIALS
TYPE 800 - STRAIGHT FLUTES - FOR CAST IRONS & STEELS

- Solid carbide head
- Straight steel shank on .1911" tool diameter and larger (smaller sizes have a straight solid carbide shank)
- Tolerances are listed on page 101
- Tool geometry appropriate for material being machined
- Diameters 7/64" and below furnished with male centers

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	801/821/811
	40	NON-FERROUS - SHORT CHIPS	801/821/811
	60	CAST IRONS	800/820/810
	80	LOW STRENGTH STEELS	800/820/810
	100	MEDIUM STRENGTH STEELS	800/820/810
	120	HIGH STRENGTH STEELS	800/820/810
	140	HIGH TEMPERATURE ALLOYS	800/820/810

MODIFICATIONS (See list on page 101)

NOTE: See NOTE on page 111

TOOL DIAMETER		TYPE 801 NON-FERROUS EDP NO.	TYPE 800 CAST IRON/ STEEL EDP NO.	BOTH TYPES PRICE	DIMENSIONS				FINISHED TO MODIFIED TOOL DIAMETER						
					MAX. SHANK DIAM.	NO. OF FLTS	LENGTH		MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DECIMAL						FLUTE	OVER-ALL		1	2	3	4	5-7	8-14**
* -	-	-	80099	-	.0800	4	¾	3	0.0811 - 0.0890	$64.10	$47.40	$41.65	$39.05	$36.10	$33.90
* 3/32	.0938	-	80006	$30.65	.0880	4	¾	3	0.0891 - 0.0970	64.10	47.40	41.65	39.05	36.10	33.90
* 7/64	.1094	-	80007	30.65	.0943	4	⅞	3 ½	0.0971 - 0.1120	64.10	47.40	41.65	39.05	36.10	33.90
* ⅛	.1250	80108	80008	30.65	.1099	4	⅞	3 ½	0.1121 - 0.1280	64.10	47.40	41.65	39.05	36.10	33.90
* 9/64	.1406	80109	80009	35.00	.1255	4	⅞	3 ½	0.1281 - 0.1435	68.50	51.70	46.05	43.40	40.55	38.25
* 5/32	.1562	80110	80010	36.00	.1411	4	1	4	0.1436 - 0.1590	69.45	52.75	47.05	44.40	41.50	39.35
* 11/64	.1719	80111	80011	40.60	.1567	4	1	4	0.1591 - 0.1750	74.00	57.35	51.70	49.00	46.20	43.90
* 3/16	.1875	80112	80012	41.45	.1724	4	1 ⅛	4 ½	0.1751 - 0.1910	74.95	58.20	52.50	49.85	47.00	44.80
13/64	.2031	80113	80013	44.20	.1880	6	1 ¼	5	-	-	-	-	-	-	-
7/32	.2188	80114	80014	44.20	.1880	6	1 ¼	5	0.1911 - 0.2210	77.70	60.95	55.30	52.60	49.75	47.55
15/64	.2344	80115	80015	47.00	.2193	6	1 ½	6	-	-	-	-	-	-	-
¼	.2500	80116	80016	47.00	.2193	6	1 ½	6	0.2211 - 0.2530	80.45	63.70	58.10	55.50	52.50	50.30
17/64	.2656	80117	80017	50.55	.2505	6	1 ½	6	-	-	-	-	-	-	-
9/32	.2812	80118	80018	50.55	.2505	6	1 ½	6	0.2531 - 0.2840	83.95	67.25	61.65	59.00	56.15	53.85
19/64	.2969	80119	80019	52.60	.2817	6	1 ⅝	6	-	-	-	-	-	-	-
5/16	.3125	80120	80020	52.60	.2817	6	1 ⅝	6	0.2841 - 0.3150	86.05	69.30	63.70	61.05	58.20	55.90
21/64	.3281	80121	80021	56.30	.3130	6	1 ⅝	6	-	-	-	-	-	-	-
11/32	.3438	80122	80022	56.30	.3130	6	1 ⅝	6	0.3151 - 0.3470	89.75	72.95	67.30	64.65	61.80	59.60
23/64	.3594	80123	80023	60.55	.3443	6	1 ¾	7	-	-	-	-	-	-	-
⅜	.3750	80124	80024	60.55	.3443	6	1 ¾	7	0.3471 - 0.3780	93.95	77.20	71.60	68.95	66.10	63.85
25/64	.3906	80125	80025	69.20	.3755	6	1 ¾	7	-	-	-	-	-	-	-
13/32	.4062	80126	80026	69.20	.3755	6	1 ¾	7	0.3781 - 0.4090	102.60	85.85	80.30	77.65	74.75	72.45
27/64	.4219	80127	80027	73.50	.4067	6	1 ¾	7	-	-	-	-	-	-	-
7/16	.4375	80128	80028	73.50	.4067	6	1 ¾	7	0.4091 - 0.4410	106.90	90.15	84.60	81.95	79.00	76.75
29/64	.4531	80129	80029	77.90	.4380	6	1 ¾	8	-	-	-	-	-	-	-
15/32	.4688	80130	80030	77.90	.4380	6	1 ¾	8	0.4411 - 0.4720	111.35	94.60	89.00	86.35	83.50	81.20
31/64	.4844	80131	80031	83.65	.4693	6	1 ¾	8	-	-	-	-	-	-	-
½	.5000	80132	80032	83.65	.4693	6	1 ¾	8	0.4721 - 0.5030	117.15	100.35	94.70	92.05	89.20	86.95
33/64	.5156	80133	80033	107.90	.5005	6	1 ⅞	9	-	-	-	-	-	-	-
17/32	.5312	80134	80034	107.90	.5005	6	1 ⅞	9	0.5031 - 0.5340	141.30	124.55	119.00	116.30	113.40	111.15
35/64	.5469	80135	80035	127.35	.5005	6	1 ⅞	9	-	-	-	-	-	-	-
9/16	.5625	80136	80036	127.35	.5005	6	1 ⅞	9	0.5341 - 0.5660	160.80	144.00	138.40	135.75	132.85	130.65
37/64	.5781	80137	80037	144.55	.5630	6	1 ⅞	9	-	-	-	-	-	-	-
19/32	.5938	80138	80038	144.55	.5630	6	1 ⅞	9	0.5661 - 0.5970	177.95	161.25	155.60	152.90	150.10	147.80
39/64	.6094	80139	80039	146.15	.5630	6	1 ⅞	9	-	-	-	-	-	-	-
⅝	.6250	80140	80040	146.15	.5630	6	1 ⅞	9	0.5971 - 0.6280	179.55	162.80	157.25	154.60	151.70	149.40
21/32	.6562	80142	80042	211.45	.6255	6	2	9 ½	0.6281 - 0.6590	243.25	227.30	222.00	219.45	217.05	214.55
11/16	.6875	80144	80044	211.45	.6255	6	2	9 ½	0.6591 - 0.6910	243.25	227.30	222.00	219.45	217.05	214.55
23/32	.7188	80146	80046	237.90	.6880	6	2	9 ½	0.6911 - 0.7220	269.70	253.75	248.45	245.90	243.50	241.00
¾	.7500	80148	80048	237.90	.6880	6	2	9 ½	0.7221 - 0.7530	269.70	253.75	248.45	245.90	243.50	241.00
25/32	.7812	80150	80050	264.10	.7505	8	2	10	0.7531 - 0.7840	295.90	279.95	274.65	272.10	269.65	267.15
13/16	.8125	80152	80052	288.15	.7817	8	2	10	0.7841 - 0.8160	319.95	304.00	298.70	296.15	293.75	291.25
27/32	.8438	80154	80054	303.90	.8130	8	2	10	0.8161 - 0.8470	335.70	319.75	314.45	311.90	309.45	307.00
⅞	.8750	80156	80056	297.55	.8440	8	2	10	0.8471 - 0.8780	329.35	313.40	308.10	305.55	303.10	300.60
29/32	.9062	80158	80058	348.15	.8755	8	2	10	0.8781 - 0.9090	379.95	364.00	358.70	356.15	353.70	351.25
15/16	.9375	80160	80060	365.95	.9067	8	2	10	0.9091 - 0.9410	397.75	381.80	376.50	373.95	371.55	369.05
31/32	.9688	80162	80062	383.35	.9380	8	2	10	0.9411 - 0.9720	415.15	399.20	393.90	391.35	388.90	386.40
1	1.0000	80164	80064	397.80	.9693	8	2	10	0.9721 - 1.0030	429.60	413.65	408.35	405.80	403.40	400.90

*Solid carbide head and shank (.0811" - .1910" tool diameters)

**Quantities of 15 or more - price of fractional size in same size range.

HANNIBAL CARBIDE TOOL, INC. • TEL 800-451-9436 • FAX 800-633-7302 • sales@hannibalcarbide.com

MATERIAL SPECIFIC REAMERS
SOLID CARBIDE HEAD TYPES 810, 811, 820, 821 FRACTIONAL

RIGHT OR LEFT SPIRAL FLUTES
STRAIGHT STEEL SHANK

TYPE 811 - RIGHT SPIRAL FLUTES - FOR NON-FERROUS MATERIALS
TYPE 810 - RIGHT SPIRAL FLUTES - FOR CAST IRONS & STEELS
TYPE 821 - LEFT SPIRAL FLUTES - FOR NON-FERROUS MATERIALS
TYPE 820 - LEFT SPIRAL FLUTES - FOR CAST IRONS & STEELS

- Solid carbide head
- Straight steel shank on .1911" tool diameter and larger (smaller sizes have a straight solid carbide shank)
- Tool diameter tolerance thru .2500": plus .0002", minus .0000"
  over .2500": plus .0003", minus .0000"
- Shank diameter tolerance: plus .0000", minus .0010"
- Left spiral flutes should not be used on blind holes
- Tool geometry appropriate for material being machined

MODIFICATIONS (See list on page 101)
Use the tool selector on page 110 to determine which tool is appropriate for the material you are reaming.

NO COATINGS

NOTE: For best results in reaming tough steel alloys and cast steels, we recommend Type 480 Carbide Tipped Reamer (page 74) or Type 459 Carbide Tipped Reamer (page 78). They utilize special steel cutting grade carbides with excellent cutting and wear characteristics.

TOOL DIAMETER		EDP NO. - R SPIRAL		EDP NO. - L SPIRAL		ALL TYPES PRICE	DIMENSIONS				FINISHED TO MODIFIED TOOL DIAMETER						
		TYPE 811 NON-FERROUS	TYPE 810 CAST IRON/ STEEL	TYPE 821 NON-FERROUS	TYPE 820 CAST IRON/ STEEL		MAX. SHANK DIAM.	NO. OF FLTS	LENGTH FLT	LENGTH OVER-ALL	MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DEC.											1	2	3	4	5-7	8-14**
* 1/8	.1250	81108	81008	82108	82008	$37.30	.1099	4	7/8	3 1/2	0.1121-0.1280	$70.80	$54.05	$48.35	$45.70	$42.80	$40.60
* 9/64	.1406	81109	81009	82109	82009	42.60	.1255	4	7/8	3 1/2	0.1281-0.1435	76.10	59.30	53.70	51.05	48.20	45.95
* 5/32	.1562	81110	81010	82110	82010	44.00	.1411	4	1	4	0.1436-0.1590	77.45	60.60	55.00	52.35	49.45	47.20
* 11/64	.1719	81111	81011	82111	82011	49.50	.1567	4	1	4	0.1591-0.1750	83.05	66.25	60.60	57.95	55.10	52.90
* 3/16	.1875	81112	81012	82112	82012	50.55	.1724	4	1 1/8	4 1/2	0.1751-0.1910	83.95	67.25	61.65	59.00	56.15	53.85
13/64	.2031	81113	81013	82113	82013	53.85	.1880	6	1 1/4	5	-	-	-	-	-	-	-
7/32	.2188	81114	81014	82114	82014	53.85	.1880	6	1 1/4	5	0.1911-0.2210	87.30	70.55	65.00	62.35	59.35	57.15
15/64	.2344	81115	81015	82115	82015	57.40	.2193	6	1 1/2	6	-	-	-	-	-	-	-
1/4	.2500	81116	81016	82116	82016	57.40	.2193	6	1 1/2	6	0.2211-0.2530	90.80	74.00	68.50	65.75	62.85	60.60
17/64	.2656	81117	81017	82117	82017	61.65	.2505	6	1 1/2	6	-	-	-	-	-	-	-
9/32	.2812	81118	81018	82118	82018	61.65	.2505	6	1 1/2	6	0.2531-0.2840	95.10	78.35	72.70	70.05	67.15	65.00
19/64	.2969	81119	81019	82119	82019	64.25	.2817	6	1 5/8	6	-	-	-	-	-	-	-
5/16	.3125	81120	81020	82120	82020	64.25	.2817	6	1 5/8	6	0.2841-0.3150	97.65	80.90	75.30	72.60	69.75	67.45
21/64	.3281	81121	81021	82121	82021	68.60	.3130	6	1 5/8	6	-	-	-	-	-	-	-
11/32	.3438	81122	81022	82122	82022	68.60	.3130	6	1 5/8	6	0.3151-0.3470	102.00	85.30	79.65	76.95	74.10	71.90
23/64	.3594	81123	81023	82123	82023	73.85	.3443	6	1 3/4	7	-	-	-	-	-	-	-
3/8	.3750	81124	81024	82124	82024	73.85	.3443	6	1 3/4	7	0.3471-0.3780	107.20	90.45	84.90	82.25	79.35	77.05
25/64	.3906	81125	81025	82125	82025	84.40	.3755	6	1 3/4	7	-	-	-	-	-	-	-
13/32	.4062	81126	81026	82126	82026	84.40	.3755	6	1 3/4	7	0.3781-0.4090	117.80	101.05	95.45	92.75	89.95	87.65
27/64	.4219	81127	81027	82127	82027	89.55	.4067	6	1 3/4	7	-	-	-	-	-	-	-
7/16	.4375	81128	81028	82128	82028	89.55	.4067	6	1 3/4	7	0.4091-0.4410	122.95	106.20	100.65	98.00	95.10	92.80
29/64	.4531	81129	81029	82129	82029	95.05	.4380	6	1 3/4	8	-	-	-	-	-	-	-
15/32	.4688	81130	81030	82130	82030	95.05	.4380	6	1 3/4	8	0.4411-0.4720	128.40	111.70	106.10	103.45	100.60	98.30
31/64	.4844	81131	81031	82131	82031	101.95	.4693	6	1 3/4	8	-	-	-	-	-	-	-
1/2	.5000	81132	81032	82132	82032	101.95	.4693	6	1 3/4	8	0.4721-0.5030	135.35	118.65	113.05	110.35	107.55	105.25
33/64	.5156	81133	81033	82133	82033	131.45	.5005	6	1 7/8	9	-	-	-	-	-	-	-
17/32	.5312	81134	81034	82134	82034	131.45	.5005	6	1 7/8	9	0.5031-0.5340	164.95	148.15	142.50	139.85	137.00	134.80
35/64	.5469	81135	81035	82135	82035	155.30	.5005	6	1 7/8	9	-	-	-	-	-	-	-
9/16	.5625	81136	81036	82136	82036	155.30	.5005	6	1 7/8	9	0.5341-0.5660	188.75	171.95	166.30	163.65	160.80	158.50
37/64	.5781	81137	81037	82137	82037	176.15	.5630	6	1 7/8	9	-	-	-	-	-	-	-
19/32	.5938	81138	81038	82138	82038	176.15	.5630	6	1 7/8	9	0.5661-0.5970	209.55	192.85	187.25	184.60	181.70	179.45
39/64	.6094	81139	81039	82139	82039	178.20	.5630	6	1 7/8	9	-	-	-	-	-	-	-
5/8	.6250	81140	81040	82140	82040	178.20	.5630	6	1 7/8	9	0.5971-0.6280	211.70	194.95	189.25	186.60	183.75	181.50
21/32	.6562	81142	81042	82142	82042	258.00	.6255	6	2	9 1/2	0.6281-0.6590	296.80	277.35	270.90	267.75	264.80	261.75
11/16	.6875	81144	81044	82144	82044	258.00	.6255	6	2	9 1/2	0.6591-0.6910	296.80	277.35	270.90	267.75	264.80	261.75
23/32	.7188	81146	81046	82146	82046	290.30	.6880	6	2	9 1/2	0.6911-0.7220	329.10	309.55	303.10	300.05	297.05	294.00
3/4	.7500	81148	81048	82148	82048	290.30	.6880	6	2	9 1/2	0.7221-0.7530	329.10	309.55	303.10	300.05	297.05	294.00
25/32	.7812	81150	81050	82150	82050	322.20	.7505	8	2	10	0.7531-0.7840	361.00	341.55	335.05	331.95	328.95	325.95
13/16	.8125	81152	81052	82152	82052	351.55	.7817	8	2	10	0.7841-0.8160	390.35	370.90	364.45	361.30	358.35	355.30
27/32	.8438	81154	81054	82154	82054	370.75	.8130	8	2	10	0.8161-0.8470	409.55	390.10	383.60	380.55	377.55	374.50
7/8	.8750	81156	81056	82156	82056	363.00	.8440	8	2	10	0.8471-0.8780	401.80	382.35	375.90	372.75	369.80	366.75
29/32	.9062	81158	81058	82158	82058	424.75	.8755	8	2	10	0.8781-0.9090	463.55	444.10	437.60	434.50	431.55	428.50
15/16	.9375	81160	81060	82160	82060	446.45	.9067	8	2	10	0.9091-0.9410	485.25	465.80	459.35	456.20	453.25	450.25
31/32	.9688	81162	81062	82162	82062	467.65	.9380	8	2	10	0.9411-0.9720	506.45	487.00	480.55	477.40	474.45	471.45
1	1.0000	81164	81064	82164	82064	485.30	.9693	8	2	10	0.9721-1.0030	524.10	504.65	498.20	495.15	492.10	489.10

*Solid carbide head and shank (.1121" - .1910" tool diameters)

**Quantities of 15 or more - price of fractional size in same size range.

CARBIDE TIPPED DRILLS TECHNICAL INFORMATION

DRILL BASICS

- Drills are end cutting tools used to produce holes when rapid removal of material is desired
- Use shortest drill available for accurate hole location and minimum runout for maximum tool life
- Non-coolant fed drills (conventional twist drills) are generally effective in holes up to 3 tool diameters deep. Peck cycles should be used for deeper holes to achieve better chip evacuation
- Coolant fed drills should be used for production drilling of holes greater than 3 tool diameters deep
- Coolant fed drills offer higher penetration rates, reduced cycle times, and straighter/rounder holes with better finishes
- If non-centering drill is used, HANNIBAL recommends using a spotting drill for improved hole location
- Spotting drill's point angle should be greater than production drill's point angle to prevent edge chipping and to ensure accurate hole location

DRILL SELECTION GUIDE

TWIST DRILLS – NON-COOLANT
- Excellent up to 3 tool diameters deep
- Use shortest length available
- Excellent in non-ferrous materials and cast irons
- Generally not recommended for drilling steels (use die drill or coolant drill instead)
- See page 113 for point selection

DIE DRILLS
- Excellent in hardened steel 35 to 65 Rockwell C
- Will cut without annealing the workpiece
- See page 113 for point selection

COOLANT FED DRILLS – STRAIGHT FLUTES
- Longer flutes for deep hole drilling
- Produce straighter holes and better finishes
- Excellent performance in many materials
- See page 113 for point selection

COOLANT FED TWIST DRILLS
- Better chip clearing ability in ductile materials and high density alloys
- Spiral flutes permit higher feed rates
- Excellent performance in most materials
- See page 113 for point selection

CORE DRILLS
- Used to enlarge cored, punched, drilled, or preformed holes
- Capable of removing up to 30% of tool diameter
- Produces near-reamed surface finish
- Often eliminates need for final reaming or boring operation

DRILL SPECIFICATIONS

- Carbide tip brazed to hardened tool steel body
- Smooth flutes for effective chip flow
- Precision ground to ensure concentricity of tip & body
- Dimension & element tolerances conform to following standard, unless otherwise specified on selected styles: ASME/ANSIB94.11M * ISO * NAS 907 * USCTI
- "Taper Shank No." refers to American Standard taper series (formerly Morse taper series) per ASME/ANSIB5.10
- Jobber length & taper length drills ½" diameter and smaller are manufactured with an overall length tolerance of plus ¼", minus ⅛"

DRILL TOLERANCES

Tool Diameter	Diameter Plus	Diameter Minus	Included Angle Plus	Included Angle Minus	Lip Height T.I.V.
Thru ⅛"	.0000"	.0005"	5°	5°	.0020"
Over ⅛" thru ¼"	.0000"	.0007"	5°	5°	.0030"
Over ¼" thru ½"	.0000"	.0010"	5°	5°	.0040"
Over ½" thru 1"	.0000"	.0012"	3°	3°	.0050"
Over 1" thru 1¼"	.0000"	.0015"	3°	3°	.0060"

DRILL PROBLEM SOLVING GUIDE – CARBIDE TIPPED

AVOID PROBLEMS BY CAREFUL ORIGINAL SET-UP

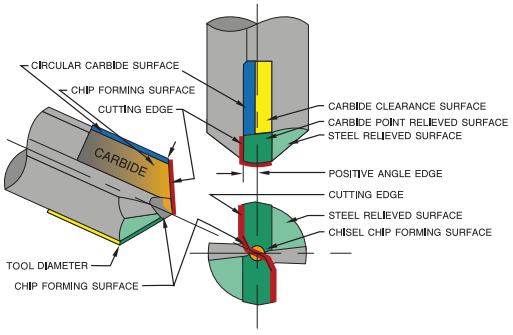
MACHINE CONDITION	❑ Tool holder in good condition and secure part holding fixture.
TOOL CONDITION	❑ Use cutting tool recommended for material being machined. Avoid excessive tool overhang.
FEEDS & SPEEDS	❑ Start with feeds and speeds recommended for material being machined (see page 8 & 9).
COOLANT	❑ Coolant flow must be adequate to avoid intermittent quenching and to flush chips promptly, avoid the recutting of hardened chips.

DRILLING PROBLEMS	POSSIBLE CAUSES	POSSIBLE SOLUTIONS
1. CHIPPED CUTTING EDGE	Excessive feed Excessive lip relief Vibration Thermal cracking carbide	Reduce feed Reduce lip relief to provide smaller chisel angle Frequently a worn drill bushing – Replace Maintain adequate coolant flow at all times
2. SHORT TOOL LIFE	Drill dwelling Only one lip cutting	Maintain adequate feed at all times Regrind with equal lip heights and chisel in center
3. DRILL WALKS OR DRIFTS	Unequal lip heights Worn drill bushing	Regrind with equal lip heights and chisel in center Replace drill bushing
4. OVERSIZED HOLES	Unequal lip heights Excessive lip relief Worn drill bushing	Regrind with equal lip heights and chisel in center Reduce lip relief to provide smaller chisel angle Replace drill bushing
5. ROUGH FINISH	Dull cutting edge Inadequate coolant	Regrind with fine grit diamond wheel Review type of coolant and maintain adequate flow

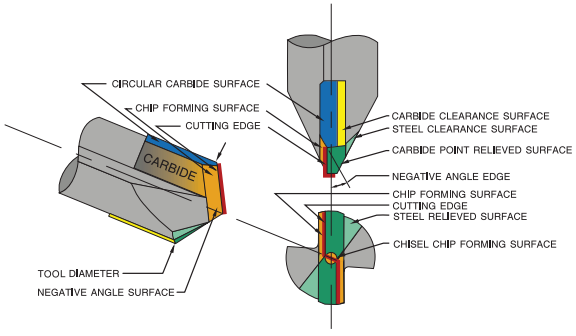
DRILL POINT SELECTION GUIDE
TWIST DRILLS, DIE DRILLS & COOLANT FED DRILLS

FOR HIGHER PENETRATION RATES, LONGER TOOL LIFE & MORE ACCURATE HOLES

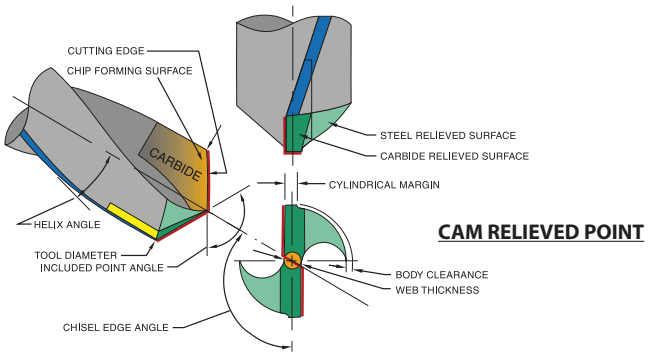
TWIST DRILLS (NON-COOLANT)	AVAILABILITY	POINT GEOMETRY & USE	ADVANTAGES
90° Included point (not spotting type)	Special Order	Cam relieved. Produces thinner chips for very ductile, soft materials (Chip Class 20 & 40)	High lip relief for faster penetration. Less abrasive wear at corners.
118° Standard point	Standard	Cam relieved. For variety of materials.	Easily resharpened on standard equipment
118° Split point	Modified Standard	Cam relieved. Excellent web thinned point.	Self centering. Split point acts as chipbreaker.
118° x 45° Double angle point	Modified Standard	Both angles cam relieved. For cast irons and abrasive materials.	Reduces corner wear at point. Reduces breakthrough burrs.
135° Split point	Standard	Cam relieved and split to NAS 907 standard. Excellent web thinning point.	Self centering. Split point acts as chipbreaker.
135° x 45° Double angle point	Modified Standard	Both angles cam relieved. For cast irons and abrasive materials.	Reduces corner wear at point. Reduces breakthrough burrs.
DIE DRILLS FOR HARD STEEL	**AVAILABILITY**	**POINT GEOMETRY & USE**	**ADVANTAGES**
118° Negative edge point	Standard	For very hard materials (50 Rc to 65 Rc).	Longer tool life.
118° Positive edge point	Standard	For less hard materials (35 Rc to 50 Rc).	Permits higher feed rates.
140° Negative edge point	Standard	For extremely tough materials (50 Rc to 65 Rc).	Longer tool life.
140° Positive edge point	Standard	For less hard materials (35 Rc to 50 Rc).	Permits higher feed rates.
COOLANT FED DRILLS – STRAIGHT FLUTES	**AVAILABILITY**	**POINT GEOMETRY & USE**	**ADVANTAGES**
125° Four facet point	Standard	Flat relieved point. Self centering - free cutting.	Permits higher feed rates. Longer tool life. Closer hole tolerance.
125° x 45° Double angle, Four facet point	Modified Standard	Both angles flat relieved. Self centering - free cutting.	Reduces corner wear at point. Reduces breakthrough burrs.
COOLANT FED TWIST DRILLS	**AVAILABILITY**	**POINT GEOMETRY & USE**	**ADVANTAGES**
125° Four facet point	Standard	Flat relieved point. Self centering - free cutting.	Permits higher feed rates. Longer tool life. Closer hole tolerances.
125° x 45° Double angle, Four facet point	Modified Standard	Both angles flat relieved. Self centering - free cutting.	Reduces corner wear at point. Reduces breakthrough burrs.
135° Split point	Standard	Cam relieved point. Excellent web thinned point.	Self centering. Split point acts as chipbreaker.
135° x 45° Double angle, Split point	Modified Standard	Both angles cam relieved. Excellent web thinning point.	Reduces corner wear at point. Reduces breakthrough burrs.



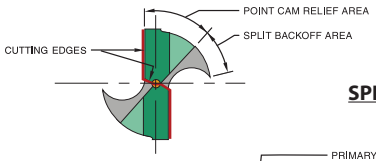
POSITIVE ANGLE CUTTING EDGE DIE DRILL (PG. 134)



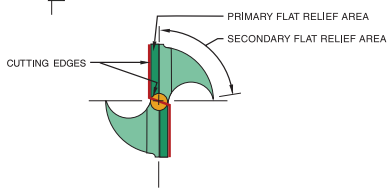
NEGATIVE ANGLE CUTTING EDGE DIE DRILL (PG. 134)



CAM RELIEVED POINT



SPLIT POINT, CAM RELIEVED



FOUR FACET POINT, FLAT RELIEVED

DRILLS INDEX AND COMPARISON CHART

DESCRIPTION	HANNIBAL FRAC. PAGE	HANNIBAL METRIC PAGE	HANNIBAL TOOL TYPE	CJT	CLEVELAND	FULLERTON	CHICAGO/ LATROBE	IMCO	MORSE	NYTD	PTD/DORMER
AIRCRAFT EXTENSION DRILLS											
6" Length, 135° Split Point	133	–	610	–	–	–	–	–	–	–	–
12" Length, 135° Split Point	133	–	611	129	–	–	–	–	–	–	–
COOLANT FED DRILLS											
Short Length, Straight, 125° 4 Facet Pt.	116	116	652	171	–	–	–	–	–	–	–
Long Length, Straight, 125° 4 Facet Pt.	117	117	650	170	–	–	–	–	–	–	–
Extra Long, Straight, 125° 4 Facet Pt.	115	115	658	172	–	–	–	–	–	–	–
Short Length, Twist, 125° 4 Facet Pt.	118	118	654	295	–	–	–	–	–	–	–
Short Length, Twist, 135° Split Pt.	118	118	655	296	–	–	–	–	–	–	–
Long Length, Twist , 125° 4 Facet Pt.	119	119	656	290	–	–	–	–	–	–	–
Long Length, Twist, 135° Split Pt.	119	119	657	–	–	–	–	–	–	–	–
CORE DRILLS											
Straight Shank	140	141	620	–	–	–	–	–	5456	–	–
Taper Shank	140	141	622	410	–	–	CD	–	5454	–	–
Straight Shank – For Steels	142	143	621	–	–	–	–	–	–	–	–
Taper Shank – For Steels	142	143	623	–	–	–	–	–	–	–	–
GLASS & TILE DRILLS	144	–	680	162	–	–	–	–	5467	–	PG6
HARD STEEL DIE DRILLS											
Negative Cutting Edge, 118° Pt.	134	134	670	–	–	–	HD	–	5423	–	D000
Negative Cutting Edge, 140° Pt.	134	–	671	–	–	–	–	–	–	–	–
Positive Cutting Edge, 118° Pt.	134	134	672	150	760	40HD	–	DT40	–	4041	–
Positive Cutting Edge, 140° Pt.	134	–	673	–	–	–	–	–	–	–	–
Spade Type, 120° Pt.	135	–	674	152	–	–	–	–	5420	–	–
Spade Type 140° Pt.	135	–	675	–	–	–	–	–	–	–	–
SOLID CARBIDE DRILLS											
118° Split Point , Jobber Length	126-127	–	860	–	–	–	–	D20	–	–	–
140° Die Drill	135	–	893	–	–	–	–	D40	–	–	–
JOBBERS LENGTH DRILLS											
118° Standard Point	122	123	600	120	2727	40CT	CTD	DT20	5330	4011	D444
135° Split Point	122	123	601	125	–	–	–	–	–	–	–
118° Standard Point – Tanged	124	125	690	–	–	–	–	–	–	–	–
135° Split Point – Tanged	124	125	691	–	–	–	–	–	–	–	–
MASONRY DRILLS	144	–	681–684	–	Yes	–	–	Yes	Yes	Yes	Yes
REDUCED SHANK DIAMETER DRILLS											
Hard Steel Die	136	–	670/672	–	–	–	–	–	–	–	–
Jobbers Length	136	–	600/601	–	–	–	–	–	–	–	–
Stub Length	136	–	640/641	–	–	–	–	–	–	–	–
Silver & Deming, 118° Std. Pt.	137	–	616	163	–	–	–	–	–	–	–
Silver & Deming, 135° Split Pt.	137	–	618	–	–	–	–	–	–	–	–
SPOTTING/CENTERING (CNC) DRILLS											
90° Short or Regular Length	137	–	647/677	–	–	–	–	D23	–	–	–
120° Short or Regular Length	137	–	648/678	–	–	–	–	D23	–	–	–
140° Short or Regular Length	137	–	649/679	–	–	–	–	–	–	–	–
STUB LENGTH (CNC) DRILLS											
118° Standard Point	120	121	640	110	–	–	–	DT21	–	–	–
135° Split Point	120	121	641	115	–	–	–	–	–	–	–
TAPER LENGTH DRILLS											
118° Standard Point	128	129	630	130	2745	40TL	TLD	DT22	5314	4013	D555
135° Split Point	128	129	631	–	–	–	–	–	–	–	–
TAPER SHANK DRILLS											
118° Standard Point	130	131	660	140	2740	40TLT	TSD	6850	5302	4451	D999
135° Split Point	130	131	661	–	–	–	–	–	–	–	–
Smaller Taper Shank, 118° Std. Pt.	131	–	668	–	–	–	–	–	–	–	–
8" Extra Long Flute, 118° Std. Pt.	132	–	664	–	–	–	–	–	–	–	–
11" Extra Long Flute, 118° Std. Pt.	132	–	665	–	–	–	–	–	–	–	–
CENTERS											
Brown & Sharpe – Half or Full	139	–	593/596	–	–	–	–	–	5293/6	–	–
Jarno – Half or Full	139	–	594/597	–	–	–	–	–	5294/7	–	–
Morse – Half or Full	139	–	592/595	–	790	–	–	–	5292/5	–	–
COBALT DRILLS 135° Split Point	138	–	699	–	–	–	–	–	–	–	–

COOLANT FED DRILLS – EXTRA LONG LENGTH CARBIDE TIPPED TYPE 658 FRACTIONAL & METRIC

COOLANT FED

125° FOUR FACET POINT

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	658
	40	NON-FERROUS - SHORT CHIPS	658
	60	CAST IRONS	658
	80	LOW STRENGTH STEELS	CALL US
	100	MEDIUM STRENGTH STEELS	658
	120	HIGH STRENGTH STEELS	658
	140	HIGH TEMPERATURE ALLOYS	CALL US

TYPE 658 – 125° FOUR FACET POINT

- Extra long length
- Flat relieved, self centering point
- Polished straight flutes
- Two coolant outlets
- Drill body diameter smaller than tool diameter to prevent gauling; shank diameter same size as tool diameter
- Shank and tool diameter tolerances: plus .000", minus .001"
- Carbide high temperature brazed to hardened tool steel body
- Extra long carbide tip for additional regrinds
- Straight flutes for superior hole straightness, improved finish and maximum chip capacity

MODIFICATIONS (See list on page 117)

USE:

- For drilling most materials, including some stainless steels
- For very deep holes, 12-24 tool diameters deep

TOOL DIAMETER		LENGTH		TYPE 658 EDP NO.	PRICE	DECIMAL DIAMETER RANGE*
FRAC.	DECIMAL	FLUTE	OVER-ALL			
5/16	.3125	8	10	65820	$213.80	0.3100 - 0.3160
11/32	.3438	8	10	65822	213.80	0.3281 - 0.3460
3/8	.3750	9	11	65824	225.95	0.3594 - 0.3770
13/32	.4062	9	11	65826	257.20	0.3906 - 0.4080
7/16	.4375	9	11	65828	257.20	0.4200 - 0.4390
15/32	.4688	9 3/4	12	65830	271.60	0.4531 - 0.4710
1/2	.5000	9 3/4	12	65832	271.60	0.4800 - 0.5030
17/32	.5312	9 3/4	12	65834	291.55	0.5118 - 0.5330
9/16	.5625	10 3/4	13	65836	314.00	0.5430 - 0.5650
5/8	.6250	10 3/4	13	65840	331.55	0.6070 - 0.6270
11/16	.6875	11 3/4	14	65844	345.25	0.6693 - 0.6900
23/32	.7188	11 3/4	14	65846	361.05	0.7031 - 0.7220
3/4	.7500	11 3/4	14	65848	365.40	0.7320 - 0.7530
13/16	.8125	12 3/4	15	65852	388.05	0.7953 - 0.8160
7/8	.8750	12 3/4	15	65856	418.15	0.8570 - 0.8780
15/16	.9375	13 3/4	16	65860	446.75	0.9180 - 0.9390
1	1.0000	13 3/4	16	65864	483.85	0.9820 - 1.0030

*Contact us for decimal diameter range prices

TOOL DIAMETER		LENGTH				TYPE 658 METRIC EDP NO.	METRIC PRICE	METRIC DIAMETER RANGE**
		FLUTE		OVERALL				
mm	INCH	mm	INCH	mm	INCH			
8.0	.3150	203	8	254	10	658080	$284.95	-
8.5	.3346	203	8	254	10	658085	284.95	8.280 - 8.788
9.0	.3543	229	9	279	11	658090	301.05	8.992 - 9.576
9.5	.3740	229	9	279	11	658095	301.05	-
10.0	.3937	229	9	279	11	658100	330.85	9.779 - 10.363
10.5	.4134	229	9	279	11	658105	330.85	10.414 - 11.151
11.0	.4331	229	9	279	11	658110	330.85	-
11.5	.4528	248	9 3/4	305	12	658115	349.50	11.153 - 12.000
12.0	.4724	248	9 3/4	305	12	658120	349.50	-
12.5	.4921	248	9 3/4	305	12	658125	349.50	12.002 - 12.776

**Contact us for metric diameter range prices

TECHNICAL INFORMATION

WHY - WHEN - HOW

WHY USE CARBIDE TIPPED COOLANT FED DRILLS?

- Deep hole capability
- Higher feeds & speeds result in reduced drilling cycle times
- Increased tool life versus non-coolant carbide or coolant high speed steel
- Better quality holes - straighter, rounder & better finish
- More efficient chip evacuation
- Superior to solid carbide drills because tough tool steel bodies absorb shock loads

WHEN TO USE CARBIDE TIPPED COOLANT FED DRILLS

- Especially effective for holes greater than three tool diameters deep
- Use on non-ferrous materials (chip classes 20 & 40), cast irons (chip class 60), medium & high strength steels (chip classes 100 & 120), and some high temp alloys (chip class 140) & stainless steels
- When improved hole size & finish could eliminate secondary finishing operations (reaming or boring)

HOW TO SELECT COOLANT PRESSURE

- Inadequate coolant pressure or volume can lead to tool failure - contact HANNIBAL for recommendations
- High coolant pressure results in higher stock removal rates & longer tool life
- High coolant pressure required to break through point vapor barrier created by chip forming heat at drill point
- High coolant pressure required to effectively evacuate the high volume of chips produced by faster feeds & speeds
- Coolant pressure requirement decreases with increase in drill diameter but requires more volume of coolant
- Coolant pressure requirement increases with decrease in drill diameter but requires less volume of coolant
- Strongly recommend automatic drilling operation shutdown if coolant flow is interrupted
- Use continuous coolant pressure system (non-pulsating)

COOLANT FED DRILLS – SHORT LENGTH CARBIDE TIPPED TYPE 652 FRACTIONAL & METRIC

COOLANT FED

125° FOUR FACET POINT

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	652
	40	NON-FERROUS - SHORT CHIPS	652
	60	CAST IRONS	652
	80	LOW STRENGTH STEELS	CALL US
	100	MEDIUM STRENGTH STEELS	652
	120	HIGH STRENGTH STEELS	652
	140	HIGH TEMPERATURE ALLOYS	CALL US

TYPE 652 – 125° FOUR FACET POINT

- Short length
- Flat relieved, self centering point
- Polished straight flutes
- Two coolant outlets
- Drill body diameter smaller than tool diameter to prevent gauling; shank diameter same size as tool diameter
- Shank and tool diameter tolerances: plus .000", minus .001"
- Carbide tips brazed to hardened tool steel body
- Extra long carbide tip for additional regrinds
- Straight flutes for superior hole straightness, improved finish and maximum chip capacity.

MODIFICATIONS (Prompt delivery)

- Decimal diameter ranges
- Metric diameter ranges
- Modified point and/or angle
- Flat(s) on shank
- Tanged shank
- Coatings available:

TITANIUM NITRIDE – TiN

TITANIUM CARBONITRIDE – TiCN

ZIRCONIUM NITRIDE – ZrN

AL TITANIUM NITRIDE – AlTiN

USE:

- For drilling most materials, including some stainless steels
- For intermediate depth holes, 5-8 tool diameters deep

TOOL DIAMETER FRAC.	TOOL DIAMETER DEC.	LENGTH FLUTE	LENGTH OVER-ALL	TYPE 652 EDP NO.	PRICE	DECIMAL DIAMETER RANGE*
1/4	.2500	2 1/2	4 29/32	65216	$135.30	.2490 - .2530
17/64	.2656	2 3/4	5 5/32	65217	135.30	-
9/32	.2812	2 3/4	5 5/32	65218	135.30	.2640 - .2840
19/64	.2969	3 3/16	5 19/32	65219	135.30	-
5/16	.3125	3 3/16	5 19/32	65220	135.30	.2950 - .3160
21/64	.3281	3 7/16	5 27/32	65221	135.30	-
11/32	.3438	3 7/16	5 27/32	65222	135.30	.3260 - .3460
23/64	.3594	3 5/8	6 1/32	65223	136.70	-
3/8	.3750	3 5/8	6 1/32	65224	136.70	.3540 - .3770
25/64	.3906	3 7/8	6 9/32	65225	140.15	-
13/32	.4062	3 7/8	6 9/32	65226	140.15	.3850 - .4080
27/64	.4219	4 1/16	6 15/32	65227	144.85	-
7/16	.4375	4 1/16	6 15/32	65228	144.85	.4100 - .4390
29/64	.4531	4 5/16	6 23/32	65229	154.25	-
15/32	.4688	4 5/16	6 23/32	65230	154.25	.4391 - .4724
31/64	.4844	4 1/2	6 29/32	65231	158.75	-
1/2	.5000	4 1/2	6 29/32	65232	158.75	.4725 - .5030
33/64	.5156	4 13/16	7 7/32	65233	165.40	-
17/32	.5312	4 13/16	7 7/32	65234	168.20	.5031 - .5330
35/64	.5469	4 13/16	7 7/32	65235	174.50	-
9/16	.5625	4 13/16	7 7/32	65236	177.55	.5331 - .5650
37/64	.5781	5 3/16	7 19/32	65237	209.15	-
19/32	.5938	5 3/16	7 19/32	65238	212.65	.5651 - .5950
39/64	.6094	5 3/16	7 19/32	65239	209.15	-
5/8	.6250	5 3/16	7 19/32	65240	212.65	.5951 - .6270
41/64	.6406	5 3/16	7 19/32	65241	224.20	-
21/32	.6562	5 3/16	7 19/32	65242	224.20	.6271 - .6570
43/64	.6719	5 5/8	8 1/32	65243	242.60	-
11/16	.6875	5 5/8	8 1/32	65244	242.90	.6571 - .6900
45/64	.7031	5 5/8	8 1/32	65245	249.80	-
23/32	.7188	5 5/8	8 1/32	65246	249.80	.6901 - .7220
47/64	.7344	6 1/16	8 15/32	65247	252.30	-
3/4	.7500	6 1/16	8 15/32	65248	252.30	.7221 - .7530
49/64	.7656	6 1/16	8 9/16	65249	264.10	-
25/32	.7812	6 1/16	8 9/16	65250	268.65	.7531 - .7840
13/16	.8125	6 1/16	8 9/16	65252	273.15	.7841 - .8160
27/32	.8438	6 1/2	9	65254	289.65	.8161 - .8470
7/8	.8750	6 1/2	9	65256	296.60	.8471 - .8780
29/32	.9062	6 15/16	9 7/16	65258	317.40	.8781 - .9090
15/16	.9375	6 15/16	9 7/16	65260	340.95	.9091 - .9390
31/32	.9688	6 15/16	9 7/16	65262	354.95	.9391 - .9700
1	1.0000	7 3/8	9 7/8	65264	364.25	.9701 - 1.0030

*Contact us for decimal and metric diameter range prices

TOOL DIAMETER mm	TOOL DIAMETER INCH	LENGTH FLUTE mm	LENGTH FLUTE INCH	LENGTH OVERALL mm	LENGTH OVERALL INCH	TYPE 652 METRIC EDP NO.	METRIC PRICE	METRIC DIAMETER RANGE*
**6.5	.2559	64	2 1/2	125	4 29/32	652065	$174.75	-
7.0	.2756	70	2 3/4	131	5 5/32	652070	174.75	6.706 - 7.214
7.5	.2953	81	3 3/16	142	5 19/32	652075	174.75	7.493 - 8.026
8.0	.3150	81	3 3/16	142	5 19/32	652080	174.75	-
8.5	.3346	87	3 7/16	148	5 27/32	652085	168.75	8.280 - 8.788
9.0	.3543	92	3 5/8	153	6 1/32	652090	168.75	8.992 - 9.576
9.5	.3740	92	3 5/8	153	6 1/32	652095	168.75	-
10.0	.3937	98	3 7/8	159	6 9/32	652100	168.75	9.779 - 10.363
10.5	.4134	103	4 1/16	164	6 15/32	652105	174.75	10.414 - 11.151
11.0	.4331	103	4 1/16	164	6 15/32	652110	174.75	-
11.5	.4528	109	4 5/16	171	6 23/32	652115	188.90	11.153 - 12.000
12.0	.4724	109	4 5/16	171	6 23/32	652120	188.90	-
12.5	.4921	114	4 1/2	175	6 29/32	652125	192.90	12.002 - 12.776
13.0	.5118	122	4 13/16	183	7 7/32	652130	204.90	12.779 - 13.538
13.5	.5315	122	4 13/16	183	7 7/32	652135	204.90	-
14.0	.5512	122	4 13/16	183	7 7/32	652140	214.95	13.541 - 14.351
14.5	.5709	131	5 3/16	193	7 19/32	652145	261.15	14.354 - 15.113
15.0	.5906	131	5 3/16	193	7 19/32	652150	261.15	-
15.5	.6102	131	5 3/16	193	7 19/32	652155	261.15	15.116 - 15.926
16.0	.6299	131	5 3/16	193	7 19/32	652160	267.15	15.928 - 16.688
16.5	.6496	131	5 3/16	193	7 19/32	652165	267.15	-
17.0	.6693	143	5 5/8	204	8 1/32	652170	285.25	16.690 - 17.526
17.5	.6890	143	5 5/8	204	8 1/32	652175	285.25	-
18.0	.7087	143	5 5/8	204	8 1/32	652180	299.40	17.529 - 18.339
18.5	.7283	154	6 1/16	215	8 15/32	652185	301.30	18.341 - 19.126
19.0	.7480	154	6 1/16	215	8 15/32	652190	301.30	-
19.5	.7677	154	6 1/16	217	8 9/16	652195	319.50	19.129 - 19.914
20.0	.7874	154	6 1/16	217	8 9/16	652200	323.50	19.916 - 20.726
20.5	.8071	154	6 1/16	217	8 9/16	652205	323.50	-
21.0	.8268	165	6 1/2	229	9	652210	341.55	20.729 - 21.514
21.5	.8465	165	6 1/2	229	9	652215	341.55	-
22.0	.8661	165	6 1/2	229	9	652220	349.60	21.516 - 22.301
22.5	.8858	176	6 15/16	240	9 7/16	652225	385.75	22.304 - 23.089
23.0	.9055	176	6 15/16	240	9 7/16	652230	385.75	-
23.5	.9252	176	6 15/16	240	9 7/16	652235	399.80	23.091 - 23.851
24.0	.9449	176	6 15/16	240	9 7/16	652240	415.85	23.853 - 24.638
24.5	.9646	176	6 15/16	240	9 7/16	652245	412.35	-
25.0	.9843	187	7 3/8	251	9 7/8	652250	415.85	24.641 - 25.476

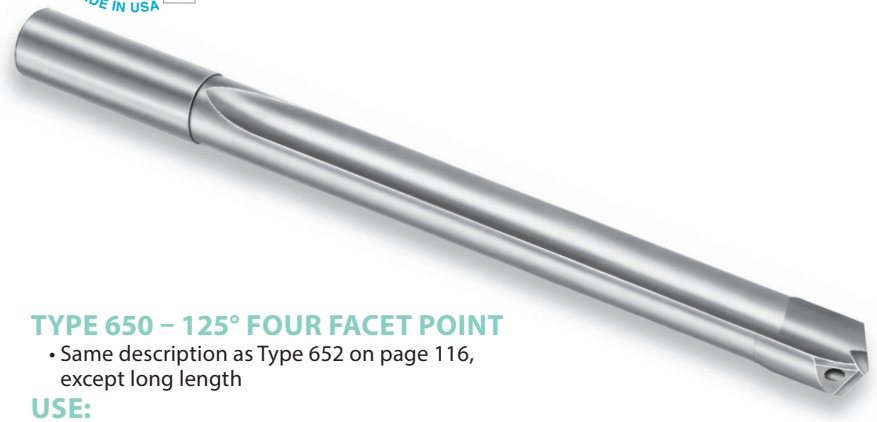
**6.5mm tool diameter has 6.35mm shank diameter

DRILLS

COOLANT FED DRILLS – LONG LENGTH CARBIDE TIPPED TYPE 650 FRACTIONAL & METRIC

COOLANT FED

125° FOUR FACET POINT



TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	650
	40	NON-FERROUS - SHORT CHIPS	650
	60	CAST IRONS	650
	80	LOW STRENGTH STEELS	CALL US
	100	MEDIUM STRENGTH STEELS	650
	120	HIGH STRENGTH STEELS	650
	140	HIGH TEMPERATURE ALLOYS	CALL US

MODIFICATIONS (Prompt delivery)

- Decimal diameter ranges
- Metric diameter ranges
- Modified point and/or angle
- Flat(s) on shank
- Tanged shank
- Coatings available:

TITANIUM NITRIDE – TiN

TITANIUM CARBONITRIDE – TiCN

ZIRCONIUM NITRIDE – ZrN

AL TITANIUM NITRIDE – AlTiN

TYPE 650 – 125° FOUR FACET POINT

- Same description as Type 652 on page 116, except long length

USE:

- For drilling most materials, including some stainless steels
- For deep holes, 7-15 tool diameters deep

TOOL DIAMETER		LENGTH		TYPE 650 EDP NO.	PRICE	DECIMAL DIAMETER RANGE*
FRAC.	DECIMAL	FLUTE	OVER-ALL			
1/4	.2500	4 5/8	6 1/8	65016	$148.15	0.2490 - 0.2530
17/64	.2656	4 3/4	6 1/4	65017	148.15	-
9/32	.2812	4 3/4	6 1/4	65018	148.15	0.2640 - 0.2840
19/64	.2969	4 7/8	6 3/8	65019	148.15	-
5/16	.3125	4 7/8	6 3/8	65020	148.15	0.2950 - 0.3160
21/64	.3281	5	6 1/2	65021	142.60	-
11/32	.3438	5	6 1/2	65022	142.60	0.3260 - 0.3460
23/64	.3594	5 1/4	6 3/4	65023	138.95	-
3/8	.3750	5 1/4	6 3/4	65024	144.30	0.3540 - 0.3770
25/64	.3906	5 1/2	7	65025	142.60	-
13/32	.4062	5 1/2	7	65026	142.60	0.3850 - 0.4080
27/64	.4219	5 3/4	7 1/4	65027	147.20	-
7/16	.4375	5 3/4	7 1/4	65028	147.20	0.4100 - 0.4390
29/64	.4531	5 3/4	7 1/2	65029	156.50	-
15/32	.4688	5 3/4	7 1/2	65030	156.50	0.4391 - 0.4724
31/64	.4844	5 3/4	7 3/4	65031	161.15	-
1/2	.5000	5 3/4	7 3/4	65032	161.15	0.4725 - 0.5030
33/64	.5156	6	8	65033	172.90	-
17/32	.5312	6	8	65034	172.90	0.5031 - 0.5330
35/64	.5469	6 1/4	8 1/4	65035	179.10	-
9/16	.5625	6 1/4	8 1/4	65036	182.15	0.5331 - 0.5650
37/64	.5781	6 3/4	8 3/4	65037	215.65	-
19/32	.5938	6 3/4	8 3/4	65038	219.30	0.5651 - 0.5950
39/64	.6094	6 3/4	8 3/4	65039	215.65	-
5/8	.6250	6 3/4	8 3/4	65040	219.30	0.5951 - 0.6270
41/64	.6406	7	9	65041	227.25	-
21/32	.6562	7	9	65042	231.20	0.6271 - 0.6570
43/64	.6719	7 1/4	9 1/4	65043	243.30	-
11/16	.6875	7 1/4	9 1/4	65044	247.60	0.6571 - 0.6900
45/64	.7031	7 1/2	9 1/2	65045	252.60	-
23/32	.7188	7 1/2	9 1/2	65046	256.85	0.6901 - 0.7220
47/64	.7344	7 3/4	9 3/4	65047	254.70	-
3/4	.7500	7 3/4	9 3/4	65048	259.15	0.7221 - 0.7530
49/64	.7656	7 7/8	9 7/8	65049	275.55	-
25/32	.7812	7 7/8	9 7/8	65050	275.55	0.7531 - 0.7840
13/16	.8125	8	10	65052	280.20	0.7841 - 0.8160
27/32	.8438	8	10	65054	296.60	0.8161 - 0.8470
7/8	.8750	8	10	65056	303.60	0.8471 - 0.8780
29/32	.9062	8	10	65058	336.35	0.8781 - 0.9090
15/16	.9375	8 3/4	10 3/4	65060	350.30	0.9091 - 0.9390
31/32	.9688	9	11	65062	353.65	0.9391 - 0.9700
1	1.0000	9	11	65064	353.65	0.9701 - 1.0030

*Contact us for decimal and metric diameter range prices

TOOL DIAMETER		LENGTH				TYPE 650 METRIC EDP NO.	METRIC PRICE	METRIC DIAMETER RANGE*
		FLUTE		OVERALL				
mm	INCH	mm	INCH	mm	INCH			
6.5	.2559	117	4 5/8	156	6 1/8	650065	$154.40	-
7.0	.2756	121	4 3/4	159	6 1/4	650070	154.40	6.706 - 7.214
7.5	.2953	124	4 7/8	162	6 3/8	650075	154.40	7.493 - 8.026
8.0	.3150	124	4 7/8	162	6 3/8	650080	154.40	-
8.5	.3346	127	5	165	6 1/2	650085	149.10	8.280 - 8.788
9.0	.3543	133	5 1/4	171	6 3/4	650090	149.10	8.992 - 9.576
9.5	.3740	133	5 1/4	171	6 3/4	650095	149.10	-
10.0	.3937	140	5 1/2	178	7	650100	149.10	9.779 - 10.363
10.5	.4134	146	5 3/4	184	7 1/4	650105	154.40	10.414 - 11.151
11.0	.4331	146	5 3/4	184	7 1/4	650110	154.40	-
11.5	.4528	146	5 3/4	191	7 1/2	650115	166.85	11.153 - 12.000
12.0	.4724	146	5 3/4	191	7 1/2	650120	166.85	-
12.5	.4921	146	5 3/4	197	7 3/4	650125	170.40	12.002 - 12.776
13.0	.5118	152	6	203	8	650130	181.00	12.779 - 13.538
13.5	.5315	152	6	203	8	650135	181.00	-
14.0	.5512	159	6 1/4	210	8 1/4	650140	189.90	13.541 - 14.351
14.5	.5709	171	6 3/4	222	8 3/4	650145	230.65	14.354 - 15.113
15.0	.5906	171	6 3/4	222	8 3/4	650150	230.65	-
15.5	.6102	171	6 3/4	222	8 3/4	650155	230.65	15.116 - 15.926
16.0	.6299	178	7	229	9	650160	236.00	15.928 - 16.688
16.5	.6496	178	7	229	9	650165	236.00	-
17.0	.6693	184	7 1/4	235	9 1/4	650170	251.95	16.690 - 17.526
17.5	.6890	184	7 1/4	235	9 1/4	650175	251.95	-
18.0	.7087	191	7 1/2	241	9 1/2	650180	264.45	17.529 - 18.339
18.5	.7283	197	7 3/4	248	9 3/4	650185	266.15	18.341 - 19.126
19.0	.7480	197	7 3/4	248	9 3/4	650190	266.15	-
19.5	.7677	200	7 7/8	251	9 7/8	650195	282.20	19.129 - 19.914
20.0	.7874	203	8	254	10	650200	285.80	19.916 - 20.726
20.5	.8071	203	8	254	10	650205	285.80	-
21.0	.8268	203	8	254	10	650210	301.70	20.729 - 21.514
21.5	.8465	203	8	254	10	650215	301.70	-
22.0	.8661	203	8	254	10	650220	308.80	21.516 - 22.301
22.5	.8858	203	8	254	10	650225	340.75	22.304 - 23.089
23.0	.9055	203	8	254	10	650230	340.75	-
23.5	.9252	222	8 3/4	273	10 3/4	650235	353.15	23.091 - 23.851
24.0	.9449	229	9	279	11	650240	367.35	23.853 - 24.638
24.5	.9646	229	9	279	11	650245	367.35	-
25.0	.9843	229	9	279	11	650250	367.35	24.641 - 25.476

**6.5mm tool diameter has 6.35mm shank diameter

DRILLS

COOLANT FED TWIST DRILLS – SHORT LENGTH CARBIDE TIPPED TYPES 654 & 655 FRACTIONAL & METRIC

COOLANT FED

125° FOUR FACET POINT OR 135° SPLIT POINT

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	654
	40	NON-FERROUS - SHORT CHIPS	654
	60	CAST IRONS	654
	80	LOW STRENGTH STEELS	CALL US
	100	MEDIUM STRENGTH STEELS	655
	120	HIGH STRENGTH STEELS	655
	140	HIGH TEMPERATURE ALLOYS	CALL US

MODIFICATIONS (See list on page 119)

TYPE 654 – 125° FLAT RELIEVED FOUR FACET POINT
TYPE 655 – 135° CAM RELIEVED SPLIT POINT

- Same descriptions as Type 656 & 657 on pg. 119, except short length
- Shank & body diameter smaller than tool diameter to prevent gauling (for modified tool diameter orders, shank & body diameter will be reduced when appropriate)

USE:

- For drilling most materials, including some stainless steels and high temperature alloys
- For intermediate depth holes, up to approximately 4 tool diameters deep

TOOL DIAMETER		DIMENSIONS			TYPE 654 - 125° PT.		TYPE 655 - 135° PT.		DECIMAL DIAMETER RANGE*
		SHANK & BODY DIAM.	LENGTH		EDP NO.	PRICE	EDP NO.	PRICE	
FRAC.	DEC.		FLT	OVER-ALL					
1/4	.2500	.2344	1 17/32	3 15/16	65416	$137.85	65516	$169.50	.2420 - .2610
17/64	.2656	.2500	1 19/32	4	65417	157.20	65517	181.00	-
9/32	.2812	.2656	1 19/32	4	65418	147.70	65518	178.95	.2611 - .2953
19/64	.2969	.2812	1 3/4	4 5/32	65419	157.20	65519	181.00	-
5/16	.3125	.2969	1 3/4	4 5/32	65420	147.70	65520	178.95	.2954 - .3230
21/64	.3281	.3125	1 15/16	4 11/32	65421	157.20	65521	181.00	-
11/32	.3438	.3281	1 15/16	4 11/32	65422	147.70	65522	178.95	.3231 - .3550
23/64	.3594	.3438	2 1/8	4 17/32	65423	157.20	65523	188.30	-
3/8	.3750	.3594	2 1/8	4 17/32	65424	147.70	65524	178.95	.3551 - .3850
25/64	.3906	.3750	2 9/32	4 11/16	65425	157.20	65525	199.30	-
13/32	.4062	.3906	2 9/32	4 11/16	65426	147.70	65526	191.85	.3851 - .4170
27/64	.4219	.4062	2 1/2	4 29/32	65427	157.20	65527	199.30	-
7/16	.4375	.4219	2 1/2	4 29/32	65428	147.70	65528	191.85	.4171 - .4430
29/64	.4531	.4375	2 21/32	5 1/16	65429	166.30	65529	199.30	-
15/32	.4688	.4531	2 21/32	5 1/16	65430	157.25	65530	191.85	.4431 - .4740
31/64	.4844	.4688	2 13/16	5 7/32	65431	170.00	65531	199.30	-
1/2	.5000	.4844	2 13/16	5 7/32	65432	161.95	65532	191.85	.4741 - .5060
33/64	.5156	.5000	3	5 13/32	65433	CALL US	65533	CALL US	-
17/32	.5312	.5156	3	5 13/32	65434	CALL US	65534	CALL US	.5061 - .5360
35/64	.5469	.5312	3 1/8	5 17/32	65435	CALL US	65535	CALL US	-
9/16	.5625	.5469	3 1/8	5 17/32	65436	CALL US	65536	CALL US	.5361 - .5680
37/64	.5781	.5625	3 9/32	5 11/16	65437	CALL US	65537	CALL US	-
19/32	.5938	.5781	3 9/32	5 11/16	65438	173.30	65538	203.20	.5681 - .5990
39/64	.6094	.5938	3 7/16	5 27/32	65439	181.00	65539	208.35	-
5/8	.6250	.6094	3 7/16	5 27/32	65440	173.30	65540	203.20	.5991 - .6310
41/64	.6406	.6250	3 21/32	6 1/16	65441	181.00	65541	208.35	-
21/32	.6562	.6406	3 21/32	6 1/16	65442	173.30	65542	203.20	.6311 - .6710
43/64	.6719	.6562	3 13/16	6 7/32	65443	181.00	65543	208.35	-
11/16	.6875	.6719	3 13/16	6 7/32	65444	173.30	65544	203.20	.6711 - .6930
45/64	.7031	.6875	3 15/16	6 11/32	65445	201.15	65545	230.35	-
23/32	.7188	.7031	3 15/16	6 11/32	65446	193.75	65546	223.60	.6931 - .7300
47/64	.7344	.7188	4 1/8	6 17/32	65447	201.15	65547	230.35	-
3/4	.7500	.7344	4 1/8	6 17/32	65448	193.75	65548	223.60	.7301 - .7560
49/64	.7656	.7500	4 9/32	6 25/32	65449	201.15	65549	230.35	-
25/32	.7812	.7656	4 9/32	6 25/32	65450	193.75	65550	223.60	.7561 - .7890
51/64	.7969	.7812	4 7/16	6 15/16	65451	239.50	65551	266.90	-
13/16	.8125	.7969	4 7/16	6 15/16	65452	231.15	65552	260.80	.7891 - .8180
53/64	.8281	.8125	4 19/32	7 3/32	65453	239.50	65553	266.90	-
27/32	.8438	.8281	4 19/32	7 3/32	65454	231.15	65554	260.80	.8181 - .8590
55/64	.8594	.8438	4 11/16	7 3/16	65455	239.50	65555	266.90	-
7/8	.8750	.8594	4 11/16	7 3/16	65456	231.15	65556	260.80	.8591 - .8810
57/64	.8906	.8750	4 7/8	7 3/8	65457	254.05	65557	283.40	-
29/32	.9062	.8906	4 7/8	7 3/8	65458	246.05	65558	275.80	.8811 - .9190
59/64	.9219	.9062	5 1/32	7 17/32	65459	254.05	65559	283.40	-
15/16	.9375	.9219	5 1/32	7 17/32	65460	246.05	65560	275.80	.9191 - .9420
61/64	.9531	.9375	5 3/16	7 11/16	65461	268.70	65561	297.95	-
31/32	.9688	.9531	5 3/16	7 11/16	65462	259.00	65562	288.75	.9421 - .9830
63/64	.9844	.9688	5 5/16	7 13/16	65463	268.70	65563	297.95	-
1	1.0000	.9844	5 5/16	7 13/16	65464	259.00	65564	288.75	.9831 - 1.0060
1 1/32	1.0312	1.0000	5 11/16	8 3/16	65466	279.50	65566	309.30	-
1 1/16	1.0625	1.0000	5 11/16	8 3/16	65468	288.75	65568	318.65	-
1 3/32	1.0938	1.0000	5 11/16	8 3/16	65470	296.25	65570	326.10	-
1 1/8	1.1250	1.0000	5 11/16	8 3/16	65472	307.45	65572	337.30	1.0061 - 1.1320

*Contact us for decimal diameter prices

TOOL DIAMETER		SHANK & BODY DIAM.		LENGTH				TYPE 654 - 125° PT.		TYPE 655 - 135° PT.	
				FLUTE		OVERALL		METRIC EDP NO.	METRIC PRICE	METRIC EDP NO.	METRIC PRICE
mm	INCH	mm	INCH	mm	INCH	mm	INCH				
6.5	.2559	6.0	.2362	39	1 17/32	100	3 15/16	654065	$148.15	655065	$173.65
7.0	.2756	6.5	.2559	40	1 19/32	102	4	654070	157.20	655070	181.00
7.5	.2953	7.0	.2756	40	1 19/32	102	4	654075	157.20	655075	181.00
8.0	.3150	7.5	.2953	44	1 3/4	106	4 5/32	654080	157.20	655080	181.00
8.5	.3346	8.0	.3150	49	1 15/16	110	4 11/32	654085	157.20	655085	188.30
9.0	.3543	8.5	.3346	49	1 15/16	110	4 11/32	654090	157.20	655090	188.30
9.5	.3740	9.0	.3543	54	2 1/8	115	4 17/32	654095	157.20	655095	188.30
10.0	.3937	9.5	.3740	58	2 9/32	119	4 11/16	654100	157.20	655100	199.30
10.5	.4134	10.0	.3937	58	2 9/32	119	4 11/16	654105	157.20	655105	199.30
11.0	.4331	10.5	.4134	64	2 1/2	125	4 29/32	654110	157.20	655110	199.30
11.5	.4528	11.0	.4331	67	2 21/32	129	5 1/16	654115	166.30	655115	199.30
12.0	.4724	11.5	.4528	67	2 21/32	129	5 1/16	654120	166.30	655120	199.30
12.5	.4921	12.0	.4724	71	2 13/16	133	5 7/32	654125	170.00	655125	199.30
13.0	.5118	12.5	.4921	76	3	137	5 13/32	654130	168.10	655130	199.30
13.5	.5315	13.0	.5118	76	3	137	5 13/32	654135	168.10	655135	199.30
14.0	.5512	13.5	.5315	79	3 1/8	140	5 17/32	654140	168.10	655140	199.30
14.5	.5709	14.0	.5512	83	3 9/32	144	5 11/16	654145	181.00	655145	208.35
15.0	.5906	14.5	.5709	83	3 9/32	144	5 11/16	654150	181.00	655150	208.35
15.5	.6102	15.0	.5906	87	3 7/16	148	5 27/32	654155	181.00	655155	208.35
16.0	.6299	15.5	.6102	87	3 7/16	148	5 27/32	654160	181.00	655160	208.35
16.5	.6496	16.0	.6299	93	3 21/32	154	6 1/16	654165	181.00	655165	208.35
17.0	.6693	16.5	.6496	93	3 21/32	154	6 1/16	654170	181.00	655170	208.35
17.5	.6890	17.0	.6693	97	3 13/16	158	6 7/32	654175	181.00	655175	230.35
18.0	.7087	17.5	.6890	100	3 15/16	161	6 11/32	654180	201.15	655180	230.35
18.5	.7283	18.0	.7087	100	3 15/16	161	6 11/32	654185	201.15	655185	230.35
19.0	.7480	18.5	.7283	105	4 1/8	166	6 17/32	654190	201.15	655190	230.35
19.5	.7677	19.0	.7480	109	4 9/32	172	6 25/32	654195	201.15	655195	230.35
20.0	.7874	19.5	.7677	109	4 9/32	172	6 25/32	654200	201.15	655200	266.90
20.5	.8071	20.0	.7874	113	4 7/16	176	6 15/16	654205	239.50	655205	266.90
21.0	.8268	20.5	.8071	117	4 19/32	180	7 3/32	654210	239.50	655210	266.90
21.5	.8465	21.0	.8268	117	4 19/32	180	7 3/32	654215	239.50	655215	266.90
22.0	.8661	21.5	.8465	119	4 11/16	183	7 3/16	654220	239.50	655220	266.90
22.5	.8858	22.0	.8661	124	4 7/8	187	7 3/8	654225	254.05	655225	283.40
23.0	.9055	22.5	.8858	124	4 7/8	187	7 3/8	654230	254.05	655230	283.40
23.5	.9252	23.0	.9055	128	5 1/32	191	7 17/32	654235	254.05	655235	283.40
24.0	.9449	23.5	.9252	132	5 3/16	195	7 11/16	654240	268.70	655240	297.95
24.5	.9646	24.0	.9449	132	5 3/16	195	7 11/16	654245	268.70	655245	297.95
25.0	.9843	24.5	.9646	135	5 5/16	198	7 13/16	654250	268.70	655250	297.95
26.0	1.0236	25.5	1.0039	144	5 11/16	208	8 3/16	654260	288.75	655260	318.15

Contact us for metric diameter ranges & prices

COOLANT FED TWIST DRILLS – LONG LENGTH CARBIDE TIPPED TYPES 656 & 657 FRACTIONAL

COOLANT FED

125° FOUR FACET POINT OR 135° SPLIT POINT

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	656
	40	NON-FERROUS - SHORT CHIPS	656
	60	CAST IRONS	656
	80	LOW STRENGTH STEELS	CALL US
	100	MEDIUM STRENGTH STEELS	657
	120	HIGH STRENGTH STEELS	657
	140	HIGH TEMPERATURE ALLOYS	CALL US

TYPE 656 – 125° FLAT RELIEVED FOUR FACET POINT

- Long length
- Polished right spiral flutes
- Self centering 125˚ point
- Two coolant outlets
- Shank & body diameter same size as tool diameter
- Shank and tool diameter tolerances: plus .000", minus .001"
- Carbide high temperature brazed to hardened tool steel body
- Extra heavy web for higher torsional strength and rigidity
- Spiral flutes for improved chip removal in vertical applications

TYPE 657 – 135° CAM RELIEVED SPLIT POINT

- Same as Type 656 above, except with 135˚ cam relieved split point designed for drilling tough abrasive or high tensile materials

USE:

- For drilling most materials, including some stainless steels and high temperature alloys
- For deep holes, up to approximately 8 tool diameters deep

MODIFICATIONS (Prompt delivery)

- Modified tool diameter
- Metric tool diameter
- Modified point and/or angle
- Flat(s) on shank
- Tanged shank
- Coatings available:

TITANIUM NITRIDE – TiN

TITANIUM CARBONITRIDE – TiCN

ZIRCONIUM NITRIDE –ZrN

AL TITANIUM NITRIDE – AlTiN

DRILLS

TOOL DIAMETER		LENGTH		TYPE 656 - 125˚ PT.		TYPE 657 - 135˚ PT.		DECIMAL DIAMETER RANGE*
FRAC.	DEC.	FLUTE	OVERALL	EDP NO.	PRICE	EDP NO.	PRICE	
1/4	.2500	3 3/4	6 1/8	65616	$148.60	65716	$186.00	-
9/32	.2812	3 7/8	6 1/4	65618	148.60	65718	183.05	0.2650 - 0.2840
5/16	.3125	4	6 3/8	65620	CALL US	65720	CALL US	0.2953 - 0.3150
11/32	.3438	4 1/8	6 1/2	65622	148.60	65722	183.05	0.3280 - 0.3460
3/8	.3750	4 1/4	6 3/4	65624	148.60	65724	183.05	0.3543 - 0.3770
13/32	.4062	4 3/8	7	65626	148.60	65726	196.45	0.3900 - 0.4080
7/16	.4375	4 5/8	7 1/4	65628	148.60	65728	196.45	0.4130 - 0.4390
15/32	.4688	4 7/8	7 1/2	65630	CALL US	65730	CALL US	0.4391 - 0.4710
1/2	.5000	5	7 3/4	65632	CALL US	65732	CALL US	0.4711 - 0.5020
17/32	.5312	5 1/4	8	65634	CALL US	65734	CALL US	0.5021 - 0.5330
9/16	.5625	5 3/8	8 1/4	65636	CALL US	65736	CALL US	0.5331 - 0.5640
19/32	.5938	5 5/8	8 1/2	65638	219.35	65738	261.60	0.5641 - 0.5940
5/8	.6250	5 3/4	8 3/4	65640	219.35	65740	261.60	0.5941 - 0.6260
21/32	.6562	5 7/8	9	65642	233.35	65742	278.25	0.6261 - 0.6570
11/16	.6875	6	9 1/4	65644	250.00	65744	298.00	0.6571 - 0.6900
23/32	.7188	6 3/16	9 1/2	65646	260.45	65746	305.70	0.6901 - 0.7210
3/4	.7500	6 3/8	9 3/4	65648	261.80	65748	307.35	0.7211 - 0.7520

*Contact us for decimal and metric diameter prices

CNC STUB LENGTH DRILLS CARBIDE TIPPED TYPES 640 & 641 FRACTIONAL/WIRE/LETTER

MATERIAL SPECIFIC

118° STANDARD OR 135° SPLIT POINT

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	640
	40	NON-FERROUS - SHORT CHIPS	640/641
	60	CAST IRONS	641/640
	80	LOW STRENGTH STEELS	CALL US
	100	MEDIUM STRENGTH STEELS	CALL US
	120	HIGH STRENGTH STEELS	CALL US
	140	HIGH TEMPERATURE ALLOYS	CALL US

TYPE 640 – 118° STANDARD POINT

- Stub length - 118° standard point
- Detailed specifications on page 112

TYPE 641 – 135° SPLIT POINT

- Same as Type 640 above, except with 135° split point designed for drilling tough abrasive or high tensile materials

USE:

- For exact location shallow drilling
- Excellent starting drill
- Often used in CNC machining centers
- Short length results in a very rigid and sturdy drill

MODIFICATIONS (See list on page 123)

NOTE: For stocked reduced shank diameters, see page 136.

TOOL DIAMETER			LENGTH		TYPE 640 - 118° PT.		TYPE 641 - 135° PT.	
FRAC.	WIRE/ LTR.	DEC. EQUIV.	FLUTE	OVER-ALL	EDP NO.	PRICE	EDP NO.	PRICE
	32	.1160	7/8	1 7/8	64232	$17.15	64332	$19.05
	31	.1200	7/8	1 7/8	64231	17.15	64331	19.05
1/8		.1250	7/8	1 7/8	64008	12.85	64108	13.90
	30	.1285	15/16	1 15/16	64230	18.15	64330	20.00
	29	.1360	15/16	1 15/16	64229	18.15	64329	20.00
	28	.1405	15/16	1 15/16	64228	18.15	64328	20.00
9/64		.1406	15/16	1 15/16	64009	15.55	64109	18.30
	27	.1440	1	2 1/16	64227	18.15	64327	20.00
	26	.1470	1	2 1/16	64226	18.15	64326	20.00
	25	.1495	1	2 1/16	64225	18.15	64325	20.00
	24	.1520	1	2 1/16	64224	18.15	64324	20.00
	23	.1540	1	2 1/16	64223	18.15	64323	20.00
5/32		.1562	1	2 1/16	64010	13.60	64110	14.80
	22	.1570	1 1/16	2 1/8	64222	18.15	64322	20.00
	21	.1590	1 1/16	2 1/8	64221	18.15	64321	20.00
	20	.1610	1 1/16	2 1/8	64220	21.05	64320	23.45
	19	.1660	1 1/16	2 1/8	64219	21.05	64319	23.45
	18	.1695	1 1/16	2 1/8	64218	21.05	64318	23.45
11/64		.1719	1 1/16	2 1/8	64011	18.50	64111	19.90
	17	.1730	1 1/8	2 3/16	64217	21.50	64317	23.85
	16	.1770	1 1/8	2 3/16	64216	21.50	64316	23.85
	15	.1800	1 1/8	2 3/16	64215	21.50	64315	23.85
	14	.1820	1 1/8	2 3/16	64214	21.50	64314	23.85
	13	.1850	1 1/8	2 3/16	64213	21.50	64313	23.85
3/16		.1875	1 1/8	2 3/16	64012	14.30	64112	15.70
	12	.1890	1 3/16	2 1/4	64212	21.35	64312	23.65
	11	.1910	1 3/16	2 1/4	64211	21.35	64311	23.65
	10	.1935	1 3/16	2 1/4	64210	21.35	64310	23.65
	9	.1960	1 3/16	2 1/4	64209	21.35	64309	23.65
	8	.1990	1 3/16	2 1/4	64208	21.35	64308	23.65
	7	.2010	1 3/16	2 1/4	64207	18.75	64307	22.50
13/64		.2031	1 3/16	2 1/4	64013	18.50	64113	19.90
	6	.2040	1 1/4	2 3/8	64206	21.50	64306	23.85
	5	.2055	1 1/4	2 3/8	64205	21.50	64305	23.85
	4	.2090	1 1/4	2 3/8	64204	21.50	64304	23.85
	3	.2130	1 1/4	2 3/8	64203	18.75	64303	22.50
7/32		.2188	1 1/4	2 3/8	64014	15.35	64114	17.05
	2	.2210	1 5/16	2 7/16	64202	21.35	64302	23.65
	1	.2280	1 5/16	2 7/16	64201	18.75	64301	23.65
	A	.2340	1 5/16	2 7/16	64401	21.35	64501	23.65
15/64		.2344	1 5/16	2 7/16	64015	17.05	64115	20.35
	B	.2380	1 3/8	2 1/2	64402	21.35	64502	23.65
	C	.2420	1 3/8	2 1/2	64403	21.35	64503	23.65
	D	.2460	1 3/8	2 1/2	64404	18.75	64504	22.50
1/4	E	.2500	1 3/8	2 1/2	64016	15.65	64116	18.05
	F	.2570	1 7/16	2 5/8	64406	21.80	64506	26.20
	G	.2610	1 7/16	2 5/8	64407	21.80	64507	26.20
17/64		.2656	1 7/16	2 5/8	64017	19.05	64117	22.60
	H	.2660	1 1/2	2 11/16	64408	21.10	64508	27.40
	I	.2720	1 1/2	2 11/16	64409	21.80	64509	26.20
	J	.2770	1 1/2	2 11/16	64410	24.65	64510	27.40
	K	.2810	1 1/2	2 11/16	64411	24.65	64511	27.40

TOOL DIAMETER			LENGTH		TYPE 640 - 118° PT.		TYPE 641 - 135° PT.	
FRAC.	LTR.	DEC. EQUIV.	FLUTE	OVER-ALL	EDP NO.	PRICE	EDP NO.	PRICE
9/32		.2812	1 1/2	2 11/16	64018	$18.00	64118	$20.95
	L	.2900	1 9/16	2 3/4	64412	25.45	64512	28.20
	M	.2950	1 9/16	2 3/4	64413	25.45	64513	28.20
19/64		.2969	1 9/16	2 3/4	64019	21.80	64119	25.85
	N	.3020	1 5/8	2 13/16	64414	29.15	64514	32.45
5/16		.3125	1 5/8	2 13/16	64020	19.15	64120	22.30
	O	.3160	1 11/16	2 15/16	64415	26.85	64515	32.40
	P	.3230	1 11/16	2 15/16	64416	30.50	64516	33.90
21/64		.3281	1 11/16	2 15/16	64021	23.65	64121	27.50
	Q	.3320	1 11/16	3	64417	26.85	64517	32.40
	R	.3390	1 11/16	3	64418	26.85	64518	32.40
11/32		.3438	1 11/16	3	64022	22.35	64122	25.85
	S	.3480	1 3/4	3 1/16	64419	30.85	64519	34.30
	T	.3580	1 3/4	3 1/16	64420	30.85	64520	34.30
23/64		.3594	1 3/4	3 1/16	64023	24.40	64123	28.40
	U	.3680	1 13/16	3 1/8	64421	27.60	64521	33.20
3/8		.3750	1 13/16	3 1/8	64024	22.90	64124	26.55
	V	.3770	1 7/8	3 1/4	64422	35.55	64522	39.45
	W	.3860	1 7/8	3 1/4	64423	31.40	64523	37.75
25/64		.3906	1 7/8	3 1/4	64025	27.15	64125	31.55
	X	.3970	1 15/16	3 5/16	64424	31.40	64524	39.45
	Y	.4040	1 15/16	3 5/16	64425	35.55	64525	39.45
13/32		.4062	1 15/16	3 5/16	64026	27.15	64126	31.55
	Z	.4130	2	3 3/8	64426	40.40	64526	44.95
27/64		.4219	2	3 3/8	64027	30.10	64127	34.30
7/16		.4375	2 1/16	3 7/16	64028	29.05	64128	32.20
29/64		.4531	2 1/8	3 9/16	64029	38.70	64129	49.70
15/32		.4688	2 1/8	3 5/8	64030	41.30	64130	48.00
31/64		.4844	2 3/16	3 11/16	64031	37.05	64131	47.60
1/2		.5000	2 1/4	3 3/4	64032	39.55	64132	45.95
33/64		.5156	2 3/8	3 7/8	64033	59.00	64133	65.65
17/32		.5312	2 3/8	3 7/8	64034	49.25	64134	55.60
35/64		.5469	2 1/2	4	64035	59.00	64135	65.65
9/16		.5625	2 1/2	4	64036	49.25	64136	55.60
37/64		.5781	2 5/8	4 1/8	64037	68.90	64137	76.60
19/32		.5938	2 5/8	4 1/8	64038	56.50	64138	63.70
39/64		.6094	2 3/4	4 1/4	64039	68.90	64139	76.60
5/8		.6250	2 3/4	4 1/4	64040	56.50	64140	63.70
41/64		.6406	2 7/8	4 1/2	64041	82.20	64141	91.50
21/32		.6562	2 7/8	4 1/2	64042	67.90	64142	76.65
43/64		.6719	2 7/8	4 5/8	64043	84.30	64143	93.75
11/16		.6875	2 7/8	4 5/8	64044	69.75	64144	78.65
45/64		.7031	3	4 3/4	64045	95.30	64145	105.90
23/32		.7188	3	4 3/4	64046	79.00	64146	91.75
47/64		.7344	3 1/8	5	64047	95.40	64147	106.15
3/4		.7500	3 1/8	5	64048	79.25	64148	89.25
49/64		.7656	3 1/4	5 1/8	64049	102.10	64149	113.60
25/32		.7812	3 1/4	5 1/8	64050	97.90	64150	113.65
51/64		.7969	3 3/8	5 1/4	64051	114.25	64151	127.10
13/16		.8125	3 3/8	5 1/4	64052	98.00	64152	110.50
53/64		.8281	3 1/2	5 3/8	64053	111.95	64153	124.45
27/32		.8438	3 1/2	5 3/8	64054	107.25	64154	124.60

CONTINUED ON NEXT PAGE

CNC STUB LENGTH DRILLS
CARBIDE TIPPED TYPES 640 & 641 METRIC

118° STANDARD OR 135° SPLIT POINT

CONTINUED FROM PAGE 120 - TYPE 640 & 641 FRACTIONAL

TOOL DIAMETER		LENGTH		TYPE 640 - 118° PT.		TYPE 641 - 135° PT.	
FRAC.	DEC. EQUIV.	FLUTE	OVER-ALL	EDP NO.	PRICE	EDP NO.	PRICE
55/64	.8594	3 1/2	5 1/2	64055	$125.35	64155	$139.45
7/8	.8750	3 1/2	5 1/2	64056	107.50	64156	121.15
57/64	.8906	3 5/8	5 5/8	64057	120.25	64157	133.70
29/32	.9062	3 5/8	5 5/8	64058	115.30	64158	133.75
59/64	.9219	3 3/4	5 3/4	64059	134.55	64159	149.70
15/16	.9375	3 3/4	5 3/4	64060	115.40	64160	130.15
61/64	.9531	3 7/8	5 7/8	64061	134.55	64161	149.70
31/32	.9688	3 7/8	5 7/8	64062	121.75	64162	141.40
63/64	.9844	4	6	64063	142.20	64163	158.25
1	1.0000	4	6	64064	121.95	64164	137.60
*1 1/32	1.0312	4	6 1/4	64066	178.20	64166	198.15
*1 1/16	1.0625	4	6 1/4	64068	152.75	64168	172.30
*1 3/32	1.0938	4	6 3/8	64070	197.75	64170	220.00
*1 1/8	1.1250	4	6 3/8	64072	169.60	64172	191.15
*1 5/32	1.1562	4 1/4	6 5/8	64074	241.35	64174	268.55
*1 3/16	1.1875	4 1/4	6 5/8	64076	207.00	64176	232.00
*1 7/32	1.2188	4 3/8	6 3/4	64078	241.35	64178	268.55
*1 1/4	1.2500	4 3/8	6 3/4	64080	207.00	64180	232.00

*Shank: 1" diameter, 2¼" long

METRIC TOOL DIAMETERS

NOTE: Modifications available (see list on page 123)

TOOL DIAMETER		LENGTH				TYPE 640 - 118° PT.		TYPE 641 - 135° PT.	
		FLUTE		OVERALL		METRIC	METRIC	METRIC	METRIC
mm	INCH	mm	INCH	mm	INCH	EDP NO.	PRICE	EDP NO.	PRICE
3.0	.1181	22	7/8	48	1 7/8	640030	$18.65	641030	$20.55
3.1	.1220	22	7/8	48	1 7/8	640031	18.65	641031	20.55
3.2	.1260	24	15/16	49	1 15/16	640032	18.65	641032	20.55
3.3	.1299	24	15/16	49	1 15/16	640033	18.65	641033	20.55
3.4	.1339	24	15/16	49	1 15/16	640034	18.65	641034	20.55
3.5	.1378	24	15/16	49	1 15/16	640035	15.95	641035	18.30
3.6	.1417	25	1	52	2 1/16	640036	18.65	641036	20.55
3.7	.1457	25	1	52	2 1/16	640037	18.65	641037	20.55
3.8	.1496	25	1	52	2 1/16	640038	18.65	641038	20.55
3.9	.1535	25	1	52	2 1/16	640039	18.65	641039	20.55
4.0	.1575	27	1 1/16	54	2 1/8	640040	15.95	641040	18.35
4.1	.1614	27	1 1/16	54	2 1/8	640041	22.25	641041	24.50
4.2	.1654	27	1 1/16	54	2 1/8	640042	22.25	641042	24.50
4.3	.1693	27	1 1/16	54	2 1/8	640043	22.25	641043	24.50
4.4	.1732	29	1 1/8	56	2 3/16	640044	22.25	641044	24.50
4.5	.1772	29	1 1/8	56	2 3/16	640045	19.05	641045	21.85
4.6	.1811	29	1 1/8	56	2 3/16	640046	22.25	641046	24.50
4.7	.1850	29	1 1/8	56	2 3/16	64213	21.50	64313	23.85
4.8	.1890	30	1 3/16	57	2 1/4	64212	21.35	64312	23.65
4.9	.1929	30	1 3/16	57	2 1/4	640049	22.25	641049	24.50
5.0	.1969	30	1 3/16	57	2 1/4	640050	19.05	641050	21.85
5.1	.2008	30	1 3/16	57	2 1/4	640051	22.25	641051	24.50
5.2	.2047	32	1 1/4	60	2 3/8	640052	22.25	641052	24.50
5.3	.2087	32	1 1/4	60	2 3/8	640053	22.25	641053	24.50
5.4	.2126	32	1 1/4	60	2 3/8	640054	22.25	641054	24.50
5.5	.2165	32	1 1/4	60	2 3/8	640055	19.05	641055	21.85
5.6	.2205	33	1 5/16	62	2 7/16	640056	22.25	641056	24.50
5.7	.2244	33	1 5/16	62	2 7/16	640057	22.25	641057	24.50
5.8	.2283	33	1 5/16	62	2 7/16	640058	22.25	641058	24.50
5.9	.2323	33	1 5/16	62	2 7/16	640059	22.25	641059	24.50
6.0	.2362	35	1 3/8	64	2 1/2	640060	17.80	641060	20.35
6.1	.2402	35	1 3/8	64	2 1/2	640061	22.95	641061	25.45
6.2	.2441	35	1 3/8	64	2 1/2	640062	22.95	641062	25.45
6.3	.2480	35	1 3/8	64	2 1/2	640063	22.95	641063	25.45
6.4	.2520	37	1 7/16	67	2 5/8	640064	22.95	641064	25.45
6.5	.2559	37	1 7/16	67	2 5/8	640065	19.70	641065	22.60
6.6	.2598	37	1 7/16	67	2 5/8	640066	$22.95	641066	$25.45
6.7	.2638	37	1 7/16	67	2 5/8	640067	22.95	641067	25.45
6.8	.2677	38	1 1/2	68	2 11/16	640068	22.95	641068	25.45
6.9	.2717	38	1 1/2	68	2 11/16	640069	22.95	641069	25.45
7.0	.2756	38	1 1/2	68	2 11/16	640070	19.70	641070	22.60
7.1	.2795	38	1 1/2	68	2 11/16	640071	22.95	641071	25.45
7.2	.2835	40	1 9/16	70	2 3/4	640072	26.40	641072	29.10
7.3	.2874	40	1 9/16	70	2 3/4	640073	26.40	641073	29.10
7.4	.2913	40	1 9/16	70	2 3/4	640074	26.40	641074	29.10
7.5	.2953	40	1 9/16	70	2 3/4	640075	22.65	641075	25.85
7.6	.2992	41	1 5/8	71	2 13/16	640076	26.40	641076	29.10
7.7	.3031	41	1 5/8	71	2 13/16	640077	26.40	641077	29.10
7.8	.3071	41	1 5/8	71	2 13/16	640078	26.40	641078	29.10
7.9	.3110	41	1 5/8	71	2 13/16	640079	26.40	641079	29.10
8.0	.3150	43	1 11/16	75	2 15/16	640080	22.65	641080	25.85
8.1	.3189	43	1 11/16	75	2 15/16	640081	28.40	641081	31.10
8.2	.3228	43	1 11/16	75	2 15/16	640082	28.40	641082	31.10
8.3	.3268	43	1 11/16	75	2 15/16	640083	28.40	641083	31.10
8.4	.3307	43	1 11/16	76	3	640084	28.40	641084	31.10
8.5	.3346	43	1 11/16	76	3	640085	24.35	641085	27.50
8.6	.3386	43	1 11/16	76	3	640086	28.40	641086	31.10
8.7	.3425	43	1 11/16	76	3	640087	28.85	641087	31.80
8.8	.3465	44	1 3/4	78	3 1/16	640088	28.85	641088	31.80
8.9	.3504	44	1 3/4	78	3 1/16	640089	28.85	641089	31.80
9.0	.3543	44	1 3/4	78	3 1/16	640090	24.75	641090	28.40
9.1	.3583	44	1 3/4	78	3 1/16	640091	28.85	641091	31.80
9.2	.3622	46	1 13/16	79	3 1/8	640092	28.85	641092	31.80
9.3	.3661	46	1 13/16	79	3 1/8	640093	28.85	641093	31.80
9.4	.3701	46	1 13/16	79	3 1/8	640094	28.85	641094	31.80
9.5	.3740	46	1 13/16	79	3 1/8	640095	24.75	641095	28.40
9.6	.3780	48	1 7/8	83	3 1/4	640096	32.10	641096	35.40
9.7	.3819	48	1 7/8	83	3 1/4	640097	32.10	641097	35.40
9.8	.3858	48	1 7/8	83	3 1/4	640098	32.10	641098	35.40
9.9	.3898	48	1 7/8	83	3 1/4	640099	32.10	641099	35.40
10.0	.3937	49	1 15/16	84	3 5/16	640100	27.55	641100	31.55
10.5	.4134	51	2	86	3 3/8	640105	30.80	641105	34.30
11.0	.4331	52	2 1/16	87	3 7/16	640110	30.80	641110	34.30
11.5	.4528	54	2 1/8	90	3 9/16	640115	43.35	641115	48.00
12.0	.4724	56	2 3/16	94	3 11/16	640120	41.45	641120	45.95
12.5	.4921	57	2 1/4	95	3 3/4	640125	41.45	641125	45.95
13.0	.5118	60	2 3/8	98	3 7/8	640130	51.20	641130	55.60
13.5	.5315	60	2 3/8	98	3 7/8	640135	50.25	641135	55.60
14.0	.5512	64	2 1/2	102	4	640140	50.25	641140	55.60
14.5	.5709	67	2 5/8	105	4 1/8	640145	70.75	641145	77.95
15.0	.5906	67	2 5/8	105	4 1/8	640150	70.75	641150	77.95
15.5	.6102	70	2 3/4	108	4 1/4	640155	79.75	641155	87.95
16.0	.6299	73	2 7/8	114	4 1/2	640160	89.90	641160	99.10
16.5	.6496	73	2 7/8	114	4 1/2	640165	89.90	641165	99.10
17.0	.6693	73	2 7/8	117	4 5/8	640170	89.90	641170	99.10
17.5	.6890	76	3	121	4 3/4	640175	99.15	641175	109.25
18.0	.7087	76	3	121	4 3/4	640180	99.15	641180	109.25
18.5	.7283	79	3 1/8	127	5	640185	108.35	641185	119.40
19.0	.7480	79	3 1/8	127	5	640190	108.35	641190	119.40
19.5	.7677	83	3 1/4	130	5 1/8	640195	119.80	641195	132.10
20.0	.7874	86	3 3/8	133	5 1/4	640200	134.00	641200	147.55
20.5	.8071	86	3 3/8	133	5 1/4	640205	134.00	641205	147.55
21.0	.8268	89	3 1/2	137	5 3/8	640210	147.10	641210	162.00
21.5	.8465	89	3 1/2	140	5 1/2	640215	147.10	641215	162.00
22.0	.8661	89	3 1/2	140	5 1/2	640220	147.10	641220	162.00
22.5	.8858	92	3 5/8	143	5 5/8	640225	151.35	641225	166.70
23.0	.9055	92	3 5/8	143	5 5/8	640230	151.35	641230	166.70
23.5	.9252	95	3 3/4	146	5 3/4	640235	155.10	641235	170.80
24.0	.9449	98	3 7/8	149	5 7/8	640240	157.95	641240	174.10
24.5	.9646	98	3 7/8	149	5 7/8	640245	157.95	641245	174.10
25.0	.9843	102	4	152	6	640250	166.85	641250	183.65

JOBBERS LENGTH DRILLS CARBIDE TIPPED TYPES 600 & 601 FRACTIONAL

118° STANDARD OR 135° SPLIT POINT

MATERIAL SPECIFIC

TYPE 600 – 118° STANDARD POINT

- Jobbers length - 118° standard point
- Detailed specifications on page 112

TYPE 601 – 135° SPLIT POINT

- Same as Type 600 above, except with 135° split point designed for drilling tough abrasive or high tensile materials

USE:

- The most popular carbide tipped drill - will perform satisfactorily under a variety of conditions

MODIFICATIONS (See list on page 123)

TOOL SELECTOR

CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
20	NON-FERROUS - LONG CHIPS	600
40	NON-FERROUS - SHORT CHIPS	600/601
60	CAST IRONS	601/600
80	LOW STRENGTH STEELS	699/860
100	MEDIUM STRENGTH STEELS	699/860
120	HIGH STRENGTH STEELS	699/860
140	HIGH TEMPERATURE ALLOYS	CALL US

NOTE: For stocked reduced shank diameters, see page 136. For jobbers length drills with tang (Types 690/691), see pages 124 & 125.

TOOL DIAMETER			LENGTH		TYPE 600 - 118° PT.		TYPE 601 - 135° PT.	
FRAC.	WIRE/LTR.	DEC.	FLUTE	OAL	EDP NO.	PRICE	EDP NO.	PRICE
	*40	.0980	1	2	60240	$15.25	-	-
	*39	.0995	1 1/4	2 1/4	60239	15.25	-	-
	*38	.1015	1 1/4	2 1/4	60238	15.25	-	-
	*37	.1040	1 1/4	2 1/4	60237	15.25	-	-
	*36	.1065	1 1/4	2 1/4	60236	15.25	-	-
*7/64		.1094	1 1/4	2 1/4	60007	15.25	-	-
	*35	.1100	1 1/4	2 1/4	60235	15.25	-	-
	*34	.1110	1 1/4	2 1/4	60234	15.25	-	-
	*33	.1130	1 1/4	2 1/4	60233	15.25	-	-
	32	.1160	1 5/8	2 3/4	60232	12.30	60332	$14.40
	31	.1200	1 5/8	2 3/4	60231	11.10	60331	12.95
1/8		.1250	1 5/8	2 3/4	60008	11.40	60108	13.30
	30	.1285	1 5/8	2 3/4	60230	11.60	60330	13.45
	29	.1360	1 3/4	2 7/8	60229	12.05	60329	13.90
	28	.1405	1 3/4	2 7/8	60228	12.15	60328	14.15
9/64		.1406	1 3/4	2 7/8	60009	12.30	60109	14.35
	27	.1440	1 7/8	3	60227	12.45	60327	14.45
	26	.1470	1 7/8	3	60226	11.55	60326	13.45
	25	.1495	1 7/8	3	60225	11.55	60325	13.45
	24	.1520	2	3 1/8	60224	12.45	60324	14.45
	23	.1540	2	3 1/8	60223	12.15	60323	14.15
5/32		.1562	2	3 1/8	60010	12.10	60110	14.15
	22	.1570	2	3 1/8	60222	13.40	60322	15.65
	21	.1590	2 1/8	3 1/4	60221	12.85	60321	14.95
	20	.1610	2 1/8	3 1/4	60220	13.20	60320	15.25
	19	.1660	2 1/8	3 1/4	60219	13.20	60319	15.25
	18	.1695	2 1/8	3 1/4	60218	13.20	60318	15.25
11/64		.1719	2 1/8	3 1/4	60011	13.20	60111	15.25
	17	.1730	2 3/16	3 3/8	60217	13.20	60317	15.25
	16	.1770	2 3/16	3 3/8	60216	12.85	60316	14.95
	15	.1800	2 3/16	3 3/8	60215	13.40	60315	15.65
	14	.1820	2 3/16	3 3/8	60214	12.85	60314	14.95
	13	.1850	2 5/16	3 1/2	60213	14.15	60313	14.95
3/16		.1875	2 5/16	3 1/2	60012	12.85	60112	14.95
	12	.1890	2 5/16	3 1/2	60212	14.80	60312	15.65
	11	.1910	2 5/16	3 1/2	60211	13.65	60311	15.80
	10	.1935	2 7/16	3 5/8	60210	13.40	60310	15.65
	9	.1960	2 7/16	3 5/8	60209	13.65	60309	15.80
	8	.1990	2 7/16	3 5/8	60208	13.65	60308	15.80
	7	.2010	2 7/16	3 5/8	60207	13.65	60307	15.80
13/64		.2031	2 7/16	3 5/8	60013	14.10	60113	16.25
	6	.2040	2 1/2	3 3/4	60206	13.95	60306	16.20
	5	.2055	2 1/2	3 3/4	60205	14.10	60305	15.80
	4	.2090	2 1/2	3 3/4	60204	13.95	60304	16.20
	3	.2130	2 1/2	3 3/4	60203	14.10	60303	15.80
7/32		.2188	2 1/2	3 3/4	60014	14.10	60114	16.25
	2	.2210	2 5/8	3 7/8	60202	14.70	60302	17.00
	1	.2280	2 5/8	3 7/8	60201	14.40	60301	16.75
	A	.2340	2 5/8	3 7/8	60401	15.95	60501	18.50
15/64		.2344	2 5/8	3 7/8	60015	15.15	60115	17.65
	B	.2380	2 3/4	4	60402	15.95	60502	18.50
	C	.2420	2 3/4	4	60403	15.95	60503	18.50
	D	.2460	2 3/4	4	60404	15.60	60504	18.15
1/4	E	.2500	2 3/4	4	60016	15.15	60116	17.65

TOOL DIAMETER			LENGTH		TYPE 600 - 118° PT.		TYPE 601 - 135° PT.	
FRAC.	LTR.	DEC.	FLUTE	OAL	EDP NO.	PRICE	EDP NO.	PRICE
	F	.2570	2 7/8	4 1/8	60406	$17.90	60506	$20.80
	G	.2610	2 7/8	4 1/8	60407	18.40	60507	21.25
17/64		.2656	2 7/8	4 1/8	60017	16.85	60117	19.30
	H	.2660	2 7/8	4 1/8	60408	18.75	60508	21.75
	I	.2720	2 7/8	4 1/8	60409	18.40	60509	21.25
	J	.2770	2 7/8	4 1/8	60410	18.75	60510	21.75
	K	.2810	2 15/16	4 1/4	60411	18.75	60511	21.75
9/32		.2812	2 15/16	4 1/4	60018	17.85	60118	20.70
	L	.2900	2 15/16	4 1/4	60412	18.75	60512	21.75
	M	.2950	3 1/16	4 3/8	60413	20.65	60513	24.05
19/64		.2969	3 1/16	4 3/8	60019	19.75	60119	22.90
	N	.3020	3 1/16	4 3/8	60414	20.20	60514	23.50
5/16		.3125	3 3/16	4 1/2	60020	19.35	60120	22.45
	O	.3160	3 3/16	4 1/2	60415	19.90	60515	23.00
	P	.3230	3 5/16	4 5/8	60416	21.20	60516	24.55
21/64		.3281	3 5/16	4 5/8	60021	20.50	60121	23.85
	Q	.3320	3 7/16	4 3/4	60417	21.60	60517	25.20
	R	.3390	3 7/16	4 3/4	60418	21.20	60518	24.55
11/32		.3438	3 7/16	4 3/4	60022	20.50	60122	23.85
	S	.3480	3 1/2	4 7/8	60419	22.80	60519	26.50
	T	.3580	3 1/2	4 7/8	60420	23.25	60520	27.10
23/64		.3594	3 1/2	4 7/8	60023	21.85	60123	25.40
	U	.3680	3 5/8	5	60421	22.35	60521	25.95
3/8		.3750	3 5/8	5	60024	21.85	60124	25.40
	V	.3770	3 5/8	5	60422	22.80	60522	26.50
	W	.3860	3 3/4	5 1/8	60423	25.05	60523	29.00
25/64		.3906	3 3/4	5 1/8	60025	23.75	60125	27.65
	X	.3970	3 3/4	5 1/8	60424	24.00	60524	27.80
	Y	.4040	3 7/8	5 1/4	60425	25.05	60525	29.00
13/32		.4062	3 7/8	5 1/4	60026	23.75	60126	27.65
	Z	.4130	3 7/8	5 1/4	60426	27.70	60526	32.05
27/64		.4219	3 15/16	5 3/8	60027	25.85	60127	30.00
7/16		.4375	4 1/16	5 1/2	60028	25.85	60128	30.00
29/64		.4531	4 3/16	5 5/8	60029	29.70	60129	34.40
15/32		.4688	4 5/16	5 3/4	60030	29.05	60130	33.65
31/64		.4844	4 3/8	5 7/8	60031	32.50	60131	37.70
1/2		.5000	4 1/2	6	60032	35.70	60132	37.70
33/64		.5156	4 13/16	6 5/8	60033	46.55	60133	54.05
17/32		.5312	4 13/16	6 5/8	60034	46.55	60134	54.05
35/64		.5469	4 13/16	6 5/8	60035	46.95	60135	54.50
9/16		.5625	4 13/16	6 5/8	60036	46.95	60136	54.50
37/64		.5781	4 13/16	6 5/8	60037	51.85	60137	60.25
19/32		.5938	5 3/16	7 1/8	60038	50.40	60138	58.55
39/64		.6094	5 3/16	7 1/8	60039	59.60	60139	69.15
5/8		.6250	5 3/16	7 1/8	60040	57.15	60140	66.25
41/64		.6406	5 3/16	7 1/8	60041	65.90	60141	76.55
21/32		.6562	5 3/16	7 1/8	60042	58.10	60142	67.40
43/64		.6719	5 5/8	7 5/8	60043	75.60	60143	87.80
11/16		.6875	5 5/8	7 5/8	60044	59.20	60144	68.70
45/64		.7031	5 5/8	7 5/8	60045	69.15	60145	76.95
23/32		.7188	5 5/8	7 5/8	60046	69.90	60146	77.70
47/64		.7344	5 5/8	7 5/8	60047	70.30	60147	78.10
3/4		.7500	5 13/16	8	60048	71.35	60148	79.30
-	-	-	-	-	-	-	-	-

*Solid carbide

DRILLS

JOBBERS LENGTH DRILLS
CARBIDE TIPPED TYPES 600 & 601 METRIC

MATERIAL SPECIFIC

118° STANDARD OR 135° SPLIT POINT

MODIFICATIONS (Prompt delivery)
- Modified tool diameter
- Modified metric tool diameter
- Modified point and/or angle
- Reduced shank diameter
- Flats on shank
- Tanged shank
- 4 coatings available (see list on pg. 125)

TOOL DIAMETER		LENGTH				TYPE 600 - 118° PT.		TYPE 601 - 135° PT.	
		FLUTE		OVERALL		METRIC	METRIC	METRIC	METRIC
mm	INCH	mm	INCH	mm	INCH	EDP NO.	PRICE	EDP NO.	PRICE
3.0	.1181	41	1 5/8	70	2 3/4	600030	$15.30	601030	$15.65
3.1	.1220	41	1 5/8	70	2 3/4	600031	16.00	601031	16.20
3.2	.1260	41	1 5/8	70	2 3/4	600032	16.00	601032	16.20
3.3	.1299	44	1 3/4	73	2 7/8	600033	16.00	601033	16.20
3.4	.1339	44	1 3/4	73	2 7/8	600034	16.00	601034	16.20
3.5	.1378	44	1 3/4	73	2 7/8	600035	14.80	601035	15.30
3.6	.1417	48	1 7/8	76	3	600036	15.30	601036	15.65
3.7	.1457	48	1 7/8	76	3	600037	15.30	601037	15.65
3.8	.1496	48	1 7/8	76	3	600038	15.30	601038	15.65
3.9	.1535	51	2	79	3 1/8	600039	15.30	601039	15.65
4.0	.1575	54	2 1/8	83	3 1/4	600040	14.40	601040	14.80
4.1	.1614	54	2 1/8	83	3 1/4	600041	13.90	601041	15.80
4.2	.1654	54	2 1/8	83	3 1/4	600042	14.80	601042	15.80
4.3	.1693	54	2 1/8	83	3 1/4	600043	14.80	601043	15.80
4.4	.1732	56	2 3/16	86	3 3/8	600044	14.80	601044	15.80
4.5	.1772	56	2 3/16	86	3 3/8	600045	15.30	601045	15.80
4.6	.1811	56	2 3/16	86	3 3/8	600046	16.70	601046	16.90
4.7	.1850	59	2 5/16	89	3 1/2	60213	14.15	60313	14.95
4.8	.1890	59	2 5/16	89	3 1/2	60212	14.80	60312	15.65
4.9	.1929	62	2 7/16	92	3 5/8	600049	16.70	601049	16.90
5.0	.1969	62	2 7/16	92	3 5/8	600050	16.00	601050	16.50
5.1	.2008	62	2 7/16	92	3 5/8	600051	17.40	601051	17.65
5.2	.2047	64	2 1/2	95	3 3/4	600052	17.40	601052	17.65
5.3	.2087	64	2 1/2	95	3 3/4	600053	17.40	601053	17.65
5.4	.2126	64	2 1/2	95	3 3/4	600054	17.40	601054	17.65
5.5	.2165	64	2 1/2	95	3 3/4	600055	17.00	601055	17.15
5.6	.2205	67	2 5/8	98	3 7/8	600056	17.85	601056	18.20
5.7	.2244	67	2 5/8	98	3 7/8	600057	17.85	601057	18.20
5.8	.2283	67	2 5/8	98	3 7/8	600058	17.85	601058	18.20
5.9	.2323	67	2 5/8	98	3 7/8	600059	17.85	601059	18.20
6.0	.2362	70	2 3/4	102	4	600060	17.65	601060	18.65
6.1	.2402	70	2 3/4	102	4	600061	18.65	601061	19.15
6.2	.2441	70	2 3/4	102	4	600062	18.65	601062	19.15
6.3	.2480	70	2 3/4	102	4	600063	18.65	601063	19.15
6.4	.2520	73	2 7/8	105	4 1/8	600064	18.65	601064	19.15
6.5	.2559	73	2 7/8	105	4 1/8	600065	18.25	601065	18.65
6.6	.2598	73	2 7/8	105	4 1/8	600066	19.50	601066	21.85
6.7	.2638	73	2 7/8	105	4 1/8	600067	19.50	601067	21.85
6.8	.2677	73	2 7/8	105	4 1/8	600068	19.50	601068	21.85
6.9	.2717	73	2 7/8	105	4 1/8	600069	19.50	601069	21.85
7.0	.2756	73	2 7/8	105	4 1/8	600070	19.10	601070	21.85
7.1	.2795	75	2 15/16	108	4 1/4	600071	20.00	601071	21.85
7.2	.2835	75	2 15/16	108	4 1/4	600072	20.00	601072	21.85
7.3	.2874	75	2 15/16	108	4 1/4	600073	20.00	601073	21.85
7.4	.2913	78	3 1/16	111	4 3/8	600074	20.00	601074	23.65
7.5	.2953	78	3 1/16	111	4 3/8	600075	20.00	601075	23.65
7.6	.2992	78	3 1/16	111	4 3/8	600076	20.95	601076	23.65
7.7	.3031	81	3 3/16	114	4 1/2	600077	20.95	601077	23.65
7.8	.3071	81	3 3/16	114	4 1/2	600078	20.95	601078	23.65
7.9	.3110	81	3 3/16	114	4 1/2	600079	20.95	601079	23.65
8.0	.3150	81	3 3/16	114	4 1/2	600080	20.45	601080	23.65
8.1	.3189	84	3 5/16	117	4 5/8	600081	22.35	601081	25.20
8.2	.3228	84	3 5/16	117	4 5/8	600082	22.35	601082	25.20
8.3	.3268	84	3 5/16	117	4 5/8	600083	22.35	601083	25.20
8.4	.3307	87	3 7/16	121	4 3/4	600084	22.35	601084	25.20
8.5	.3346	87	3 7/16	121	4 3/4	600085	21.40	601085	25.20
8.6	.3386	87	3 7/16	121	4 3/4	600086	22.35	601086	25.20
8.7	.3425	87	3 7/16	121	4 3/4	600087	$22.35	601087	$25.20
8.8	.3465	89	3 1/2	124	4 7/8	600088	22.35	601088	25.20
8.9	.3504	89	3 1/2	124	4 7/8	600089	22.35	601089	26.80
9.0	.3543	89	3 1/2	124	4 7/8	600090	21.85	601090	26.80
9.1	.3583	89	3 1/2	124	4 7/8	600091	24.20	601091	26.80
9.2	.3622	92	3 5/8	127	5	600092	24.20	601092	26.80
9.3	.3661	92	3 5/8	127	5	600093	24.20	601093	26.80
9.4	.3701	92	3 5/8	127	5	600094	24.20	601094	26.80
9.5	.3740	92	3 5/8	127	5	600095	23.75	601095	26.80
9.6	.3780	95	3 3/4	130	5 1/8	600096	24.60	601096	29.20
9.7	.3819	95	3 3/4	130	5 1/8	600097	24.60	601097	29.20
9.8	.3858	95	3 3/4	130	5 1/8	600098	24.60	601098	29.20
9.9	.3898	95	3 3/4	130	5 1/8	600099	24.60	601099	29.20
10.0	.3937	95	3 3/4	130	5 1/8	600100	24.60	601100	29.20
10.1	.3976	98	3 7/8	133	5 1/4	600101	29.30	601101	30.10
10.2	.4016	98	3 7/8	133	5 1/4	600102	29.30	601102	30.10
10.3	.4055	98	3 7/8	133	5 1/4	600103	29.30	601103	30.10
10.4	.4094	98	3 7/8	133	5 1/4	600104	29.30	601104	31.60
10.5	.4134	98	3 7/8	133	5 1/4	600105	28.35	601105	31.60
10.6	.4173	100	3 15/16	137	5 3/8	600106	32.10	601106	32.70
10.7	.4213	100	3 15/16	137	5 3/8	600107	32.10	601107	32.70
10.8	.4252	103	4 1/16	140	5 1/2	600108	32.10	601108	32.70
10.9	.4291	103	4 1/16	140	5 1/2	600109	32.10	601109	32.70
11.0	.4331	103	4 1/16	140	5 1/2	600110	30.75	601110	31.60
11.1	.4370	103	4 1/16	140	5 1/2	600111	35.85	601111	36.40
11.2	.4409	106	4 3/16	143	5 5/8	600112	35.85	601112	36.70
11.3	.4449	106	4 3/16	143	5 5/8	600113	35.85	601113	36.70
11.4	.4488	106	4 3/16	143	5 5/8	600114	35.85	601114	35.60
11.5	.4528	106	4 3/16	143	5 5/8	600115	34.45	601115	35.60
11.6	.4567	110	4 5/16	146	5 3/4	600116	39.05	601116	39.65
11.7	.4606	110	4 5/16	146	5 3/4	600117	39.05	601117	39.65
11.8	.4646	110	4 5/16	146	5 3/4	600118	39.05	601118	39.65
11.9	.4685	110	4 5/16	146	5 3/4	600119	39.05	601119	39.65
12.0	.4724	111	4 3/8	149	5 7/8	600120	37.30	601120	39.85
12.1	.4764	111	4 3/8	149	5 7/8	600121	40.60	601121	41.20
12.2	.4803	111	4 3/8	149	5 7/8	600122	40.60	601122	41.20
12.3	.4843	111	4 3/8	149	5 7/8	600123	40.60	601123	41.20
12.4	.4882	114	4 1/2	152	6	600124	40.60	601124	41.20
12.5	.4921	114	4 1/2	152	6	600125	38.70	601125	39.85
12.6	.4961	114	4 1/2	152	6	600126	42.05	601126	42.55
12.7	.5000	114	4 1/2	152	6	60032	35.70	60132	37.70
12.8	.5039	114	4 1/2	152	6	600128	46.10	601128	58.70
12.9	.5079	114	4 1/2	152	6	600129	46.10	601129	58.70
13.0	.5118	114	4 1/2	152	6	600130	46.10	601130	58.70
13.5	.5315	122	4 13/16	168	6 5/8	600135	59.70	601135	64.40
14.0	.5512	122	4 13/16	168	6 5/8	600140	63.30	601140	68.25
14.5	.5709	122	4 13/16	168	6 5/8	600145	67.85	601145	73.35
15.0	.5906	132	5 3/16	181	7 1/8	600150	67.85	601150	73.35
15.5	.6102	132	5 3/16	181	7 1/8	600155	68.75	601155	74.25
16.0	.6299	132	5 3/16	181	7 1/8	600160	70.00	601160	75.60
16.5	.6496	132	5 3/16	181	7 1/8	600165	70.00	601165	75.60
17.0	.6693	143	5 5/8	194	7 5/8	600170	72.70	601170	78.55
17.5	.6890	143	5 5/8	194	7 5/8	600175	72.70	601175	78.55
18.0	.7087	143	5 5/8	194	7 5/8	600180	73.55	601180	79.30
18.5	.7283	143	5 5/8	194	7 5/8	600185	73.95	601185	79.80
19.0	.7480	148	5 13/16	203	8	600190	74.90	601190	80.95

JOBBERS LENGTH DRILLS - TANGED CARBIDE TIPPED TYPES 690 & 691 FRACTIONAL

MATERIAL SPECIFIC

118° STANDARD OR 135° SPLIT POINT

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	690
	40	NON-FERROUS - SHORT CHIPS	690/691
	60	CAST IRONS	691/690
	80	LOW STRENGTH STEELS	CALL US
	100	MEDIUM STRENGTH STEELS	CALL US
	120	HIGH STRENGTH STEELS	CALL US
	140	HIGH TEMPERATURE ALLOYS	CALL US

TYPE 690 – 118° STANDARD POINT

- Tanged jobbers length - 118° standard point
- Detailed specifications on page 112

TYPE 691 – 135° SPLIT POINT

- Same as Type 690 above, except with 135° split point designed for drilling tough abrasive or high tensile materials

USE:

- For use in ASA split sleeve drill drivers

MODIFICATIONS (See list on page 125)

NOTE: For lower priced jobbers length drills without tang (Types 600 & 601), see pages 122 & 123.

TOOL DIAMETER			LENGTH		TYPE 690 - 118° PT.		TYPE 691 - 135° PT.	
FRAC.	WIRE/ LTR.	DEC. EQUIV.	FLUTE	OVER-ALL	EDP NO.	PRICE	EDP NO.	PRICE
1/8		.1250	1 5/8	2 3/4	69008	$13.65	69108	$16.05
	30	.1285	1 5/8	2 3/4	69230	14.05	69330	16.30
	29	.1360	1 3/4	2 7/8	69229	14.50	69329	16.75
	28	.1405	1 3/4	2 7/8	69228	14.65	69328	17.10
9/64		.1406	1 3/4	2 7/8	69009	14.85	69109	17.40
	27	.1440	1 7/8	3	69227	15.05	69327	17.55
	26	.1470	1 7/8	3	69226	14.00	69326	16.30
	25	.1495	1 7/8	3	69225	14.00	69325	16.30
	24	.1520	2	3 1/8	69224	15.05	69324	17.55
	23	.1540	2	3 1/8	69223	14.65	69323	17.10
5/32		.1562	2	3 1/8	69010	14.60	69110	17.10
	22	.1570	2	3 1/8	69222	16.25	69322	18.85
	21	.1590	2 1/8	3 1/4	69221	15.50	69321	18.00
	20	.1610	2 1/8	3 1/4	69220	15.90	69320	18.50
	19	.1660	2 1/8	3 1/4	69219	15.90	69319	18.50
	18	.1695	2 1/8	3 1/4	69218	15.90	69318	18.50
11/64		.1719	2 1/8	3 1/4	69011	15.90	69111	18.50
	17	.1730	2 3/16	3 3/8	69217	15.90	69317	18.50
	16	.1770	2 3/16	3 3/8	69216	15.50	69316	18.00
	15	.1800	2 3/16	3 3/8	69215	16.25	69315	18.85
	14	.1820	2 3/16	3 3/8	69214	15.50	69314	18.00
	13	.1850	2 5/16	3 1/2	69213	17.10	69313	18.00
3/16		.1875	2 5/16	3 1/2	69012	15.50	69112	18.00
	12	.1890	2 5/16	3 1/2	69212	17.80	69312	18.85
	11	.1910	2 5/16	3 1/2	69211	16.50	69311	19.05
	10	.1935	2 7/16	3 5/8	69210	16.25	69310	18.85
	9	.1960	2 7/16	3 5/8	69209	16.50	69309	19.05
	8	.1990	2 7/16	3 5/8	69208	16.50	69308	19.05
	7	.2010	2 7/16	3 5/8	69207	16.50	69307	19.05
13/64		.2031	2 7/16	3 5/8	69013	17.00	69113	19.65
	6	.2040	2 1/2	3 3/4	69206	16.80	69306	19.60
	5	.2055	2 1/2	3 3/4	69205	17.05	69305	19.05
	4	.2090	2 1/2	3 3/4	69204	16.80	69304	19.60
	3	.2130	2 1/2	3 3/4	69203	17.05	69303	19.05
7/32		.2188	2 1/2	3 3/4	69014	17.00	69114	19.75
	2	.2210	2 5/8	3 7/8	69202	17.70	69302	20.50
	1	.2280	2 5/8	3 7/8	69201	17.50	69301	20.25
	A	.2340	2 5/8	3 7/8	69401	19.30	69501	22.30
15/64		.2344	2 5/8	3 7/8	69015	18.30	69115	21.30
	B	.2380	2 3/4	4	69402	19.30	69502	22.30
	C	.2420	2 3/4	4	69403	19.30	69503	22.30
	D	.2460	2 3/4	4	69404	18.80	69504	21.85
1/4	E	.2500	2 3/4	4	69016	18.30	69116	21.30
	F	.2570	2 7/8	4 1/8	69406	21.60	69506	25.25
	G	.2610	2 7/8	4 1/8	69407	22.20	69507	25.65
17/64		.2656	2 7/8	4 1/8	69017	20.35	69117	23.25
	H	.2660	2 7/8	4 1/8	69408	22.65	69508	26.30
	I	.2720	2 7/8	4 1/8	69409	22.20	69509	25.65

TOOL DIAMETER			LENGTH		TYPE 690 - 118° PT.		TYPE 691 - 135° PT.	
FRAC.	LTR.	DEC. EQUIV.	FLUTE	OVER-ALL	EDP NO.	PRICE	EDP NO.	PRICE
	J	.2770	2 7/8	4 1/8	69410	$22.65	69510	$26.30
	K	.2810	2 15/16	4 1/4	69411	22.65	69511	26.30
9/32		.2812	2 15/16	4 1/4	69018	21.55	69118	24.95
	L	.2900	2 15/16	4 1/4	69412	22.65	69512	26.30
	M	.2950	3 1/16	4 3/8	69413	24.90	69513	29.05
19/64		.2969	3 1/16	4 3/8	69019	23.95	69119	27.65
	N	.3020	3 1/16	4 3/8	69414	24.40	69514	28.40
5/16		.3125	3 3/16	4 1/2	69020	23.35	69120	27.15
	O	.3160	3 3/16	4 1/2	69415	24.00	69515	27.70
	P	.3230	3 5/16	4 5/8	69416	25.60	69516	29.70
21/64		.3281	3 5/16	4 5/8	69021	24.75	69121	28.85
	Q	.3320	3 7/16	4 3/4	69417	26.20	69517	30.35
	R	.3390	3 7/16	4 3/4	69418	25.60	69518	29.70
11/32		.3438	3 7/16	4 3/4	69022	24.75	69122	28.85
	S	.3480	3 1/2	4 7/8	69419	27.55	69519	32.05
	T	.3580	3 1/2	4 7/8	69420	28.10	69520	32.65
23/64		.3594	3 1/2	4 7/8	69023	26.40	69123	30.70
	U	.3680	3 5/8	5	69421	27.10	69521	31.30
3/8		.3750	3 5/8	5	69024	26.40	69124	30.70
	V	.3770	3 5/8	5	69422	27.55	69522	32.05
	W	.3860	3 3/4	5 1/8	69423	30.25	69523	35.00
25/64		.3906	3 3/4	5 1/8	69025	28.65	69125	33.40
	X	.3970	3 3/4	5 1/8	69424	28.95	69524	33.55
	Y	.4040	3 7/8	5 1/4	69425	30.25	69525	35.00
13/32		.4062	3 7/8	5 1/4	69026	28.65	69126	33.40
	Z	.4130	3 7/8	5 1/4	69426	33.45	69526	38.75
27/64		.4219	3 15/16	5 3/8	69027	31.20	69127	36.25
7/16		.4375	4 1/16	5 1/2	69028	31.20	69128	36.25
29/64		.4531	4 3/16	5 5/8	69029	35.80	69129	41.50
15/32		.4688	4 5/16	5 3/4	69030	35.15	69130	40.60
31/64		.4844	4 3/8	5 7/8	69031	39.20	69131	45.55
1/2		.5000	4 1/2	6	69032	43.15	69132	45.55
33/64		.5156	4 13/16	6 5/8	69033	56.15	69133	65.25
17/32		.5312	4 13/16	6 5/8	69034	56.15	69134	65.25
35/64		.5469	4 13/16	6 5/8	69035	56.70	69135	65.90
9/16		.5625	4 13/16	6 5/8	69036	56.70	69136	65.90
37/64		.5781	4 13/16	6 5/8	69037	62.60	69137	72.75
19/32		.5938	5 3/16	7 1/8	69038	60.95	69138	70.70
39/64		.6094	5 3/16	7 1/8	69039	71.95	69139	83.55
5/8		.6250	5 3/16	7 1/8	69040	69.00	69140	80.00
41/64		.6406	5 3/16	7 1/8	69041	79.60	69141	92.40
21/32		.6562	5 3/16	7 1/8	69042	70.10	69142	81.40
43/64		.6719	5 5/8	7 5/8	69043	91.35	69143	106.00
11/16		.6875	5 5/8	7 5/8	69044	71.50	69144	82.90
45/64		.7031	5 5/8	7 5/8	69045	83.60	69145	92.95
23/32		.7188	5 5/8	7 5/8	69046	84.45	69146	93.75
47/64		.7344	5 5/8	7 5/8	69047	84.85	69147	94.40
3/4		.7500	5 13/16	8	69048	86.30	69148	95.75

JOBBERS LENGTH DRILLS – TANGED CARBIDE TIPPED TYPES 690 & 691 METRIC

MATERIAL SPECIFIC

118° STANDARD OR 135° SPLIT POINT

MODIFICATIONS (Prompt delivery)

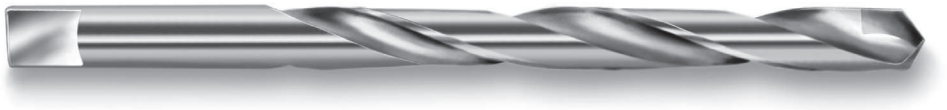
- Modified tool diameter
- Modified metric tool diameter
- Modified point and/or angle
- Reduced shank diameter
- Coatings available:

TITANIUM NITRIDE – TiN

TITANIUM CARBONITRIDE – TiCN

ZIRCONIUM NITRIDE – ZrN

AL TITANIUM NITRIDE – AlTiN



TOOL DIAMETER		LENGTH				TYPE 690 - 118° PT.		TYPE 691 - 135° PT.	
		FLUTE		OVERALL		METRIC	METRIC	METRIC	METRIC
mm	INCH	mm	INCH	mm	INCH	EDP NO.	PRICE	EDP NO.	PRICE
3.2	.1260	41	1 5/8	70	2 3/4	690032	$19.40	691032	$19.60
3.3	.1299	44	1 3/4	73	2 7/8	690033	19.40	691033	19.60
3.4	.1339	44	1 3/4	73	2 7/8	690034	19.40	691034	19.60
3.5	.1378	44	1 3/4	73	2 7/8	690035	17.80	691035	18.50
3.6	.1417	48	1 7/8	76	3	690036	18.55	691036	18.85
3.7	.1457	48	1 7/8	76	3	690037	18.55	691037	18.85
3.8	.1496	48	1 7/8	76	3	690038	18.55	691038	18.85
3.9	.1535	51	2	79	3 1/8	690039	18.55	691039	18.85
4.0	.1575	54	2 1/8	83	3 1/4	690040	17.50	691040	17.90
4.1	.1614	54	2 1/8	83	3 1/4	690041	16.75	691041	19.05
4.2	.1654	54	2 1/8	83	3 1/4	690042	17.80	691042	19.05
4.3	.1693	54	2 1/8	83	3 1/4	690043	17.80	691043	19.05
4.4	.1732	56	2 3/16	86	3 3/8	690044	17.80	691044	19.05
4.5	.1772	56	2 3/16	86	3 3/8	690045	18.55	691045	19.05
4.6	.1811	56	2 3/16	86	3 3/8	690046	20.20	691046	20.40
4.7	.1850	59	2 5/16	89	3 1/2	69213	17.10	69313	18.00
4.8	.1890	59	2 5/16	89	3 1/2	69212	17.80	69312	18.85
4.9	.1929	62	2 7/16	92	3 5/8	690049	20.20	691049	20.40
5.0	.1969	62	2 7/16	92	3 5/8	690050	19.35	691050	19.90
5.1	.2008	62	2 7/16	92	3 5/8	690051	20.95	691051	21.30
5.2	.2047	64	2 1/2	95	3 3/4	690052	20.95	691052	21.30
5.3	.2087	64	2 1/2	95	3 3/4	690053	20.95	691053	21.30
5.4	.2126	64	2 1/2	95	3 3/4	690054	20.95	691054	21.30
5.5	.2165	64	2 1/2	95	3 3/4	690055	20.45	691055	20.80
5.6	.2205	67	2 5/8	98	3 7/8	690056	21.55	691056	22.05
5.7	.2244	67	2 5/8	98	3 7/8	690057	21.55	691057	22.05
5.8	.2283	67	2 5/8	98	3 7/8	690058	21.55	691058	22.05
5.9	.2323	67	2 5/8	98	3 7/8	690059	21.55	691059	22.05
6.0	.2362	70	2 3/4	102	4	690060	21.30	691060	22.50
6.1	.2402	70	2 3/4	102	4	690061	22.50	691061	23.15
6.2	.2441	70	2 3/4	102	4	690062	22.50	691062	23.15
6.3	.2480	70	2 3/4	102	4	690063	22.50	691063	23.15
6.4	.2520	73	2 7/8	105	4 1/8	690064	22.50	691064	23.15
6.5	.2559	73	2 7/8	105	4 1/8	690065	22.15	691065	22.50
6.6	.2598	73	2 7/8	105	4 1/8	690066	23.55	691066	26.45
6.7	.2638	73	2 7/8	105	4 1/8	690067	23.55	691067	26.45
6.8	.2677	73	2 7/8	105	4 1/8	690068	23.55	691068	26.45
6.9	.2717	73	2 7/8	105	4 1/8	690069	23.55	691069	26.45
7.0	.2756	73	2 7/8	105	4 1/8	690070	23.05	691070	26.45
7.1	.2795	75	2 15/16	108	4 1/4	690071	24.15	691071	26.45
7.2	.2835	75	2 15/16	108	4 1/4	690072	24.15	691072	26.45
7.3	.2874	75	2 15/16	108	4 1/4	690073	24.15	691073	26.45
7.4	.2913	78	3 1/16	111	4 3/8	690074	24.15	691074	28.55
7.5	.2953	78	3 1/16	111	4 3/8	690075	24.15	691075	28.55
7.6	.2992	78	3 1/16	111	4 3/8	690076	25.35	691076	28.55
7.7	.3031	81	3 3/16	114	4 1/2	690077	25.35	691077	28.55
7.8	.3071	81	3 3/16	114	4 1/2	690078	25.35	691078	28.55
7.9	.3110	81	3 3/16	114	4 1/2	690079	25.35	691079	28.55
8.0	.3150	81	3 3/16	114	4 1/2	690080	24.75	691080	28.55
8.1	.3189	84	3 5/16	117	4 5/8	690081	27.00	691081	30.35
8.2	.3228	84	3 5/16	117	4 5/8	690082	27.00	691082	30.35
8.3	.3268	84	3 5/16	117	4 5/8	690083	27.00	691083	30.35
8.4	.3307	87	3 7/16	121	4 3/4	690084	$27.00	691084	$30.35
8.5	.3346	87	3 7/16	121	4 3/4	690085	25.80	691085	30.35
8.6	.3386	87	3 7/16	121	4 3/4	690086	27.00	691086	30.35
8.7	.3425	87	3 7/16	121	4 3/4	690087	27.00	691087	30.35
8.8	.3465	89	3 1/2	124	4 7/8	690088	27.00	691088	30.35
8.9	.3504	89	3 1/2	124	4 7/8	690089	27.00	691089	32.30
9.0	.3543	89	3 1/2	124	4 7/8	690090	26.40	691090	32.30
9.1	.3583	89	3 1/2	124	4 7/8	690091	29.25	691091	32.30
9.2	.3622	92	3 5/8	127	5	690092	29.25	691092	32.30
9.3	.3661	92	3 5/8	127	5	690093	29.25	691093	32.30
9.4	.3701	92	3 5/8	127	5	690094	29.25	691094	32.30
9.5	.3740	92	3 5/8	127	5	690095	28.65	691095	32.30
9.6	.3780	95	3 3/4	130	5 1/8	690096	29.75	691096	35.30
9.7	.3819	95	3 3/4	130	5 1/8	690097	29.75	691097	35.30
9.8	.3858	95	3 3/4	130	5 1/8	690098	29.75	691098	35.30
9.9	.3898	95	3 3/4	130	5 1/8	690099	29.75	691099	35.30
10.0	.3937	95	3 3/4	130	5 1/8	690100	29.75	691100	35.30
10.1	.3976	98	3 7/8	133	5 1/4	690101	35.35	691101	36.30
10.2	.4016	98	3 7/8	133	5 1/4	690102	35.35	691102	36.30
10.3	.4055	98	3 7/8	133	5 1/4	690103	35.35	691103	36.30
10.4	.4094	98	3 7/8	133	5 1/4	690104	35.40	691104	38.10
10.5	.4134	98	3 7/8	133	5 1/4	690105	34.30	691105	38.10
10.6	.4173	100	3 15/16	137	5 3/8	690106	38.90	691106	39.45
10.7	.4213	100	3 15/16	137	5 3/8	690107	38.90	691107	39.45
10.8	.4252	103	4 1/16	140	5 1/2	690108	38.90	691108	39.45
10.9	.4291	103	4 1/16	140	5 1/2	690109	38.90	691109	39.45
11.0	.4331	103	4 1/16	140	5 1/2	690110	37.10	691110	38.10
11.1	.4370	103	4 1/16	140	5 1/2	690111	43.25	691111	43.90
11.2	.4409	106	4 3/16	143	5 5/8	690112	43.30	691112	44.30
11.3	.4449	106	4 3/16	143	5 5/8	690113	43.30	691113	44.30
11.4	.4488	106	4 3/16	143	5 5/8	690114	43.25	691114	43.00
11.5	.4528	106	4 3/16	143	5 5/8	690115	41.55	691115	43.00
11.6	.4567	110	4 5/16	146	5 3/4	690116	47.00	691116	47.85
11.7	.4606	110	4 5/16	146	5 3/4	690117	47.00	691117	47.85
11.8	.4646	110	4 5/16	146	5 3/4	690118	47.00	691118	47.85
11.9	.4685	110	4 5/16	146	5 3/4	690119	47.00	691119	47.85
12.0	.4724	111	4 3/8	149	5 7/8	690120	45.05	691120	48.10
12.5	.4921	114	4 1/2	152	6	690125	46.75	691125	48.10
13.0	.5118	114	4 1/2	152	6	690130	55.70	691130	70.95
13.5	.5315	122	4 13/16	168	6 5/8	690135	72.05	691135	77.75
14.0	.5512	122	4 13/16	168	6 5/8	690140	76.45	691140	82.40
14.5	.5709	122	4 13/16	168	6 5/8	690145	81.95	691145	88.60
15.0	.5906	132	5 3/16	181	7 1/8	690150	81.95	691150	88.60
15.5	.6102	132	5 3/16	181	7 1/8	690155	83.05	691155	89.70
16.0	.6299	132	5 3/16	181	7 1/8	690160	84.55	691160	91.25
16.5	.6496	132	5 3/16	181	7 1/8	690165	84.55	691165	91.25
17.0	.6693	143	5 5/8	194	7 5/8	690170	87.75	691170	94.90
17.5	.6890	143	5 5/8	194	7 5/8	690175	87.75	691175	94.90
18.0	.7087	143	5 5/8	194	7 5/8	690180	88.70	691180	95.75
18.5	.7283	143	5 5/8	194	7 5/8	690185	89.25	691185	96.35
19.0	.7480	148	5 13/16	203	8	690190	90.40	691190	97.75

DRILLS

JOBBERS LENGTH DRILLS
SOLID CARBIDE TYPE 860 FRACTIONAL

GENERAL PURPOSE

118° SPLIT POINT

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	860
	40	NON-FERROUS - SHORT CHIPS	860
	60	CAST IRONS	860
	80	LOW STRENGTH STEELS	860
	100	MEDIUM STRENGTH STEELS	860
	120	HIGH STRENGTH STEELS	860
	140	HIGH TEMPERATURE ALLOYS	CALL US

TYPE 860 – 118° SPLIT POINT

- Sold Carbide Jobbers Length
- 20-25° Helix - 118° Split Point
- Chisel Point Centrality is within .001"

USE:

- For general purpose drilling of aluminum, plastics, other non-ferrous materials, cast iron, and steels.

MODIFICATIONS (Prompt delivery)

- Coatings available:

TITANIUM NITRIDE – TiN

TITANIUM CARBONITRIDE – TiCN

ZIRCONIUM NITRIDE – ZrN

AL TITANIUM NITRIDE – AlTiN

Lip Height TIV: plus .0015", minus .0015"
Included angle tolerance: plus 2°, minus 2°
Tool diameter tolerance: plus .0000", minus .0005"

DRILLS

NOTE: For carbide tipped jobbers length drills (Types 600 & 601), see pages 122 & 123.

TOOL DIAMETER			LENGTH		TYPE 860 - 118°	
FRAC.	WIRE	DEC. EQUIV.	FLT.	OVER-ALL	EDP NO.	PRICE
	60	.0400	¾	1 ½	8600400	$11.90
	59	.0410	¾	1 ½	8600410	11.90
	58	.0420	¾	1 ½	8600420	11.90
	57	.0430	¾	1 ½	8600430	11.90
	56	.0465	¾	1 ½	8600465	11.90
3/64		.0469	¾	1 ½	86003	11.90
	55	.0520	¾	1 ½	8600520	11.90
	54	.0550	¾	1 ½	8600550	11.90
	53	.0595	¾	1 ½	8600595	11.90
1/16		.0625	¾	1 ½	86004	11.25
	52	.0635	¾	1 ½	8600635	11.90
	51	.0670	¾	1 ½	8600670	11.90
	50	.0700	⅞	1 ¾	8600700	12.20
	49	.0730	⅞	1 ¾	8600730	12.50
	48	.0760	⅞	1 ¾	8600760	12.65
5/64		.0781	⅞	1 ¾	86005	12.45
	47	.0785	⅞	1 ¾	8600785	12.65
	46	.0810	⅞	1 ¾	8600810	12.65
	45	.0820	⅞	1 ¾	8600820	12.95
	44	.0860	1	2	8600860	13.40
	43	.0890	1	2	8600890	13.40
	42	.0935	1	2	8600935	13.45
3/32		.0938	1	2	86006	12.90
	41	.0960	1	2	8600960	13.50
	40	.0980	1	2	8600980	13.60
	39	.0995	1 ¼	2 ¼	8600995	13.80
	38	.1015	1 ¼	2 ¼	8601015	13.80
	37	.1040	1 ¼	2 ¼	8601040	13.80
	36	.1065	1 ¼	2 ¼	8601065	13.80
7/64		.1094	1 ¼	2 ¼	86007	14.10
	35	.1100	1 ¼	2 ¼	8601100	14.10
	34	.1110	1 ¼	2 ¼	8601110	14.45
	33	.1130	1 ¼	2 ¼	8601130	14.45
	32	.1160	1 ¼	2 ¼	8601160	14.80
	31	.1200	1 ¼	2 ¼	8601200	15.05
1/8		.1250	1 ¼	2 ¼	86008	14.65
	30	.1285	1 ¼	2 ¼	8601285	15.65
	29	.1360	1 ⅜	2 ½	8601360	15.80
	28	.1405	1 ⅜	2 ½	8601405	16.20
9/64		.1406	1 ⅜	2 ½	86009	17.40

TOOL DIAMETER			LENGTH		TYPE 860 - 118°	
FRAC.	WIRE LTR.	DEC. EQUIV.	FLT.	OVER-ALL	EDP NO.	PRICE
	27	.1440	1 ⅜	2 ½	8601440	$16.85
	26	.1470	1 ⅜	2 ½	8601470	17.15
	25	.1495	1 ⅜	2 ½	8601495	17.30
	24	.1520	1 ⅜	2 ½	8601520	17.75
	23	.1540	1 ⅜	2 ½	8601540	18.45
5/32		.1562	1 ⅜	2 ½	86010	18.20
	22	.1570	1 ⅜	2 ½	8601570	19.60
	21	.1590	1 ⅜	2 ½	8601590	19.80
	20	.1610	1 ⅜	2 ½	8601610	20.00
	19	.1660	1 ⅝	2 ¾	8601660	20.80
	18	.1695	1 ⅝	2 ¾	8601695	20.95
11/64		.1719	1 ⅝	2 ¾	86011	21.35
	17	.1730	1 ⅝	2 ¾	8601730	21.35
	16	.1770	1 ⅝	2 ¾	8601770	21.75
	15	.1800	1 ⅝	2 ¾	8601800	21.90
	14	.1820	1 ⅝	2 ¾	8601820	21.80
	13	.1850	1 ⅝	2 ¾	8601850	22.25
3/16		.1875	1 ⅝	2 ¾	86012	21.40
	12	.1890	1 ⅝	2 ¾	8601890	22.60
	11	.1910	1 ⅝	2 ¾	8601910	23.00
	10	.1935	1 ⅝	2 ¾	8601935	23.35
	9	.1960	1 ¾	3	8601960	23.85
	8	.1990	1 ¾	3	8601990	24.50
	7	.2010	1 ¾	3	8602010	24.75
13/64		.2031	1 ¾	3	86013	26.10
	6	.2040	1 ¾	3	8602040	25.75
	5	.2055	1 ¾	3	8602055	26.10
	4	.2090	1 ¾	3	8602090	26.75
	3	.2130	1 ¾	3	8602130	27.50
7/32		.2188	1 ¾	3	86014	27.00
	2	.2210	1 ¾	3	8602210	28.55
	1	.2280	1 ¾	3	8602280	30.05
	A	.2340	2	3 ¼	8602340	33.35
15/64		.2344	2	3 ¼	86015	29.95
	B	.2380	2	3 ¼	8602380	34.20
	C	.2420	2	3 ¼	8602420	34.30
	D	.2460	2	3 ¼	8602460	35.25
¼	E	.2500	2	3 ¼	86016	30.55
	F	.2570	2	3 ¼	8602570	37.40
	G	.2610	2 ⅛	3 ½	8602610	38.00

TOOL DIAMETER			LENGTH		TYPE 860 - 118°	
FRAC.	LTR.	DEC. EQUIV.	FLT.	OVER-ALL	EDP NO.	PRICE
17/64		.2656	2 ⅛	3 ½	86017	$33.40
	H	.2660	2 ⅛	3 ½	8602660	39.05
	I	.2720	2 ⅛	3 ½	8602720	39.85
	J	.2770	2 ⅛	3 ½	8602770	40.80
	K	.2810	2 ⅛	3 ½	8602810	41.15
9/32		.2812	2 ⅛	3 ½	86018	36.05
	L	.2900	2 ⅛	3 ½	8602900	43.15
	M	.2950	2 ⅜	3 ¾	8602950	44.65
19/64		.2969	2 ⅜	3 ¾	86019	41.00
	N	.3020	2 ⅜	3 ¾	8603020	47.30
5/16		.3125	2 ⅜	3 ¾	86020	43.55
	O	.3160	2 ⅜	3 ¾	8603160	50.10
	P	.3230	2 ⅜	3 ¾	8603230	51.70
21/64		.3281	2 ½	4	86021	47.50
	Q	.3320	2 ½	4	8603320	54.85
	R	.3390	2 ½	4	8603390	56.60
11/32		.3438	2 ½	4	86022	52.65
	S	.3480	2 ½	4	8603480	62.15
	T	.3580	2 ¾	4 ¼	8603580	64.40
23/64		.3594	2 ¾	4 ¼	86023	57.45
	U	.3680	2 ¾	4 ¼	8603680	65.65
3/8		.3750	2 ¾	4 ¼	86024	62.35
	V	.3770	2 ¾	4 ¼	8603770	72.45
	W	.3860	2 ⅞	4 ½	8603860	76.85
25/64		.3906	2 ⅞	4 ½	86025	70.50
	X	.3970	2 ⅞	4 ½	8603970	83.15
	Y	.4040	2 ⅞	4 ½	8604040	82.50
13/32		.4062	2 ⅞	4 ½	86026	78.20
	Z	.4130	2 ⅞	4 ½	8604130	91.10
27/64		.4219	2 ⅞	4 ½	86027	85.55
7/16		.4375	2 ⅞	4 ½	86028	92.65
29/64		.4531	3	4 ¾	86029	100.40
15/32		.4688	3	4 ¾	86030	108.05
31/64		.4844	3	4 ¾	86031	111.25
½		.5000	3	4 ¾	86032	114.05
9/16		.5625	3 ¼	5	86036	209.70
5/8		.6250	3 ¼	5	86040	253.40
¾		.7500	3 ¾	6	86048	307.45
-	-	-	-	-	-	-
-	-	-	-	-	-	-

*Smaller sizes available. Call for pricing.

JOBBERS LENGTH DRILLS
SOLID CARBIDE TYPE 860 METRIC

GENERAL PURPOSE

118° SPLIT POINT

MODIFICATIONS (Prompt delivery)

- Coatings available:

TITANIUM NITRIDE – TiN

TITANIUM CARBONITRIDE – TiCN

ZIRCONIUM NITRIDE – ZrN

AL TITANIUM NITRIDE – AlTiN

TYPE 860 – 118° SPLIT POINT

- Solid Carbide Jobber Length
- 20-25° Helix - 118° Split Point
- Chisel Point Centrality is within .001"

USE:

- For general purpose drilling of aluminum, plastics, other non-ferrous materials, cast iron, and steels.

Lip Height TIV: plus .0015", minus .0015"
Included angle tolerance: plus 2°, minus 2°
Tool diameter tolerance: plus .0000", minus .0005"

NOTE: For carbide tipped jobbers length drills (Types 600 & 601), see pages 122 & 123.

TOOL DIAMETER		LENGTH		TYPE 860 - 118° PT.	
		FLT.	OAL	METRIC EDP NO.	METRIC PRICE
mm	INCH	mm	mm		
1.0	.0394	16	38	860010	$14.25
1.1	.0433	19	38	860011	17.55
1.2	.0472	19	38	860012	17.70
1.3	.0512	19	38	860013	18.05
1.4	.0551	19	38	860014	18.35
1.5	.0591	19	38	860015	14.20
1.6	.0630	19	38	860016	17.65
1.7	.0669	19	38	860017	17.90
1.8	.0709	22	44	860018	18.15
1.9	.0748	22	44	860019	18.35
2.0	.0787	22	44	860020	15.10
2.1	.0827	22	44	860021	14.80
2.2	.0866	25	50	860022	14.80
2.3	.0906	25	50	860023	15.10
2.4	.0945	25	50	860024	15.30
2.5	.0984	25	50	860025	15.55
2.6	.1024	31	57	860026	16.60
2.7	.1063	31	57	860027	16.60
2.8	.1102	31	57	860028	16.85
2.9	.1142	31	57	860029	17.50
3.0	.1181	32	57	860030	17.30
3.1	.1220	31	57	860031	17.90
3.2	.1260	31	57	860032	18.20
3.3	.1299	31	57	860033	18.35
3.4	.1339	34	63	860034	18.35
3.5	.1378	35	63	860035	18.20
3.6	.1417	34	63	860036	18.75
3.7	.1457	34	63	860037	19.55
3.8	.1496	34	63	860038	20.40
3.9	.1535	34	63	860039	21.25
4.0	.1575	35	63	860040	21.75
4.1	.1614	34	63	860041	22.40
4.2	.1654	41	70	860042	23.00
4.3	.1693	41	70	860043	23.30
4.4	.1732	41	70	860044	23.75
4.5	.1772	41	70	860045	24.05
4.6	.1811	41	70	860046	24.60
4.7	.1850	41	70	860047	24.75
4.8	.1890	41	70	860048	25.60
4.9	.1929	41	70	860049	26.40
5.0	.1969	44	75	860050	26.80
5.1	.2008	44	76	860051	28.40
5.2	.2047	44	76	860052	28.80
5.3	.2087	44	76	860053	30.05

TOOL DIAMETER		LENGTH		TYPE 860 - 118° PT.	
		FLT.	OAL	METRIC EDP NO.	METRIC PRICE
mm	INCH	mm	mm		
5.4	.2126	44	76	860054	$30.75
5.5	.2165	44	75	860055	30.25
5.6	.2205	44	76	860056	32.10
5.7	.2244	44	76	860057	32.05
5.8	.2283	44	76	860058	32.70
5.9	.2323	51	82	860059	34.05
6.0	.2362	50	82	860060	33.55
6.1	.2402	51	82	860061	36.25
6.2	.2441	51	82	860062	37.00
6.3	.2480	51	82	860063	37.85
6.4	.2520	51	82	860064	42.55
6.5	.2559	50	82	860065	39.80
6.6	.2598	54	89	860066	39.90
6.7	.2638	54	89	860067	38.95
6.8	.2677	54	89	860068	41.10
6.9	.2717	54	89	860069	41.90
7.0	.2756	54	89	860070	44.50
7.1	.2795	54	89	860071	43.05
7.2	.2835	54	89	860072	45.45
7.3	.2874	54	89	860073	47.65
7.4	.2913	60	95	860074	48.60
7.5	.2953	60	95	860075	48.60
7.6	.2992	60	95	860076	49.80
7.7	.3031	60	95	860077	50.35
7.8	.3071	60	95	860078	53.15
7.9	.3110	60	95	860079	53.15
8.0	.3150	60	95	860080	49.40
8.1	.3189	60	95	860081	54.10
8.2	.3228	60	95	860082	54.85
8.3	.3268	63	101	860083	56.80
8.4	.3307	63	101	860084	57.70
8.5	.3346	63	100	860085	58.60
8.6	.3386	63	101	860086	59.60
8.7	.3425	63	101	860087	60.25
8.8	.3465	63	101	860088	62.65
8.9	.3504	63	101	860089	64.65
9.0	.3543	70	100	860090	66.75
9.1	.3583	70	108	860091	68.80
9.2	.3622	70	108	860092	68.80
9.3	.3661	70	108	860093	71.30
9.4	.3701	70	108	860094	73.00
9.5	.3740	70	108	860095	69.05
9.6	.3780	70	108	860096	76.80
9.7	.3819	70	108	860097	79.10

TOOL DIAMETER		LENGTH		TYPE 860 - 118° PT.	
		FLT.	OAL	METRIC EDP NO.	METRIC PRICE
mm	INCH	mm	mm		
9.8	.3858	70	108	860098	$82.25
9.9	.3900	73	114	860099	84.10
10.0	.3937	73	114	860100	82.15
10.1	.3976	73	114	860101	87.70
10.2	.4016	73	114	860102	89.70
10.3	.4055	73	114	860103	93.25
10.4	.4094	73	114	860104	95.50
10.5	.4134	73	114	860105	94.00
10.6	.4173	73	114	860106	99.85
10.7	.4213	73	114	860107	102.15
10.8	.4252	73	114	860108	105.80
10.9	.4291	73	114	860109	107.60
11.0	.4331	73	114	860110	104.90
11.1	.4370	73	114	860111	111.10
11.2	.4409	76	120	860112	112.30
11.3	.4449	76	120	860113	116.00
11.4	.4488	76	120	860114	117.90
11.5	.4528	76	120	860115	114.55
11.6	.4567	76	120	860116	121.65
11.7	.4606	76	120	860117	123.45
11.8	.4646	76	120	860118	127.10
11.9	.4685	76	120	860119	129.00
12.0	.4724	76	120	860120	121.80
12.1	.4764	76	120	860121	130.85
12.2	.4803	76	120	860122	131.70
12.3	.4843	76	120	860123	133.40
12.4	.4882	76	120	860124	134.45
12.5	.4921	76	120	860125	135.30
12.6	.4961	76	120	860126	136.25
12.7	.5000	76	120	860127	137.65
13.0	.5118	82	127	860130	161.15
13.5	.5315	82	127	860135	211.75
14.0	.5512	82	127	860140	202.95
14.5	.5709	82	127	860145	262.00
15.0	.5906	82	127	860150	250.70
15.5	.6102	82	127	860155	250.70
16.0	.6299	82	127	860160	226.85
16.5	.6496	89	140	860165	340.20
17.0	.6693	89	140	860170	340.20
17.5	.6890	89	140	860175	316.35
18.0	.7087	89	140	860180	393.95
18.5	.7283	89	140	860185	393.95
19.0	.7480	95	152	860190	370.05
-	-	-	-	-	-

TAPER LENGTH DRILLS CARBIDE TIPPED TYPES 630 & 631 FRACTIONAL

MATERIAL SPECIFIC

118° STANDARD OR 135° SPLIT POINT

USE:

- The longer length of these drills increases their effective reach through drill bushings
- For use in ASA split sleeve drill drivers

TYPE 630 – 118° STANDARD POINT

- Tanged, straight shank, taper length
- Longer flute and overall lengths than jobbers length drills
- Detailed specifications on page 112

TYPE 631 – 135° SPLIT POINT

- Same as Type 630 above, except with 135° split point designed for drilling tough abrasive or high tensile materials

TOOL SELECTOR BOX (Shown on page 129)

MODIFICATIONS (See list on page 125)

TOOL DIAMETER			LENGTH		TYPE 630 - 118° PT.		TYPE 631 - 135° PT.	
FRAC.	WIRE/ LTR.	DEC. EQUIV.	FLUTE	OVER-ALL	EDP NO.	PRICE	EDP NO.	PRICE
1/8		.1250	2 3/4	5 1/8	63008	$15.30	63108	$19.05
	30	.1285	3	5 3/8	63230	21.35	63330	23.05
	29	.1360	3	5 3/8	63229	21.35	63329	23.05
	28	.1405	3	5 3/8	63228	21.35	63328	23.05
9/64		.1406	3	5 3/8	63009	17.65	63109	20.10
	27	.1440	3	5 3/8	63227	21.35	63327	23.05
	26	.1470	3	5 3/8	63226	21.35	63326	23.05
	25	.1495	3	5 3/8	63225	21.35	63325	23.05
	24	.1520	3	5 3/8	63224	21.35	63324	23.05
	23	.1540	3	5 3/8	63223	21.35	63323	23.05
5/32		.1562	3	5 3/8	63010	16.20	63110	20.10
	22	.1570	3 3/8	5 3/4	63222	22.15	63322	23.95
	21	.1590	3 3/8	5 3/4	63221	22.15	63321	23.95
	20	.1610	3 3/8	5 3/4	63220	22.15	63320	23.95
	19	.1660	3 3/8	5 3/4	63219	22.15	63319	23.95
	18	.1695	3 3/8	5 3/4	63218	22.15	63318	23.95
11/64		.1719	3 3/8	5 3/4	63011	16.50	63111	20.85
	17	.1730	3 3/8	5 3/4	63217	22.15	63317	23.95
	16	.1770	3 3/8	5 3/4	63216	22.15	63316	23.95
	15	.1800	3 3/8	5 3/4	63215	22.15	63315	23.95
	14	.1820	3 3/8	5 3/4	63214	22.15	63314	23.95
	13	.1850	3 3/8	5 3/4	63213	22.15	63313	23.95
3/16		.1875	3 3/8	5 3/4	63012	16.50	63112	20.85
	12	.1890	3 5/8	6	63212	23.35	63312	25.25
	11	.1910	3 5/8	6	63211	23.35	63311	25.25
	10	.1935	3 5/8	6	63210	23.35	63310	25.25
	9	.1960	3 5/8	6	63209	23.35	63309	25.25
	8	.1990	3 5/8	6	63208	23.35	63308	25.25
	7	.2010	3 5/8	6	63207	23.35	63307	25.25
13/64		.2031	3 5/8	6	63013	17.45	63113	21.95
	6	.2040	3 5/8	6	63206	23.35	63306	25.25
	5	.2055	3 5/8	6	63205	23.35	63305	25.25
	4	.2090	3 5/8	6	63204	23.35	63304	25.25
	3	.2130	3 5/8	6	63203	23.35	63303	25.25
7/32		.2188	3 5/8	6	63014	17.45	63114	21.95
	2	.2210	3 3/4	6 1/8	63202	26.45	63302	28.60
	1	.2280	3 3/4	6 1/8	63201	26.45	63301	28.60
	A	.2340	3 3/4	6 1/8	63401	26.45	63501	28.60
15/64		.2344	3 3/4	6 1/8	63015	19.75	63115	24.80
	B	.2380	3 3/4	6 1/8	63402	26.45	63502	28.60
	C	.2420	3 3/4	6 1/8	63403	26.45	63503	28.60
	D	.2460	3 3/4	6 1/8	63404	26.45	63504	28.60
1/4	E	.2500	3 3/4	6 1/8	63016	19.75	63116	24.80
	F	.2570	3 7/8	6 1/4	63406	29.55	63506	32.00
	G	.2610	3 7/8	6 1/4	63407	29.55	63507	32.00
17/64		.2656	3 7/8	6 1/4	63017	22.15	63117	27.80
	H	.2660	3 7/8	6 1/4	63408	29.55	63508	32.00
	I	.2720	3 7/8	6 1/4	63409	29.55	63509	32.00
	J	.2770	3 7/8	6 1/4	63410	29.55	63510	32.00
	K	.2810	3 7/8	6 1/4	63411	29.55	63511	32.00
9/32		.2812	3 7/8	6 1/4	63018	22.15	63118	27.80
	L	.2900	4	6 3/8	63412	32.05	63512	34.55
	M	.2950	4	6 3/8	63413	32.05	63513	34.55
19/64		.2969	4	6 3/8	63019	23.85	63119	30.05
	N	.3020	4	6 3/8	63414	32.05	63514	34.55
5/16		.3125	4	6 3/8	63020	23.85	63120	30.05
	O	.3160	4 1/8	6 1/2	63415	36.35	63515	39.25
	P	.3230	4 1/8	6 1/2	63416	36.35	63516	39.25
21/64		.3281	4 1/8	6 1/2	63021	26.30	63121	34.20
	Q	.3320	4 1/8	6 1/2	63417	$36.35	63517	$39.25
	R	.3390	4 1/8	6 1/2	63418	36.35	63518	39.25
11/32		.3438	4 1/8	6 1/2	63022	26.30	63122	34.55
	S	.3480	4 1/4	6 3/4	63419	39.75	63519	43.00
	T	.3580	4 1/4	6 3/4	63420	39.75	63520	43.00
23/64		.3594	4 1/4	6 3/4	63023	29.65	63123	37.40
	U	.3680	4 1/4	6 3/4	63421	39.75	63521	43.00
3/8		.3750	4 1/4	6 3/4	63024	29.65	63124	37.40
	V	.3770	4 3/8	7	63422	42.60	63522	46.05
	W	.3860	4 3/8	7	63423	42.60	63523	46.05
25/64		.3906	4 3/8	7	63025	31.80	63125	40.10
	X	.3970	4 3/8	7	63424	42.60	63524	46.05
	Y	.4040	4 3/8	7	63425	42.60	63525	46.05
13/32		.4062	4 3/8	7	63026	31.80	63126	40.10
	Z	.4130	4 5/8	7 1/4	63426	49.10	63526	53.00
27/64		.4219	4 5/8	7 1/4	63027	36.70	63127	46.05
7/16		.4375	4 5/8	7 1/4	63028	36.70	63128	46.05
29/64		.4531	4 3/4	7 1/2	63029	40.40	63129	50.95
15/32		.4688	4 3/4	7 1/2	63030	40.40	63130	50.95
31/64		.4844	4 3/4	7 3/4	63031	42.40	63131	53.35
1/2		.5000	4 3/4	7 3/4	63032	42.40	63132	53.35
33/64		.5156	4 3/4	8	63033	47.65	63133	59.00
17/32		.5312	4 3/4	8	63034	48.70	63134	59.00
35/64		.5469	4 7/8	8 1/4	63035	49.20	63135	62.00
9/16		.5625	4 7/8	8 1/4	63036	49.20	63136	62.00
37/64		.5781	4 7/8	8 3/4	63037	51.85	63137	65.55
19/32		.5938	4 7/8	8 3/4	63038	52.80	63138	65.55
39/64		.6094	4 7/8	8 3/4	63039	59.85	63139	75.40
5/8		.6250	4 7/8	8 3/4	63040	59.85	63140	75.40
41/64		.6406	5 1/8	9	63041	62.05	63141	76.80
21/32		.6562	5 1/8	9	63042	61.00	63142	73.35
43/64		.6719	5 3/8	9 1/4	63043	64.20	63143	77.65
11/16		.6875	5 3/8	9 1/4	63044	62.00	63144	77.65
45/64		.7031	5 5/8	9 1/2	63045	62.65	63145	79.00
23/32		.7188	5 5/8	9 1/2	63046	63.30	63146	79.80
47/64		.7344	5 7/8	9 3/4	63047	63.65	63147	80.30
3/4		.7500	5 7/8	9 3/4	63048	64.65	63148	81.45
49/64		.7656	6	9 7/8	63049	82.15	63149	88.70
25/32		.7812	6	9 7/8	63050	82.15	63150	88.70
51/64		.7969	6 1/8	10	63051	82.45	63151	89.10
13/16		.8125	6 1/8	10	63052	74.55	63152	89.10
53/64		.8281	6 1/8	10	63053	82.45	63153	89.10
27/32		.8438	6 1/8	10	63054	82.45	63154	89.10
55/64		.8594	6 1/8	10	63055	87.30	63155	94.30
7/8		.8750	6 1/8	10	63056	78.90	63156	94.30
57/64		.8906	6 1/8	10	63057	90.25	63157	97.50
29/32		.9062	6 1/8	10	63058	90.25	63158	97.50
59/64		.9219	6 1/8	10 3/4	63059	91.60	63159	98.95
15/16		.9375	6 1/8	10 3/4	63060	82.80	63160	98.95
61/64		.9531	6 3/8	11	63061	95.95	63161	103.55
31/32		.9688	6 3/8	11	63062	95.95	63162	103.55
63/64		.9844	6 3/8	11	63063	98.95	63163	106.80
1		1.0000	6 3/8	11	63064	87.80	63164	106.80

TAPER LENGTH DRILLS
CARBIDE TIPPED TYPES 630 & 631 METRIC

118° STANDARD OR 135° SPLIT POINT

MATERIAL SPECIFIC

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	630
	40	NON-FERROUS - SHORT CHIPS	630/631
	60	CAST IRONS	631/630
	80	LOW STRENGTH STEELS	CALL US
	100	MEDIUM STRENGTH STEELS	CALL US
	120	HIGH STRENGTH STEELS	CALL US
	140	HIGH TEMPERATURE ALLOYS	CALL US

NOTE: Modifications available (see list on page 125).

TOOL DIAMETER		LENGTH				TYPE 630 - 118° PT.		TYPE 631 - 135° PT.	
		FLUTE		OVERALL		METRIC EDP NO.	METRIC PRICE	METRIC EDP NO.	METRIC PRICE
mm	INCH	mm	INCH	mm	INCH				
3.2	.1260	76	3	137	5 3/8	630032	$19.70	631032	$21.25
3.3	.1299	76	3	137	5 3/8	630033	19.70	631033	21.25
3.4	.1339	76	3	137	5 3/8	630034	19.70	631034	21.25
3.5	.1378	76	3	137	5 3/8	630035	19.10	631035	20.80
3.6	.1417	76	3	137	5 3/8	630036	19.10	631036	20.80
3.7	.1457	76	3	137	5 3/8	630037	19.10	631037	20.80
3.8	.1496	76	3	137	5 3/8	630038	19.10	631038	20.80
3.9	.1535	76	3	137	5 3/8	630039	19.10	631039	20.80
4.0	.1575	86	3 3/8	146	5 3/4	630040	18.70	631040	20.25
4.1	.1614	86	3 3/8	146	5 3/4	630041	19.70	631041	21.25
4.2	.1654	86	3 3/8	146	5 3/4	630042	19.70	631042	21.25
4.3	.1693	86	3 3/8	146	5 3/4	630043	19.70	631043	21.25
4.4	.1732	86	3 3/8	146	5 3/4	630044	20.80	631044	22.35
4.5	.1772	86	3 3/8	146	5 3/4	630045	20.80	631045	22.35
4.6	.1811	86	3 3/8	146	5 3/4	630046	20.80	631046	22.35
4.7	.1850	86	3 3/8	146	5 3/4	63213	22.15	63313	23.95
4.8	.1890	92	3 5/8	152	6	63212	23.35	63312	25.25
4.9	.1929	92	3 5/8	152	6	630049	20.80	631049	22.35
5.0	.1969	92	3 5/8	152	6	630050	20.70	631050	22.35
5.1	.2008	92	3 5/8	152	6	630051	21.55	631051	23.30
5.2	.2047	92	3 5/8	152	6	630052	18.50	631052	23.30
5.3	.2087	92	3 5/8	152	6	630053	21.55	631053	23.30
5.4	.2126	92	3 5/8	152	6	630054	21.55	631054	23.30
5.5	.2165	92	3 5/8	152	6	630055	22.10	631055	23.30
5.6	.2205	95	3 3/4	156	6 1/8	630056	21.55	631056	23.30
5.7	.2244	95	3 3/4	156	6 1/8	630057	21.55	631057	23.30
5.8	.2283	95	3 3/4	156	6 1/8	630058	21.55	631058	23.30
5.9	.2323	95	3 3/4	156	6 1/8	630059	22.45	631059	24.35
6.0	.2362	95	3 3/4	156	6 1/8	630060	22.90	631060	25.30
6.1	.2402	95	3 3/4	156	6 1/8	630061	23.95	631061	25.80
6.2	.2441	95	3 3/4	156	6 1/8	630062	23.95	631062	25.80
6.3	.2480	95	3 3/4	156	6 1/8	630063	23.95	631063	25.80
6.4	.2520	98	3 7/8	159	6 1/4	630064	26.30	631064	28.40
6.5	.2559	98	3 7/8	159	6 1/4	630065	23.75	631065	28.40
6.6	.2598	98	3 7/8	159	6 1/4	630066	27.10	631066	29.15
6.7	.2638	98	3 7/8	159	6 1/4	630067	27.10	631067	29.15
6.8	.2677	98	3 7/8	159	6 1/4	630068	27.10	631068	29.15
6.9	.2717	98	3 7/8	159	6 1/4	630069	27.10	631069	29.15
7.0	.2756	98	3 7/8	159	6 1/4	630070	24.75	631070	28.40
7.1	.2795	98	3 7/8	159	6 1/4	630071	27.10	631071	29.15
7.2	.2835	102	4	162	6 3/8	630072	27.10	631072	29.15
7.3	.2874	102	4	162	6 3/8	630073	27.10	631073	29.15
7.4	.2913	102	4	162	6 3/8	630074	27.10	631074	29.15
7.5	.2953	102	4	162	6 3/8	630075	26.25	631075	30.70
7.6	.2992	102	4	162	6 3/8	630076	28.40	631076	30.70
7.7	.3031	102	4	162	6 3/8	630077	28.40	631077	30.70
7.8	.3071	102	4	162	6 3/8	630078	28.40	631078	30.70
7.9	.3110	102	4	162	6 3/8	630079	28.40	631079	30.70
8.0	.3150	105	4 1/8	165	6 1/2	630080	26.60	631080	30.70
8.1	.3189	105	4 1/8	165	6 1/2	630081	28.40	631081	30.70
8.2	.3228	105	4 1/8	165	6 1/2	630082	30.25	631082	32.60
8.3	.3268	105	4 1/8	165	6 1/2	630083	30.25	631083	32.60
8.4	.3307	105	4 1/8	165	6 1/2	630084	30.25	631084	32.60
8.5	.3346	105	4 1/8	165	6 1/2	630085	27.90	631085	34.75
8.6	.3386	105	4 1/8	165	6 1/2	630086	32.20	631086	34.75
8.7	.3425	105	4 1/8	165	6 1/2	630087	32.20	631087	34.75
8.8	.3465	108	4 1/4	171	6 3/4	630088	$32.20	631088	$34.75
8.9	.3504	108	4 1/4	171	6 3/4	630089	32.20	631089	34.75
9.0	.3543	108	4 1/4	171	6 3/4	630090	30.15	631090	38.15
9.1	.3583	108	4 1/4	171	6 3/4	630091	35.30	631091	38.15
9.2	.3622	108	4 1/4	171	6 3/4	630092	35.30	631092	38.15
9.3	.3661	108	4 1/4	171	6 3/4	630093	35.30	631093	38.15
9.4	.3701	108	4 1/4	171	6 3/4	630094	35.30	631094	38.15
9.5	.3740	108	4 1/4	171	6 3/4	630095	30.90	631095	38.15
9.6	.3780	111	4 3/8	178	7	630096	37.05	631096	40.00
9.7	.3819	111	4 3/8	178	7	630097	37.05	631097	40.00
9.8	.3858	111	4 3/8	178	7	630098	37.05	631098	40.00
9.9	.3898	111	4 3/8	178	7	630099	37.05	631099	40.00
10.0	.3937	111	4 3/8	178	7	630100	32.45	631100	40.95
10.1	.3976	111	4 3/8	178	7	630101	37.90	631101	40.95
10.2	.4016	111	4 3/8	178	7	630102	39.55	631102	42.70
10.3	.4055	111	4 3/8	178	7	630103	39.55	631103	42.70
10.4	.4094	117	4 5/8	184	7 1/4	630104	41.30	631104	44.50
10.5	.4134	117	4 5/8	184	7 1/4	630105	36.95	631105	44.50
10.6	.4173	117	4 5/8	184	7 1/4	630106	43.25	631106	46.75
10.7	.4213	117	4 5/8	184	7 1/4	630107	43.25	631107	46.75
10.8	.4252	117	4 5/8	184	7 1/4	630108	43.25	631108	46.75
10.9	.4291	117	4 5/8	184	7 1/4	630109	43.25	631109	46.75
11.0	.4331	117	4 5/8	184	7 1/4	630110	39.95	631110	46.95
11.5	.4528	121	4 3/4	190	7 1/2	630115	44.85	631115	51.95
12.0	.4724	121	4 3/4	197	7 3/4	630120	48.50	631120	54.45
12.5	.4921	121	4 3/4	197	7 3/4	630125	50.25	631125	54.45
13.0	.5118	121	4 3/4	203	8	630130	51.50	631130	57.45
13.5	.5315	121	4 3/4	203	8	630135	54.70	631135	57.45
14.0	.5512	124	4 7/8	210	8 1/4	630140	58.10	631140	63.65
14.5	.5709	124	4 7/8	222	8 3/4	630145	62.35	631145	68.15
15.0	.5906	124	4 7/8	222	8 3/4	630150	62.35	631150	68.15
15.5	.6102	124	4 7/8	222	8 3/4	630155	70.65	631155	77.45
16.0	.6299	130	5 1/8	229	9	630160	70.65	631160	77.85
16.5	.6496	130	5 1/8	229	9	630165	75.45	631165	77.85
17.0	.6693	137	5 3/8	235	9 1/4	630170	73.20	631170	80.30
17.5	.6890	143	5 5/8	241	9 1/2	630175	73.20	631175	80.30
18.0	.7087	143	5 5/8	241	9 1/2	630180	74.80	631180	81.90
18.5	.7283	149	5 7/8	248	9 3/4	630185	76.45	631185	83.60
19.0	.7480	149	5 7/8	248	9 3/4	630190	76.45	631190	83.60
19.5	.7677	152	6	251	9 7/8	630195	92.15	631195	99.50
20.0	.7874	156	6 1/8	254	10	630200	92.55	631200	99.95
20.5	.8071	156	6 1/8	254	10	630205	92.55	631205	99.95
21.0	.8268	156	6 1/8	254	10	630210	92.55	631210	99.95
21.5	.8465	156	6 1/8	254	10	630215	92.55	631215	99.95
22.0	.8661	156	6 1/8	254	10	630220	97.95	631220	105.75
22.5	.8858	156	6 1/8	254	10	630225	101.35	631225	109.40
23.0	.9055	156	6 1/8	254	10	630230	101.35	631230	109.40
23.5	.9252	156	6 1/8	273	10 3/4	630235	102.75	631235	111.00
24.0	.9449	162	6 3/8	279	11	630240	107.60	631240	116.25
24.5	.9646	162	6 3/8	279	11	630245	107.60	631245	116.25
25.0	.9843	162	6 3/8	279	11	630250	111.00	631250	119.90

TAPER SHANK DRILLS
CARBIDE TIPPED TYPES 660 & 661 FRACTIONAL

118° STANDARD OR 135° SPLIT POINT

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	660
	40	NON-FERROUS - SHORT CHIPS	660/661
	60	CAST IRONS	661/660
	80	LOW STRENGTH STEELS	CALL US
	100	MEDIUM STRENGTH STEELS	CALL US
	120	HIGH STRENGTH STEELS	CALL US
	140	HIGH TEMPERATURE ALLOYS	CALL US

TYPE 660 – 118° STANDARD POINT
- Standard taper shank
- Heavy duty construction
- Detailed specifications on page 112

TYPE 661 – 135° SPLIT POINT
- Same as Type 660 above, except with 135° split point designed for drilling abrasive or high tensile materials

MODIFICATIONS (Prompt delivery)
- Modified tool diameter
- Modified metric tool diameter
- Modified point and/or angle
- Shank whistle notch for set screw
- Coatings available:

TITANIUM NITRIDE – TiN

TITANIUM CARBONITRIDE – TiCN

ZIRCONIUM NITRIDE – ZrN

AL TITANIUM NITRIDE – AlTiN

DRILLS

NOTE: For extra long flute length with 118° standard point, see pg. 132.
For stocked smaller taper shank with 118° standard point, see pg. 131.

TOOL DIAMETER		LENGTH		TAPER SHANK NO.	TYPE 660 118° PT.		TYPE 661 135° PT.	
FRAC.	DEC.	FLUTE	OVER-ALL		EDP NO.	PRICE	EDP NO.	PRICE
1/4	.2500	2 7/8	6 1/8	1	66016	$38.50	66116	$43.65
17/64	.2656	3	6 1/4	1	66017	CALL US	66117	CALL US
9/32	.2812	3	6 1/4	1	66018	CALL US	66118	CALL US
19/64	.2969	3 1/8	6 3/8	1	66019	CALL US	66119	CALL US
5/16	.3125	3 1/8	6 3/8	1	66020	39.40	66120	44.65
21/64	.3281	3 1/4	6 1/2	1	66021	50.15	66121	56.65
11/32	.3438	3 1/4	6 1/2	1	66022	50.15	66122	56.65
23/64	.3594	3 1/2	6 3/4	1	66023	50.15	66123	56.65
3/8	.3750	3 1/2	6 3/4	1	66024	50.15	66124	56.65
25/64	.3906	3 5/8	7	1	66025	58.00	66125	65.75
13/32	.4062	3 5/8	7	1	66026	58.00	66126	65.75
27/64	.4219	3 7/8	7 1/4	1	66027	58.00	66127	65.75
7/16	.4375	3 7/8	7 1/4	1	66028	50.75	66128	57.55
29/64	.4531	4 1/8	7 1/2	1	66029	61.65	66129	69.90
15/32	.4688	4 1/8	7 1/2	1	66030	61.65	66130	69.90
31/64	.4844	4 3/8	8 1/4	2	66031	61.65	66131	69.90
1/2	.5000	4 3/8	8 1/4	2	66032	48.50	66132	64.65
33/64	.5156	4 5/8	8 1/2	2	66033	62.65	66133	75.20
17/32	.5312	4 5/8	8 1/2	2	66034	51.20	66134	66.50
35/64	.5469	4 7/8	8 3/4	2	66035	63.55	66135	76.25
9/16	.5625	4 7/8	8 3/4	2	66036	51.60	66136	67.40
37/64	.5781	4 7/8	8 3/4	2	66037	66.50	66137	79.85
19/32	.5938	4 7/8	8 3/4	2	66038	56.95	66138	74.60
39/64	.6094	4 7/8	8 3/4	2	66039	77.05	66139	92.50
5/8	.6250	4 7/8	8 3/4	2	66040	62.75	66140	81.65
41/64	.6406	5 1/8	9	2	66041	78.30	66141	93.95
21/32	.6562	5 1/8	9	2	66042	61.15	66142	83.05
43/64	.6719	5 3/8	9 1/4	2	66043	79.20	66143	95.15
11/16	.6875	5 3/8	9 1/4	2	66044	63.10	66144	84.05
45/64	.7031	5 5/8	9 1/2	2	66045	81.40	66145	97.65
23/32	.7188	5 5/8	9 1/2	2	66046	70.15	66146	93.65
47/64	.7344	5 7/8	9 3/4	2	66047	83.00	66147	99.65
3/4	.7500	5 7/8	9 3/4	2	66048	71.80	66148	90.60
49/64	.7656	6	9 7/8	2	66049	88.30	66149	106.00
25/32	.7812	6	9 7/8	2	66050	85.50	66150	105.95
51/64	.7969	6 1/8	10 3/4	3	66051	89.20	66151	107.05
13/16	.8125	6 1/8	10 3/4	3	66052	86.45	66152	107.10
53/64	.8281	6 1/8	10 3/4	3	66053	96.75	66153	116.15
27/32	.8438	6 1/8	10 3/4	3	66054	88.25	66154	107.10
55/64	.8594	6 1/8	10 3/4	3	66055	CALL US	66155	CALL US

TOOL DIAMETER		LENGTH		TAPER SHANK NO.	TYPE 660 118° PT.		TYPE 661 135° PT.	
FRAC.	DEC.	FLUTE	OVER-ALL		EDP NO.	PRICE	EDP NO.	PRICE
7/8	.8750	6 1/8	10 3/4	3	66056	$93.85	66156	$113.15
57/64	.8906	6 1/8	10 3/4	3	66057	101.05	66157	121.15
29/32	.9062	6 1/8	10 3/4	3	66058	101.75	66158	117.90
59/64	.9219	6 1/8	10 3/4	3	66059	102.90	66159	123.40
15/16	.9375	6 1/8	10 3/4	3	66060	103.25	66160	114.10
61/64	.9531	6 3/8	11	3	66061	CALL US	66161	CALL US
31/32	.9688	6 3/8	11	3	66062	107.75	66162	124.80
63/64	.9844	6 3/8	11	3	66063	112.75	66163	135.30
1	1.0000	6 3/8	11	3	66064	101.60	66164	122.80
1 1/64	1.0156	6 1/2	11 1/8	3	66065	CALL US	66165	CALL US
1 1/32	1.0312	6 1/2	11 1/8	3	66066	137.05	66166	155.40
1 3/64	1.0469	6 5/8	11 1/4	3	66067	CALL US	66167	CALL US
1 1/16	1.0625	6 5/8	11 1/4	3	66068	131.65	66168	166.85
1 5/64	1.0781	6 7/8	12 1/2	4	66069	CALL US	66169	CALL US
1 3/32	1.0938	6 7/8	12 1/2	4	66070	CALL US	66170	CALL US
1 7/64	1.1094	7 1/8	12 3/4	4	66071	CALL US	66171	CALL US
1 1/8	1.1250	7 1/8	12 3/4	4	66072	145.80	66172	185.05
1 9/64	1.1406	7 1/4	12 7/8	4	66073	CALL US	66173	CALL US
1 5/32	1.1562	7 1/4	12 7/8	4	66074	CALL US	66174	CALL US
1 11/64	1.1719	7 3/8	13	4	66075	CALL US	66175	CALL US
1 3/16	1.1875	7 3/8	13	4	66076	167.05	66176	211.75
1 13/64	1.2031	7 1/2	13 1/8	4	66077	CALL US	66177	CALL US
1 7/32	1.2188	7 1/2	13 1/8	4	66078	CALL US	66178	CALL US
1 15/64	1.2344	7 7/8	13 1/2	4	66079	CALL US	66179	CALL US
1 1/4	1.2500	7 7/8	13 1/2	4	66080	178.75	66180	226.85
1 9/32	1.2812	8 1/2	14 1/8	4	66082	CALL US	66182	CALL US
1 5/16	1.3125	8 5/8	14 1/4	4	66084	252.85	66184	286.40
1 11/32	1.3438	8 3/4	14 3/8	4	66086	CALL US	66186	CALL US
1 3/8	1.3750	8 7/8	14 1/2	4	66088	283.40	66188	321.00
1 13/32	1.4062	9	14 5/8	4	66090	CALL US	66190	CALL US
1 7/16	1.4375	9 1/8	14 3/4	4	66092	CALL US	66192	CALL US
1 15/32	1.4688	9 1/4	14 7/8	4	66094	CALL US	66194	CALL US
1 1/2	1.5000	9 3/8	15	4	66096	310.85	66196	352.25

TAPER SHANK DRILLS CARBIDE TIPPED TYPE 660 METRIC

MATERIAL SPECIFIC

118° STANDARD POINT

NOTE: Modifications available (see list on page 130).

TOOL DIAMETER		LENGTH				TAPER SHANK NO.	TYPE 660 - 118° PT.	
		FLUTE		OVERALL			METRIC EDP NO.	METRIC PRICE
mm	INCH	mm	INCH	mm	INCH			
13.0	.5118	117	4 5/8	216	8 1/2	2	660130	$63.90
13.5	.5315	117	4 5/8	216	8 1/2	2	660135	59.15
14.0	.5512	124	4 7/8	222	8 3/4	2	660140	60.00
14.5	.5709	124	4 7/8	222	8 3/4	2	660145	67.80
15.0	.5906	124	4 7/8	222	8 3/4	2	660150	62.85
15.5	.6102	124	4 7/8	222	8 3/4	2	660155	78.60
16.0	.6299	130	5 1/8	229	9	2	660160	79.85
16.5	.6496	130	5 1/8	229	9	2	660165	74.05
17.0	.6693	137	5 3/8	235	9 1/4	2	660170	80.75
17.5	.6890	143	5 5/8	241	9 1/2	2	660175	83.00
18.0	.7087	143	5 5/8	241	9 1/2	2	660180	76.90
18.5	.7283	149	5 7/8	248	9 3/4	2	660185	84.65
19.0	.7480	149	5 7/8	248	9 3/4	2	660190	78.35
20.0	.7874	156	6 1/8	273	10 3/4	3	660200	90.90
21.0	.8268	156	6 1/8	273	10 3/4	3	660210	90.90
22.0	.8661	156	6 1/8	273	10 3/4	3	660220	89.00
23.0	.9055	156	6 1/8	273	10 3/4	3	660230	91.95
24.0	.9449	162	6 3/8	279	11	3	660240	106.10
25.0	.9843	162	6 3/8	279	11	3	660250	108.85
26.0	1.0236	165	6 1/2	283	11 1/8	3	660260	163.05
28.0	1.1024	181	7 1/8	324	12 3/4	4	660280	180.75
30.0	1.1811	187	7 3/8	330	13	4	660300	217.65
32.0	1.2598	216	8 1/2	359	14 1/8	4	660320	270.30
34.0	1.3386	222	8 3/4	365	14 3/8	4	660340	290.35
36.0	1.4173	232	9 1/8	375	14 3/4	4	660360	332.45
38.0	1.4961	238	9 3/8	381	15	4	660380	345.70

DRILLS

TAPER SHANK DRILLS CARBIDE TIPPED TYPE 668 FRACTIONAL

SMALLER TAPER SHANK NUMBER 118° STANDARD POINT

TYPE 668

- Same as Type 660 on page 130, except taper shank is one number smaller
- Heavy duty construction
- Detailed specifications on page 112

USE:

- For tool holders that require a smaller taper shank

MODIFICATIONS (Prompt delivery)

- Modified tool diameter
- Metric tool diameter
- Modified point and/or angle
- Shank whistle notch for set screw
- Coatings available:

TITANIUM NITRIDE – TiN

TITANIUM CARBONITRIDE – TiCN

ZIRCONIUM NITRIDE – ZrN

AL TITANIUM NITRIDE – AlTiN

While supplies last

TOOL DIAMETER		LENGTH		TAPER SHANK NO.	TYPE 668 118° PT.	
FRACTION	DECIMAL	FLUTE	OVERALL		EDP NO.	PRICE
31/64	.4844	4 3/8	7 3/4	1	66831	$70.50
1/2	.5000	4 3/8	7 3/4	1	66832	55.40
33/64	.5156	4 5/8	8	1	66833	68.35
17/32	.5312	4 5/8	8	1	66834	58.55
35/64	.5469	4 7/8	8 1/4	1	66835	69.30
9/16	.5625	4 7/8	8 1/4	1	66836	59.00
51/64	.7969	6 1/8	10	2	66851	97.30
13/16	.8125	6 1/8	10	2	66852	82.55
53/64	.8281	6 1/8	10	2	66853	97.30
27/32	.8438	6 1/8	10	2	66854	84.30
55/64	.8594	6 1/8	10	2	66855	102.80
7/8	.8750	6 1/8	10	2	66856	89.75
29/32	.9062	6 1/8	10	2	66858	96.45
1 3/32	1.0938	6 7/8	11 1/2	3	66870	204.85
1 1/8	1.1250	7 1/8	11 3/4	3	66872	147.20
1 5/32	1.1562	7 1/4	11 7/8	3	66874	199.80
1 3/16	1.1875	7 3/8	12	3	66876	168.60
1 1/4	1.2500	7 7/8	12 1/2	3	66880	180.40

TAPER SHANK DRILLS CARBIDE TIPPED TYPES 664 & 665 FRACTIONAL

MATERIAL SPECIFIC

EXTRA LONG FLUTE LENGTH: 8" OR 11" 118° STANDARD POINT

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	664 or 665
	40	NON-FERROUS - SHORT CHIPS	664 or 665
	60	CAST IRONS	664 or 665
	80	LOW STRENGTH STEELS	CALL US
	100	MEDIUM STRENGTH STEELS	CALL US
	120	HIGH STRENGTH STEELS	CALL US
	140	HIGH TEMPERATURE ALLOYS	CALL US

TYPE 664 – 8" FLUTE LENGTH – 118° STANDARD POINT
TYPE 665 – 11" FLUTE LENGTH – 118° STANDARD POINT

- Same carbide tipped heavy duty construction as standard flute length taper shank drill (Type 660 on page 130)
- Detailed specifications on page 112

USE:

- The longer flute length of these drills increases their effective reach through drill bushings

MODIFICATIONS (Prompt delivery)

- Modified tool diameter
- Metric tool diameter
- Modified point and/or angle
- Shank whistle notch for set screw
- Coatings available:

TITANIUM NITRIDE – TiN
TITANIUM CARBONITRIDE – TiCN
ZIRCONIUM NITRIDE – ZrN
AL TITANIUM NITRIDE – AlTiN

TYPE 664 – 8" FLUTE LENGTH

TOOL DIAMETER		LENGTH		TAPER SHANK NO.	TYPE 664 – 8" 118° POINT	
FRAC.	DECIMAL	FLUTE	OVERALL		EDP NO.	PRICE
1/2	.5000	8	12	2	66432	$119.65
17/32	.5312	8	12	2	66434	138.35
9/16	.5625	8	12	2	66436	138.35
19/32	.5938	8	12	2	66438	138.35
5/8	.6250	8	12	2	66440	183.15
21/32	.6562	8	12	2	66442	192.25
11/16	.6875	8	12	2	66444	192.25
23/32	.7188	8	12	2	66446	201.95
3/4	.7500	8	12	2	66448	201.95
25/32	.7812	8	12	2	66450	212.00

While supplies last

TYPE 665 – 11" FLUTE LENGTH

TOOL DIAMETER		LENGTH		TAPER SHANK NO.	TYPE 665 – 11" 118° POINT	
FRAC.	DECIMAL	FLUTE	OVERALL		EDP NO.	PRICE
5/8	.6250	11	14 3/4	2	66540	$196.00
21/32	.6562	11	14 3/4	2	66542	205.75
43/64	.6719	11	14 3/4	2	66543	218.10
11/16	.6875	11	14 3/4	2	66544	205.75
23/32	.7188	11	14 3/4	2	66546	216.05
3/4	.7500	11	14 3/4	2	66548	216.05
25/32	.7812	11	14 3/4	2	66550	226.85
13/16	.8125	11	15 1/2	3	66552	247.90
27/32	.8438	11	15 1/2	3	66554	247.90
7/8	.8750	11	15 1/2	3	66556	247.90
29/32	.9062	11	15 1/2	3	66558	302.80
15/16	.9375	11	15 1/2	3	66560	302.80
31/32	.9688	11	15 1/2	3	66562	318.00
1	1.0000	11	15 1/2	3	66564	318.00
1 1/32	1.0312	11	15 1/2	3	66566	327.55
1 1/16	1.0625	11	15 1/2	3	66568	337.35

While supplies last

AIRCRAFT EXTENSION DRILLS CARBIDE TIPPED TYPES 610 & 611 FRACTIONAL

MATERIAL SPECIFIC

135° SPLIT POINT

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	610 or 611
	40	NON-FERROUS - SHORT CHIPS	610 or 611
	60	CAST IRONS	610 or 611
	80	LOW STRENGTH STEELS	CALL US
	100	MEDIUM STRENGTH STEELS	CALL US
	120	HIGH STRENGTH STEELS	CALL US
	140	HIGH TEMPERATURE ALLOYS	CALL US

TYPE 610 – AIRCRAFT EXTENSION DRILLS – 6" OVERALL LENGTH

- 135° split point per NAS 907 specifications
- Detailed specifications on page 112

TYPE 611 – AIRCRAFT EXTENSION DRILLS – 12" OVERALL LENGTH

- Same as Type 610 above, except 12" long

USE (BOTH TYPES):

- For drilling holes not accessible with shorter drills
- Feeds should be light to medium
- Not recommended for deep hole applications

MODIFICATIONS (Prompt delivery)

- Modified tool diameter
- Metric tool diameter
- Shortened shank or reduced shank diameter
- Flat(s) or tang on shank
- Extra long shank
- Coatings available:

TITANIUM NITRIDE – TiN

TITANIUM CARBONITRIDE – TiCN

ZIRCONIUM NITRIDE – ZrN

AL TITANIUM NITRIDE – AlTiN

DRILLS

TOOL DIAMETER FRAC.	WIRE/ LETTER	DECIMAL EQUIV.	FLUTE LENGTH	TYPE 610 - 6" EDP NO.	TYPE 610 - 6" PRICE	TYPE 611 - 12" EDP NO.	TYPE 611 - 12" PRICE
	32	.1160	1 5/8	61232	$21.55	61332	$25.45
	31	.1200	1 5/8	61231	19.30	61331	22.70
1/8		.1250	1 5/8	61008	14.95	61108	17.65
	30	.1285	1 5/8	61230	20.35	61330	23.95
	29	.1360	1 3/4	61229	21.00	61329	24.70
	28	.1405	1 3/4	61228	21.35	61328	25.20
9/64		.1406	1 3/4	61009	16.25	61109	19.10
	27	.1440	1 7/8	61227	21.85	61327	25.65
	26	.1470	1 7/8	61226	21.35	61326	25.20
	25	.1495	1 7/8	61225	21.35	61325	25.20
	24	.1520	2	61224	21.85	61324	25.65
	23	.1540	2	61223	21.35	61323	25.20
5/32		.1562	2	61010	15.90	61110	18.75
	22	.1570	2	61222	23.35	61322	27.50
	21	.1590	2 1/8	61221	22.65	61321	26.65
	20	.1610	2 1/8	61220	23.20	61320	27.25
	19	.1660	2 1/8	61219	23.20	61319	27.25
	18	.1695	2 1/8	61218	23.20	61318	27.25
11/64		.1719	2 1/8	61011	17.40	61111	20.40
	17	.1730	2 3/16	61217	23.20	61317	27.25
	16	.1770	2 3/16	61216	22.65	61316	26.65
	15	.1800	2 3/16	61215	23.35	61315	27.50
	14	.1820	2 3/16	61214	22.65	61314	26.65
	13	.1850	2 5/16	61213	22.65	61313	26.65
3/16		.1875	2 5/16	61012	16.95	61112	20.00
	12	.1890	2 5/16	61212	23.60	61312	27.75
	11	.1910	2 5/16	61211	23.85	61311	28.15
	10	.1935	2 7/16	61210	23.60	61310	27.75
	9	.1960	2 7/16	61209	23.85	61309	28.15
	8	.1990	2 7/16	61208	23.85	61308	28.15
	7	.2010	2 7/16	61207	23.85	61307	28.15
13/64		.2031	2 7/16	61013	18.60	61113	21.85
	6	.2040	2 1/2	61206	24.55	61306	28.90
	5	.2055	2 1/2	61205	23.85	61305	28.15
	4	.2090	2 1/2	61204	22.45	61304	26.45
	3	.2130	2 1/2	61203	23.85	61303	28.15
7/32		.2188	2 1/2	61014	18.60	61114	21.85
	2	.2210	2 5/8	61202	23.50	61302	27.60
	1	.2280	2 5/8	61201	23.20	61301	27.25
	A	.2340	2 5/8	61401	27.90	61501	32.75
15/64		.2344	2 5/8	61015	20.00	61115	23.55

TOOL DIAMETER FRAC.	LETTER	DECIMAL EQUIV.	FLUTE LENGTH	TYPE 610 - 6" EDP NO.	TYPE 610 - 6" PRICE	TYPE 611 - 12" EDP NO.	TYPE 611 - 12" PRICE
	B	.2380	2 3/4	61402	$27.90	61502	$32.75
	C	.2420	2 3/4	61403	27.90	61503	32.75
	D	.2460	2 3/4	61404	27.40	61504	32.20
1/4	E	.2500	2 3/4	61016	20.00	61116	23.55
	F	.2570	2 7/8	61406	28.60	61506	33.65
	G	.2610	2 7/8	61407	29.25	61507	34.45
17/64		.2656	2 7/8	61017	21.35	61117	25.20
	H	.2660	2 7/8	61408	29.90	61508	35.20
	I	.2720	2 7/8	61409	29.25	61509	34.45
	J	.2770	2 7/8	61410	29.90	61510	35.20
	K	.2810	2 15/16	61411	29.90	61511	35.20
9/32		.2812	2 15/16	61018	21.35	61118	25.20
	L	.2900	2 15/16	61412	29.90	61512	35.20
	M	.2950	3 1/16	61413	32.90	61513	38.75
19/64		.2969	3 1/16	61019	23.20	61119	27.25
	N	.3020	3 1/16	61414	32.20	61514	37.90
5/16		.3125	3 3/16	61020	23.20	61120	27.25
	O	.3160	3 3/16	61415	30.65	61515	36.00
	P	.3230	3 5/16	61416	32.60	61516	38.30
21/64		.3281	3 5/16	61021	24.65	61121	29.05
	Q	.3320	3 7/16	61417	33.45	61517	39.35
	R	.3390	3 7/16	61418	32.60	61518	38.30
11/32		.3438	3 7/16	61022	24.65	61122	29.05
	S	.3480	3 1/2	61419	35.25	61519	41.40
	T	.3580	3 1/2	61420	36.10	61520	42.45
23/64		.3594	3 1/2	61023	26.30	61123	30.85
	U	.3680	3 5/8	61421	34.70	61521	40.90
3/8		.3750	3 5/8	61024	26.30	61124	30.85
	V	.3770	3 5/8	61422	35.25	61522	41.40
	W	.3860	3 3/4	61423	37.80	61523	44.45
25/64		.3906	3 3/4	61025	27.00	61125	31.80
	X	.3970	3 3/4	61424	35.80	61524	42.15
	Y	.4040	3 7/8	61425	37.15	61525	43.65
13/32		.4062	3 7/8	61026	26.60	61126	31.30
	Z	.4130	3 7/8	61426	41.90	61526	49.25
27/64		.4219	3 15/16	61027	29.25	61127	34.45
7/16		.4375	4 1/16	61028	29.25	61128	34.45
29/64		.4531	4 3/16	61029	33.60	61129	39.60
15/32		.4688	4 5/16	61030	32.90	61130	38.75
31/64		.4844	4 3/8	61031	36.95	61131	43.45
1/2		.5000	4 1/2	61032	36.95	61132	43.45

HARD STEEL DIE DRILLS CARBIDE TIPPED

TYPES 670, 671, 672 & 673 FRACTIONAL, 670 & 672 METRIC

MATERIAL SPECIFIC

NEGATIVE OR POSITIVE EDGE 118° OR 140° POINT

TYPE 670 & 671 - NEGATIVE ANGLE CUTTING EDGE

TYPE 672 & 673 - POSITIVE ANGLE CUTTING EDGE

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	60	CAST IRONS	673/672
	80	LOW STRENGTH STEELS	672/673
	100	MEDIUM STRENGTH STEELS (UP TO 50 Rc)	672/673
	100	MEDIUM STRENGTH STEELS (OVER 50 Rc)	670/671
	120	HIGH STRENGTH STEELS (UP TO 50 Rc)	673/672
	120	HIGH STRENGTH STEELS (OVER 50 Rc)	671/670
	140	HIGH TEMPERATURE ALLOYS	673/672

USE:

- For drilling hardened steel in the range of 35 to 65 Rockwell C
- Will cut without annealing the workpiece
- Light feed with steady pressure – clear chips frequently
- Flood the cutting point with coolant

MODIFICATIONS (Prompt delivery)

- Modified tool diameter
- Modified metric tool diameter
- Modified point and/or angle
- Shortened shank or reduced shank diameter
- Reduced shank diameter
- Flat(s) on shank
- Coatings available:

TITANIUM NITRIDE – TiN

TITANIUM CARBONITRIDE – TiCN

ZIRCONIUM NITRIDE – ZrN

AL TITANIUM NITRIDE – AlTiN

NOTE: For stocked reduced shank diameters (Types 670/672), see pg. 136.

TOOL DIAMETER		LENGTH		NEGATIVE EDGE		POSITIVE EDGE		ALL TYPES PRICE
FRAC.	DEC.	FLUTE	OVER-ALL	TYPE 670 118° PT EDP NO.	TYPE 671 140° PT EDP NO.	TYPE 672 118° PT EDP NO.	TYPE 673 140° PT EDP NO.	
* 1/16	.0625	-	1 1/2	67004	67104	-	-	$22.95
* 5/64	.0781	-	1 1/2	67005	67105	-	-	22.95
* 3/32	.0938	-	2	67006	67106	-	-	25.25
* 7/64	.1094	-	2	67007	67107	-	-	25.25
* 1/8	.1250	-	2	67008	67108	-	-	25.95
* 9/64	.1406	-	2	67009	67109	-	-	25.95
* 5/32	.1562	-	2	67010	67110	-	-	27.35
* 11/64	.1719	-	2 3/8	67011	67111	-	-	27.35
3/16	.1875	1 1/2	3 1/2	67012	67112	67212	67312	24.80
13/64	.2031	1 1/2	3 1/2	67013	67113	67213	67313	24.80
7/32	.2188	1 3/4	3 3/4	67014	67114	67214	67314	25.60
15/64	.2344	1 3/4	3 3/4	67015	67115	67215	67315	26.45
1/4	.2500	2	4	67016	67116	67216	67316	26.45
17/64	.2656	2	4	67017	67117	67217	67317	27.95
9/32	.2812	2 1/4	4 1/4	67018	67118	67218	67318	27.95
19/64	.2969	2 1/4	4 1/4	67019	67119	67219	67319	29.25
5/16	.3125	2 1/2	4 1/2	67020	67120	67220	67320	29.25
21/64	.3281	2 1/2	4 1/2	67021	67121	67221	67321	31.15
11/32	.3438	2 3/4	4 3/4	67022	67122	67222	67322	31.15
23/64	.3594	2 3/4	4 3/4	67023	67123	67223	67323	33.50
3/8	.3750	3	5	67024	67124	67224	67324	33.50
25/64	.3906	3	5	67025	67125	67225	67325	37.80
13/32	.4062	3	5 1/4	67026	67126	67226	67326	39.20
27/64	.4219	3	5 1/4	67027	67127	67227	67327	42.35
7/16	.4375	3	5 1/2	67028	67128	67228	67328	45.55
29/64	.4531	3	5 1/2	67029	67129	67229	67329	47.75
15/32	.4688	3 1/4	5 3/4	67030	67130	67230	67330	50.00
31/64	.4844	3 1/4	5 3/4	67031	67131	67231	67331	60.65
1/2	.5000	3 1/2	6	67032	67132	67232	67332	58.65
17/32	.5312	3 1/2	6	67034	67134	67234	67334	67.20
9/16	.5625	3 1/2	6	67036	67136	67236	67336	69.55
19/32	.5938	4	7	67038	67138	67238	67338	73.60
5/8	.6250	4	7	67040	67140	67240	67340	75.85
21/32	.6562	4 1/2	7 1/2	67042	67142	67242	67342	81.20
11/16	.6875	4 1/2	7 1/2	67044	67144	67244	67344	83.35
23/32	.7188	4 3/4	8	67046	67146	67246	67346	87.35
3/4	.7500	4 3/4	8	67048	67148	67248	67348	89.75
25/32	.7812	4 3/4	8	67050	67150	67250	67350	173.30
13/16	.8125	4 3/4	8	67052	67152	67252	67352	160.90
7/8	.8750	4 3/4	8	67056	67156	67256	67356	164.20
15/16	.9375	4 3/4	8	67060	67160	67260	67360	182.90
1	1.0000	4 3/4	8	67064	67164	67264	67364	194.05

*Solid carbide

TYPE 670 – 118° POINT WITH NEGATIVE EDGE

- Die drill - negative angle cutting edge
- Drill body diameter smaller than tool diameter to prevent gauling (see die drill diagrams on page 113)
- Detailed specifications on page 112

TYPE 671 – 140° POINT WITH NEGATIVE EDGE

- Same as Type 670 above, except with 140° point designed for drilling tough abrasive or high tensile materials

TYPE 672 – 118° POINT WITH POSITIVE EDGE

- Die drill - positive angle cutting edge
- Same as Type 670 above, except with thinned web which permits higher feed rates with less spindle power

TYPE 673 – 140° POINT WITH POSITIVE EDGE

- Same as Type 672 above, except with 140° point designed for drilling tough abrasive or high tensile materials

METRIC TOOL DIAMETERS

TOOL DIAMETER		LENGTH				TYPE 670 NEG. 118° PT METRIC EDP NO.	TYPE 672 POS. 118° PT METRIC EDP NO.	BOTH TYPES METRIC PRICE
		FLUTE		OVERALL				
mm	INCH	mm	INCH	mm	INCH			
5.0	.1969	38	1 1/2	89	3 1/2	670050	672050	$25.35
5.5	.2165	45	1 3/4	95	3 3/4	670055	672055	28.20
6.0	.2362	51	2	102	4	670060	672060	28.40
6.5	.2559	51	2	102	4	670065	672065	30.05
7.0	.2756	57	2 1/4	108	4 1/4	670070	672070	30.05
7.5	.2953	57	2 1/4	108	4 1/4	670075	672075	31.40
8.0	.3150	64	2 1/2	114	4 1/2	670080	672080	33.90
8.5	.3346	70	2 3/4	121	4 3/4	670085	672085	33.90
9.0	.3543	70	2 3/4	121	4 3/4	670090	672090	36.10
9.5	.3740	76	3	127	5	670095	672095	34.25
10.0	.3937	76	3	133	5 1/4	670100	672100	42.15
10.5	.4134	76	3	133	5 1/4	670105	672105	48.85
11.0	.4331	76	3	140	5 1/2	670110	672110	68.75
11.5	.4528	76	3	140	5 1/2	670115	672115	51.45
12.0	.4724	83	3 1/4	146	5 3/4	670120	672120	62.85
12.5	.4921	89	3 1/2	152	6	670125	672125	62.85
13.0	.5118	89	3 1/2	152	6	670130	672130	72.15
13.5	.5315	89	3 1/2	152	6	670135	672135	72.15
14.0	.5512	89	3 1/2	152	6	670140	672140	74.70

HARD STEEL DIE DRILLS CARBIDE TIPPED TYPES 674 & 675 FRACTIONAL

MATERIAL SPECIFIC

SPADE TYPE 120° OR 140° POINT

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	-
	40	NON-FERROUS - SHORT CHIPS	-
	60	CAST IRONS	675
	80	LOW STRENGTH STEELS	674
	100	MEDIUM STRENGTH STEELS	674 or 675
	120	HIGH STRENGTH STEELS	675 or 893
	140	HIGH TEMPERATURE ALLOYS	675 or 893

TYPE 674 – 120° POINT SPADE TYPE

- Cam relieved 120˚ point
- Carbide tip brazed to tool steel body
- Precision ground to ensure concentricity of tip and shank body
- Drill body diameter smaller than tool diameter to prevent gauling
- Detailed specifications on page 112

TYPE 675 – 140° POINT SPADE TYPE

- Same as Type 674 above, except with cam relieved 140˚ point designed for drilling tough abrasive or high tensile materials

USE:

- For shallow holes, approximately 2 tool diameters deep
- Short heavy construction allows more rigidity for tough applications where longer length drills are not needed

MODIFICATIONS (Prompt delivery)

- Modified tool diameter
- Metric tool diameter
- Modified point and/or angle
- Shortened shank or reduced shank diameter
- Flat(s) on shank
- Coatings available:

TITANIUM NITRIDE – TiN

TITANIUM CARBONITRIDE – TiCN

ZIRCONIUM NITRIDE – ZrN

AL TITANIUM NITRIDE – AlTiN

TOOL DIAMETER FRAC.	TOOL DIAMETER DECIMAL	OVER-ALL LENGTH	TYPE 674 120˚ PT. EDP NO.	TYPE 675 140˚ PT. EDP NO.	BOTH TYPES PRICE
* 3/32	.0938	2	67406	67506	$16.05
* 7/64	.1094	2	67407	67507	16.40
* 1/8	.1250	2	67408	67508	16.40
* 9/64	.1406	2	67409	67509	17.75
* 5/32	.1562	2	67410	67510	20.40
* 11/64	.1719	3	67411	67511	21.80
* 3/16	.1875	3	67412	67512	25.80
* 13/64	.2031	3	67413	67513	29.05
7/32	.2188	3 1/2	67414	67514	CALL US
15/64	.2344	3 1/2	67415	67515	CALL US
1/4	.2500	4	67416	67516	CALL US
17/64	.2656	4	67417	67517	CALL US
9/32	.2812	4	67418	67518	CALL US
19/64	.2969	4	67419	67519	CALL US
5/16	.3125	4	67420	67520	CALL US
21/64	.3281	4	67421	67521	CALL US

*Solid carbide

TOOL DIAMETER FRAC.	TOOL DIAMETER DECIMAL	OVER-ALL LENGTH	TYPE 674 120˚ PT. EDP NO.	TYPE 675 140˚ PT. EDP NO.	BOTH TYPES PRICE
11/32	.3438	4	67422	67522	CALL US
23/64	.3594	4	67423	67523	CALL US
3/8	.3750	4	67424	67524	CALL US
25/64	.3906	4	67425	67525	CALL US
13/32	.4062	4	67426	67526	CALL US
27/64	.4219	4	67427	67527	CALL US
7/16	.4375	4 1/2	67428	67528	CALL US
29/64	.4531	4 1/2	67429	67529	CALL US
15/32	.4688	4 1/2	67430	67530	CALL US
31/64	.4844	4 1/2	67431	67531	CALL US
1/2	.5000	5	67432	67532	CALL US

SOLID CARBIDE DIE DRILLS TYPE 893 FRACTIONAL

MATERIAL SPECIFIC

TYPE 893

- 140˚ point
- Two straight flutes
- Designed for drilling tough abrasive or high tensile materials

TOOL DIAMETER FRAC.	TOOL DIAMETER DECIMAL	LENGTH FLUTE	LENGTH OVERALL	TYPE 893 140˚ PT. EDP NO.	PRICE
3/64	.0469	1/2	1 1/2	89303	$11.55
1/16	.0625	5/8	1 3/4	89304	11.55
5/64	.0781	3/4	1 3/4	89305	12.00
3/32	.0938	3/4	1 3/4	89306	12.40
7/64	.1094	7/8	1 7/8	89307	13.05
1/8	.1250	7/8	1 7/8	89308	13.75
9/64	.1406	1	2	89309	16.10
5/32	.1562	1	2 1/8	89310	16.90
11/64	.1719	1 1/8	2 1/8	89311	20.80
3/16	.1875	1 1/8	2 1/4	89312	22.60
13/64	.2031	1 3/16	2 1/4	89313	24.90
7/32	.2188	1 1/4	2 1/2	89314	26.00

TOOL DIAMETER FRAC.	TOOL DIAMETER DECIMAL	LENGTH FLUTE	LENGTH OVERALL	TYPE 893 140˚ PT. EDP NO.	PRICE
15/64	.2344	1 5/16	2 1/2	89315	$30.20
1/4	.2500	1 3/8	2 1/2	89316	28.45
17/64	.2656	1 7/16	2 3/4	89317	46.60
9/32	.2812	1 1/2	2 3/4	89318	48.20
19/64	.2969	1 9/16	2 3/4	89319	50.65
5/16	.3125	1 5/8	2 3/4	89320	44.30
21/64	.3281	1 3/4	3	89321	52.75
11/32	.3438	1 3/4	3	89322	55.30
23/64	.3594	1 3/4	3	89323	61.20
3/8	.3750	1 7/8	3	89324	58.30
25/64	.3906	2	3 1/4	89325	68.60
13/32	.4062	2	3 1/4	89326	76.10
27/64	.4219	2	3 1/2	89327	78.05
7/16	.4375	2 1/16	3 1/2	89328	78.20
29/64	.4531	2 1/8	3 3/4	89329	96.00
15/32	.4688	2 1/8	3 3/4	89330	96.40
31/64	.4844	2 1/4	3 3/4	89331	97.00
1/2	.5000	2 1/4	3 3/4	89332	86.50

REDUCED SHANK DIAMETER DRILLS CARBIDE TIPPED TYPES 600, 601, 640, 641, 670, 672 FRACTIONAL

MATERIAL SPECIFIC

¼", ⅜", ½" OR ¾" SHANK DIAMETER STUB LENGTH, JOBBERS LENGTH, AND HARD STEEL DIE DRILLS

MODIFICATIONS (Prompt delivery)

- Modified tool diameter
- Metric tool diameter
- Modified point and/or angle
- Flat(s) on shank
- Coatings available:

TITANIUM NITRIDE – TiN

TITANIUM CARBONITRIDE – TiCN

ZIRCONIUM NITRIDE – ZrN

AL TITANIUM NITRIDE – AlTiN

USE:

- Can be used in drill chucks with diameter limitations

DRILLS

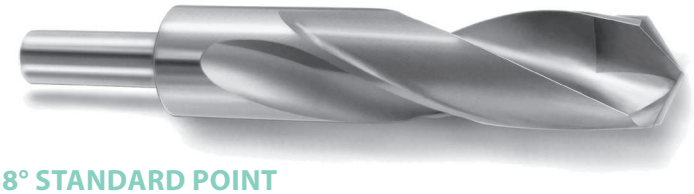
SHANK DIAM.	TOOL DIAMETER		STUB LENGTH DRILLS (reference pg. 120)					JOBBERS LENGTH DRILLS (reference pg. 122)					HARD STEEL DIE DRILLS (reference pg. 134)			
			OVER-ALL LENGTH	TYPE 640 118° PT.		TYPE 641 135° PT.		OVER-ALL LENGTH	TYPE 600 118° PT.		TYPE 601 135° PT.		OVER-ALL LENGTH	TYPE 670 NEG. 118° PT.	TYPE 672 POS. 118° PT.	BOTH TYPES PRICE
	FRAC.	DEC.		EDP NO.	PRICE	EDP NO.	PRICE		EDP NO.	PRICE	EDP NO.	PRICE		EDP NO.	EDP NO.	
¼	9/32	.2812	2 11/16	640618	$27.10	641618	$31.45	4 ¼	600618	$26.80	601618	$31.05	-	-	-	-
	5/16	.3125	2 13/16	640620	28.80	641620	33.45	4 ½	600620	29.00	601620	33.70	4 ½	670620	672620	$43.90
	11/32	.3438	3	640622	33.50	641622	38.80	4 ¾	600622	30.80	601622	35.85	4 ¾	670622	672622	46.75
	⅜	.3750	3 ⅛	640624	34.35	641624	39.85	5	600624	32.75	601624	38.10	5	670624	672624	50.25
	13/32	.4062	3 5/16	640626	40.70	641626	47.40	5 ¼	600626	35.60	601626	41.45	5 ¼	670626	672626	58.90
	7/16	.4375	3 7/16	640628	43.50	641628	48.30	5 ½	600628	38.75	601628	45.00	5 ½	670628	672628	68.25
	15/32	.4688	3 ⅝	640630	61.95	641630	72.05	5 ¾	600630	43.60	601630	50.45	5 ¾	670630	672630	74.95
	½	.5000	3 ¾	640632	59.25	641632	68.95	6	600632	53.60	601632	56.50	6	670632	672632	87.95
⅜	13/32	.4062	3 5/16	640726	40.70	641726	47.40	5 ¼	600726	35.60	601726	41.45	-	-	-	-
	7/16	.4375	3 7/16	640728	43.50	641728	48.30	5 ½	600728	38.75	601728	45.00	5 ½	670728	672728	68.25
	15/32	.4688	3 ⅝	640730	61.95	641730	72.05	5 ¾	600730	43.60	601730	50.45	5 ¾	670730	672730	74.95
	½	.5000	3 ¾	640732	59.25	641732	68.95	6	600732	53.60	601732	56.50	6	670732	672732	87.95
	17/32	.5312	3 ⅞	640734	73.90	641734	83.25	6 ⅝	600734	69.80	601734	81.10	6	670734	672734	100.90
	9/16	.5625	4	640736	73.90	641736	83.25	6 ⅝	600736	70.45	601736	81.80	6	670736	672736	104.35
	19/32	.5938	4 ⅛	640738	84.75	641738	95.55	7 ⅛	600738	75.70	601738	87.80	7	670738	672738	110.40
	⅝	.6250	4 ¼	640740	84.75	641740	95.55	7 ⅛	600740	85.75	601740	99.40	7	670740	672740	113.80
	21/32	.6562	4 ½	640742	101.95	641742	114.95	7 ⅛	600742	87.15	601742	101.10	7 ½	670742	672742	121.75
	11/16	.6875	4 ⅝	640744	104.55	641744	118.00	7 ⅝	600744	88.85	601744	103.05	7 ½	670744	672744	125.05
	23/32	.7188	4 ¾	640746	118.60	641746	137.70	7 ⅝	600746	104.85	601746	116.60	8	670746	672746	131.00
	¾	.7500	5	640748	118.90	641748	133.90	8	600748	107.05	601748	119.00	8	670748	672748	134.55
½	17/32	.5312	3 ⅞	640834	73.90	641834	83.25	6 ⅝	600834	69.80	601834	81.10	-	-	-	-
	9/16	.5625	4	640836	73.90	641836	83.25	6 ⅝	600836	70.45	601836	81.80	6	670836	672836	104.35
	19/32	.5938	4 ⅛	640838	84.75	641838	95.55	7 ⅛	600838	75.70	601838	87.80	7	670838	672838	110.40
	⅝	.6250	4 ¼	640840	84.75	641840	95.55	7 ⅛	600840	85.75	601840	99.40	7	670840	672840	113.80
	21/32	.6562	4 ½	640842	101.95	641842	114.95	7 ⅛	600842	87.15	601842	101.10	7 ½	670842	672842	121.75
	11/16	.6875	4 ⅝	640844	104.55	641844	118.00	7 ⅝	600844	88.85	601844	103.05	7 ½	670844	672844	125.05
	23/32	.7188	4 ¾	640846	118.60	641846	137.70	7 ⅝	600846	104.85	601846	116.60	8	670846	672846	131.00
	¾	.7500	5	640848	118.90	641848	133.90	8	600848	107.05	601848	119.00	8	670848	672848	134.55
	13/16	.8125	5 ¼	640852	146.90	641852	165.85	-	-	-	-	-	8	670852	672852	241.25
	⅞	.8750	5 ½	640856	161.25	641856	181.75	-	-	-	-	-	8	670856	672856	246.30
	15/16	.9375	5 ¾	640860	173.10	641860	195.25	-	-	-	-	-	8	670860	672860	274.45
	1	1.0000	6	640864	182.85	641864	206.35	-	-	-	-	-	8	670864	672864	291.15
¾	13/16	.8125	5 ¼	640952	146.90	641952	165.85	-	-	-	-	-	8	670952	672952	241.25
	⅞	.8750	5 ½	640956	161.25	641956	181.75	-	-	-	-	-	8	670956	672956	246.30
	15/16	.9375	5 ¾	640960	173.10	641960	195.25	-	-	-	-	-	8	670960	672960	274.45
	1	1.0000	6	640964	182.85	641964	206.35	-	-	-	-	-	8	670964	672964	291.15
	1 1/16	1.0625	6 ¼	640968	229.15	641968	258.40	-	-	-	-	-	-	-	-	-
	1 ⅛	1.1250	6 ⅜	640972	254.45	641972	286.85	-	-	-	-	-	-	-	-	-
	1 3/16	1.1875	6 ⅝	640976	310.45	641976	348.05	-	-	-	-	-	-	-	-	-
	1 ¼	1.2500	6 ¾	640980	310.45	641980	348.05	-	-	-	-	-	-	-	-	-

SILVER & DEMING DRILLS
CARBIDE TIPPED TYPES 616 & 618 FRACTIONAL

MATERIAL SPECIFIC

118° STANDARD OR 135° SPLIT POINT

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	616
	40	NON-FERROUS - SHORT CHIPS	616/618
	60	CAST IRONS	618/616
	80	LOW STRENGTH STEELS	CALL US
	100	MEDIUM STRENGTH STEELS	CALL US
	120	HIGH STRENGTH STEELS	CALL US
	140	HIGH TEMPERATURE ALLOYS	CALL US



TYPE 616 – 118° STANDARD POINT
- Shank : ½" diameter, 2¼" long
- 118° point - 6" overall length
- Heavy duty quality construction
- Detailed specifications on page 112

TYPE 618 – 135° SPLIT POINT
- Same as Type 616 above, except 135° split point designed for drilling tough abrasive or high tensile materials

USE:
- Allows larger tool diameter drilling using a ½" drill chuck

MODIFICATIONS (Prompt delivery)
- Modified tool diameter
- Metric tool diameter
- Modified point and/or angle
- Flat(s) on shank
- Coatings available:

TITANIUM NITRIDE – TiN
TITANIUM CARBONITRIDE – TiCN
ZIRCONIUM NITRIDE – ZrN
AL TITANIUM NITRIDE – AlTiN

TOOL DIAMETER		LENGTH		TYPE 616 -118° PT.		TYPE 618 - 135° PT.	
FRAC.	DECIMAL	FLUTE	OVER-ALL	EDP NO.	PRICE	EDP NO.	PRICE
½	.5000	3 ⅛	6	61632	$44.95	61832	$51.70
17/32	.5312	3 ⅛	6	61634	65.75	61834	75.65
9/16	.5625	3 ⅛	6	61636	68.15	61836	78.40
19/32	.5938	3 ⅛	6	61638	70.90	61838	81.50
⅝	.6250	3 ⅛	6	61640	78.75	61840	90.50
21/32	.6562	3 ⅛	6	61642	85.40	61842	98.15
11/16	.6875	3 ⅛	6	61644	88.70	61844	102.10
23/32	.7188	3 ⅛	6	61646	92.05	61846	105.85
¾	.7500	3 ⅛	6	61648	96.45	61848	110.95
25/32	.7812	3 ⅛	6	61650	106.35	61850	122.25
13/16	.8125	3 ⅛	6	61652	106.60	61852	122.60
27/32	.8438	3 ⅛	6	61654	106.60	61854	122.60
⅞	.8750	3 ⅛	6	61656	110.90	61856	127.50

TOOL DIAMETER		LENGTH		TYPE 616 -118° PT.		TYPE 618 - 135° PT.	
FRAC.	DECIMAL	FLUTE	OVER-ALL	EDP NO.	PRICE	EDP NO.	PRICE
29/32	.9062	3 ⅛	6	61658	$113.55	61858	$130.60
15/16	.9375	3 ⅛	6	61660	114.70	61860	131.85
31/32	.9688	3 ⅛	6	61662	118.60	61862	136.30
1	1.0000	3 ⅛	6	61664	121.10	61864	139.30
1 1/32	1.0312	3 ⅛	6	61666	116.90	61866	134.45
1 1/16	1.0625	3 ⅛	6	61668	126.80	61868	145.75
1 3/32	1.0938	3 ⅛	6	61670	129.80	61870	149.25
1 ⅛	1.1250	3 ⅛	6	61672	132.35	61872	152.15
1 5/32	1.1562	3 ⅛	6	61674	160.60	61874	184.70
1 3/16	1.1875	3 ⅛	6	61676	163.50	61876	188.05
1 7/32	1.2188	3 ⅛	6	61678	171.70	61878	197.50
1 ¼	1.2500	3 ⅛	6	61680	156.75	61880	180.30

CNC SPOTTING/CENTERING DRILLS
CARBIDE TIPPED TYPES 647, 648, 649 & 677, 678, 679 FRACTIONAL

GENERAL PURPOSE

ALL TYPES:
- Tool diameter not cleared
- Accurately ground point
- Polished flutes

USE:
- For accurate centering and chamfering
- Drill wandering minimized
- Cuts only to depth of point
- Not for drilling holes
- Ideal for CNC machining

TYPE 677 – 90° POINT REGULAR LENGTH
TYPE 678 – 120° POINT REGULAR LENGTH
TYPE 679 – 140° POINT REGULAR LENGTH

TOOL DIAMETER		LENGTH		TYPE 677 90° PT. EDP NO.	TYPE 678 120° PT. EDP NO.	TYPE 679 140° PT. EDP NO.	ALL TYPES PRICE
FRAC.	DECIMAL	FLUTE	OVER-ALL				
¼	.2500	1	4	67716	67816	67916	$69.65
⅜	.3750	1 ⅛	5	67724	67824	67924	81.30
½	.5000	1 ½	6	67732	67832	67932	109.30
⅝	.6250	1 ⅝	7	67740	67840	67940	158.30
¾	.7500	1 ⅞	8	67748	67848	67948	183.65
1	1.0000	2 ¼	8	67764	67864	67964	243.45

TYPE 647 – 90° POINT SHORT LENGTH
TYPE 648 – 120° POINT SHORT LENGTH
TYPE 649 – 140° POINT SHORT LENGTH

TOOL DIAMETER		LENGTH		TYPE 647 90° PT. EDP NO.	TYPE 648 120° PT. EDP NO.	TYPE 649 140° PT. EDP NO.	ALL TYPES PRICE
FRAC.	DECIMAL	FLUTE	OVER-ALL				
¼	.2500	1	2 ½	64716	64816	64916	$66.15
⅜	.3750	1 ⅛	3 ⅛	64724	64824	64924	77.20
½	.5000	1 ½	3 ¾	64732	64832	64932	103.90
⅝	.6250	1 ⅝	4 ¼	64740	64840	64940	150.40
¾	.7500	1 ⅞	5	64748	64848	64948	174.50
1	1.0000	2 ¼	6	64764	64864	64964	231.25

DRILLS

COBALT DRILLS FOR STEEL

COBALT TYPES 699 FRACTIONAL, WIRE, LETTER, & NUMBER

135° SPLIT POINT

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	600/601
	40	NON-FERROUS - SHORT CHIPS	600/601
	60	CAST IRONS	600/601
	80	LOW STRENGTH STEELS	699
	100	MEDIUM STRENGTH STEELS	699
	120	HIGH STRENGTH STEELS	699
	140	HIGH TEMPERATURE ALLOYS	699

TYPE 699 – 135° SPLIT POINT

- Manufactured from Industrial Grade NAS Cobalt Steel
- CNC machined for accuracy, improved chip evacuation and premium performance
- 135° split point improves accuracy and control - prevents drill from "walking"
- Hardened for high temperature applications

MODIFICATIONS (Prompt delivery)

- Coatings available:

TITANIUM NITRIDE – TiN

TITANIUM CARBONITRIDE – TiCN

ZIRCONIUM NITRIDE – ZrN

AL TITANIUM NITRIDE – AlTiN

USE:

- For drilling hardened steel and steel alloys

NOTES:

Diameters .0400" to .3020" sold in packages of 12
Diameters .3125" and larger sold in packages of 6

TOOL DIAMETER			LENGTH		135° POINT	
FRAC.	DEC.	WIRE LETTER	FLT.	OAL	TYPE 699 EDP NO.	PRICE EACH
	.0400	60	1 1/16	1 5/8	6990400	$2.40
	.0410	59	1 1/16	1 5/8	6990410	2.40
	.0420	58	1 1/16	1 5/8	6990420	2.40
	.0430	57	3/4	1 3/4	6990430	2.40
	.0465	56	3/4	1 3/4	6990465	2.40
	.0520	55	7/8	1 7/8	6990520	2.05
	.0550	54	7/8	1 7/8	6990550	2.05
	.0595	53	7/8	1 7/8	6990595	2.05
1/16	.0625		7/8	1 7/8	69904	1.90
	.0635	52	7/8	1 7/8	6990635	1.90
	.0670	51	1	2	6990670	1.90
	.0700	50	1	2	6990700	1.90
	.0730	49	1	2	6990730	1.90
	.0760	48	1	2	6990760	1.90
5/64	.0781		1	2	69905	1.90
	.0785	47	1	2	6990785	1.90
	.0810	46	1 1/8	2 1/8	6990810	1.90
	.0820	45	1 1/8	2 1/8	6990820	1.90
	.0860	44	1 1/8	2 1/8	6990860	1.90
	.0890	43	1 1/4	2 1/4	6990890	1.90
	.0935	42	1 1/4	2 1/4	6990935	1.90
3/32	.0938		1 1/4	2 1/4	69906	1.90
	.0960	41	1 3/8	2 3/8	6990960	1.90
	.0980	40	1 3/8	2 3/8	6990980	1.95
	.0995	39	1 3/8	2 3/8	6990995	1.95
	.1015	38	1 7/16	2 1/2	6991015	1.95
	.1040	37	1 7/16	2 1/2	6991040	2.05
	.1065	36	1 7/16	2 1/2	6991065	2.05
7/64	.1094		1 1/2	2 5/8	69907	2.00
	.1100	35	1 1/2	2 5/8	6991100	2.05
	.1110	34	1 1/2	2 5/8	6991110	2.05
	.1130	33	1 1/2	2 5/8	6991130	2.05
	.1160	32	1 5/8	2 3/4	6991160	2.20
	.1200	31	1 5/8	2 3/4	6991200	2.20
1/8	.1250		1 5/8	2 3/4	69908	2.45
	.1285	30	1 5/8	2 3/4	6991285	2.25
	.1360	29	1 3/4	2 7/8	6991360	2.40
	.1405	28	1 3/4	2 7/8	6991405	2.45

TOOL DIAMETER			LENGTH		135° POINT	
FRAC.	DEC.	WIRE LETTER	FLT.	OAL	TYPE 699 EDP NO.	PRICE EACH
9/64	.1406		1 3/4	2 7/8	69909	$2.45
	.1440	27	1 7/8	3	6991440	2.60
	.1470	26	1 7/8	3	6991470	2.60
	.1495	25	1 7/8	3	6991495	2.60
	.1520	24	2	3 1/8	6991520	2.95
	.1540	23	2	3 1/8	6991540	2.95
5/32	.1562		2	3 1/8	69910	2.75
	.1570	22	2	3 1/8	6991570	2.95
	.1590	21	2 1/8	3 1/4	6991590	2.95
	.1610	20	2 1/8	3 1/4	6991610	2.95
	.1660	19	2 1/8	3 1/4	6991660	2.95
	.1695	18	2 1/8	3 1/4	6991695	3.00
11/64	.1719		2 1/8	3 1/4	69911	2.85
	.1730	17	2 3/16	3 3/8	6991730	3.30
	.1770	16	2 3/16	3 3/8	6991770	3.35
	.1800	15	2 3/16	3 3/8	6991800	3.60
	.1820	14	2 3/16	3 3/8	6991820	3.60
	.1850	13	2 5/16	3 1/2	6991850	3.60
3/16	.1875		2 5/16	3 1/2	69912	3.25
	.1890	12	2 5/16	3 1/2	6991890	3.80
	.1910	11	2 5/16	3 1/2	6991910	3.80
	.1935	10	2 7/16	3 5/8	6991935	3.80
	.1960	9	2 7/16	3 5/8	6991960	3.80
	.1990	8	2 7/16	3 5/8	6991990	3.80
	.2010	7	2 7/16	3 5/8	6992010	3.80
13/64	.2031		2 7/16	3 5/8	69913	3.90
	.2040	6	2 1/2	3 3/4	6992040	4.90
	.2055	5	2 1/2	3 3/4	6992055	4.90
	.2090	4	2 1/2	3 3/4	6992090	4.90
	.2130	3	2 1/2	3 3/4	6992130	4.90
7/32	.2188		2 1/2	3 3/4	69914	4.25
	.2210	2	2 5/8	3 7/8	6992210	5.20
	.2280	1	2 5/8	3 7/8	6992280	5.20
	.2340	A	2 5/8	3 7/8	6992340	6.00
15/64	.2344		2 5/8	3 7/8	69915	4.50
	.2380	B	2 3/4	4	6992380	6.90
	.2420	C	2 3/4	4	6992420	6.90
	.2460	D	2 3/4	4	6992460	6.95

TOOL DIAMETER			LENGTH		135° POINT	
FRAC.	DEC.	WIRE LETTER	FLT.	OAL	TYPE 699 EDP NO.	PRICE EACH
1/4	.2500	E	2 3/4	4	69916	$4.80
	.2570	F	2 7/8	4 1/8	6992570	7.25
	.2610	G	2 7/8	4 1/8	6992610	7.50
17/64	.2656		2 7/8	4 1/8	69917	5.50
	.2660	H	2 7/8	4 1/8	6992660	7.75
	.2720	I	2 7/8	4 1/8	6992720	7.80
	.2770	J	2 7/8	4 1/8	6992770	8.00
	.2810	K	2 15/16	4 1/4	6992810	8.15
9/32	.2812		2 15/16	4 1/4	69918	5.75
	.2900	L	2 15/16	4 1/4	6992900	8.80
	.2950	M	3 1/16	4 3/8	6992950	9.35
19/64	.2969		3 1/16	4 3/8	69919	7.00
	.3020	N	3 1/16	4 3/8	6993020	9.35
5/16	.3125		3 3/16	4 1/2	69920	7.45
	.3160	O	3 1/16	4 1/2	6993160	10.30
	.3230	P	3 5/16	4 5/8	6993230	11.00
21/64	.3281		3 5/16	4 5/8	69921	8.25
	.3320	Q	3 7/16	4 3/4	6993320	11.35
	.3390	R	3 7/16	4 3/4	6993390	11.35
11/32	.3438		3 7/16	4 3/4	69922	9.05
	.3480	S	3 1/2	4 7/8	6993480	13.90
23/64	.3594		3 1/2	4 7/8	69923	9.95
	.3580	T	3 1/2	4 7/8	6993580	13.90
	.3680	U	3 5/8	5	6993680	13.90
3/8	.3750		3 5/8	5	69924	10.30
	.3770	V	3 5/8	5	6993770	15.30
	.3860	W	3 3/4	5 1/8	6993860	15.30
25/64	.3960		3 3/4	5 1/8	69925	11.85
	.3970	X	3 3/4	5 1/8	6993970	15.30
	.4040	Y	3 7/8	5 1/4	6994040	16.25
13/32	.4062		3 7/8	5 1/4	69926	12.30
	.4130	Z	3 7/8	5 1/4	6994130	17.70
27/64	.4210		3 15/16	5 3/8	69927	13.60
7/16	.4375		4 1/16	5 1/2	69928	13.90
29/64	.4531		4 3/16	5 5/8	69929	16.70
15/32	.4688		4 5/16	5 3/4	69930	17.00
31/64	.4844		4 3/8	5 7/8	69931	17.55
1/2	.5000		4 1/2	6	69932	17.70

FULL CENTERS & HALF CENTERS
CARBIDE TIPPED TYPES 592, 593, 594, 595, 596, 597

MORSE - BROWN & SHARPE - JARNO TAPERS

FULL CENTERS:
TYPE 595 - MORSE TAPER
TYPE 596 - BROWN & SHARPE TAPER
TYPE 597 - JARNO TAPER

- Carbide tip brazed to hardened alloy steel body
- Center precision ground to 60˚ included angle
- Center tip concentric to precision ground taper

USE (ALL TYPES):
- Carbide tipped center holds point angle and overall concentricity so parts can be held securely and accurately for precision turning and grinding
- When operating at high speed, carbide tipped center will not wear as rapidly, avoiding burning or scoring of workpiece's center hole

HALF CENTERS:
TYPE 592 - MORSE TAPER
TYPE 593 - BROWN & SHARPE TAPER
TYPE 594 - JARNO TAPER

- Same construction as full centers
- Half center provides clearance for the grinding wheel or turning tool when machining a small diameter near the end of the part

MORSE TAPER SHANK	OVERALL LENGTH	TYPE 595 - FULL CENTER - MORSE TAPER				TYPE 592 - HALF CENTER - MORSE TAPER					
		CARBIDE		EDP NO.	PRICE	CARBIDE		UNDERCUT LENGTH	HEIGHT ABOVE CENTER	EDP NO.	PRICE
		LENGTH	DIAMETER			LENGTH	DIAMETER				
1	3 5/16	7/16	1/4	59501	$33.35	7/16	1/4	1	9/64	59201	$61.45
2	4 3/16	9/16	5/16	59502	39.70	9/16	5/16	1 3/8	11/64	59202	76.10
3	5 1/4	7/8	1/2	59503	72.80	11/16	3/8	1 11/16	13/64	59203	114.95
4	6 3/4	7/8	1/2	59504	110.65	7/8	1/2	2 1/4	17/64	59204	168.10
5	8 1/2	1 1/16	5/8	59505	181.05	1 1/16	5/8	2 3/4	21/64	59205	280.95

BROWN & SHARPE TAPER SHANK	OVERALL LENGTH	TYPE 596 - FULL CENTER - B & S TAPER				TYPE 593 - HALF CENTER - B & S TAPER					
		CARBIDE		EDP NO.	PRICE	CARBIDE		UNDERCUT LENGTH	HEIGHT ABOVE CENTER	EDP NO.	PRICE
		LENGTH	DIAMETER			LENGTH	DIAMETER				
7	4 1/2	9/16	5/16	59607	$50.90	9/16	5/16	1 1/8	11/64	59307	$86.25
8	5 11/32	11/16	3/8	59608	71.45	9/16	5/16	1 5/16	11/64	59308	113.25
9	6	7/8	1/2	59609	90.60	11/16	3/8	1 1/2	13/64	59309	134.85
10	8 17/32	7/8	1/2	59610	129.50	7/8	1/2	2 1/4	17/64	59310	188.90
11	10 1/8	1 1/16	5/8	59611	172.00	1 1/16	5/8	2 1/2	3/8	59311	259.50

JARNO TAPER SHANK	OVERALL LENGTH	TYPE 597 - FULL CENTER - JARNO TAPER				TYPE 594 - HALF CENTER - JARNO TAPER					
		CARBIDE		EDP NO.	PRICE	CARBIDE		UNDERCUT LENGTH	HEIGHT ABOVE CENTER	EDP NO.	PRICE
		LENGTH	DIAMETER			LENGTH	DIAMETER				
4	3	7/16	1/4	59704	$36.45	7/16	1/4	25/32	9/64	59404	$67.05
5	3 5/8	7/16	1/4	59705	40.30	7/16	1/4	15/16	9/64	59405	74.20
6	4 1/2	9/16	5/16	59706	49.75	9/16	5/16	1 1/8	11/64	59406	82.70
7	5 1/4	11/16	3/8	59707	64.45	11/16	3/8	1 3/16	13/64	59407	108.40
8	6	7/8	1/2	59708	83.35	7/8	1/2	1 3/8	17/64	59408	133.90
9	6 3/4	7/8	1/2	59709	90.45	7/8	1/2	1 5/8	17/64	59409	150.85
10	7 1/2	7/8	1/2	59710	114.95	7/8	1/2	2	17/64	59410	178.60
11	8 1/4	7/8	1/2	59711	129.35	7/8	1/2	2	17/64	59411	197.70
12	9	1 1/16	5/8	59712	143.10	1 1/16	5/8	2 1/4	21/64	59412	222.70

CORE DRILLS CARBIDE TIPPED TYPES 620 & 622 FRACTIONAL

GENERAL PURPOSE

FOUR RIGHT SPIRAL FLUTES STRAIGHT OR TAPER SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	620 or 622
	40	NON-FERROUS - SHORT CHIPS	620 or 622
	60	CAST IRONS	620 or 622
	80	LOW STRENGTH STEELS	621[MS] or 623[MS]
	100	MEDIUM STRENGTH STEELS	621[MS] or 623[MS]
	120	HIGH STRENGTH STEELS	621[MS] or 623[MS]
	140	HIGH TEMPERATURE ALLOYS	620 or 622

[MS]Types 621 & 623 on page 142

TYPE 620 – STRAIGHT SHANK

- Four large right spiral polished flutes permit higher feeds and speeds
- Carbide tips brazed to hardened tool steel body
- 118° included chamfer angle
- Rigid design provides maximum support for the carbide tips
- Tool diameter tolerance: plus .000", minus .001"

TYPE 622 – TAPER SHANK

- Same as Type 620 above, except with taper shank

MODIFICATIONS (See list on page 141)

USE:

- Designed for economically enlarging cored, punched, drilled, or preformed holes - can remove up to 30% of the tool diameter
- The balanced cutting action of the core drill removes considerably more material than a reamer, often eliminating the need for a final reaming or boring operation

TOOL DIAMETER		DIMENSIONS				TYPE 620		TYPE 622		BOTH TYPES PRICE	FINISHED TO MODIFIED TOOL DIAMETER						
		MIN. CUT DIAM.	LENGTH			SHANK DIAM.	EDP NO.	TAPER SHANK NO.	EDP NO.		MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DEC.		CAR-BIDE	FLT	OVER-ALL							1	2	3	4	5-7	8-14**
* 3/8	.3750	.262	5/8	3 1/2	6 3/4	3/8	62012	1	62212	$89.25	0.3471 - 0.3780	$121.85	$105.45	$100.05	$97.45	$94.60	$92.50
* 13/32	.4062	.284	5/8	3 5/8	7	13/32	62013	1	62213	89.25	0.3781 - 0.4090	121.85	105.45	100.05	97.45	94.60	92.50
* 7/16	.4375	.306	3/4	3 7/8	7 1/4	7/16	62014	1	62214	89.25	0.4091 - 0.4410	121.85	105.45	100.05	97.45	94.60	92.50
* 15/32	.4688	.328	3/4	4 1/8	7 1/2	15/32	62015	1	62215	89.25	0.4411 - 0.4720	121.85	105.45	100.05	97.45	94.60	92.50
1/2	.5000	.350	3/4	4 3/8	8 1/4	1/2	62016	2	62216	89.25	0.4721 - 0.5030	121.85	105.45	100.05	97.45	94.60	92.50
17/32	.5312	.372	3/4	4 3/8	8 1/4	17/32	62017	2	62217	89.60	0.5031 - 0.5340	122.30	105.95	100.40	97.85	95.05	92.80
9/16	.5625	.394	3/4	4 3/8	8 1/4	9/16	62018	2	62218	89.60	0.5341 - 0.5660	122.30	105.95	100.40	97.85	95.05	92.80
19/32	.5938	.416	3/4	4 3/8	8 1/4	19/32	62019	2	62219	94.10	0.5661 - 0.5970	126.70	110.35	104.95	102.30	99.55	97.35
5/8	.6250	.438	3/4	4 3/8	8 1/4	5/8	62020	2	62220	94.10	0.5971 - 0.6280	126.70	110.35	104.95	102.30	99.55	97.35
21/32	.6562	.459	3/4	4 3/8	8 1/4	21/32	62021	2	62221	95.20	0.6281 - 0.6590	127.85	111.50	106.05	103.40	100.70	98.45
11/16	.6875	.481	7/8	4 3/8	8 1/4	11/16	62022	2	62222	96.05	0.6591 - 0.6910	128.70	112.35	106.85	104.25	101.50	99.20
23/32	.7188	.503	7/8	4 3/8	8 1/4	23/32	62023	2	62223	96.05	0.6911 - 0.7220	128.70	112.35	106.85	104.25	101.50	99.20
3/4	.7500	.525	7/8	4 3/8	8 1/4	3/4	62024	2	62224	96.05	0.7221 - 0.7530	128.70	112.35	106.85	104.25	101.50	99.20
25/32	.7812	.547	7/8	4 3/8	8 1/4	25/32	62025	2	62225	98.15	0.7531 - 0.7840	130.80	114.45	109.00	106.40	103.60	101.40
13/16	.8125	.569	7/8	4 7/8	9 1/2	13/16	62026	3	62226	100.90	0.7841 - 0.8160	133.55	117.20	111.70	109.15	106.25	104.15
27/32	.8438	.591	7/8	4 7/8	9 1/2	27/32	62027	3	62227	106.25	0.8161 - 0.8470	138.95	122.60	117.15	114.50	111.70	109.50
7/8	.8750	.612	7/8	4 7/8	9 1/2	7/8	62028	3	62228	106.25	0.8471 - 0.8780	138.95	122.60	117.15	114.50	111.70	109.50
29/32	.9062	.634	7/8	4 7/8	9 1/2	29/32	62029	3	62229	106.95	0.8781 - 0.9090	139.60	123.30	117.75	115.20	112.40	110.20
15/16	.9375	.656	7/8	4 7/8	9 1/2	15/16	62030	3	62230	106.95	0.9091 - 0.9410	139.60	123.30	117.75	115.20	112.40	110.20
31/32	.9688	.678	7/8	4 7/8	9 1/2	31/32	62031	3	62231	110.95	0.9411 - 0.9720	143.50	127.15	121.75	119.15	116.30	114.15
1	1.0000	.700	7/8	4 7/8	9 1/2	1	62032	3	62232	113.00	0.9721 - 1.0030	145.65	129.30	123.75	121.20	118.40	116.20
1 1/32	1.0312	.722	7/8	4 7/8	9 1/2	1 1/32	62033	3	62233	113.95	1.0031 - 1.0340	146.55	130.15	124.75	122.10	119.35	117.15
1 1/16	1.0625	.744	7/8	4 7/8	9 1/2	1 1/16	62034	3	62234	115.50	1.0341 - 1.0660	148.20	131.80	126.35	123.70	120.90	118.70
1 3/32	1.0938	.766	1	4 7/8	10 1/2	1 3/32	62035	4	62235	134.55	1.0661 - 1.0970	167.15	150.85	145.35	142.80	139.95	137.75
1 1/8	1.1250	.787	1	4 7/8	10 1/2	1 1/8	62036	4	62236	134.55	1.0971 - 1.1280	167.15	150.85	145.35	142.80	139.95	137.75
1 5/32	1.1562	.809	1	4 7/8	10 1/2	1 5/32	62037	4	62237	146.90	1.1281 - 1.1590	179.50	163.20	157.75	155.15	152.30	150.10
1 3/16	1.1875	.831	1	4 7/8	10 1/2	1 3/16	62038	4	62238	151.15	1.1591 - 1.1905	183.75	167.50	161.95	159.35	156.60	154.40
1 7/32	1.2188	.853	1	4 7/8	10 1/2	1 7/32	62039	4	62239	151.70	1.1906 - 1.2220	184.35	167.95	162.55	159.90	157.10	154.90
1 1/4	1.2500	.875	1	4 7/8	10 1/2	1 1/4	62040	4	62240	152.30	1.2221 - 1.2530	184.95	168.60	163.15	160.50	157.75	155.50
1 9/32	1.2812	.897	1	4 7/8	10 1/2	1 9/32	62041	4	62241	163.20	1.2531 - 1.2840	195.85	179.45	174.05	171.35	168.60	166.35
1 5/16	1.3125	.919	1	4 7/8	10 1/2	1 5/16	62042	4	62242	167.75	1.2841 - 1.3150	200.40	184.05	178.50	175.95	173.15	170.90
1 11/32	1.3438	.940	1	4 7/8	10 1/2	1 11/32	62043	4	62243	171.25	1.3151 - 1.3470	203.90	187.55	182.05	179.45	176.70	174.40
1 3/8	1.3750	.962	1	4 7/8	10 1/2	1 3/8	62044	4	62244	175.40	1.3471 - 1.3780	208.00	191.70	186.20	183.60	180.85	178.55
1 13/32	1.4062	.984	1	4 7/8	10 1/2	1 13/32	62045	4	62245	179.40	1.3781 - 1.4090	212.05	195.75	190.20	187.60	184.80	182.60
1 7/16	1.4375	1.006	1	4 7/8	10 1/2	1 7/16	62046	4	62246	184.65	1.4091 - 1.4410	217.30	201.00	195.45	192.85	190.10	187.85
1 15/32	1.4688	1.025	1	4 7/8	10 1/2	1 15/32	62047	4	62247	190.15	1.4411 - 1.4720	222.75	206.40	201.00	198.40	195.50	193.40
1 1/2	1.5000	1.050	1	4 7/8	10 1/2	1 1/2	62048	4	62248	194.25	1.4721 - 1.5030	226.85	210.45	205.05	202.45	199.60	197.50

*3 flutes

**Quantities of 15 or more - price of fractional size in same size range.

CORE DRILLS
CARBIDE TIPPED TYPES 620 & 622 METRIC

GENERAL PURPOSE

FOUR RIGHT SPIRAL FLUTES
STRAIGHT OR TAPER SHANK

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced on pg. 140
- Modified metric tool diameter - priced below
- Closer tool diameter tolerance
- End chamfer other than 118° included angle
- End cutting or corner radius
- Shortened shank or reduced shank diameter (for Type 620)
- Flat(s) or tang on shank (for Type 620)
- Shank whistle notch for set screw (for Type 622)
- Smaller taper shank (for Type 622)
- Coatings available:

TITANIUM NITRIDE – TiN
TITANIUM CARBONITRIDE – TiCN
ZIRCONIUM NITRIDE – ZrN
AL TITANIUM NITRIDE – AlTiN

DRILLS

NOTE: Tool diameter in millimeters (mm): all other dimensions in inches.

TOOL DIAMETER		DIMENSIONS				TYPE 620		TYPE 622		BOTH TYPES METRIC PRICE	FINISHED TO MODIFIED TOOL DIAMETER							
		MIN. CUT DIAM.	LENGTH			SHANK DIAM.	METRIC EDP NO.	TAPER SHANK NO.	METRIC EDP NO.		MODIFIED DIAMETER RANGE (mm)	PRICE EACH - BASED ON QUANTITY ORDERED						
mm	INCH		CARBIDE	FLT	OVERALL							1	2	3	4	5-7	8-14	OVER 14
* 9.0	.3543	.262	5/8	3 1/2	6 3/4	3/8	620090	1	622090	$100.05	8.815 - 9.601	$124.60	$108.35	$102.80	$100.15	$97.45	$95.15	$92.00
*10.0	.3937	.284	5/8	3 5/8	7	13/32	620100	1	622100	100.05	9.602 - 10.389	124.60	108.35	102.80	100.15	97.45	95.15	92.00
*11.0	.4331	.306	3/4	3 7/8	7 1/4	7/16	620110	1	622110	100.05	10.390 - 11.201	124.60	108.35	102.80	100.15	97.45	95.15	92.00
* -	-	.328	3/4	4 1/8	7 1/2	15/32	620119	1	622119	-	11.202 - 11.989	124.60	108.35	102.80	100.15	97.45	95.15	92.00
12.0	.4724	.350	3/4	4 3/8	8 1/4	1/2	620120	2	622120	100.05	11.990 - 12.776	124.60	108.35	102.80	100.15	97.45	95.15	92.00
13.0	.5118	.372	3/4	4 3/8	8 1/4	17/32	620130	2	622130	100.40	12.777 - 13.564	124.95	108.75	103.25	100.65	97.85	95.60	92.50
14.0	.5512	.394	3/4	4 3/8	8 1/4	9/16	620140	2	622140	100.40	13.565 - 14.376	124.95	108.75	103.25	100.65	97.85	95.60	92.50
15.0	.5906	.416	3/4	4 3/8	8 1/4	19/32	620150	2	622150	104.95	14.377 - 15.164	129.50	113.20	107.75	105.05	102.30	100.05	96.90
-	-	.438	3/4	4 3/8	8 1/4	5/8	620159	2	622159	-	15.165 - 15.951	129.50	113.20	107.75	105.05	102.30	100.05	96.90
16.0	.6299	.459	3/4	4 3/8	8 1/4	21/32	620160	2	622160	106.05	15.952 - 16.739	130.65	114.30	108.85	106.15	103.40	101.10	98.05
17.0	.6693	.481	7/8	4 3/8	8 1/4	11/16	620170	2	622170	106.85	16.740 - 17.551	131.45	115.10	109.60	106.95	104.25	101.95	98.80
18.0	.7087	.503	7/8	4 3/8	8 1/4	23/32	620180	2	622180	106.85	17.552 - 18.339	131.45	115.10	109.60	106.95	104.25	101.95	98.80
19.0	.7480	.525	7/8	4 3/8	8 1/4	3/4	620190	2	622190	106.85	18.340 - 19.126	131.45	115.10	109.60	106.95	104.25	101.95	98.80
-	-	.547	7/8	4 3/8	8 1/4	25/32	620199	2	622199	-	19.127 - 19.914	133.55	117.30	111.85	109.15	106.40	104.15	100.95
20.0	.7874	.569	7/8	4 7/8	9 1/2	13/16	620200	3	622200	111.70	19.915 - 20.726	136.25	120.05	114.50	111.90	109.15	106.85	103.70
21.0	.8268	.591	7/8	4 7/8	9 1/2	27/32	620210	3	622210	117.15	20.727 - 21.514	141.70	125.40	119.95	117.30	114.50	112.30	109.15
22.0	.8661	.612	7/8	4 7/8	9 1/2	7/8	620220	3	622220	117.15	21.515 - 22.301	141.70	125.40	119.95	117.30	114.50	112.30	109.15
23.0	.9055	.634	7/8	4 7/8	9 1/2	29/32	620230	3	622230	117.75	22.302 - 23.089	142.35	126.05	120.65	117.85	115.20	112.95	109.80
-	-	.656	7/8	4 7/8	9 1/2	15/16	620239	3	622239	-	23.090 - 23.901	142.35	126.05	120.65	117.85	115.20	112.95	109.80
24.0	.9449	.678	7/8	4 7/8	9 1/2	31/32	620240	3	622240	121.75	23.902 - 24.689	146.30	130.00	124.55	121.85	119.15	116.80	113.70
25.0	.9843	.700	7/8	4 7/8	9 1/2	1	620250	3	622250	123.75	24.690 - 25.476	148.40	132.10	126.60	123.95	121.20	118.95	115.80
26.0	1.0236	.722	7/8	4 7/8	9 1/2	1 1/32	620260	3	622260	124.75	25.477 - 26.264	149.30	133.00	127.55	124.85	122.10	119.90	116.70
27.0	1.0630	.744	7/8	4 7/8	9 1/2	1 1/16	620270	3	622270	126.35	26.265 - 27.076	150.95	134.60	129.10	126.50	123.70	121.50	118.35
-	-	.766	1	4 7/8	10 1/2	1 3/32	620279	4	622279	-	27.077 - 27.864	169.90	153.60	148.20	145.45	142.80	140.45	137.40
28.0	1.1024	.787	1	4 7/8	10 1/2	1 1/8	620280	4	622280	145.35	27.865 - 28.651	169.90	153.60	148.20	145.45	142.80	140.45	137.40
29.0	1.1417	.809	1	4 7/8	10 1/2	1 5/32	620290	4	622290	157.75	28.652 - 29.439	182.25	166.00	160.50	157.85	155.15	152.80	149.65
30.0	1.1811	.831	1	4 7/8	10 1/2	1 3/16	620300	4	622300	161.95	29.440 - 30.239	186.55	170.25	164.85	162.05	159.35	157.10	154.00
31.0	1.2205	.853	1	4 7/8	10 1/2	1 7/32	620310	4	622310	162.55	30.240 - 31.039	187.10	170.80	165.35	162.65	159.90	157.60	154.50
-	-	.875	1	4 7/8	10 1/2	1 1/4	620319	4	622319	-	31.040 - 31.826	187.65	171.35	165.95	163.30	160.50	158.25	155.15
32.0	1.2598	.897	1	4 7/8	10 1/2	1 9/32	620320	4	622320	174.05	31.827 - 32.614	198.60	182.25	176.80	174.15	171.35	169.10	166.00
33.0	1.2992	.919	1	4 7/8	10 1/2	1 5/16	620330	4	622330	178.50	32.615 - 33.401	203.05	186.75	181.30	178.60	175.95	173.70	170.55
34.0	1.3386	.940	1	4 7/8	10 1/2	1 11/32	620340	4	622340	182.05	33.402 - 34.214	206.70	190.40	184.90	182.20	179.45	177.20	174.10
35.0	1.3780	.962	1	4 7/8	10 1/2	1 3/8	620350	4	622350	186.20	34.215 - 35.001	210.85	194.50	189.05	186.35	183.60	181.30	178.25
-	-	.984	1	4 7/8	10 1/2	1 13/32	620359	4	622359	-	35.002 - 35.789	214.75	198.55	192.95	190.40	187.60	185.35	182.20
36.0	1.4173	1.006	1	4 7/8	10 1/2	1 7/16	620360	4	622360	195.45	35.790 - 36.601	220.05	203.75	198.35	195.55	192.85	190.60	187.50
37.0	1.4567	1.025	1	4 7/8	10 1/2	1 15/32	620370	4	622370	201.00	36.602 - 37.389	225.50	209.25	203.75	201.10	198.40	196.05	192.90
38.0	1.4961	1.050	1	4 7/8	10 1/2	1 1/2	620380	4	622380	205.05	37.390 - 38.176	229.60	213.30	207.85	205.15	202.45	200.15	197.00

*3 flutes

CORE DRILLS - FOR STEELS
CARBIDE TIPPED TYPES 621 & 623 FRACTIONAL

MATERIAL SPECIFIC

FOUR RIGHT SPIRAL FLUTES
STRAIGHT OR TAPER SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	620* or 622*
	40	NON-FERROUS - SHORT CHIPS	620* or 622*
	60	CAST IRONS	620* or 622*
	80	LOW STRENGTH STEELS	621 or 623
	100	MEDIUM STRENGTH STEELS	621 or 623
	120	HIGH STRENGTH STEELS	621 or 623
	140	HIGH TEMPERATURE ALLOYS	620* or 622*

*Types 620 & 622 on page 140

TYPE 621 – STRAIGHT SHANK FOR MACHINING STEELS

- Special carbide grade & tool geometry permit the heavy chip loads and speeds required for machining steel
- Not to be used for machining non-ferrous materials, cast irons, or high temp alloys
- Four large right spiral polished flutes permit higher feeds and speeds
- Carbide tips brazed to hardened tool steel body
- 118˚ included chamfer angle
- Rigid design provides maximum support for the carbide tips
- Tool diameter tolerance: plus .000", minus .001"

TYPE 623 – TAPER SHANK FOR MACHINING STEELS

- Same as Type 621 above, except with taper shank

MODIFICATIONS (See list on page 143)

USE:

- Designed for economically enlarging cored, punched, drilled, or preformed holes - can remove up to 30% of the tool diameter
- The balanced cutting action of the core drill removes considerably more material than a reamer, often eliminating the need for a final reaming or boring operation

TOOL DIAMETER		DIMENSIONS				TYPE 621		TYPE 623		BOTH TYPES PRICE	FINISHED TO MODIFIED TOOL DIAMETER						
		MIN. CUT DIAM.	LENGTH			SHANK DIAM.	STEEL EDP NO.	TAPER SHANK NO.	STEEL EDP NO.		MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DEC.		CAR-BIDE	FLT	OVER-ALL							1	2	3	4	5-7	8-14**
* 3/8	.3750	.262	5/8	3 1/2	6 3/4	3/8	62112	1	62312	$98.25	0.3471 - 0.3780	130.90	$114.50	$109.05	$106.50	$103.65	$101.50
* 13/32	.4062	.284	5/8	3 5/8	7	13/32	62113	1	62313	98.25	0.3781 - 0.4090	130.90	114.50	109.05	106.50	103.65	101.50
* 7/16	.4375	.306	3/4	3 7/8	7 1/4	7/16	62114	1	62314	98.25	0.4091 - 0.4410	130.90	114.50	109.05	106.50	103.65	101.50
* 15/32	.4688	.328	3/4	4 1/8	7 1/2	15/32	62115	1	62315	98.25	0.4411 - 0.4720	130.90	114.50	109.05	106.50	103.65	101.50
1/2	.5000	.350	3/4	4 3/8	8 1/4	1/2	62116	2	62316	98.25	0.4721 - 0.5030	130.90	114.50	109.05	106.50	103.65	101.50
17/32	.5312	.372	3/4	4 3/8	8 1/4	17/32	62117	2	62317	98.60	0.5031 - 0.5340	131.20	114.90	109.40	106.80	104.00	101.80
9/16	.5625	.394	3/4	4 3/8	8 1/4	9/16	62118	2	62318	98.60	0.5341 - 0.5660	131.20	114.90	109.40	106.80	104.00	101.80
19/32	.5938	.416	3/4	4 3/8	8 1/4	19/32	62119	2	62319	103.60	0.5661 - 0.5970	136.20	119.90	114.35	111.85	109.00	106.80
5/8	.6250	.438	3/4	4 3/8	8 1/4	5/8	62120	2	62320	103.60	0.5971 - 0.6280	136.20	119.90	114.35	111.85	109.00	106.80
21/32	.6562	.459	3/4	4 3/8	8 1/4	21/32	62121	2	62321	104.80	0.6281 - 0.6590	137.40	120.95	115.50	112.95	110.15	107.90
11/16	.6875	.481	7/8	4 3/8	8 1/4	11/16	62122	2	62322	105.70	0.6591 - 0.6910	138.30	121.90	116.50	113.85	111.10	108.85
23/32	.7188	.503	7/8	4 3/8	8 1/4	23/32	62123	2	62323	105.70	0.6911 - 0.7220	138.30	121.90	116.50	113.85	111.10	108.85
3/4	.7500	.525	7/8	4 3/8	8 1/4	3/4	62124	2	62324	105.70	0.7221 - 0.7530	138.30	121.90	116.50	113.85	111.10	108.85
25/32	.7812	.547	7/8	4 3/8	8 1/4	25/32	62125	2	62325	107.90	0.7531 - 0.7840	140.50	124.25	118.70	116.10	113.30	111.15
13/16	.8125	.569	7/8	4 7/8	9 1/2	13/16	62126	3	62326	111.00	0.7841 - 0.8160	143.60	127.30	121.80	119.25	116.45	114.20
27/32	.8438	.591	7/8	4 7/8	9 1/2	27/32	62127	3	62327	116.95	0.8161 - 0.8470	149.55	133.25	127.75	125.15	122.40	120.15
7/8	.8750	.612	7/8	4 7/8	9 1/2	7/8	62128	3	62328	116.95	0.8471 - 0.8780	149.55	133.25	127.75	125.15	122.40	120.15
29/32	.9062	.634	7/8	4 7/8	9 1/2	29/32	62129	3	62329	117.65	0.8781 - 0.9090	150.30	134.00	128.45	125.90	123.10	120.85
15/16	.9375	.656	7/8	4 7/8	9 1/2	15/16	62130	3	62330	117.65	0.9091 - 0.9410	150.30	134.00	128.45	125.90	123.10	120.85
31/32	.9688	.678	7/8	4 7/8	9 1/2	31/32	62131	3	62331	121.95	0.9411 - 0.9720	154.60	138.30	132.80	130.15	127.45	125.25
1	1.0000	.700	7/8	4 7/8	9 1/2	1	62132	3	62332	124.35	0.9721 - 1.0030	156.95	140.65	135.15	132.55	129.80	127.55
1 1/32	1.0312	.722	7/8	4 7/8	9 1/2	1 1/32	62133	3	62333	125.30	1.0031 - 1.0340	157.90	141.55	136.05	133.50	130.70	128.45
1 1/16	1.0625	.744	7/8	4 7/8	9 1/2	1 1/16	62134	3	62334	127.00	1.0341 - 1.0660	159.65	143.30	137.80	135.20	132.45	130.15
1 3/32	1.0938	.766	1	4 7/8	10 1/2	1 3/32	62135	4	62335	148.00	1.0661 - 1.0970	180.55	164.25	158.75	156.20	153.40	151.15
1 1/8	1.1250	.787	1	4 7/8	10 1/2	1 1/8	62136	4	62336	154.65	1.0971 - 1.1280	187.35	171.00	165.50	162.85	160.10	157.90
1 5/32	1.1562	.809	1	4 7/8	10 1/2	1 5/32	62137	4	62337	161.60	1.1281 - 1.1590	194.25	177.85	172.40	169.80	166.95	164.85
1 3/16	1.1875	.831	1	4 7/8	10 1/2	1 3/16	62138	4	62338	166.25	1.1591 - 1.1905	198.90	182.60	177.15	174.50	171.75	169.55
1 7/32	1.2188	.853	1	4 7/8	10 1/2	1 7/32	62139	4	62339	166.90	1.1906 - 1.2220	199.55	183.20	177.75	175.10	172.35	170.15
1 1/4	1.2500	.875	1	4 7/8	10 1/2	1 1/4	62140	4	62340	167.55	1.2221 - 1.2530	200.15	183.75	178.35	175.75	172.95	170.75
1 9/32	1.2812	.897	1	4 7/8	10 1/2	1 9/32	62141	4	62341	179.45	1.2531 - 1.2840	212.10	195.80	190.25	187.65	184.90	182.65
1 5/16	1.3125	.919	1	4 7/8	10 1/2	1 5/16	62142	4	62342	184.45	1.2841 - 1.3150	217.10	200.75	195.30	192.70	189.90	187.65
1 11/32	1.3438	.940	1	4 7/8	10 1/2	1 11/32	62143	4	62343	188.40	1.3151 - 1.3470	221.05	204.70	199.25	196.65	193.75	191.65
1 3/8	1.3750	.962	1	4 7/8	10 1/2	1 3/8	62144	4	62344	192.90	1.3471 - 1.3780	225.55	209.25	203.75	201.15	198.40	196.10
1 13/32	1.4062	.984	1	4 7/8	10 1/2	1 13/32	62145	4	62345	197.50	1.3781 - 1.4090	230.05	213.70	208.25	205.65	202.85	200.60
1 7/16	1.4375	1.006	1	4 7/8	10 1/2	1 7/16	62146	4	62346	203.20	1.4091 - 1.4410	235.85	219.40	213.95	211.35	208.60	206.35
1 15/32	1.4688	1.025	1	4 7/8	10 1/2	1 15/32	62147	4	62347	209.20	1.4411 - 1.4720	241.85	225.45	220.00	217.40	214.55	212.35
1 1/2	1.5000	1.050	1	4 7/8	10 1/2	1 1/2	62148	4	62348	213.60	1.4721 - 1.5030	246.25	229.90	224.45	221.85	219.10	216.90

*3 flutes

**Quantities of 15 or more - price of fractional size in same size range.

CORE DRILLS - FOR STEELS
CARBIDE TIPPED TYPES 621 & 623 METRIC

MATERIAL SPECIFIC

FOUR RIGHT SPIRAL FLUTES
STRAIGHT OR TAPER SHANK

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced on pg. 142
- Modified metric tool diameter - priced below
- Closer tool diameter tolerance
- End chamfer other than 118˚ included angle
- End cutting or corner radius
- Shortened shank or reduced shank diameter (for Type 621)
- Flat(s) or tang on shank (for Type 621)
- Shank whistle notch for set screw (for Type 623)
- Smaller taper shank (for Type 623)
- Coatings available:

TITANIUM NITRIDE – TiN
TITANIUM CARBONITRIDE – TiCN
ZIRCONIUM NITRIDE – ZrN
AL TITANIUM NITRIDE – AlTiN

DRILLS

NOTE: Tool diameter in millimeters (mm): all other dimensions in inches.

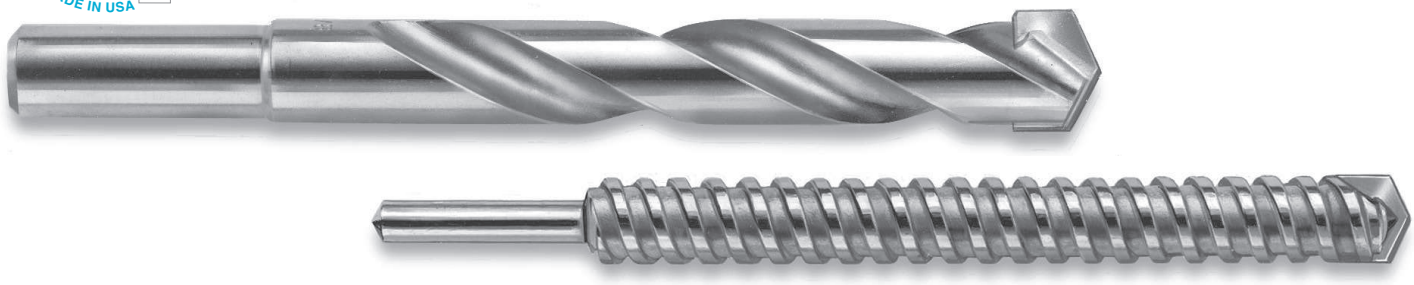
TOOL DIAMETER		DIMENSIONS				TYPE 621		TYPE 623		BOTH TYPES METRIC PRICE	FINISHED TO MODIFIED TOOL DIAMETER						
		MIN. CUT DIAM.	LENGTH			SHANK DIAM.	STEEL METRIC EDP NO.	TAPER SHANK NO.	STEEL METRIC EDP NO.		MODIFIED DIAMETER RANGE (mm)	PRICE EACH - BASED ON QUANTITY ORDERED						
mm	INCH		CAR-BIDE	FLT	OVER-ALL							1	2	3	4	5-7	8-14	OVER 14
* 9.0	.3543	.262	5/8	3 1/2	6 3/4	3/8	621090	1	623090	$109.05	8.815-9.601	$133.60	$117.35	$111.90	$109.20	$106.50	$104.20	$101.00
*10.0	.3937	.284	5/8	3 5/8	7	13/32	621100	1	623100	109.05	9.602-10.389	133.60	117.35	111.90	109.20	106.50	104.20	101.00
*11.0	.4331	.306	3/4	3 7/8	7 1/4	7/16	621110	1	623110	109.05	10.390-11.201	133.60	117.35	111.90	109.20	106.50	104.20	101.00
* -	-	.328	3/4	4 1/8	7 1/2	15/32	621119	1	623119	-	11.202-11.989	133.60	117.35	111.90	109.20	106.50	104.20	101.00
12.0	.4724	.350	3/4	4 3/8	8 1/4	1/2	621120	2	623120	109.05	11.990-12.776	133.60	117.35	111.90	109.20	106.50	104.20	101.00
13.0	.5118	.372	3/4	4 3/8	8 1/4	17/32	621130	2	623130	109.40	12.777-13.564	134.00	117.65	112.15	109.50	106.80	104.45	101.40
14.0	.5512	.394	3/4	4 3/8	8 1/4	9/16	621140	2	623140	109.40	13.565-14.376	134.00	117.65	112.15	109.50	106.80	104.45	101.40
15.0	.5906	.416	3/4	4 3/8	8 1/4	19/32	621150	2	623150	114.35	14.377-15.164	138.95	122.65	117.20	114.50	111.85	109.50	106.40
-	-	.438	3/4	4 3/8	8 1/4	5/8	621159	2	623159	-	15.165-15.951	138.95	122.65	117.20	114.50	111.85	109.50	106.40
16.0	.6299	.459	3/4	4 3/8	8 1/4	21/32	621160	2	623160	115.50	15.952-16.739	140.10	123.75	118.35	115.65	112.95	110.65	107.50
17.0	.6693	.481	7/8	4 3/8	8 1/4	11/16	621170	2	623170	116.50	16.740-17.551	141.05	124.75	119.30	116.60	113.85	111.55	108.45
18.0	.7087	.503	7/8	4 3/8	8 1/4	23/32	621180	2	623180	116.50	17.552-18.339	141.05	124.75	119.30	116.60	113.85	111.55	108.45
19.0	.7480	.525	7/8	4 3/8	8 1/4	3/4	621190	2	623190	116.50	18.340-19.126	141.05	124.75	119.30	116.60	113.85	111.55	108.45
-	-	.547	7/8	4 3/8	8 1/4	25/32	621199	2	623199	-	19.127-19.914	143.30	127.00	121.60	118.85	116.10	113.85	110.75
20.0	.7874	.569	7/8	4 7/8	9 1/2	13/16	621200	3	623200	121.80	19.915-20.726	146.35	130.05	124.60	121.90	119.25	116.95	113.75
21.0	.8268	.591	7/8	4 7/8	9 1/2	27/32	621210	3	623210	127.75	20.727-21.514	152.30	136.00	130.55	127.85	125.15	122.85	119.75
22.0	.8661	.612	7/8	4 7/8	9 1/2	7/8	621220	3	623220	127.75	21.515-22.301	152.30	136.00	130.55	127.85	125.15	122.85	119.75
23.0	.9055	.634	7/8	4 7/8	9 1/2	29/32	621230	3	623230	128.45	22.302-23.089	153.05	136.80	131.25	128.65	125.90	123.60	120.45
-	-	.656	7/8	4 7/8	9 1/2	15/16	621239	3	623239	-	23.090-23.901	153.05	136.80	131.25	128.65	125.90	123.60	120.45
24.0	.9449	.678	7/8	4 7/8	9 1/2	31/32	621240	3	623240	132.80	23.902-24.689	157.40	141.10	135.70	132.90	130.15	127.90	124.80
25.0	.9843	.700	7/8	4 7/8	9 1/2	1	621250	3	623250	135.15	24.690-25.476	159.70	143.40	137.95	135.25	132.55	130.20	127.10
26.0	1.0236	.722	7/8	4 7/8	9 1/2	1 1/32	621260	3	623260	136.05	25.477-26.264	160.70	144.35	138.85	136.20	133.50	131.20	128.10
27.0	1.0630	.744	7/8	4 7/8	9 1/2	1 1/16	621270	3	623270	137.80	26.265-27.076	162.45	146.10	140.65	137.95	135.20	132.90	129.85
-	-	.766	1	4 7/8	10 1/2	1 3/32	621279	4	623279	-	27.077-27.864	183.40	167.05	161.60	158.90	156.20	153.85	150.80
28.0	1.1024	.787	1	4 7/8	10 1/2	1 1/8	621280	4	623280	165.50	27.865-28.651	190.10	173.80	168.35	165.70	162.85	160.70	157.50
29.0	1.1417	.809	1	4 7/8	10 1/2	1 5/32	621290	4	623290	172.40	28.652-29.439	196.95	180.70	175.20	172.55	169.80	167.55	164.40
30.0	1.1811	.831	1	4 7/8	10 1/2	1 3/16	621300	4	623300	177.15	29.440-30.239	201.70	185.40	180.00	177.25	174.50	172.20	169.10
31.0	1.2205	.853	1	4 7/8	10 1/2	1 7/32	621310	4	623310	177.75	30.240-31.039	202.25	186.05	180.50	177.85	175.10	172.90	169.70
-	-	.875	1	4 7/8	10 1/2	1 1/4	621319	4	623319	-	31.040-31.826	202.90	186.60	181.15	178.45	175.75	173.40	170.30
32.0	1.2598	.897	1	4 7/8	10 1/2	1 9/32	621320	4	623320	190.25	31.827-32.614	214.90	198.60	193.05	190.45	187.65	185.40	182.25
33.0	1.2992	.919	1	4 7/8	10 1/2	1 5/16	621330	4	623330	195.30	32.615-33.401	219.85	203.55	198.05	195.40	192.70	190.45	187.25
34.0	1.3386	.940	1	4 7/8	10 1/2	1 11/32	621340	4	623340	199.25	33.402-34.214	223.75	207.50	202.05	199.40	196.65	194.35	191.20
35.0	1.3780	.962	1	4 7/8	10 1/2	1 3/8	621350	4	623350	203.75	34.215-35.001	228.40	212.05	206.60	203.90	201.15	198.85	195.80
-	-	.984	1	4 7/8	10 1/2	1 13/32	621359	4	623359	-	35.002-35.789	232.80	216.50	211.05	208.35	205.65	203.35	200.20
36.0	1.4173	1.006	1	4 7/8	10 1/2	1 7/16	621360	4	623360	213.95	35.790-36.601	238.55	222.25	216.75	214.10	211.35	209.15	205.95
37.0	1.4567	1.025	1	4 7/8	10 1/2	1 15/32	621370	4	623370	220.00	36.602-37.389	244.50	228.30	222.75	220.15	217.40	215.15	212.00
38.0	1.4961	1.050	1	4 7/8	10 1/2	1 1/2	621380	4	623380	224.45	37.390-38.176	249.00	232.70	227.25	224.55	221.85	219.60	216.40

*3 flutes

MASONRY DRILLS CARBIDE TIPPED TYPES 681, 682, 683, 684 FRACTIONAL

MATERIAL SPECIFIC

FOUR TYPES FOR MOST APPLICATIONS



TYPE 681 – REGULAR HELIX (WIDE SPIRAL)
- Fast feeding with large open flutes

TYPE 682 – HIGH HELIX (FAST SPIRAL)
TYPE 683 – HIGH HELIX (FAST SPIRAL) – 13" LENGTH
TYPE 684 – HIGH HELIX (FAST SPIRAL) – 18" LENGTH

TOOL DIAMETER	SHANK DIAMETER	OVERALL LENGTH	TYPE 681 REGULAR HELIX EDP NO.	TYPE 682 HIGH HELIX EDP NO.	BOTH TYPES PRICE
1/8	1/8	3	68108	68208	$4.70
3/16	3/16	3	68112	68212	4.70
1/4	1/4	4	68116	68216	4.70
1/4	1/4	6	68117	68217	5.35
5/16	1/4	4	68120	68220	5.35
5/16	1/4	6	68121	68221	5.85
3/8	1/4	4	68124	68224	5.85
3/8	1/4	6	68125	68225	5.85
7/16	1/4	4	68128	68228	6.45
7/16	1/4	6	68129	68229	6.60
1/2	1/4	4	68132	68232	7.15
1/2	1/4	6	68133	68233	7.15
1/2	3/8	6	68134	68234	7.15
9/16	3/8	6	68136	68236	9.65
5/8	1/2	6	68140	68240	10.25
11/16	1/2	6	68144	68244	11.60
3/4	1/2	6	68148	68248	12.70
7/8	1/2	6	68156	68256	15.85
1	1/2	6	68164	68264	19.60

ALL TYPES:
- Carbide tip brazed to tough steel body
- Carbide tip is larger than the tool diameter listed to provide clearance for installation of anchor screws, expansion shields and toggle bolts

USE:
- Designed for use in portable electric drills
- For drilling masonry including concrete, plaster, wall board, stone, brick, marble, slate, carbon, asphalt and cement
- Performs best at moderate pressure and slow speeds
- Keep drill cutting rather than rubbing
- On deep holes, withdraw frequently to prevent clogging
- Use punch or star type hand drill to shatter obstructions such as glazed rock

TOOL DIAMETER	SHANK DIAMETER	TYPE 683 – HIGH HELIX 13" OVERALL LENGTH		TYPE 684 – HIGH HELIX 18" OVERALL LENGTH	
		EDP NO.	PRICE	EDP NO.	PRICE
1/4	1/4	68316	$12.25	68416	$16.55
5/16	1/4	68320	14.05	68420	19.15
3/8	1/4	68324	15.40	68424	20.25
7/16	1/4	68328	16.90	68428	22.15
1/2	3/8	68332	19.35	68432	22.75
9/16	3/8	68336	22.15	68436	24.75
5/8	1/2	68340	24.75	68440	27.80
11/16	1/2	68344	27.75	68444	29.95
3/4	1/2	68348	28.45	68448	32.05
7/8	1/2	68356	35.15	68456	40.05
1	1/2	68364	38.90	68464	43.85

GLASS & TILE DRILLS CARBIDE TIPPED TYPE 680 FRACTIONAL

TYPE 680 – CARBIDE SPEAR POINT – STRAIGHT SHANK
- Carbide tip brazed to hardened tool steel body
- Long carbide tip permits many regrinds

USE:
- For drilling glass, tile, porcelain, ceramic and other hard, fragile materials without chipping or cracking the material when properly used
- Speed should be approx. 25 surface feet per minute (150 to 760 RPM based on tool diameter) using a steady, moderate hand feed
- Constant flow of coolant important
- Material being drilled should be backed with wood or rubber to support material during drill break-through
- Avoid vibration and excessive stress
- Keep drill sharp to eliminate excessive pressure

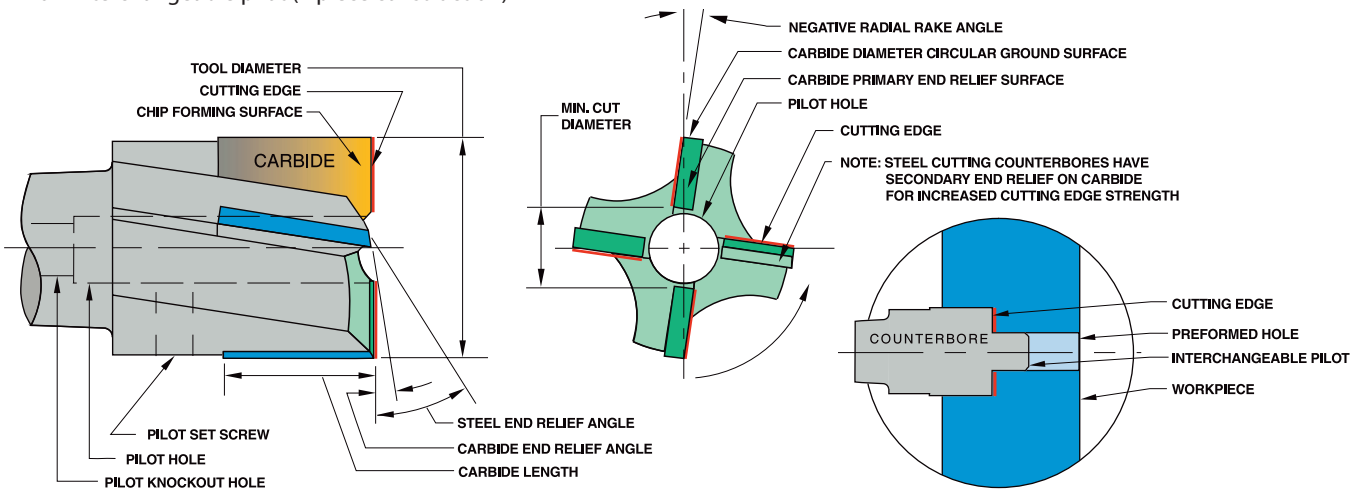
TOOL DIAMETER		SHANK DIAMETER	OVERALL LENGTH	TYPE 680 EDP NO.	PRICE EACH
FRAC.	DECIMAL				
1/8	.1250	7/64	2 1/2	68008	$18.50
3/16	.1875	5/32	2 1/2	68012	18.50
1/4	.2500	7/32	2 1/2	68016	21.25
5/16	.3125	1/4	3	68020	27.35
3/8	.3750	5/16	3 1/2	68024	30.40
7/16	.4375	3/8	3 1/2	68028	34.50
1/2	.5000	7/16	3 1/2	68032	37.65
9/16	.5625	1/2	4	68036	52.90
5/8	.6250	9/16	4	68040	63.75

CARBIDE TIPPED COUNTERBORES INDEX AND TECHNICAL INFORMATION

MOST TYPES FOR INTERCHANGEABLE PILOTS

DESCRIPTION	HANNIBAL FRAC. PAGE	HANNIBAL METRIC PAGE	HANNIBAL TOOL TYPE	CLEVELAND	ECLIPSE	METCUT	MORSE	WHITNEY
AIRCRAFT COUNTERBORES								
3 Flutes (similar to Craig 850 series)	147	–	522	–	–	–	–	–
STRAIGHT SHANK COUNTERBORES								
4 Flutes	148	149	512	–	–	–	–	–
3 - 4 Flutes	148	149	514	779	–	–	5779	–
3 - 4 Flutes – For Steels	152	153	510	–	–	–	–	–
TAPER SHANK COUNTERBORES								
4 Flutes	150	151	518	–	–	–	–	–
3 - 4 Flutes	150	151	516	–	–	–	5780	–
3 - 4 Flutes – For Steels	152	153	511	–	–	–	–	–
STUB LENGTH COUNTERBORES								
Pin Drive – For Non-Ferrous & Cast Irons	155	–	573	–	412	200	–	–
Pin Drive – For Steels	155	–	574	–	–	–	–	–
Stub Taper – For Non-Ferrous & Cast Irons	154	–	575	–	427	210	–	–
Stub Taper – For Steels	154	–	576	–	–	–	–	–
Radial Drive – For Non-Ferrous & Cast Irons	156	–	577	–	402	220	–	–
Radial Drive – For Steels	156	–	578	-	–	–	–	–
***CAPSCREW COUNTERBORES**								
Straight Shank - For Non-Ferrous & Cast Iron	157	157	513	–	–	–	–	–
Straight Shank - For Steels	157	157	515	–	–	–	–	–
PILOTS								
Short Shank	158	–	500	Yes	–	410	776	Yes

*Non-interchangeable pilot (1 piece construction)



COUNTERBORE BASICS

- The counterbore is used to enlarge a preformed hole when a flat bottom is required or to spotface when a machine finish is required
- The counterbore is an end cutting tool which may utilize a pilot to align the enlarged hole being machined with the preformed hole
- The three flute counterbore tends to reduce chatter & improve finish
- Coatings are especially effective (see "Coating Selector" on page 10)

COUNTERBORE PROBLEM SOLVING GUIDE

- Refer to guide shown on page 188

COUNTERBORE SPECIFICATIONS & TOLERANCES

- Geometry and carbide grade appropriate for material being machined
- Carbide tips brazed to tough hardened alloy steel body, except aircraft counterbores which are not hardened
- Precision ground cutting edges
- USCTI
- "Taper Shank No." refers to American Standard taper series (formerly Morse taper series) per ASME/ANSI B5.10
- Tool diameter tolerance: plus .001". minus .000"
- Shank diameter tolerance: plus .0000", minus .0005"
- Steel cutting counterbores have secondary end relief on carbide for increased cutting edge strength

FEEDS & SPEEDS - COUNTERBORES CARBIDE TIPPED

Speeds & feeds are starting recommendations only. Factors such as machine, fixture and tooling rigidity, horsepower available, coolant application and others will affect the performance significantly. Please read machine operators instructions and use all safety shields and glasses before performing these operations. Use this chart for carbide tipped counterbores.

RPM=SFPM*3.82/CUTTER DIAMETER

CHIP CLASS	MATERIAL	COUNTERBORING		FEED RATE (INCHES PER REVOLUTION) FINISHED HOLE DIAMETER IN INCHES					
		BRINELL	SFPM	¼	½	¾	1	1 ½	2
20	ALUMINUM ALLOY - WROUGHT	30-150	750-900	.006	.006	.007	.007	.009	.010
	MAGNESIUM ALLOY	50-90	875-1000	.006	.006	.007	.007	.009	.010
	LEAD	10-20	875-1000	.006	.006	.007	.007	.009	.010
	NON-METAL AND PLASTIC	-	700-1200	.006	.006	.007	.007	.009	.010
	ZINC ALLOY - DIE CAST	80-100	700-850	.005	.005	.006	.006	.007	.009
40	ALUMINUM BRONZE	40-175	700-850	.006	.006	.007	.007	.009	.010
	BRASS ALLOY - LEADED AND FREE CUTTING	10-100Rb	850-1000	.006	.006	.007	.007	.009	.010
	CHROMIUM - NICKEL	10-100Rb	75-85	.003	.003	.003	.003	.004	.005
	COPPER ALLOY - TOUGH	40-200*	275-350	.005	.005	.006	.006	.007	.009
60	DUCTILE CAST IRON - AUSTENITIC	120-275	85-110	.002	.002	.002	.002	.003	.004
	DUCTILE CAST IRON - FERRITIC	140-270	200-250	.006	.006	.007	.007	.009	.010
	DUCTILE CAST IRON - MARTENSITIC	270-400	75-95	.002	.002	.002	.002	.003	.004
	GRAY - PEARLITIC	220-320	125-200	.004	.004	.004	.005	.006	.007
	GRAY - FERRITIC	110-240	200-250	.004	.004	.004	.005	.006	.007
	MALLEABLE CAST IRON - MARTENSITIC	200-320	60-85	.004	.004	.004	.005	.006	.007
80	LOW AND MEDIUM CARBON STEEL - FREE MACHINING	100-250	200-250	.006	.006	.007	.007	.009	.010
	LOW AND MEDIUM CARBON STEEL - WROUGHT	100-375	150-200	.006	.006	.007	.007	.009	.010
100	LOW AND MEDIUM CARBON ALLOY STEEL - FREE MACHINING	100-275	145-185	.004	.004	.004	.005	.006	.007
	LOW AND MEDIUM CARBON ALLOY STEEL	85-375	130-165	.004	.004	.004	.005	.006	.007
	STAINLESS STEEL - 400 SERIES	135-325	150-200	.003	.003	.003	.003	.004	.005
	STAINLESS STEEL - 400 SERIES FREE MACHINING	135-275	155-205	.003	.003	.003	.003	.004	.005
120	HIGH STRENGTH STEEL - WROUGHT & TOOL STEEL	175-400	90-135	.002	.002	.002	.002	.003	.003
140	HIGH TEMP ALLOYS NICKEL & IRON BASE ALLOY	140-300	40-65	.002	.002	.002	.002	.003	.003
	STAINLESS STEEL - 300 SERIES	135-375	150-300	.003	.003	.003	.003	.004	.005
	STAINLESS STEEL - PH SERIES	150-440	115-175	.003	.003	.003	.003	.004	.005
	TITANIUM ALLOY	110-380	125-175	.002	.002	.002	.002	.003	.003

AIRCRAFT COUNTERBORES CARBIDE TIPPED TYPE 522 FRACTIONAL

GENERAL PURPOSE

INTERCHANGEABLE PILOT TYPE STRAIGHT SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	522
	40	NON-FERROUS - SHORT CHIPS	522
	60	CAST IRONS	522
	80	LOW STRENGTH STEELS	522
	100	MEDIUM STRENGTH STEELS	522
	120	HIGH STRENGTH STEELS	522
	140	HIGH TEMPERATURE ALLOYS	522

TYPE 522 – STRAIGHT SHANK

- 3 flutes
- Furnished with 1⁄64" corner radius
- Carbide tips brazed to tough alloy steel body
- Tool diameter tolerance: plus .001", minus .000"
- Shank diameter tolerance: plus .0000", minus .001"
- Detailed specifications on page 145

USE:

- For counterboring and spotfacing non-ferrous materials, composites, and non-metals used in airframe manufacturing

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Metric tool diameter
- Cutting diameter reduced for step
- Corner chamfer or corner radius
- 4 coatings available (listed on page 154)

TOOL DIAMETER		DIMENSIONS				TYPE 522 EDP NO.	PRICE	FINISHED TO MODIFIED TOOL DIAMETER						
		MIN CUT DIAM.	PILOT HOLE DIAM.	SMALL SHANK DIAM.	OVERALL LENGTH			MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRACTION	DECIMAL								1	2	3	4	5-7	8-14*
1/4	.2500	.1250	.0938	1/4	2 3/8	52208	$49.50	0.2381 - 0.2530	$84.15	$66.90	$61.05	$58.30	$55.35	$52.90
9/32	.2812	.1250	.0938	1/4	2 3/8	52209	49.55	0.2531 - 0.2840	84.20	66.95	61.15	58.35	55.40	53.00
5/16	.3125	.1250	.0938	1/4	2 3/8	52210	50.85	0.2841 - 0.3150	85.55	68.15	62.35	59.50	56.60	54.25
11/32	.3438	.1250	.0938	1/4	2 3/8	52211	51.85	0.3151 - 0.3470	86.55	69.15	63.40	60.55	57.65	55.30
3/8	.3750	.1250	.0938	1/4	2 3/8	52212	52.00	0.3471 - 0.3780	86.65	69.30	63.60	60.70	57.75	55.40
13/32	.4062	.1560	.1250	1/4	2 3/4	52213	59.15	0.3781 - 0.4090	93.70	76.50	70.65	67.85	64.85	62.55
7/16	.4375	.1560	.1250	1/4	2 3/4	52214	63.75	0.4091 - 0.4410	98.40	81.05	75.30	72.40	69.55	67.15
15/32	.4688	.1560	.1250	1/4	2 3/4	52215	64.80	0.4411 - 0.4720	99.50	82.15	76.35	73.55	70.60	68.20
1/2	.5000	.1560	.1250	1/4	2 3/4	52216	65.60	0.4721 - 0.5030	100.30	82.95	77.15	74.25	71.35	68.95
17/32	.5312	.1560	.1250	1/4	2 3/4	52217	65.95	0.5031 - 0.5340	100.55	83.20	77.50	74.60	71.65	69.30
9/16	.5625	.1560	.1250	1/4	2 3/4	52218	66.20	0.5341 - 0.5660	100.85	83.55	77.75	74.85	72.05	69.60
19/32	.5938	.1560	.1250	1/4	2 3/4	52219	66.55	0.5661 - 0.5970	101.30	83.95	78.20	75.30	72.35	69.95
5/8	.6250	.1560	.1250	1/4	2 3/4	52220	67.30	0.5971 - 0.6280	101.95	84.70	78.85	76.10	73.15	70.70
21/32	.6562	.2190	.1875	1/4	2 3/4	52221	74.80	0.6281 - 0.6590	109.45	92.10	86.40	83.55	80.60	78.25
11/16	.6875	.2190	.1875	1/4	2 3/4	52222	78.55	0.6591 - 0.6910	113.20	95.90	90.10	87.25	84.25	81.95
23/32	.7188	.2190	.1875	1/4	2 3/4	52223	81.20	0.6911 - 0.7220	115.80	98.55	92.70	89.95	86.95	84.65
3/4	.7500	.2190	.1875	1/4	2 3/4	52224	82.20	0.7221 - 0.7530	116.85	99.55	93.70	90.95	88.05	85.65
25/32	.7812	.2190	.1875	1/4	2 3/4	52225	82.55	0.7531 - 0.7840	117.25	99.90	94.15	91.20	88.35	85.95
13/16	.8125	.2190	.1875	1/4	2 3/4	52226	83.25	0.7841 - 0.8160	118.05	100.60	94.85	92.00	89.10	86.70
27/32	.8438	.2190	.1875	1/4	2 3/4	52227	83.90	0.8161 - 0.8470	118.55	101.10	95.40	92.55	89.60	87.25
7/8	.8750	.2190	.1875	1/4	2 3/4	52228	84.70	0.8471 - 0.8780	119.30	101.95	96.25	93.40	90.40	88.10
29/32	.9062	.2190	.1875	1/4	2 3/4	52229	85.20	0.8781 - 0.9090	119.90	102.60	96.85	94.00	91.05	88.65
15/16	.9375	.2190	.1875	1/4	2 3/4	52230	86.05	0.9091 - 0.9410	120.75	103.45	97.65	94.80	91.90	89.45
31/32	.9688	.2190	.1875	1/4	2 3/4	52231	86.65	0.9411 - 0.9720	121.30	103.95	98.25	95.35	92.45	90.05
1	1.0000	.2190	.1875	1/4	2 3/4	52232	86.90	0.9721 - 1.0030	121.60	104.25	98.45	95.60	92.65	90.30
1 1/16	1.0625	.2190	.1875	3/8	2 3/4	52234	110.95	1.0031 - 1.0660	145.55	128.20	122.50	119.60	116.65	114.30
1 1/8	1.1250	.2190	.1875	3/8	2 3/4	52236	118.35	1.0661 - 1.1280	153.00	135.70	129.95	127.10	124.15	121.75
1 3/16	1.1875	.2190	.1875	3/8	2 3/4	52238	119.85	1.1281 - 1.1905	154.50	137.20	131.45	128.60	125.65	123.30
1 1/4	1.2500	.2810	.2500	3/8	2 3/4	52240	122.10	1.1906 - 1.2530	156.85	139.45	133.60	130.80	127.95	125.55
1 5/16	1.3125	.2810	.2500	3/8	2 3/4	52242	124.35	1.2531 - 1.3155	159.00	141.65	135.95	133.10	130.10	127.75
1 3/8	1.3750	.2810	.2500	3/8	2 3/4	52244	125.80	1.3156 - 1.3780	160.50	143.25	137.45	134.50	131.65	129.20
1 7/16	1.4375	.2810	.2500	3/8	2 3/4	52246	127.30	1.3781 - 1.4405	162.05	144.65	138.90	136.05	133.15	130.75
1 1/2	1.5000	.2810	.2500	3/8	2 3/4	52248	134.05	1.4406 - 1.5030	169.95	152.00	146.00	143.05	139.95	137.55
1 9/16	1.5625	.3430	.3125	1/2	3 1/16	52250	149.10	1.5031 - 1.5660	185.00	167.10	161.10	158.15	155.15	152.70
1 5/8	1.6250	.3430	.3125	1/2	3 1/16	52252	151.05	1.5661 - 1.6280	187.00	169.05	163.15	160.15	157.10	154.55
1 11/16	1.6875	.3430	.3125	1/2	3 1/16	52254	153.05	1.6281 - 1.6910	189.00	171.05	165.05	162.15	159.10	156.60
1 3/4	1.7500	.3430	.3125	1/2	3 1/16	52256	155.40	1.6911 - 1.7530	191.35	173.30	167.35	164.40	161.40	158.95
1 13/16	1.8125	.3430	.3125	1/2	3 1/16	52258	157.25	1.7531 - 1.8160	192.85	174.95	168.95	166.00	162.85	160.45
1 7/8	1.8750	.3430	.3125	1/2	3 1/16	52260	158.40	1.8161 - 1.8780	194.35	176.40	170.35	167.50	164.40	161.90
1 15/16	1.9375	.3430	.3125	1/2	3 1/16	52262	174.80	1.8781 - 1.9410	210.75	192.75	186.75	183.80	180.75	178.30
2	2.0000	.3430	.3125	1/2	3 1/16	52264	217.50	1.9411 - 2.0030	253.55	235.55	229.55	226.60	223.55	221.05

*Quantities of 15 or more - price of fractional size in same size range.

COUNTERBORES CARBIDE TIPPED TYPES 512 & 514 FRACTIONAL

GENERAL PURPOSE

INTERCHANGEABLE PILOT TYPE STRAIGHT SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	512 or 514
	40	NON-FERROUS - SHORT CHIPS	512 or 514
	60	CAST IRONS	512 or 514
	80	LOW STRENGTH STEELS	510[MS]
	100	MEDIUM STRENGTH STEELS	510[MS]
	120	HIGH STRENGTH STEELS	510[MS]
	140	HIGH TEMPERATURE ALLOYS	512 or 514

[MS]See page 152 for Type 510

TYPE 512 – FOUR FLUTES – STRAIGHT SHANK
TYPE 514 – THREE/FOUR FLUTES – STRAIGHT SHANK

- Right spiral flutes
- Carbide tips brazed to tough hardened alloy steel body
- Tool diameter tolerance: plus .001", minus .000"
- Shank diameter tolerance: plus .0000", minus .0005"
- Detailed specifications on page 145

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Modified metric tool diameter - priced on pg. 149
- Cutting diameter reduced for step
- Corner chamfer or corner radius
- Shortened shank or reduced shank diameter
- Flat(s) or tang on shank
- 4 coatings available (listed on page 154)

TOOL DIAMETER		DIMENSIONS				TYPE 512		TYPE 514		BOTH TYPES PRICE	FINISHED TO MODIFIED TOOL DIAMETER						
		MIN CUT DIAM.	PILOT HOLE DIAM.	SHANK DIAM.	OVER-ALL LENGTH	NO. OF FLTS	EDP NO.	NO. OF FLTS	EDP NO.		MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DEC.											1	2	3	4	5-7	8-14*
1/4	.2500	.1140	.0938	15/64	3 13/16	-	-	3	51408	$61.35	0.2381 - 0.2530	$96.00	$78.70	$72.95	$70.05	$67.10	$64.75
9/32	.2812	.1140	.0938	17/64	3 13/16	-	-	3	51409	75.00	0.2531 - 0.2840	109.55	92.35	86.55	83.70	80.80	78.40
5/16	.3125	.1140	.0938	19/64	3 13/16	-	-	3	51410	68.15	0.2841 - 0.3150	102.75	85.50	79.70	76.85	73.95	71.55
11/32	.3438	.1140	.0938	5/16	3 13/16	-	-	3	51411	86.30	0.3151 - 0.3470	120.85	103.50	97.75	94.90	92.00	89.55
3/8	.3750	.1820	.1562	5/16	4 1/16	-	-	3	51412	72.25	0.3471 - 0.3780	104.20	88.25	82.90	80.30	77.60	75.40
13/32	.4062	.1820	.1562	3/8	4 1/16	-	-	3	51413	81.50	0.3781 - 0.4090	113.40	97.50	92.15	89.50	86.80	84.65
7/16	.4375	.1820	.1562	3/8	4 1/16	-	-	3	51414	74.15	0.4091 - 0.4410	106.05	90.10	84.75	82.20	79.45	77.25
15/32	.4688	.2280	.1875	7/16	4 5/16	-	-	3	51415	90.50	0.4411 - 0.4720	122.45	106.50	101.20	98.60	95.80	93.65
1/2	.5000	.2280	.1875	7/16	4 5/16	4	51216	3	51416	82.30	0.4721 - 0.5030	114.20	98.20	92.95	90.30	87.60	85.45
17/32	.5312	.2280	.1875	1/2	4 5/16	4	51217	3	51417	93.15	0.5031 - 0.5340	125.05	109.15	103.85	101.20	98.45	96.25
9/16	.5625	.2280	.1875	1/2	4 5/16	4	51218	3	51418	84.70	0.5341 - 0.5660	116.65	100.65	95.35	92.70	90.05	87.80
19/32	.5938	.2280	.1875	1/2	5 1/8	4	51219	3	51419	94.15	0.5661 - 0.5970	126.00	110.10	104.80	102.15	99.40	97.20
5/8	.6250	.2280	.1875	1/2	5 1/8	4	51220	3	51420	85.55	0.5971 - 0.6280	117.45	101.45	96.15	93.55	90.85	88.65
21/32	.6562	.2280	.1875	1/2	5 1/8	4	51221	3	51421	99.65	0.6281 - 0.6590	131.50	115.60	110.25	107.60	104.95	102.75
11/16	.6875	.2280	.1875	1/2	5 1/8	4	51222	3	51422	90.60	0.6591 - 0.6910	122.55	106.55	101.25	98.65	95.95	93.70
23/32	.7188	.2900	.2500	1/2	5 3/8	4	51223	3	51423	102.00	0.6911 - 0.7220	133.80	117.90	112.60	110.05	107.25	105.10
3/4	.7500	.2900	.2500	1/2	5 3/8	4	51224	3	51424	92.65	0.7221 - 0.7530	124.60	108.60	103.30	100.65	98.00	95.75
25/32	.7812	.2900	.2500	5/8	5 3/8	4	51225	3	51425	104.15	0.7531 - 0.7840	136.00	120.05	114.75	112.15	109.40	107.20
13/16	.8125	.2900	.2500	5/8	5 3/8	4	51226	3	51426	94.60	0.7841 - 0.8160	126.50	110.50	105.25	102.55	99.95	97.75
27/32	.8438	.2900	.2500	3/4	5 3/8	4	51227	3	51427	110.30	0.8161 - 0.8470	142.20	126.20	120.95	118.30	115.65	113.40
7/8	.8750	.2900	.2500	3/4	5 3/8	4	51228	3	51428	100.30	0.8471 - 0.8780	132.20	116.25	110.95	108.30	105.60	103.40
29/32	.9062	.2900	.2500	3/4	6 1/8	4	51229	3	51429	112.50	0.8781 - 0.9090	144.50	128.45	123.15	120.60	117.85	115.70
15/16	.9375	.2900	.2500	3/4	6 1/8	4	51230	3	51430	102.35	0.9091 - 0.9410	134.30	118.30	113.00	110.35	107.65	105.45
31/32	.9688	.3530	.3125	3/4	6 3/8	4	51231	3	51431	115.80	0.9411 - 0.9720	147.70	131.70	126.45	123.80	121.10	118.95
1	1.0000	.3530	.3125	3/4	6 3/8	4	51232	3	51432	105.30	0.9721 - 1.0030	137.20	121.20	115.90	113.30	110.60	108.40
1 1/16	1.0625	.3530	.3125	3/4	6 3/8	4	51234	3	51434	106.40	1.0031 - 1.0660	138.35	122.30	117.00	114.45	111.70	109.50
1 1/8	1.1250	.3530	.3125	1	6 3/8	4	51236	3	51436	109.15	1.0661 - 1.1280	141.00	125.05	119.80	117.10	114.45	112.25
1 3/16	1.1875	.3530	.3125	1	6 3/8	4	51238	3	51438	113.95	1.1281 - 1.1905	145.85	129.95	124.65	122.00	119.25	117.10
1 1/4	1.2500	.4260	.3750	1	6 5/8	-	-	4	51440	126.95	1.1906 - 1.2530	161.50	144.25	138.45	135.65	132.65	130.35
1 5/16	1.3125	.4260	.3750	1	6 5/8	-	-	4	51442	137.00	1.2531 - 1.3155	171.65	154.35	148.50	145.70	142.80	140.40
1 3/8	1.3750	.4260	.3750	1	6 5/8	-	-	4	51444	144.15	1.3156 - 1.3780	178.70	161.40	155.60	152.75	149.85	147.45
1 7/16	1.4375	.4260	.3750	1 1/4	7 7/8	-	-	4	51446	158.00	1.3781 - 1.4405	195.55	176.75	170.45	167.35	164.25	161.60
1 1/2	1.5000	.4260	.3750	1 1/4	7 7/8	-	-	4	51448	182.65	1.4406 - 1.5030	221.65	202.10	195.65	192.50	189.15	186.45
1 9/16	1.5625	.4890	.4375	1 1/4	8 1/8	-	-	4	51450	188.00	1.5031 - 1.5660	227.10	207.50	201.00	197.80	194.55	191.85
1 5/8	1.6250	.4890	.4375	1 1/4	8 1/8	-	-	4	51452	191.95	1.5661 - 1.6280	231.00	211.50	205.05	201.80	198.50	195.85
1 11/16	1.6875	.4890	.4375	1 1/4	8 1/8	-	-	4	51454	229.70	1.6281 - 1.6910	271.75	250.75	243.70	240.20	236.65	233.75
1 3/4	1.7500	.4890	.4375	1 1/4	8 1/8	-	-	4	51456	229.70	1.6911 - 1.7530	271.75	250.75	243.70	240.20	236.65	233.75
1 13/16	1.8125	.4890	.4375	1 1/2	8 1/8	-	-	4	51458	271.90	1.7531 1.8160	314.05	293.00	285.95	282.50	278.85	276.05
1 7/8	1.8750	.4890	.4375	1 1/2	8 1/8	-	-	4	51460	271.90	1.8161 - 1.8780	314.05	293.00	285.95	282.50	278.85	276.05
1 15/16	1.9375	.4890	.4375	1 1/2	8 1/8	-	-	4	51462	297.15	1.8781 - 1.9410	339.35	318.30	311.20	307.70	304.15	301.30
2	2.0000	.5510	.5000	1 1/2	8 3/8	-	-	4	51464	297.15	1.9411 - 2.0030	339.35	318.30	311.20	307.70	304.15	301.30

*Quantities of 15 or more - price of fractional size in same size range.

COUNTERBORES CARBIDE TIPPED TYPES 512 & 514 METRIC

GENERAL PURPOSE

INTERCHANGEABLE PILOT TYPE STRAIGHT SHANK

NOTE: Tool diameter in millimeters (mm); all other dimensions in inches. Also, modifications available (see list on page 148).

TOOL DIAMETER		DIMENSIONS				TYPE 512		TYPE 514		BOTH TYPES METRIC PRICE	FINISHED TO MODIFIED TOOL DIAMETER							
											MODIFIED DIAMETER RANGE (mm)	PRICE EACH - BASED ON QUANTITY ORDERED						
mm	INCH	MIN CUT DIAM.	PILOT HOLE DIAM.	SHANK DIAM.	OVER-ALL LENGTH	NO. OF FLTS	METRIC EDP NO.	NO. OF FLTS	METRIC EDP NO.			1	2	3	4	5-7	8-14	OVER 14
6.0	.2362	.1140	.0938	15⁄64	3 13⁄16	-	-	3	514060	$72.95	6.000-6.426	$98.75	$81.45	$75.70	$72.95	$70.00	$67.70	$64.25
6.5	.2559	.1140	.0938	17⁄64	3 13⁄16	-	-	3	514065	86.55	6.427-7.214	112.40	95.10	89.35	86.55	83.65	81.30	77.85
7.0	.2756	.1140	.0938	17⁄64	3 13⁄16	-	-	3	514070	86.55	-	-	-	-	-	-	-	-
7.5	.2953	.1140	.0938	19⁄64	3 13⁄16	-	-	3	514075	79.70	7.215-8.001	105.50	88.25	82.45	79.70	76.80	74.45	71.00
8.0	.3150	.1140	.0938	19⁄64	3 13⁄16	-	-	3	514080	79.70	-	-	-	-	-	-	-	-
8.5	.3346	.1140	.0938	5⁄16	3 13⁄16	-	-	3	514085	97.75	8.002-8.814	123.60	106.30	100.50	97.75	94.80	92.45	89.10
9.0	.3543	.1820	.1562	5⁄16	4 1⁄16	-	-	3	514090	82.90	8.815-9.601	106.75	90.80	85.50	82.90	80.25	78.00	74.90
9.5	.3740	.1820	.1562	5⁄16	4 1⁄16	-	-	3	514095	82.90	-	-	-	-	-	-	-	-
10.0	.3937	.1820	.1562	3⁄8	4 1⁄16	-	-	3	514100	92.15	9.602-10.389	115.95	100.05	94.70	92.15	89.45	87.30	84.20
10.5	.4134	.1820	.1562	3⁄8	4 1⁄16	-	-	3	514105	84.75	10.390-11.201	108.60	92.65	87.35	84.75	82.15	79.90	76.80
11.0	.4331	.1820	.1562	3⁄8	4 1⁄16	-	-	3	514110	84.75	-	-	-	-	-	-	-	-
11.5	.4528	.2280	.1875	7⁄16	4 5⁄16	-	-	3	514115	101.20	11.202-11.989	124.95	109.05	103.75	101.20	98.45	96.25	93.15
12.0	.4724	.2280	.1875	7⁄16	4 5⁄16	4	512120	3	514120	92.95	11.990-12.776	116.75	100.85	95.50	92.95	90.25	88.05	84.85
12.5	.4921	.2280	.1875	7⁄16	4 5⁄16	4	512125	3	514125	92.95	-	-	-	-	-	-	-	-
13.0	.5118	.2280	.1875	1⁄2	4 5⁄16	4	512130	3	514130	103.85	12.777-13.564	127.60	111.65	106.35	103.85	101.10	98.95	95.75
13.5	.5315	.2280	.1875	1⁄2	4 5⁄16	4	512135	3	514135	103.85	-	-	-	-	-	-	-	-
14.0	.5512	.2280	.1875	1⁄2	4 5⁄16	4	512140	3	514140	95.35	13.565-14.376	119.15	103.25	97.95	95.35	92.65	90.45	87.35
14.5	.5709	.2280	.1875	1⁄2	5 1⁄8	4	512145	3	514145	104.80	14.377-15.164	128.60	112.60	107.25	104.80	102.10	99.90	96.70
15.0	.5906	.2280	.1875	1⁄2	5 1⁄8	4	512150	3	514150	104.80	-	-	-	-	-	-	-	-
15.5	.6102	.2280	.1875	1⁄2	5 1⁄8	4	512155	3	514155	96.15	15.165-15.951	120.00	104.10	98.75	96.15	93.50	91.30	88.20
16.0	.6299	.2280	.1875	1⁄2	5 1⁄8	4	512160	3	514160	110.25	15.952-16.739	134.05	118.10	112.80	110.25	107.55	105.35	102.25
16.5	.6496	.2280	.1875	1⁄2	5 1⁄8	4	512165	3	514165	110.25	-	-	-	-	-	-	-	-
17.0	.6693	.2280	.1875	1⁄2	5 1⁄8	4	512170	3	514170	101.25	16.740-17.551	125.05	109.15	103.85	101.25	98.60	96.35	93.25
17.5	.6890	.2280	.1875	1⁄2	5 1⁄8	4	512175	3	514175	101.25	-	-	-	-	-	-	-	-
18.0	.7087	.2900	.2500	1⁄2	5 3⁄8	4	512180	3	514180	112.60	17.552-18.339	136.50	120.50	115.20	112.60	109.90	107.75	104.55
18.5	.7283	.2900	.2500	1⁄2	5 3⁄8	4	512185	3	514185	103.30	18.340-19.126	127.10	111.20	105.90	103.30	100.60	98.35	95.30
19.0	.7480	.2900	.2500	1⁄2	5 3⁄8	4	512190	3	514190	103.30	-	-	-	-	-	-	-	-
19.5	.7677	.2900	.2500	5⁄8	5 3⁄8	4	512195	3	514195	114.75	19.127-19.914	138.55	122.65	117.30	114.75	112.10	109.85	106.75
20.0	.7874	.2900	.2500	5⁄8	5 3⁄8	4	512200	3	514200	105.25	19.915-20.726	129.05	113.15	107.80	105.25	102.50	100.35	97.20
20.5	.8071	.2900	.2500	5⁄8	5 3⁄8	4	512205	3	514205	105.25	-	-	-	-	-	-	-	-
21.0	.8268	.2900	.2500	3⁄4	5 3⁄8	4	512210	3	514210	120.95	20.727-21.514	144.75	128.85	123.55	120.95	118.20	116.00	112.90
21.5	.8465	.2900	.2500	3⁄4	5 3⁄8	4	512215	3	514215	120.95	-	-	-	-	-	-	-	-
22.0	.8661	.2900	.2500	3⁄4	5 3⁄8	4	512220	3	514220	110.95	21.515-22.301	134.75	118.85	113.45	110.95	108.25	106.05	102.95
22.5	.8858	.2900	.2500	3⁄4	6 1⁄8	4	512225	3	514225	123.15	22.302-23.089	147.00	131.05	125.75	123.15	120.50	118.30	115.20
23.0	.9055	.2900	.2500	3⁄4	6 1⁄8	4	512230	3	514230	123.15	-	-	-	-	-	-	-	-
23.5	.9252	.2900	.2500	3⁄4	6 1⁄8	4	512235	3	514235	113.00	23.090-23.901	136.80	120.90	115.60	113.00	110.30	108.10	105.00
24.0	.9449	.3530	.3125	3⁄4	6 3⁄8	4	512240	3	514240	126.45	23.902-24.689	150.25	134.35	129.00	126.45	123.75	121.60	118.40
24.5	.9646	.3530	.3125	3⁄4	6 3⁄8	4	512245	3	514245	126.45	-	-	-	-	-	-	-	-
25.0	.9843	.3530	.3125	3⁄4	6 3⁄8	4	512250	3	514250	115.90	24.690-25.476	139.75	123.80	118.50	115.90	113.25	111.10	107.95
25.5	1.0039	.3530	.3125	3⁄4	6 3⁄8	4	512255	3	514255	117.00	25.477-27.076	140.85	124.90	119.65	117.00	114.35	112.20	109.05
26.0	1.0236	.3530	.3125	3⁄4	6 3⁄8	4	512260	3	514260	117.00	-	-	-	-	-	-	-	-
27.0	1.0630	.3530	.3125	3⁄4	6 3⁄8	4	512270	3	514270	117.00	-	-	-	-	-	-	-	-
28.0	1.1024	.3530	.3125	1	6 3⁄8	4	512280	3	514280	119.80	27.077-28.651	143.60	127.60	122.25	119.80	117.00	114.85	111.70
29.0	1.1417	.3530	.3125	1	6 3⁄8	4	512290	3	514290	124.65	28.652 30.239	148.40	132.50	127.15	124.65	121.95	119.80	116.65
30.0	1.1811	.3530	.3125	1	6 3⁄8	4	512300	3	514300	124.65	-	-	-	-	-	-	-	-
31.0	1.2205	.4260	.3750	1	6 5⁄8	-	-	4	514310	138.45	30.240-31.826	164.30	147.00	141.25	138.45	135.55	133.15	129.80
32.0	1.2598	.4260	.3750	1	6 5⁄8	-	-	4	514320	148.50	31.827-33.414	174.40	157.10	151.35	148.50	145.65	143.30	139.85
33.0	1.2992	.4260	.3750	1	6 5⁄8	-	-	4	514330	148.50	-	-	-	-	-	-	-	-
34.0	1.3386	.4260	.3750	1	6 5⁄8	-	-	4	514340	155.60	33.415-35.001	181.45	164.20	158.35	155.60	152.70	150.30	146.90
35.0	1.3780	.4260	.3750	1	6 5⁄8	-	-	4	514350	155.60	-	-	-	-	-	-	-	-
36.0	1.4173	.4260	.3750	1 1⁄4	7 7⁄8	-	-	4	514360	170.45	35.002-36.589	198.55	179.85	173.45	170.45	167.25	164.70	161.05
37.0	1.4567	.4260	.3750	1 1⁄4	7 7⁄8	-	-	4	514370	188.50	36.590-38.176	216.60	197.85	191.60	188.50	185.40	182.80	179.10
38.0	1.4961	.4260	.3750	1 1⁄4	7 7⁄8	-	-	4	514380	188.50	-	-	-	-	-	-	-	-

Modified tool diameters are available up to 50mm-contact us for price.

COUNTERBORES CARBIDE TIPPED TYPES 516 & 518 FRACTIONAL

GENERAL PURPOSE

INTERCHANGEABLE PILOT TYPE TAPER SHANK

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	516 or 518
	40	NON-FERROUS - SHORT CHIPS	516 or 518
	60	CAST IRONS	516 or 518
	80	LOW STRENGTH STEELS	511[MS]
	100	MEDIUM STRENGTH STEELS	511[MS]
	120	HIGH STRENGTH STEELS	511[MS]
	140	HIGH TEMPERATURE ALLOYS	516 or 518

[MS]See page 152 for Type 511

TYPE 518 – FOUR FLUTES – TAPER SHANK
TYPE 516 – THREE/FOUR FLUTES – TAPER SHANK

- Right spiral flutes
- Carbide tips brazed to tough hardened alloy steel body
- Tool diameter tolerance: plus .001", minus .000"
- Detailed specifications on page 145

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Modified metric tool diameter - priced on pg. 151
- Cutting diameter reduced for step
- Corner chamfer or corner radius
- Shank whistle notch for set screw
- Smaller taper shank
- 4 coatings available (listed on page 154)

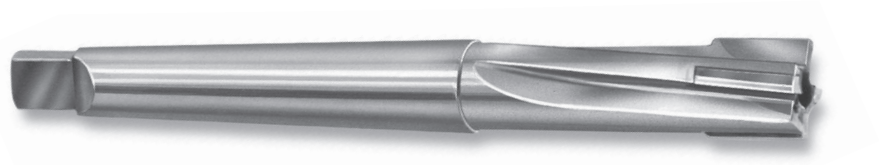
TOOL DIAMETER		DIMENSIONS				TYPE 518		TYPE 516		BOTH TYPES PRICE	FINISHED TO MODIFIED TOOL DIAMETER						
		MIN CUT DIAM.	PILOT HOLE DIAM.	TAPER SHANK NO.	OVER-ALL LENGTH	NO. OF FLTS	EDP NO.	NO. OF FLTS	EDP NO.		MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DEC.											1	2	3	4	5-7	8-14*
¼	.2500	.1140	.0938	1	3 13⁄16	-	-	3	51608	$74.45	0.2381-0.2530	$110.40	$92.45	$86.45	$83.50	$80.45	$78.00
9⁄32	.2812	.1140	.0938	1	3 13⁄16	-	-	3	51609	89.60	0.2531-0.2840	125.45	107.45	101.50	98.55	95.60	93.05
5⁄16	.3125	.1140	.0938	1	3 13⁄16	-	-	3	51610	81.50	0.2841-0.3150	117.35	99.40	93.45	90.50	87.45	85.00
11⁄32	.3438	.1140	.0938	1	3 13⁄16	-	-	3	51611	100.40	0.3151-0.3470	136.30	118.30	112.30	109.40	106.35	103.90
3⁄8	.3750	.1820	.1562	1	4 1⁄16	-	-	3	51612	84.10	0.3471-0.3780	117.15	100.65	95.10	92.40	89.65	87.40
13⁄32	.4062	.1820	.1562	1	4 1⁄16	-	-	3	51613	95.00	0.3781-0.4090	128.10	111.55	106.05	103.30	100.55	98.25
7⁄16	.4375	.1820	.1562	1	4 1⁄16	-	-	3	51614	86.40	0.4091-0.4410	119.40	102.90	97.35	94.70	91.90	89.65
15⁄32	.4688	.2280	.1875	1	4 5⁄16	-	-	3	51615	104.90	0.4411-0.4720	137.95	121.40	115.90	113.20	110.40	108.15
½	.5000	.2280	.1875	1	4 5⁄16	4	51816	3	51616	95.35	0.4721-0.5030	128.50	111.90	106.35	103.75	100.85	98.60
17⁄32	.5312	.2280	.1875	1	4 5⁄16	4	51817	3	51617	106.80	0.5031-0.5340	139.85	123.35	117.80	115.10	112.30	110.05
9⁄16	.5625	.2280	.1875	1	4 5⁄16	4	51818	3	51618	97.15	0.5341-0.5660	130.25	113.65	108.20	105.40	102.70	100.40
19⁄32	.5938	.2280	.1875	2	5 1⁄8	4	51819	3	51619	109.70	0.5661-0.5970	142.85	126.30	120.80	118.05	115.30	112.95
5⁄8	.6250	.2280	.1875	2	5 1⁄8	4	51820	3	51620	99.70	0.5971-0.6280	132.80	116.30	110.75	108.10	105.20	102.95
21⁄32	.6562	.2280	.1875	2	5 1⁄8	4	51821	3	51621	115.85	0.6281-0.6590	148.95	132.40	126.85	124.20	121.35	119.10
11⁄16	.6875	.2280	.1875	2	5 1⁄8	4	51822	3	51622	105.20	0.6591-0.6910	138.40	121.75	116.30	113.50	110.75	108.45
23⁄32	.7188	.2900	.2500	2	5 3⁄8	4	51823	3	51623	117.75	0.6911-0.7220	150.85	134.30	128.80	126.10	123.30	121.05
¾	.7500	.2900	.2500	2	5 3⁄8	4	51824	3	51624	107.05	0.7221-0.7530	140.10	123.55	118.05	115.35	112.50	110.20
25⁄32	.7812	.2900	.2500	2	5 3⁄8	4	51825	3	51625	119.75	0.7531-0.7840	152.80	136.30	130.75	128.00	125.25	123.00
13⁄16	.8125	.2900	.2500	2	5 3⁄8	4	51826	3	51626	108.90	0.7841-0.8160	141.95	125.45	119.95	117.15	114.40	112.15
27⁄32	.8438	.2900	.2500	2	5 3⁄8	4	51827	3	51627	125.90	0.8161-0.8470	159.05	142.50	137.00	134.25	131.50	129.20
7⁄8	.8750	.2900	.2500	2	5 3⁄8	4	51828	3	51628	114.45	0.8471-0.8780	147.55	130.95	125.50	122.75	120.00	117.70
29⁄32	.9062	.2900	.2500	3	6 1⁄8	4	51829	3	51629	129.35	0.8781-0.9090	162.40	145.85	140.40	137.60	134.85	132.60
15⁄16	.9375	.2900	.2500	3	6 1⁄8	4	51830	3	51630	117.60	0.9091-0.9410	150.65	134.10	128.60	125.85	123.15	120.85
31⁄32	.9688	.3530	.3125	3	6 3⁄8	4	51831	3	51631	132.35	0.9411-0.9720	165.40	148.90	143.40	140.65	137.80	135.50
1	1.0000	.3530	.3125	3	6 3⁄8	4	51832	3	51632	124.85	0.9721-1.0030	159.20	142.05	136.30	133.50	130.50	128.20
1 1⁄16	1.0625	.3530	.3125	3	6 3⁄8	4	51834	3	51634	126.50	1.0031-1.0660	160.75	143.60	137.90	135.10	132.15	129.80
1 1⁄8	1.1250	.3530	.3125	3	6 3⁄8	4	51836	3	51636	130.45	1.0661-1.1280	164.85	147.75	141.90	139.10	136.20	133.85
1 3⁄16	1.1875	.3530	.3125	3	6 3⁄8	4	51838	3	51638	134.90	1.1281-1.1905	169.35	152.15	146.35	143.55	140.65	138.30
1 ¼	1.2500	.4260	.3750	3	6 5⁄8	-	-	4	51640	150.00	1.1906-1.2530	187.20	168.60	162.40	159.35	156.20	153.60
1 5⁄16	1.3125	.4260	.3750	3	6 5⁄8	-	-	4	51642	160.75	1.2531-1.3155	198.10	179.35	173.25	170.10	167.05	164.45
1 3⁄8	1.3750	.4260	.3750	3	6 5⁄8	-	-	4	51644	168.45	1.3156-1.3780	205.70	187.10	180.90	177.80	174.70	172.10
1 7⁄16	1.4375	.4260	.3750	4	7 7⁄8	-	-	4	51646	187.40	1.3781-1.4405	227.90	207.70	200.85	197.55	194.15	191.35
1 ½	1.5000	.4260	.3750	4	7 7⁄8	-	-	4	51648	207.80	1.4406-1.5030	248.30	228.05	221.30	217.95	214.60	211.75
1 9⁄16	1.5625	.4890	.4375	4	8 1⁄8	-	-	4	51650	223.25	1.5031-1.5660	265.65	244.50	237.50	233.90	230.35	227.50
1 5⁄8	1.6250	.4890	.4375	4	8 1⁄8	-	-	4	51652	227.25	1.5661-1.6280	269.65	248.50	241.45	237.90	234.30	231.50
1 11⁄16	1.6875	.4890	.4375	4	8 1⁄8	-	-	4	51654	271.90	1.6281-1.6910	317.75	294.85	287.25	283.45	279.55	276.45
1 ¾	1.7500	.4890	.4375	4	8 1⁄8	-	-	4	51656	271.90	1.6911-1.7530	317.75	294.85	287.25	283.45	279.55	276.45
1 13⁄16	1.8125	.4890	.4375	4	8 1⁄8	-	-	4	51658	321.85	1.7531-1.8160	367.60	344.75	337.10	333.30	329.45	326.25
1 7⁄8	1.8750	.4890	.4375	4	8 1⁄8	-	-	4	51660	321.85	1.8161-1.8780	367.60	344.75	337.10	333.30	329.45	326.25
1 15⁄16	1.9375	.4890	.4375	4	8 1⁄8	-	-	4	51662	351.60	1.8781-1.9410	397.45	374.55	366.85	363.15	359.30	356.10
2	2.0000	.5510	.5000	4	8 3⁄8	-	-	4	51664	351.60	1.9411-2.0030	397.45	374.55	366.85	363.15	359.30	356.10

*Quantities of 15 or more - price of fractional size in same size range.

COUNTERBORES CARBIDE TIPPED TYPES 516 & 518 METRIC

GENERAL PURPOSE

INTERCHANGEABLE PILOT TYPE TAPER SHANK



NOTE: Tool diameter in millimeters (mm); all other dimensions in inches. Also, modifications available (see list on page 150).

TOOL DIAMETER		DIMENSIONS				TYPE 518		TYPE 516		BOTH TYPES METRIC PRICE	FINISHED TO MODIFIED TOOL DIAMETER							
		MIN CUT DIAM.	PILOT HOLE DIAM.	TAPER SHANK NO.	OVER-ALL LENGTH	NO. OF FLTS	METRIC EDP NO.	NO. OF FLTS	METRIC EDP NO.		MODIFIED DIAMETER RANGE (mm)	PRICE EACH - BASED ON QUANTITY ORDERED						
mm	INCH											1	2	3	4	5-7	8-14	OVER 14
6.0	.2362	.1140	.0938	1	3 13/16	-	-	3	516060	$86.45	6.000-6.426	$113.25	$95.25	$89.30	$86.45	$83.45	$80.90	$77.45
6.5	.2559	.1140	.0938	1	3 13/16	-	-	3	516065	101.50	6.427-7.214	128.30	110.40	104.35	101.50	98.50	96.05	92.50
7.0	.2756	.1140	.0938	1	3 13/16	-	-	3	516070	101.50	-	-	-	-	-	-	-	-
7.5	.2953	.1140	.0938	1	3 13/16	-	-	3	516075	93.45	7.215-8.001	120.25	102.30	96.25	93.45	90.40	87.90	84.40
8.0	.3150	.1140	.0938	1	3 13/16	-	-	3	516080	93.45	-	-	-	-	-	-	-	-
8.5	.3346	.1140	.0938	1	3 13/16	-	-	3	516085	112.30	8.002-8.814	139.15	121.20	115.30	112.30	109.35	106.90	103.30
9.0	.3543	.1820	.1562	1	4 1/16	-	-	3	516090	95.10	8.815-9.601	119.85	103.30	97.80	95.10	92.30	90.05	86.80
9.5	.3740	.1820	.1562	1	4 1/16	-	-	3	516095	95.10	-	-	-	-	-	-	-	-
10.0	.3937	.1820	.1562	1	4 1/16	-	-	3	516100	106.05	9.602-10.389	130.75	114.25	108.75	106.05	103.20	100.90	97.75
10.5	.4134	.1820	.1562	1	4 1/16	-	-	3	516105	97.35	10.390-11.201	122.15	105.55	100.10	97.35	94.60	92.30	89.05
11.0	.4331	.1820	.1562	1	4 1/16	-	-	3	516110	97.35	-	-	-	-	-	-	-	-
11.5	.4528	.2280	.1875	1	4 5/16	-	-	3	516115	115.90	11.202-11.989	140.65	124.10	118.60	115.90	113.15	110.80	107.50
12.0	.4724	.2280	.1875	1	4 5/16	4	518120	3	516120	106.35	11.990-12.776	131.20	114.55	109.05	106.35	103.70	101.35	98.10
12.5	.4921	.2280	.1875	1	4 5/16	4	518125	3	516125	106.35	-	-	-	-	-	-	-	-
13.0	.5118	.2280	.1875	1	4 5/16	4	518130	3	516130	117.80	12.777-13.564	142.55	126.05	120.45	117.80	115.05	112.80	109.50
13.5	.5315	.2280	.1875	1	4 5/16	4	518135	3	516135	117.80	-	-	-	-	-	-	-	-
14.0	.5512	.2280	.1875	1	4 5/16	4	518140	3	516140	108.20	13.565-14.376	132.90	116.40	110.80	108.20	105.30	103.05	99.80
14.5	.5709	.2280	.1875	2	5 1/8	4	518145	3	516145	120.80	14.377-15.164	145.55	128.90	123.40	120.80	118.00	115.65	112.40
15.0	.5906	.2280	.1875	2	5 1/8	4	518150	3	516150	120.80	-	-	-	-	-	-	-	-
15.5	.6102	.2280	.1875	2	5 1/8	4	518155	3	516155	110.75	15.165-15.951	135.45	118.95	113.40	110.75	108.00	105.75	102.45
16.0	.6299	.2280	.1875	2	5 1/8	4	518160	3	516160	126.85	15.952-16.739	151.60	135.00	129.50	126.85	124.10	121.75	118.60
16.5	.6496	.2280	.1875	2	5 1/8	4	518165	3	516165	126.85	-	-	-	-	-	-	-	-
17.0	.6693	.2280	.1875	2	5 1/8	4	518170	3	516170	116.30	16.740-17.551	140.95	124.45	118.95	116.30	113.45	111.20	108.00
17.5	.6890	.2280	.1875	2	5 1/8	4	518175	3	516175	116.30	-	-	-	-	-	-	-	-
18.0	.7087	.2900	.2500	2	5 3/8	4	518180	3	516180	128.80	17.552-18.339	153.50	137.00	131.50	128.80	126.05	123.70	120.45
18.5	.7283	.2900	.2500	2	5 3/8	4	518185	3	516185	118.05	18.340-19.126	142.80	126.20	120.65	118.05	115.30	112.95	109.70
19.0	.7480	.2900	.2500	2	5 3/8	4	518190	3	516190	118.05	-	-	-	-	-	-	-	-
19.5	.7677	.2900	.2500	2	5 3/8	4	518195	3	516195	130.75	19.127-19.914	155.50	138.90	133.45	130.75	127.95	125.70	122.45
20.0	.7874	.2900	.2500	2	5 3/8	4	518200	3	516200	119.95	19.915-20.726	144.65	128.10	122.55	119.95	117.10	114.85	111.60
20.5	.8071	.2900	.2500	2	5 3/8	4	518205	3	516205	119.95	-	-	-	-	-	-	-	-
21.0	.8268	.2900	.2500	2	5 3/8	4	518210	3	516210	137.00	20.727-21.514	161.75	145.15	139.65	137.00	134.20	131.90	128.65
21.5	.8465	.2900	.2500	2	5 3/8	4	518215	3	516215	137.00	-	-	-	-	-	-	-	-
22.0	.8661	.2900	.2500	2	5 3/8	4	518220	3	516220	125.50	21.515-22.301	150.20	133.70	128.20	125.50	122.65	120.40	117.15
22.5	.8858	.2900	.2500	3	6 1/8	4	518225	3	516225	140.40	22.302-23.089	165.10	148.55	143.00	140.40	137.55	135.30	132.00
23.0	.9055	.2900	.2500	3	6 1/8	4	518230	3	516230	140.40	-	-	-	-	-	-	-	-
23.5	.9252	.2900	.2500	3	6 1/8	4	518235	3	516235	128.60	23.090-23.901	153.35	136.75	131.30	128.60	125.80	123.55	120.30
24.0	.9449	.3530	.3125	3	6 3/8	4	518240	3	516240	143.40	23.902-24.689	168.10	151.50	145.95	143.40	140.60	138.30	135.00
24.5	.9646	.3530	.3125	3	6 3/8	4	518245	3	516245	143.40	-	-	-	-	-	-	-	-
25.0	.9843	.3530	.3125	3	6 3/8	4	518250	3	516250	131.35	24.690-25.476	156.05	139.55	134.00	131.35	128.55	126.30	123.10
25.5	1.0039	.3530	.3125	3	6 3/8	4	518255	3	516255	137.90	25.477-27.076	163.55	146.35	140.65	137.90	135.00	132.65	129.25
26.0	1.0236	.3530	.3125	3	6 3/8	4	518260	3	516260	137.90	-	-	-	-	-	-	-	-
27.0	1.0630	.3530	.3125	3	6 3/8	4	518270	3	516270	137.90	-	-	-	-	-	-	-	-
28.0	1.1024	.3530	.3125	3	6 3/8	4	518280	3	516280	141.90	27.077-28.651	167.60	150.40	144.70	141.90	139.05	136.70	133.30
29.0	1.1417	.3530	.3125	3	6 3/8	4	518290	3	516290	146.35	28.652-30.239	172.05	154.90	149.15	146.35	143.50	141.15	137.80
30.0	1.1811	.3530	.3125	3	6 3/8	4	518300	3	516300	146.35	-	-	-	-	-	-	-	-
31.0	1.2205	.4260	.3750	3	6 5/8	-	-	4	516310	162.40	30.240-31.826	190.25	171.60	165.40	162.40	159.30	156.75	153.00
32.0	1.2598	.4260	.3750	3	6 5/8	-	-	4	516320	173.25	31.827-33.414	201.10	182.45	176.20	173.25	170.05	167.55	163.85
33.0	1.2992	.4260	.3750	3	6 5/8	-	-	4	516330	173.25	-	-	-	-	-	-	-	-
34.0	1.3386	.4260	.3750	3	6 5/8	-	-	4	516340	180.90	33.415-35.001	208.80	190.10	183.85	180.90	177.75	175.25	171.50
35.0	1.3780	.4260	.3750	3	6 5/8	-	-	4	516350	180.90	-	-	-	-	-	-	-	-
36.0	1.4173	.4260	.3750	4	7 7/8	-	-	4	516360	200.85	35.002-36.589	231.15	210.90	204.15	200.85	197.50	194.75	190.70
37.0	1.4567	.4260	.3750	4	7 7/8	-	-	4	516370	221.30	36.590-38.176	251.55	231.30	224.50	221.30	217.90	215.10	211.15
38.0	1.4961	.4260	.3750	4	7 7/8	-	-	4	516380	221.30	-	-	-	-	-	-	-	-

Modified tool diameters are available up to 50mm-contact us for price.

COUNTERBORES – FOR STEELS
CARBIDE TIPPED TYPES 510 & 511 FRACTIONAL

MATERIAL SPECIFIC

INTERCHANGEABLE PILOT TYPE STRAIGHT OR TAPER SHANK

TYPE 510 – STRAIGHT SHANK FOR MACHINING STEELS

TYPE 511 – TAPER SHANK FOR MACHINING STEELS

BOTH TYPES:

- Right spiral flutes
- Carbide tips brazed to tough hardened alloy steel body
- Tool diameter tolerance: plus .001", minus .000"
- Shank diameter tolerance: plus .0000", minus .0005" (Type 510)
- Detailed specifications on page 145

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	514[GP] or 516[GP]
	40	NON-FERROUS - SHORT CHIPS	514[GP] or 516[GP]
	60	CAST IRONS	514[GP] or 516[GP]
	80	LOW STRENGTH STEELS	510 or 511
	100	MEDIUM STRENGTH STEELS	510 or 511
	120	HIGH STRENGTH STEELS	510 or 511
	140	HIGH TEMPERATURE ALLOYS	514[GP] or 516[GP]

[GP]See page 148 for Type 514 , page 150 for Type 516

MODIFICATIONS (For Type 510, see list on page 148. For Type 511, see list on page 150)

USE:

- Special steel cutting grade of carbide and appropriate tool geometry permit the machining of steels, tough steel alloys, and cast steels

TOOL DIAMETER		DIMENSIONS				TYPE 510		TYPE 511		BOTH TYPES PRICE	FINISHED TO MODIFIED TOOL DIAMETER						
		MIN CUT DIAM.	PILOT HOLE DIAM.	OVER-ALL LENGTH	NO. OF FLTS	SHANK DIAM.	STEEL EDP NO.	TAPER SHANK NO.	STEEL EDP NO.		MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DEC.											1	2	3	4	5-7	8-14*
1/4	.2500	.1140	.0938	3 13/16	3	15/64	51008	1	51108	$74.45	0.2381 - 0.2530	$110.40	$92.45	$86.45	$83.50	$80.45	$78.00
9/32	.2812	.1140	.0938	3 13/16	3	17/64	51009	1	51109	89.60	0.2531 - 0.2840	125.45	107.45	101.50	98.55	95.60	93.05
5/16	.3125	.1140	.0938	3 13/16	3	19/64	51010	1	51110	81.50	0.2841 - 0.3150	117.35	99.40	93.45	90.50	87.45	85.00
11/32	.3438	.1140	.0938	3 13/16	3	5/16	51011	1	51111	100.40	0.3151 - 0.3470	136.30	118.30	112.30	109.40	106.35	103.90
3/8	.3750	.1820	.1562	4 1/16	3	5/16	51012	1	51112	84.10	0.3471 - 0.3780	117.15	100.65	95.10	92.40	89.65	87.40
13/32	.4062	.1820	.1562	4 1/16	3	3/8	51013	1	51113	95.00	0.3781 - 0.4090	128.10	111.55	106.05	103.30	100.55	98.25
7/16	.4375	.1820	.1562	4 1/16	3	3/8	51014	1	51114	86.40	0.4091 - 0.4410	119.40	102.90	97.35	94.70	91.90	89.65
15/32	.4688	.2280	.1875	4 5/16	3	7/16	51015	1	51115	104.90	0.4411 - 0.4720	137.95	121.40	115.90	113.20	110.40	108.15
1/2	.5000	.2280	.1875	4 5/16	3	7/16	51016	1	51116	95.35	0.4721 - 0.5030	128.50	111.90	106.35	103.75	100.85	98.60
17/32	.5312	.2280	.1875	4 5/16	3	1/2	51017	1	51117	102.95	0.5031 - 0.5340	134.80	118.90	113.55	110.95	108.25	106.05
9/16	.5625	.2280	.1875	4 5/16	3	1/2	51018	1	51118	93.60	0.5341 - 0.5660	125.50	109.50	104.25	101.55	98.95	96.70
19/32	.5938	.2280	.1875	5 1/8	3	1/2	51019	2	51119	105.75	0.5661 - 0.5970	137.65	121.70	116.40	113.75	111.10	108.85
5/8	.6250	.2280	.1875	5 1/8	3	1/2	51020	2	51120	96.10	0.5971 - 0.6280	128.00	112.10	106.75	104.15	101.40	99.20
21/32	.6562	.2280	.1875	5 1/8	3	1/2	51021	2	51121	111.60	0.6281 - 0.6590	143.50	127.55	122.20	119.65	116.90	114.75
11/16	.6875	.2280	.1875	5 1/8	3	1/2	51022	2	51122	101.40	0.6591 - 0.6910	133.35	117.35	112.10	109.40	106.75	104.50
23/32	.7188	.2900	.2500	5 3/8	3	1/2	51023	2	51123	113.45	0.6911 - 0.7220	145.40	129.45	124.15	121.55	118.85	116.65
3/4	.7500	.2900	.2500	5 3/8	3	1/2	51024	2	51124	103.15	0.7221 - 0.7530	135.00	119.05	113.75	111.15	108.40	106.20
25/32	.7812	.2900	.2500	5 3/8	3	5/8	51025	2	51125	115.40	0.7531 - 0.7840	147.25	131.35	126.00	123.35	120.70	118.50
13/16	.8125	.2900	.2500	5 3/8	3	5/8	51026	2	51126	104.95	0.7841 - 0.8160	136.80	120.90	115.60	112.90	110.25	108.05
27/32	.8438	.2900	.2500	5 3/8	3	3/4	51027	2	51127	121.30	0.8161 - 0.8470	153.30	137.30	132.00	129.35	126.70	124.50
7/8	.8750	.2900	.2500	5 3/8	3	3/4	51028	2	51128	110.30	0.8471 - 0.8780	142.20	126.20	120.95	118.30	115.65	113.40
29/32	.9062	.2900	.2500	6 1/8	3	3/4	51029	3	51129	124.65	0.8781 - 0.9090	156.50	140.55	135.30	132.60	129.95	127.80
15/16	.9375	.2900	.2500	6 1/8	3	3/4	51030	3	51130	113.30	0.9091 - 0.9410	145.15	129.20	123.90	121.25	118.65	116.45
31/32	.9688	.3530	.3125	6 3/8	3	3/4	51031	3	51131	127.50	0.9411 - 0.9720	159.35	143.45	138.15	135.50	132.75	130.60
1	1.0000	.3530	.3125	6 3/8	3	3/4	51032	3	51132	120.30	0.9721 - 1.0030	153.45	136.90	131.35	128.65	125.75	123.55
1 1/16	1.0625	.3530	.3125	6 3/8	3	3/4	51034	3	51134	121.90	1.0031 - 1.0660	154.90	138.40	132.85	130.15	127.35	125.10
1 1/8	1.1250	.3530	.3125	6 3/8	3	1	51036	3	51136	125.70	1.0661 - 1.1280	158.85	142.35	136.75	134.05	131.25	129.00
1 3/16	1.1875	.3530	.3125	6 3/8	3	1	51038	3	51138	130.00	1.1281 - 1.1905	163.20	146.60	141.05	138.35	135.50	133.30
1 1/4	1.2500	.4260	.3750	6 5/8	4	1	51040	3	51140	144.55	1.1906 - 1.2530	180.40	162.45	156.50	153.55	150.50	148.05
1 5/16	1.3125	.4260	.3750	6 5/8	4	1	51042	3	51142	154.90	1.2531 - 1.3155	190.90	172.85	166.95	163.95	160.95	158.45
1 3/8	1.3750	.4260	.3750	6 5/8	4	1	51044	3	51144	162.35	1.3156 - 1.3780	198.20	180.30	174.30	171.35	168.35	165.85
1 7/16	1.4375	.4260	.3750	7 7/8	4	1 1/4	51046	4	51146	180.55	1.3781 - 1.4405	219.65	200.15	193.55	190.40	187.10	184.40
1 1/2	1.5000	.4260	.3750	7 7/8	4	1 1/4	51048	4	51148	207.80	1.4406 - 1.5030	248.30	228.05	221.30	217.95	214.60	211.75
1 9/16	1.5625	.4890	.4375	8 1/8	4	1 1/4	51050	4	51150	223.25	1.5031 - 1.5660	265.65	244.50	237.50	233.90	230.35	227.50
1 5/8	1.6250	.4890	.4375	8 1/8	4	1 1/4	51052	4	51152	227.25	1.5661 - 1.6280	269.65	248.50	241.45	237.90	234.30	231.50
1 11/16	1.6875	.4890	.4375	8 1/8	4	1 1/4	51054	4	51154	271.90	1.6281 - 1.6910	317.75	294.85	287.25	283.45	279.55	276.45
1 3/4	1.7500	.4890	.4375	8 1/8	4	1 1/4	51056	4	51156	271.90	1.6911 - 1.7530	317.75	294.85	287.25	283.45	279.55	276.45
1 13/16	1.8125	.4890	.4375	8 1/8	4	1 1/2	51058	4	51158	321.85	1.7531 - 1.8160	367.60	344.75	337.10	333.30	329.45	326.25
1 7/8	1.8750	.4890	.4375	8 1/8	4	1 1/2	51060	4	51160	321.85	1.8161 - 1.8780	367.60	344.75	337.10	333.30	329.45	326.25
1 15/16	1.9375	.4890	.4375	8 1/8	4	1 1/2	51062	4	51162	351.60	1.8781 - 1.9410	397.45	374.55	366.85	363.15	359.30	356.10
2	2.0000	.5510	.5000	8 3/8	4	1 1/2	51064	4	51164	351.60	1.9411 - 2.0030	397.45	374.55	366.85	363.15	359.30	356.10

*Quantities of 15 or more - price of fractional size in same size range.

COUNTERBORES – FOR STEELS
CARBIDE TIPPED TYPES 510 & 511 METRIC

MATERIAL SPECIFIC

INTERCHANGEABLE PILOT TYPE
STRAIGHT OR TAPER SHANK

NOTE: Tool diameter in millimeters (mm); all other dimensions in inches. Modifications available (Type 510 see page 148, type 511 see page 150).

TOOL DIAMETER		DIMENSIONS				TYPE 510		TYPE 511		BOTH TYPES METRIC PRICE	FINISHED TO MODIFIED TOOL DIAMETER							
											MODIFIED DIAMETER RANGE (mm)	PRICE EACH - BASED ON QUANTITY ORDERED						
mm	INCH	MIN CUT DIAM.	PILOT HOLE DIAM.	OVER-ALL LENGTH	NO. OF FLTS	SHANK DIAM.	STEEL METRIC EDP NO.	TAPER SHANK NO.	STEEL METRIC EDP NO.			1	2	3	4	5-7	8-14	OVER 14
6.0	.2362	.1140	.0938	3 13/16	3	15/64	510060	1	511060	$86.45	6.000-6.426	$113.25	$95.25	$89.30	$86.45	$83.45	$80.90	$77.45
6.5	.2559	.1140	.0938	3 13/16	3	17/64	510065	1	511065	101.50	6.427-7.214	128.30	110.40	104.35	101.50	98.50	96.05	92.50
7.0	.2756	.1140	.0938	3 13/16	3	17/64	510070	1	511070	101.50	-	-	-	-	-	-	-	-
7.5	.2953	.1140	.0938	3 13/16	3	19/64	510075	1	511075	93.45	7.215-8.001	120.25	102.30	96.25	93.45	90.40	87.90	84.40
8.0	.3150	.1140	.0938	3 13/16	3	19/64	510080	1	511080	93.45	-	-	-	-	-	-	-	-
8.5	.3346	.1140	.0938	3 13/16	3	5/16	510085	1	511085	112.30	8.002-8.814	139.15	121.20	115.30	112.30	109.35	106.90	103.30
9.0	.3543	.1820	.1562	4 1/16	3	5/16	510090	1	511090	95.10	8.815-9.601	119.85	103.30	97.80	95.10	92.30	90.05	86.80
9.5	.3740	.1820	.1562	4 1/16	3	5/16	510095	1	511095	95.10	-	-	-	-	-	-	-	-
10.0	.3937	.1820	.1562	4 1/16	3	3/8	510100	1	511100	106.05	9.602-10.389	130.75	114.25	108.75	106.05	103.20	100.90	97.75
10.5	.4134	.1820	.1562	4 1/16	3	3/8	510105	1	511105	97.35	10.390-11.201	122.15	105.55	100.10	97.35	94.60	92.30	89.05
11.0	.4331	.1820	.1562	4 1/16	3	3/8	510110	1	511110	97.35	-	-	-	-	-	-	-	-
11.5	.4528	.2280	.1875	4 5/16	3	7/16	510115	1	511115	115.90	11.202-11.989	140.65	124.10	118.60	115.90	113.15	110.80	107.50
12.0	.4724	.2280	.1875	4 5/16	3	7/16	510120	1	511120	106.35	11.990-12.776	131.20	114.55	109.05	106.35	103.70	101.35	98.10
12.5	.4921	.2280	.1875	4 5/16	3	7/16	510125	1	511125	106.35	-	-	-	-	-	-	-	-
13.0	.5118	.2280	.1875	4 5/16	3	1/2	510130	1	511130	113.55	12.777-13.564	137.40	121.50	116.05	113.55	110.90	108.70	105.50
13.5	.5315	.2280	.1875	4 5/16	3	1/2	510135	1	511135	113.55	-	-	-	-	-	-	-	-
14.0	.5512	.2280	.1875	4 5/16	3	1/2	510140	1	511140	104.25	13.565-14.376	128.05	112.15	106.80	104.25	101.50	99.30	96.20
14.5	.5709	.2280	.1875	5 1/8	3	1/2	510145	2	511145	116.40	14.377-15.164	140.25	124.25	118.95	116.40	113.70	111.45	108.35
15.0	.5906	.2280	.1875	5 1/8	3	1/2	510150	2	511150	116.40	-	-	-	-	-	-	-	-
15.5	.6102	.2280	.1875	5 1/8	3	1/2	510155	2	511155	106.75	15.165-15.951	130.55	114.65	109.30	106.75	104.10	101.90	98.75
16.0	.6299	.2280	.1875	5 1/8	3	1/2	510160	2	511160	106.75	15.952-16.739	130.55	114.65	109.30	106.75	104.10	101.90	98.75
16.5	.6496	.2280	.1875	5 1/8	3	1/2	510165	2	511165	122.20	-	-	-	-	-	-	-	-
17.0	.6693	.2280	.1875	5 1/8	3	1/2	510170	2	511170	112.10	16.740-17.551	135.85	119.95	114.65	112.10	109.35	107.15	104.10
17.5	.6890	.2280	.1875	5 1/8	3	1/2	510175	2	511175	112.10	-	-	-	-	-	-	-	-
18.0	.7087	.2900	.2500	5 3/8	3	1/2	510180	2	511180	124.15	17.552-18.339	147.90	132.00	126.70	124.15	121.50	119.20	116.05
18.5	.7283	.2900	.2500	5 3/8	3	1/2	510185	2	511185	113.75	18.340-19.126	137.60	121.65	116.30	113.75	111.10	108.85	105.75
19.0	.7480	.2900	.2500	5 3/8	3	1/2	510190	2	511190	113.75	-	-	-	-	-	-	-	-
19.5	.7677	.2900	.2500	5 3/8	3	5/8	510195	2	511195	126.00	19.127-19.914	149.85	133.80	128.60	126.00	123.30	121.10	118.00
20.0	.7874	.2900	.2500	5 3/8	3	5/8	510200	2	511200	115.60	19.915-20.726	139.40	123.45	118.10	115.60	112.85	110.65	107.55
20.5	.8071	.2900	.2500	5 3/8	3	5/8	510205	2	511205	115.60	-	-	-	-	-	-	-	-
21.0	.8268	.2900	.2500	5 3/8	3	3/4	510210	2	511210	132.00	20.727-21.514	155.85	139.85	134.55	132.00	129.30	127.10	123.95
21.5	.8465	.2900	.2500	5 3/8	3	3/4	510215	2	511215	132.00	-	-	-	-	-	-	-	-
22.0	.8661	.2900	.2500	5 3/8	3	3/4	510220	2	511220	120.95	21.515-22.301	144.75	128.85	123.55	120.95	118.20	116.00	112.90
22.5	.8858	.2900	.2500	6 1/8	3	3/4	510225	3	511225	135.30	22.302-23.089	159.10	143.15	137.80	135.30	132.55	130.40	127.20
23.0	.9055	.2900	.2500	6 1/8	3	3/4	510230	3	511230	135.30	-	-	-	-	-	-	-	-
23.5	.9252	.2900	.2500	6 1/8	3	3/4	510235	3	511235	123.90	23.090-23.901	147.75	131.75	126.50	123.90	121.20	119.05	115.90
24.0	.9449	.3530	.3125	6 3/8	3	3/4	510240	3	511240	138.15	23.902-24.689	161.95	146.00	140.65	138.15	135.45	133.30	130.10
24.5	.9646	.3530	.3125	6 3/8	3	3/4	510245	3	511245	138.15	-	-	-	-	-	-	-	-
25.0	.9843	.3530	.3125	6 3/8	3	3/4	510250	3	511250	126.55	24.690-25.476	150.35	134.45	129.10	126.55	123.85	121.70	118.60
25.5	1.0039	.3530	.3125	6 3/8	3	3/4	510255	3	511255	132.85	25.477-27.076	157.60	141.05	135.50	132.85	130.10	127.85	124.55
26.0	1.0236	.3530	.3125	6 3/8	3	3/4	510260	3	511260	132.85	-	-	-	-	-	-	-	-
27.0	1.0630	.3530	.3125	6 3/8	3	3/4	510270	3	511270	132.85	-	-	-	-	-	-	-	-
28.0	1.1024	.3530	.3125	6 3/8	3	1	510280	3	511280	136.75	27.077-28.651	161.50	144.95	139.45	136.75	134.00	131.70	128.45
29.0	1.1417	.3530	.3125	6 3/8	3	1	510290	3	511290	141.05	28.652-30.239	165.80	149.25	143.75	141.05	138.30	136.00	132.75
30.0	1.1811	.3530	.3125	6 3/8	3	1	510300	3	511300	141.05	-	-	-	-	-	-	-	-
31.0	1.2205	.4260	.3750	6 5/8	4	1	510310	3	511310	156.50	30.240-31.826	183.35	165.35	159.35	156.50	153.50	151.05	147.45
32.0	1.2598	.4260	.3750	6 5/8	4	1	510320	3	511320	166.95	31.827-33.414	193.75	175.80	169.80	166.95	163.90	161.45	157.90
33.0	1.2992	.4260	.3750	6 5/8	4	1	510330	3	511330	166.95	-	-	-	-	-	-	-	-
34.0	1.3386	.4260	.3750	6 5/8	4	1	510340	3	511340	174.30	33.415-35.001	201.20	183.15	177.20	174.30	171.30	168.85	165.25
35.0	1.3780	.4260	.3750	6 5/8	4	1	510350	3	511350	174.30	-	-	-	-	-	-	-	-
36.0	1.4173	.4260	.3750	7 7/8	4	1 1/4	510360	4	511360	193.55	35.002-36.589	222.75	203.25	196.75	193.55	190.30	187.65	183.75
37.0	1.4567	.4260	.3750	7 7/8	4	1 1/4	510370	4	511370	213.25	36.590-38.176	242.40	222.85	216.35	213.25	210.00	207.30	203.45
38.0	1.4961	.4260	.3750	7 7/8	4	1 1/4	510380	4	511380	213.25	-	-	-	-	-	-	-	-

Modified tool diameters are available up to 50mm-contact us for price.

COUNTERBORES CARBIDE TIPPED TYPES 575 & 576 FRACTIONAL

STUB TAPER SHANK - TWO TYPES: FOR NON-FERROUS & CAST IRONS OR FOR STEELS

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	575
	40	NON-FERROUS - SHORT CHIPS	575
	60	CAST IRONS	575
	80	LOW STRENGTH STEELS	576
	100	MEDIUM STRENGTH STEELS	576
	120	HIGH STRENGTH STEELS	576
	140	HIGH TEMPERATURE ALLOYS	575

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Metric tool diameter
- Cutting diameter reduced for step
- Corner chamfer or corner radius
- Coatings available:

TITANIUM NITRIDE – TiN

TITANIUM CARBONITRIDE – TiCN

ZIRCONIUM NITRIDE – ZrN

AL TITANIUM NITRIDE – AlTiN

STUB TAPER SHANK:
TYPE 575 - FOR NON-FERROUS MATERIALS AND CAST IRONS
TYPE 576 - FOR STEELS

- 10° right spiral flutes
- Body length = 1¼" through 1.9410" tool diameter; 1½" above 1.9410" tool diameter
- Tool diameter tolerance: plus .001", minus .000"
- Both types will accept only short shank pilots (see page 158)
- Stub taper dimensions conform to ASME/ANSI B5.10 specifications
- Tool geometry and carbide grade appropriate for material being machined

C'BORES

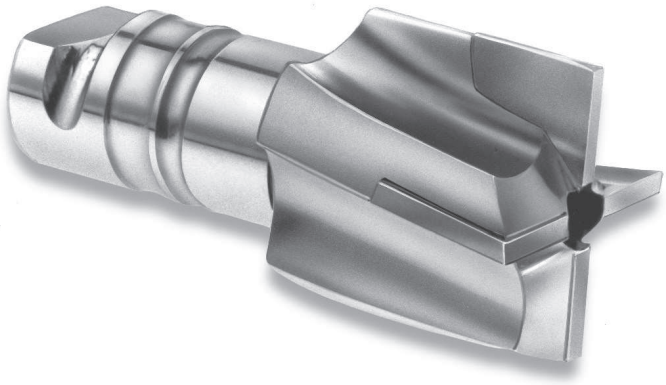
TOOL DIAMETER		DIMENSIONS						TYPE 575 N-F/CI EDP NO.	TYPE 576 STEEL EDP NO.	BOTH TYPES PRICE	FINISHED TO MODIFIED TOOL DIAMETER						
		MIN. CUT DIAM.	PILOT HOLE DIAM.	STUB TAPER NO.	LENGTH		NO. OF FLTS				MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DEC.				CARBIDE	OVER-ALL						1	2	3	4	5-7	8-14*
½	.5000	.2188	.1875	1	¾	2 9/16	3	57516	57616	$162.30	0.4721 - 0.5030	$224.15	$193.25	$182.90	$177.80	$172.60	$168.35
9/16	.5625	.2188	.1875	1	¾	2 9/16	3	57518	57618	162.30	0.5341 - 0.5660	224.15	193.25	182.90	177.80	172.60	168.35
⅝	.6250	.2188	.1875	1	¾	2 9/16	3	57520	57620	162.30	0.5971 - 0.6280	224.15	193.25	182.90	177.80	172.60	168.35
11/16	.6875	.2188	.1875	1	¾	2 9/16	3	57522	57622	162.30	0.6591 - 0.6910	224.15	193.25	182.90	177.80	172.60	168.35
¾	.7500	.2969	.2500	2	¾	2 ⅞	4	57524	57624	152.10	0.7221 - 0.7530	213.90	183.10	172.75	167.70	162.50	158.20
13/16	.8125	.2969	.2500	2	¾	2 ⅞	4	57526	57626	152.10	0.7841 - 0.8160	213.90	183.10	172.75	167.70	162.50	158.20
⅞	.8750	.2969	.2500	2	¾	2 ⅞	4	57528	57628	152.10	0.8471 - 0.8780	213.90	183.10	172.75	167.70	162.50	158.20
15/16	.9375	.2969	.2500	2	¾	2 ⅞	4	57530	57630	146.70	0.9091 - 0.9410	208.55	177.65	167.30	162.25	157.10	152.80
1	1.0000	.3594	.3125	2	¾	2 ⅞	4	57532	57632	146.70	0.9721 - 1.0030	208.55	177.65	167.30	162.25	157.10	152.80
1 1/16	1.0625	.3594	.3125	2	¾	2 ⅞	4	57534	57634	146.70	1.0031 - 1.0660	208.55	177.65	167.30	162.25	157.10	152.80
1 ⅛	1.1250	.3594	.3125	2	¾	2 ⅞	4	57536	57636	146.70	1.0661 - 1.1280	208.55	177.65	167.30	162.25	157.10	152.80
1 3/16	1.1875	.3594	.3125	2	¾	2 ⅞	4	57538	57638	152.10	1.1281 - 1.1905	213.90	183.10	172.75	167.70	162.50	158.20
1 ¼	1.2500	.3594	.3125	2	¾	2 ⅞	4	57540	57640	152.10	1.1906 - 1.2530	213.90	183.10	172.75	167.70	162.50	158.20
1 5/16	1.3125	.3594	.3125	2	¾	2 ⅞	4	57542	57642	154.55	1.2531 - 1.3155	216.35	185.45	175.15	170.00	164.90	160.60
1 ⅜	1.3750	.3594	.3125	2	¾	2 ⅞	4	57544	57644	170.30	1.3156 - 1.3780	232.10	201.25	190.90	185.80	180.70	176.40
1 7/16	1.4375	.3594	.3125	2	½	2 ⅞	4	57546	57646	186.05	1.3781 - 1.4405	247.80	216.95	206.60	201.50	196.30	191.95
1 ½	1.5000	.3594	.3125	2	½	2 ⅞	4	57548	57648	201.60	1.4406 - 1.5030	263.45	232.55	222.25	217.15	212.00	207.70
1 9/16	1.5625	.4844	.4375	3	½	3 3/16	6	57550	57650	214.70	1.5031 - 1.5660	276.55	245.60	235.30	230.30	225.10	220.80
1 ⅝	1.6250	.4844	.4375	3	½	3 3/16	6	57552	57652	240.95	1.5661 - 1.6280	302.70	271.85	261.55	256.40	251.20	246.95
1 11/16	1.6875	.4844	.4375	3	½	3 3/16	6	57554	57654	261.75	1.6281 - 1.6910	323.60	292.70	282.40	277.30	272.15	267.85
1 ¾	1.7500	.4844	.4375	3	½	3 3/16	6	57556	57656	282.75	1.6911 - 1.7530	344.50	313.65	303.35	298.25	293.05	288.80
1 13/16	1.8125	.4844	.4375	3	½	3 3/16	6	57558	57658	298.55	1.7531 - 1.8160	360.40	329.50	319.10	314.10	308.90	304.65
1 ⅞	1.8750	.4844	.4375	3	½	3 3/16	6	57560	57660	314.15	1.8161 - 1.8780	375.95	345.05	334.75	329.60	324.40	320.15
1 15/16	1.9375	.4844	.4375	3	½	3 3/16	6	57562	57662	330.00	1.8781 - 1.9410	391.80	360.90	350.60	345.50	340.35	336.00
2	2.0000	.5625	.5000	4	½	3 ¾	6	57564	57664	345.55	1.9411 - 2.0030	407.30	376.55	366.20	361.10	355.95	351.60
2 ⅛	2.1250	.5625	.5000	4	½	3 ¾	6	57568	57668	356.05	2.0661 - 2.1280	417.85	386.95	376.65	371.55	366.40	362.10
2 ¼	2.2500	.5625	.5000	4	½	3 ¾	6	57572	57672	366.35	2.1906 - 2.2530	428.15	397.30	386.90	381.85	376.65	372.40
2 ⅜	2.3750	.5625	.5000	4	½	3 ¾	6	57576	57676	394.00	2.3156 - 2.3780	458.05	426.00	415.30	410.05	404.70	400.25
2 ½	2.5000	.5625	.5000	4	½	3 ¾	6	57580	57680	407.70	2.4406 - 2.5030	471.85	439.80	429.10	423.80	418.45	414.00
2 ¾	2.7500	.5625	.5000	4	½	3 ¾	6	57588	57688	429.35	2.6911 - 2.7530	493.45	461.40	450.65	445.40	440.05	435.65
3	3.0000	.5625	.5000	4	½	3 ¾	6	57596	57696	451.00	2.9411 - 3.0030	515.05	483.10	472.35	467.05	461.70	457.25

*Quantities of 15 or more - price of fractional size in same size range.

COUNTERBORES CARBIDE TIPPED TYPES 573 & 574 FRACTIONAL

MATERIAL SPECIFIC

PIN DRIVE - TWO TYPES: FOR NON-FERROUS & CAST IRONS OR FOR STEELS



TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	573
	40	NON-FERROUS - SHORT CHIPS	573
	60	CAST IRONS	573
	80	LOW STRENGTH STEELS	574
	100	MEDIUM STRENGTH STEELS	574
	120	HIGH STRENGTH STEELS	574
	140	HIGH TEMPERATURE ALLOYS	573

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Metric tool diameter
- Cutting diameter reduced for step
- Coatings available:

TITANIUM NITRIDE – TiN

TITANIUM CARBONITRIDE – TiCN

ZIRCONIUM NITRIDE – ZrN

AL TITANIUM NITRIDE – AlTiN

PIN DRIVE:

TYPE 573 - FOR NON-FERROUS MATERIALS AND CAST IRONS

TYPE 574 - FOR STEELS

- 10° right spiral flutes
- Body length = 1⅜"
- Tool diameter tolerance: plus .001", minus .000"
- Counterbore's set screw design accepts short shank pilots (see page 158)
- Tool geometry and carbide grade appropriate for material being machined

USE:

- Pin drive shank may also be used in straight shank holder or collet

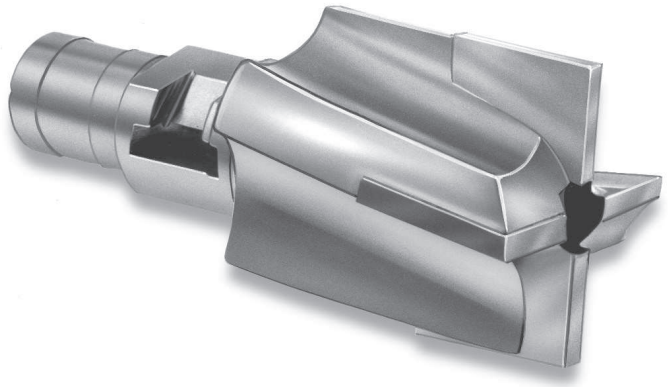
TOOL DIAMETER		DIMENSIONS							TYPE 573 N-F/CI EDP NO.	TYPE 574 STEEL EDP NO.	BOTH TYPES PRICE	FINISHED TO MODIFIED TOOL DIAMETER						
		MIN. CUT DIAM.	PILOT HOLE DIAM.	PIN DRIVE NO.	SHANK DIAM.	LENGTH		NO. OF FLTS				MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DECIMAL					CARBIDE	OVER-ALL						1	2	3	4	5-7	8-14*
½	.5000	.2188	.1875	1	9/16	¾	2 7/8	3	57316	57416	$133.55	0.4721 - 0.5030	$197.85	$165.75	$154.90	$149.65	$144.25	$139.80
9/16	.5625	.2188	.1875	1	9/16	¾	2 7/8	3	57318	57418	133.55	0.5341 - 0.5660	197.85	165.75	154.90	149.65	144.25	139.80
5/8	.6250	.2188	.1875	1	9/16	¾	2 7/8	3	57320	57420	133.55	0.5971 - 0.6280	197.85	165.75	154.90	149.65	144.25	139.80
11/16	.6875	.2969	.2500	1	9/16	¾	2 7/8	3	57322	57422	125.50	0.6591 - 0.6910	189.75	157.60	146.90	141.65	136.25	131.75
¾	.7500	.2969	.2500	1	9/16	¾	2 7/8	3	57324	57424	125.50	0.7221 - 0.7530	189.75	157.60	146.90	141.65	136.25	131.75
13/16	.8125	.2969	.2500	1	9/16	¾	2 7/8	4	57326	57426	125.50	0.7841 - 0.8160	189.75	157.60	146.90	141.65	136.25	131.75
7/8	.8750	.2969	.2500	1	9/16	¾	2 7/8	4	57328	57428	125.50	0.8471 - 0.8780	189.75	157.60	146.90	141.65	136.25	131.75
15/16	.9375	.2969	.2500	1	9/16	¾	2 7/8	4	57330	57430	128.30	0.9091 - 0.9410	192.60	160.50	149.80	144.50	139.05	134.60
1	1.0000	.2969	.2500	1	9/16	¾	2 7/8	4	57332	57432	130.70	0.9721 - 1.0030	194.95	162.85	152.05	146.75	141.40	136.95
1 1/16	1.0625	.2969	.2500	1	9/16	¾	2 7/8	4	57334	57434	144.50	1.0031 - 1.0660	208.70	176.65	165.90	160.60	155.20	150.80
1 1/16	1.0625	.3594	.3125	2	7/8	¾	3	4	57335	57435	152.65	1.0031 - 1.0660	216.90	184.80	174.05	168.75	163.35	158.95
1 1/8	1.1250	.2969	.2500	1	9/16	¾	2 7/8	4	57336	57436	144.50	1.0661 - 1.1280	208.70	176.65	165.90	160.60	155.20	150.80
1 1/8	1.1250	.3594	.3125	2	7/8	¾	3	4	57337	57437	152.65	1.0661 - 1.1280	216.90	184.80	174.05	168.75	163.35	158.95
1 3/16	1.1875	.3594	.3125	2	7/8	¾	3	4	57338	57438	158.20	1.1281 - 1.1905	222.55	190.45	179.65	174.35	169.00	164.55
1 ¼	1.2500	.3594	.3125	2	7/8	¾	3	4	57340	57440	158.20	1.1906 1.2530	222.55	190.45	179.65	174.35	169.00	164.55
1 5/16	1.3125	.3594	.3125	2	7/8	¾	3	4	57342	57442	160.75	1.2531 - 1.3155	225.05	192.90	182.15	176.85	171.50	167.05
1 3/8	1.3750	.3594	.3125	2	7/8	¾	3	4	57344	57444	160.75	1.3156 - 1.3780	225.05	192.90	182.15	176.85	171.50	167.05
1 7/16	1.4375	.3594	.3125	2	7/8	½	3	4	57346	57446	168.85	1.3781 - 1.4405	233.10	201.05	190.20	184.95	179.55	175.10
1 ½	1.5000	.3594	.3125	2	7/8	½	3	4	57348	57448	177.20	1.4406 - 1.5030	241.35	209.30	198.55	193.25	187.85	183.40
1 9/16	1.5625	.3594	.3125	2	7/8	½	3	4	57350	57450	190.50	1.5031 - 1.5660	254.75	222.65	211.95	206.60	201.25	196.80
1 5/8	1.6250	.3594	.3125	2	7/8	½	3	4	57352	57452	198.80	1.5661 - 1.6280	263.05	230.95	220.25	214.95	209.60	205.15
1 11/16	1.6875	.3594	.3125	2	7/8	½	3	4	57354	57454	206.90	1.6281 - 1.6910	271.25	239.10	228.40	223.10	217.70	213.25
1 ¾	1.7500	.3594	.3125	2	7/8	½	3	4	57356	57456	217.95	1.6911 - 1.7530	282.15	250.05	239.35	234.05	228.70	224.25
1 ¾	1.7500	.4844	.4375	3	1 ¼	½	3 1/16	6	57357	57457	248.05	1.6911 - 1.7530	312.40	280.25	269.50	264.20	258.85	254.40
1 7/8	1.8750	.4844	.4375	3	1 ¼	½	3 1/16	6	57360	57460	248.05	1.8161 - 1.8780	312.40	280.25	269.50	264.20	258.85	254.40
2	2.0000	.4844	.4375	3	1 ¼	½	3 1/16	6	57364	57464	280.80	1.9411 - 2.0030	345.00	312.95	302.20	296.95	291.50	287.05
2 ⅛	2.1250	.4844	.4375	3	1 ¼	½	3 1/16	6	57368	57468	288.60	2.0661 - 2.1280	352.80	320.75	310.00	304.70	299.35	294.90
2 ¼	2.2500	.4844	.4375	3	1 ¼	½	3 1/16	6	57372	57472	299.55	2.1906 - 2.2530	363.90	331.75	321.00	315.70	310.35	305.90
2 ⅜	2.3750	.4844	.4375	3	1 ¼	½	3 1/16	6	57376	57476	336.15	2.3156 - 2.3780	402.90	369.50	358.45	352.85	347.30	342.70
2 ½	2.5000	.5625	.5000	3	1 ¼	½	3 1/16	6	57380	57480	361.50	2.4406 - 2.5030	428.25	394.90	383.70	378.25	372.70	368.10
2 ¾	2.7500	.5625	.5000	3	1 ¼	½	3 1/16	6	57388	57488	401.30	2.6911 - 2.7530	468.00	434.65	423.50	418.00	412.45	407.85
3	3.0000	.5625	.5000	3	1 ¼	½	3 1/16	6	57396	57496	423.95	2.9411 - 3.0030	490.75	457.40	446.25	440.75	435.20	430.55

*Quantities of 15 or more - price of fractional size in same size range.

COUNTERBORES CARBIDE TIPPED TYPES 577 & 578 FRACTIONAL

MATERIAL SPECIFIC

RADIAL DRIVE - TWO TYPES: FOR NON-FERROUS & CAST IRONS OR FOR STEELS



TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	577
	40	NON-FERROUS - SHORT CHIPS	577
	60	CAST IRONS	577
	80	LOW STRENGTH STEELS	578
	100	MEDIUM STRENGTH STEELS	578
	120	HIGH STRENGTH STEELS	578
	140	HIGH TEMPERATURE ALLOYS	577

MODIFICATIONS (Prompt delivery)

- Modified tool diameter - priced below
- Metric tool diameter
- Cutting diameter reduced for step
- Corner chamfer or corner radius
- Coatings available:

TITANIUM NITRIDE – TiN

TITANIUM CARBONITRIDE – TiCN

ZIRCONIUM NITRIDE – ZrN

AL TITANIUM NITRIDE – AlTiN

RADIAL DRIVE:
TYPE 577 - FOR NON-FERROUS MATERIALS AND CAST IRONS
TYPE 578 - FOR STEELS

- 10° right spiral flutes
- Body length = 1½"
- Tool diameter tolerance: plus .001", minus .000"
- Counterbore's set screw design accepts short shank pilots (see page 158)
- Tool geometry and carbide grade appropriate for material being machined

C'BORES

TOOL DIAMETER		DIMENSIONS							TYPE 577 N-F/CI EDP NO.	TYPE 578 STEEL EDP NO.	BOTH TYPES PRICE	FINISHED TO MODIFIED TOOL DIAMETER						
						LENGTH						MODIFIED DIAMETER RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DEC.	MIN. CUT DIAM.	PILOT HOLE DIAM.	RADIAL DRIVE SIZE	LARGE SHANK DIAM.	CAR-BIDE	OVER-ALL	NO. OF FLTS					1	2	3	4	5-7	8-14*
½	.5000	.2188	.1875	RB	⅝	¾	2 ⅞	3	57716	57816	$139.05	0.4721-0.5030	$203.30	$171.30	$160.50	$155.20	$149.85	$145.40
9/16	.5625	.2188	.1875	RB	⅝	¾	2 ⅞	3	57718	57818	139.05	0.5341-0.5660	203.30	171.30	160.50	155.20	149.85	145.40
⅝	.6250	.2188	.1875	RB	⅝	¾	2 ⅞	3	57720	57820	139.05	0.5971-0.6280	203.30	171.30	160.50	155.20	149.85	145.40
11/16	.6875	.2969	.2500	RB	⅝	¾	2 ⅞	3	57722	57822	139.05	0.6591-0.6910	203.30	171.30	160.50	155.20	149.85	145.40
¾	.7500	.2969	.2500	RB	⅝	¾	2 ⅞	4	57724	57824	139.05	0.7221-0.7530	203.30	171.30	160.50	155.20	149.85	145.40
13/16	.8125	.2969	.2500	RB	⅝	¾	2 ⅞	4	57726	57826	141.70	0.7841-0.8160	205.95	173.85	163.10	157.85	152.50	148.00
⅞	.8750	.2969	.2500	RB	⅝	¾	2 ⅞	4	57728	57828	141.70	0.8471-0.8780	205.95	173.85	163.10	157.85	152.50	148.00
15/16	.9375	.2969	.2500	RB	⅝	¾	2 ⅞	4	57730	57830	150.00	0.9091-0.9410	214.25	182.15	171.40	166.10	160.75	156.30
1	1.0000	.2969	.2500	RB	⅝	¾	2 ⅞	4	57732	57832	150.00	0.9721-1.0030	214.25	182.15	171.40	166.10	160.75	156.30
1	1.0000	.3594	.3125	RC	¾	¾	2 ⅞	4	57733	57833	152.65	0.9721-1.0030	216.90	184.80	174.05	168.75	163.35	158.95
1 1/16	1.0625	.3594	.3125	RC	¾	¾	2 ⅞	4	57734	57834	152.65	1.0031-1.0660	216.90	184.80	174.05	168.75	163.35	158.95
1 ⅛	1.1250	.3594	.3125	RC	¾	¾	2 ⅞	4	57736	57836	152.65	1.0661-1.1280	216.90	184.80	174.05	168.75	163.35	158.95
1 3/16	1.1875	.3594	.3125	RC	¾	¾	2 ⅞	4	57738	57838	163.35	1.1281-1.1905	227.60	195.50	184.80	179.50	174.15	169.70
1 ¼	1.2500	.3594	.3125	RC	¾	¾	2 ⅞	4	57740	57840	163.35	1.1906-1.2530	227.60	195.50	184.80	179.50	174.15	169.70
1 5/16	1.3125	.3594	.3125	RC	¾	¾	2 ⅞	4	57742	57842	163.35	1.2531-1.3155	227.60	195.50	184.80	179.50	174.15	169.70
1 ⅜	1.3750	.3594	.3125	RC	¾	¾	2 ⅞	4	57744	57844	163.35	1.3156-1.3780	227.60	195.50	184.80	179.50	174.15	169.70
1 ⅜	1.3750	.3594	.3125	RE	1	¾	3	4	57745	57845	177.20	1.3151-1.3780	241.35	209.30	198.55	193.25	187.85	183.40
1 ½	1.5000	.3594	.3125	RE	1	½	3	4	57748	57848	198.80	1.4406-1.5030	263.05	230.95	220.25	214.95	209.60	205.15
1 ½	1.5000	.4844	.4375	RF	1 ⅛	½	3 1/16	4	57749	57849	206.90	1.4406-1.5030	271.25	239.10	228.40	223.10	217.70	213.25
1 ⅝	1.6250	.3594	.3125	RE	1	½	3	4	57752	57852	206.90	1.5661-1.6280	271.25	239.10	228.40	223.10	217.70	213.25
1 ⅝	1.6250	.4844	.4375	RF	1 ⅛	½	3 1/16	4	57753	57853	212.55	1.5661-1.6280	276.80	244.70	234.00	228.70	223.35	218.90
1 ¾	1.7500	.4844	.4375	RF	1 ⅛	½	3 1/16	6	57756	57856	261.30	1.6911-1.7530	325.55	293.45	282.75	277.45	272.10	267.65
1 ⅞	1.8750	.4844	.4375	RF	1 ⅛	½	3 1/16	6	57760	57860	275.05	1.8161-1.8780	339.30	307.20	296.50	291.20	285.80	281.30
2	2.0000	.4844	.4375	RF	1 ⅛	½	3 1/16	6	57764	57864	299.55	1.9411-2.0030	363.90	331.75	321.00	315.70	310.35	305.90
2	2.0000	.5625	.5000	RJ	1 ⅜	½	3 1/16	6	57765	57865	299.55	1.9411-2.0030	363.90	331.75	321.00	315.70	310.35	305.90
2 ⅛	2.1250	.5625	.5000	RJ	1 ⅜	½	3 1/16	6	57768	57868	307.70	2.0661-2.1280	371.95	339.95	329.20	323.90	318.55	314.10
2 ¼	2.2500	.5625	.5000	RJ	1 ⅜	½	3 1/16	6	57772	57872	321.20	2.1906-2.2530	385.50	353.40	342.65	337.35	332.00	327.55
2 ⅜	2.3750	.5625	.5000	RJ	1 ⅜	½	3 1/16	6	57776	57876	339.05	2.3156-2.3780	405.75	372.40	361.25	355.85	350.15	345.50
2 ½	2.5000	.5625	.5000	RJ	1 ⅜	½	3 1/16	6	57780	57880	353.35	2.4406-2.5030	420.10	386.75	375.55	370.10	364.55	359.90
2 ⅝	2.6250	.5625	.5000	RJ	1 ⅜	½	3 1/16	6	57784	57884	361.50	2.5661-2.6280	428.25	394.90	383.70	378.25	372.70	368.10
2 ¾	2.7500	.5625	.5000	RS	1 ¾	½	3 ⅛	6	57788	57888	367.30	2.6911-2.7530	433.95	400.70	389.55	384.05	378.55	373.85
2 ⅞	2.8750	.5625	.5000	RS	1 ¾	½	3 ⅛	6	57792	57892	387.15	2.8161-2.8780	453.85	420.50	409.40	403.85	398.30	393.70
3	3.0000	.5625	.5000	RS	1 ¾	½	3 ⅛	6	57796	57896	415.40	2.9411-3.0030	482.05	448.75	437.60	432.15	426.55	421.90

*Quantities of 15 or more - price of fractional size in same size range.

CAPSCREW COUNTERBORES CARBIDE TIPPED TYPES 513 & 515 FRACTIONAL & METRIC

MATERIAL SPECIFIC

STRAIGHT SHANK FOR NON-FERROUS, CAST IRON AND STEEL

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	513
	40	NON-FERROUS - SHORT CHIPS	513
	60	CAST IRONS	513
	80	LOW STRENGTH STEELS	515
	100	MEDIUM STRENGTH STEELS	515
	120	HIGH STRENGTH STEELS	515
	140	HIGH TEMPERATURE ALLOYS	513

TYPE 513 - STRAIGHT SHANK - FOR NON-FERROUS AND CAST IRONS
TYPE 515 - STRAIGHT SHANK - FOR STEELS

- Right spiral smooth flutes
- Carbide tips brazed to tough hardened alloy steel bodies
- Integral pilot types
- Tools are designed with appropriate carbide grade and tool geometry for material being machined. The pilot is manufactured in nominal screw body diameters as well as 1/64" and 1/32" over size diameters

MODIFICATIONS (Prompt delivery)

- Modified tool diameter
- Corner radius or corner chamfer
- Flat(s) or tang on shank
- Shortened shank or reduced shank diameter
- Coatings available (see pg 156)

USE:

- To form a recess for a capscrew head

TOOL DIAMETER		PILOT DIAMETER	PILOT LENGTH	SHANK DIAMETER	OVERALL LENGTH	NO. OF FLUTES	TYPE 513		TYPE 515	
DECIMAL	SCREW SIZE						NON-FERR/CI EDP NO.	PRICE EACH	STEEL EDP NO.	PRICE EACH
.3820	1/4	.2500	.3125	5/16	5 5/8	3	5132500	$75.95	5152500	$83.55
.3980	1/4	.2650	.3125	5/16	5 5/8	3	5132650	84.40	5152650	92.85
.4140	1/4	.2810	.3125	5/16	5 5/8	3	5132810	84.40	5152810	92.85
.4750	5/16	.3125	.3750	3/8	6 1/8	3	5133125	84.95	5153125	93.50
.4910	5/16	.3280	.3750	3/8	6 1/8	3	5133280	84.95	5153280	93.50
.5070	5/16	.3430	.3750	3/8	6 1/8	3	5133430	84.95	5153430	93.50
.5720	3/8	.3750	.5000	1/2	6 1/2	3	5133750	95.80	5153750	105.40
.5880	3/8	.3900	.5000	1/2	6 1/2	3	5133900	95.80	5153900	105.40
.6040	3/8	.4060	.5000	1/2	6 1/2	3	5134060	95.80	5154060	105.40
.6630	7/16	.4375	.5000	1/2	7	3	5134375	92.55	5154375	101.80
.6790	7/16	.4530	.5000	1/2	7	3	5134530	92.55	5154530	101.80
.6950	7/16	.4680	.5000	1/2	7	3	5134680	92.55	5154680	101.80
.7570	1/2	.5000	.5000	1/2	7 1/2	3	5135000	104.95	5155000	115.50
.7730	1/2	.5150	.5000	1/2	7 1/2	3	5135150	104.95	5155150	115.50
.7890	1/2	.5310	.5000	1/2	7 1/2	3	5135310	104.95	5155310	115.50
.8510	9/16	.5625	.5625	5/8	7 5/8	3	5135625	101.45	5155625	111.60
.8670	9/16	.5780	.5625	5/8	7 5/8	3	5135780	101.45	5155780	111.60
.8830	9/16	.5930	.5625	5/8	7 5/8	3	5135930	101.45	5155930	111.60
.9450	5/8	.6250	.6250	5/8	7 5/8	3	5136250	115.65	5156250	127.20
.9610	5/8	.6400	.6250	5/8	7 5/8	3	5136400	115.65	5156400	127.20
.9770	5/8	.6560	.6250	5/8	7 5/8	3	5136560	115.65	5156560	127.20
1.1330	3/4	.7500	.7500	3/4	7 3/4	3	5137500	114.00	5157500	125.40
1.1490	3/4	.7650	.7500	3/4	7 3/4	3	5137650	114.00	5157650	125.40
1.1650	3/4	.7810	.7500	3/4	7 3/4	3	5137810	114.00	5157810	125.40
1.3220	7/8	.8750	.8750	7/8	8 1/8	4	5138750	126.70	5158750	139.50
1.3380	7/8	.8910	.8750	7/8	8 1/8	4	5138910	126.70	5158910	139.50
1.3540	7/8	.9060	.8750	7/8	8 1/8	4	5139060	126.70	5159060	139.50
1.5100	1	1.0000	1.0000	1	8 1/2	4	5130000	145.10	5150000	159.65
1.5260	1	1.0150	1.0000	1	8 1/2	4	5130156	145.10	5150156	159.65
1.5420	1	1.0310	1.0000	1	8 1/2	4	5130313	145.10	5150313	159.65

TYPE 513 - STRAIGHT SHANK - FOR NON-FERROUS AND CAST IRONS - METRIC
TYPE 515 - STRAIGHT SHANK - FOR STEELS - METRIC

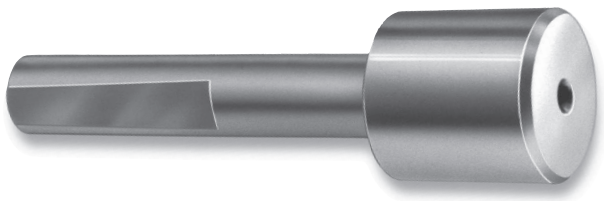
USE:

- Same as above except metric sizes.

TOOL DIAMETER		PILOT DIAMETER mm	PILOT LENGTH	SHANK DIAMETER	OVERALL LENGTH	NO. OF FLUTES	TYPE 513		TYPE 515	
DECIMAL	SCREW SIZE mm						NON-FERR/CI EDP NO.	PRICE EACH	STEEL EDP NO.	PRICE EACH
.3543	5	5.5	9/32	5/16	5 5/8	3	513055	$84.15	515055	$92.55
.4134	6	6.5	5/16	5/16	5 5/8	3	513065	88.85	515065	97.75
.5315	8	8.5	3/8	1/2	6 1/2	3	513085	105.50	515085	116.00
.6496	10	10.5	1/2	1/2	7	3	513105	114.75	515105	126.25
.7283	12	12.5	1/2	1/2	7 1/2	3	513125	107.70	515125	118.40
.8465	14	14.5	9/16	5/8	7 5/8	3	513145	125.55	515145	138.05
.9646	16	16.5	5/8	5/8	7 5/8	3	513165	131.20	515165	144.30
1.2008	20	20.5	3/4	7/8	8	3	513205	121.65	515205	133.80

INTERCHANGEABLE COUNTERBORE PILOTS TYPE 500 FRACTIONAL

SHORT SHANK PILOTS



PILOT HEAD DIAMETER	TOLERANCE
1/8" thru 1/4"	minus .001", minus .002"
over 1/4" thru 7/8"	minus .003", minus .004"
over 7/8" thru 1 1/4"	minus .005", minus .006"
over 1 1/4"	minus .006", minus .007"

TYPE 500

- Shank diameter tolerance: plus .0000", minus .0005"
- Shank diameter ordered must be the same as pilot hole diameter in the counterbore to be used
- Pilot head diameter must be larger than the counterbore's minimum cut diameter

MODIFICATIONS (prompt delivery)

- Modified pilot head diameter - priced below (ground down from finished pilot)
- Corner radius

PILOT HEAD DIAMETER		SHANK DIAMETER									ALL TYPES PRICE	FINISHED TO MODIFIED PILOT HEAD DIAMETER					
												PRICE EACH - BASED ON QUANTITY ORDERED					
FRAC.	DECIMAL	3/32 .0938 EDP NO.	1/8 .1250 EDP NO.	5/32 .1562 EDP NO.	3/16 .1875 EDP NO.	1/4 .2500 EDP NO.	5/16 .3125 EDP NO.	3/8 .3750 EDP NO.	7/16 .4375 EDP NO.	1/2 .5000 EDP NO.		1	2	3	4	5-7	OVER 7
1/8	.1250	50104	-	-	-	-	-	-	-	-	$19.45	$77.25	$48.40	$38.75	$34.05	$29.10	$25.10
5/32	.1562	50105	50205	-	-	-	-	-	-	-	15.80	73.55	44.70	35.05	30.20	25.45	21.45
3/16	.1875	50106	50206	50306	-	-	-	-	-	-	16.10	73.90	45.00	35.35	30.60	25.70	21.70
7/32	.2188	50107	50207	50307	50407	-	-	-	-	-	18.25	76.05	47.10	37.45	32.80	27.90	23.90
1/4	.2500	50108	50208	50308	50408	-	-	-	-	-	18.25	76.05	47.10	37.45	32.80	27.90	23.90
9/32	.2812	50109	50209	50309	50409	50509	-	-	-	-	19.45	77.25	48.40	38.75	34.05	29.10	25.10
5/16	.3125	50110	50210	50310	50410	50510	-	-	-	-	19.45	77.25	48.40	38.75	34.05	29.10	25.10
11/32	.3438	50111	50211	50311	50411	50511	50611	-	-	-	19.45	77.25	48.40	38.75	34.05	29.10	25.10
3/8	.3750	-	50212	50312	50412	50512	50612	-	-	-	21.45	79.25	50.35	40.70	35.90	31.05	27.15
13/32	.4062	-	50213	50313	50413	50513	50613	-	-	-	21.45	79.25	50.35	40.70	35.90	31.05	27.15
7/16	.4375	-	50214	50314	50414	50514	50614	50714	-	-	21.95	79.70	50.85	41.20	36.40	31.60	27.60
15/32	.4688	-	50215	-	50415	50515	50615	-	-	-	21.95	79.70	50.85	41.20	36.40	31.60	27.60
1/2	.5000	-	50216	-	50416	50516	50616	50716	50816	-	25.10	82.95	54.05	44.35	39.70	34.75	30.80
17/32	.5312	-	50217	-	50417	50517	50617	-	50817	-	29.25	87.10	58.20	48.60	43.80	38.95	35.00
9/16	.5625	-	50218	-	50418	50518	50618	50718	50818	50918	32.85	90.70	61.80	52.15	47.45	42.55	38.55
19/32	.5938	-	50219	-	-	50519	50619	-	50819	50919	36.10	93.90	65.00	55.35	50.50	45.70	41.75
5/8	.6250	-	50220	-	50420	50520	50620	50720	50820	50920	36.10	93.90	65.00	55.35	50.50	45.70	41.75
21/32	.6562	-	-	-	50421	50521	50621	-	50821	-	36.95	94.75	65.85	56.20	51.50	46.60	42.60
11/16	.6875	-	-	-	50422	50522	50622	50722	50822	50922	36.95	94.75	65.85	56.20	51.50	46.60	42.60
23/32	.7188	-	-	-	-	50523	50623	-	50823	50923	41.85	99.65	70.75	61.10	56.35	51.50	47.55
3/4	.7500	-	-	-	50424	50524	50624	50724	50824	50924	41.85	99.65	70.75	61.10	56.35	51.50	47.55
25/32	.7812	-	-	-	-	50525	50625	-	50825	50925	47.05	104.85	75.95	66.30	61.65	56.70	52.75
13/16	.8125	-	-	-	50426	50526	50626	50726	50826	50926	47.05	104.85	75.95	66.30	61.65	56.70	52.75
27/32	.8438	-	-	-	-	50527	-	-	-	-	52.05	109.85	80.95	71.35	66.50	61.70	57.70
7/8	.8750	-	-	-	50428	50528	50628	50728	50828	50928	52.05	109.85	80.95	71.35	66.50	61.70	57.70
15/16	.9375	-	-	-	50430	50530	50630	50730	50830	50930	54.90	112.70	83.80	74.20	69.40	64.55	60.60
1	1.0000	-	-	-	50432	50532	50632	50732	50832	50932	56.80	114.60	85.70	76.05	71.35	66.45	62.50
1 1/16	1.0625	-	-	-	-	-	50634	50734	50834	50934	58.90	116.65	87.75	78.10	73.30	68.55	64.55
1 1/8	1.1250	-	-	-	-	-	50636	50736	50836	50936	70.95	128.80	99.85	90.20	85.50	80.55	76.65
1 3/16	1.1875	-	-	-	-	-	50638	50738	50838	50938	73.15	130.90	102.00	92.40	87.65	82.80	78.80
1 1/4	1.2500	-	-	-	-	-	50640	50740	50840	50940	77.10	134.90	106.00	96.35	91.70	86.70	82.80
1 5/16	1.3125	-	-	-	-	-	-	50742	50842	50942	81.15	138.95	110.10	100.45	95.70	90.85	86.80
1 3/8	1.3750	-	-	-	-	-	50644	50744	50844	50944	88.60	146.55	117.65	108.00	103.20	98.35	94.35
1 7/16	1.4375	-	-	-	-	-	-	50746	50846	50946	89.70	147.50	118.55	108.90	104.20	99.25	95.35
1 1/2	1.5000	-	-	-	-	-	-	-	50848	50948	90.85	148.70	119.80	110.15	105.30	100.50	96.55
1 9/16	1.5625	-	-	-	-	-	-	-	50850	50950	91.90	149.85	120.95	111.30	106.50	101.65	97.70
1 5/8	1.6250	-	-	-	-	-	-	-	-	50952	92.90	150.70	121.80	112.15	107.40	102.50	98.60
1 11/16	1.6875	-	-	-	-	-	-	-	-	50954	94.15	151.90	123.00	113.35	108.60	103.70	99.80
1 3/4	1.7500	-	-	-	-	-	-	-	50856	50956	95.60	153.35	124.40	114.75	110.10	105.15	101.20
1 7/8	1.8750	-	-	-	-	-	-	-	-	50960	115.10	173.10	144.15	134.50	129.70	124.85	120.95
2	2.0000	-	-	-	-	-	-	-	-	50964	115.10	173.10	144.15	134.50	129.70	124.85	120.95

For larger pilot head diameters, contact us for price and availability.

MILLING CUTTERS INDEX AND COMPARISON CHART

DESCRIPTION	HANNIBAL		CLEVELAND	GAY-LEE	MORSE	NIAGARA	WHITNEY
	PAGE	TOOL TYPE					
ARBOR HOLE TYPES							
SHELL END MILLS							
For Non-Ferrous	**174**	530	–	–	5858	4920	–
For Cast Irons	**174**	531	–	–	5859	4900	–
For Steels	**174**	532	–	–	5860	4910	–
SIDE MILLING CUTTERS							
Staggered Tooth For General Purpose	**162**	547	–	–	–	–	–
Straight Tooth For Non-Ferrous	**163**	540	–	–	5861	1630	–
Straight Tooth For Cast Irons	**163**	541	–	–	5862	1590	–
Straight Tooth For Steels	**163**	542	–	–	5863	1550	–
Straight Tooth For High Temp Alloys	**163**	543	–	–	5849	–	–
Single Angle Cutters – For Non-Ferrous & Cast Irons			–	–	–	–	–
45° Right	**174**	714	–	–	–	–	–
45° Left	**174**	716	–	–	–	–	–
60° Right	**174**	724	–	–	–	–	–
60° Left	**174**	726	–	–	–	–	–
Double Angle Cutters – For Non-Ferrous & Cast Irons			–	–	–	–	–
45° Included	**174**	750	–	–	–	–	–
60° Included	**174**	752	–	–	–	–	DAA XXX 60
90° Included	**174**	754	–	–	–	–	DAA XXX 90
SLITTING SAWS – COARSE TOOTH							
For Non-Ferrous	**164**	550	–	CNF	5846	4690	–
For Cast Irons	**164**	552	–	CCI	5847	4240	–
For Steels	**164**	554	–	CST	5848	4220	–
For High Temp Alloys	**164**	558	–	GSS	5850	4260	–
SLITTING SAWS – STANDARD TOOTH							
For Non-Ferrous	**165**	551	1361	GPP	–	–	–
For Cast Irons	**165**	553	1361	GPP	–	–	–
For Steels	**165, 166-169**	556	1360	STL	–	–	–
For High Temp Alloys	**165, 170-173**	559	–	GSS	–	–	–
SHANK TYPES							
CHAMFER MILLING CUTTERS							
45° for Non-Ferrous & Cast Irons/Steels	**183**	730/731	–	–	–	–	CH XXXX 45C
60° for Non-Ferrous & Cast Irons/Steels	**183**	732/733	–	–	–	–	CH XXXX 60C
CORNER ROUNDING END MILLS							
For Non-Ferrous & Cast Irons/Steels	**182**	740/741	–	–	–	–	–
COUNTERSINKS							
Single Flute (60°/82°/90°/100°)	**175**	561/581/584/591	791	–	–	–	–
Three Flutes (60°/82°/90°/100°)	**175**	563/583/585/590	793	–	–	–	–
DOUBLE ANGLE CUTTERS							
60° for Non-Ferrous & Cast Irons/Steels	**184**	746/747	–	–	–	–	DA XXX 60C
90° for Non-Ferrous & Cast Irons/Steels	**184**	748/749	–	–	–	–	DA XXX 90C
DOVETAIL CUTTERS							
45° for Non-Ferrous & Cast Irons/Steels	**183**	734/735	–	–	–	–	C90 XXX 45
60° for Non-Ferrous & Cast Irons/Steels	**183**	736/737	–	–	–	–	C90 XXX 60
FACE MILLING CUTTERS – For Non-Ferrous/Cast Irons/Steels	**175**	536/537/538	–	–	–	1450/1460	–
KEYSEAT CUTTERS							
High Performance Straight Tooth for Aluminum	**177**	704	–	–	–	–	–
Straight Tooth for Non-Ferrous & Cast Irons	**178**	700	–	–	–	CB444	120
Staggered Tooth for Non-Ferrous & Cast Irons	**179**	701	–	–	–	–	121
Straight Tooth for Steels	**180**	702	–	–	–	–	–
Staggered Tooth for Steels	**181**	703	–	–	–	–	–
RADIUS CUTTERS – For Non-Ferrous/Cast Irons/Steels	**184**	718/719	–	–	–	–	R XXX C
T-SLOT CUTTERS – For Non-Ferrous/Cast Irons/Steels	**182**	720/721	–	–	–	–	C XXXX

ARBOR DIAMETER: Select the **largest diameter** available to maximize rigidity and minimize deflection. For example, a 1¼" arbor is more than twice as rigid as a 1" arbor.

TOOL DIAMETER: For **slitting saws**, select the smallest diameter which permits the greatest number of teeth to be engaged in the cut at all times.

For **slot and side milling cutters,** select the diameter which permits no more than two teeth to be engaged in the cut at any time.

NUMBER OF TEETH: Select **fewer teeth** for low tensile materials and heavier chip loads. Select **more teeth** for high tensile materials and better finishes.

COATINGS are especially effective (see "Coating Selector" on page 10).

APPROPRIATE carbide grade, carbide finish, number of teeth, flute size, radial rake angle and cutting edge clearance are engineered by HANNIBAL for optimum performance when machining the materials indicated.

TYPES OF MILLING: In **conventional milling**, the direction of cutter rotation is opposite to the direction of workpiece feed. The initial portion of the chip generated is very thin and gradually increases through the cutting cycle. The maximum cutting force is upward at the end of the cutting cycle.

In **climb milling,** the direction of the cutter rotation and the direction of workpiece feed are the same. The initial portion of the chip generated is thick and gradually thins through the cutting cycle, producing a better finish. The maximum cutting force is the initial downward thrust at the beginning of the cutting cycle.

For **deep slotting,** HANNIBAL'S saws are appropriate due to adequate side & body clearance.

FEEDS & SPEEDS - MILLING CUTTERS OR SAWS CARBIDE TIPPED

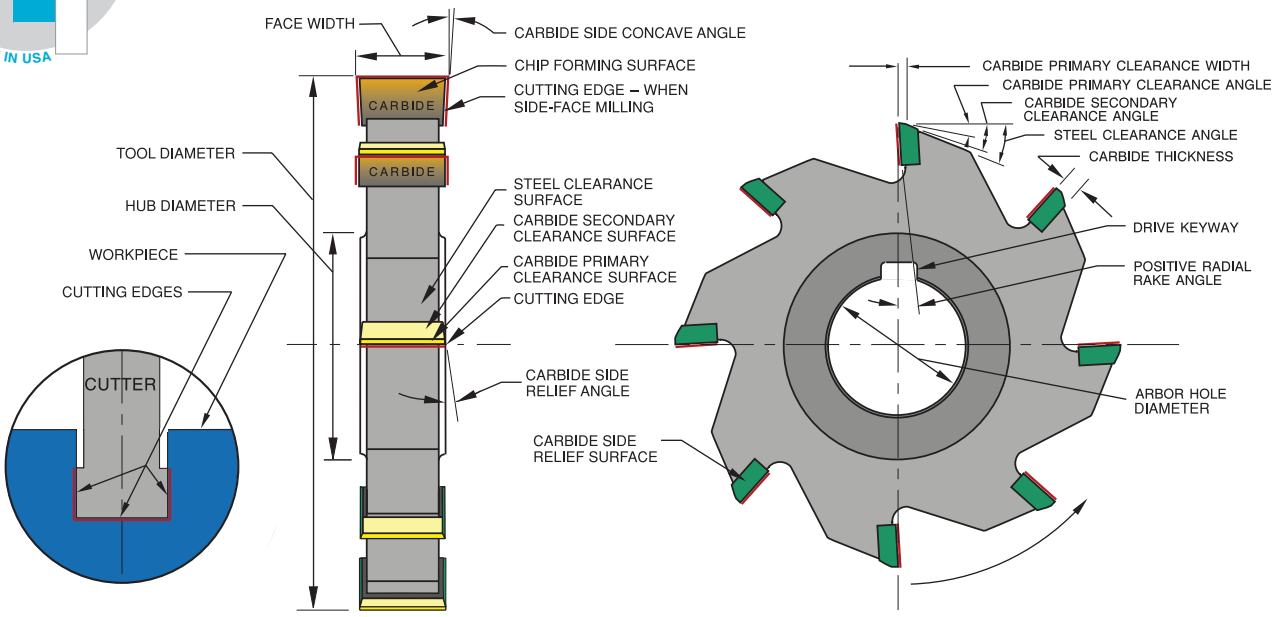
RPM FORMULA: $\frac{\text{SFM X 3.82}}{\text{Diameter}}$

IPM FORMULA: IPT X RPM X Number of teeth

Feeds & speeds are starting recommendations only. Factors including fixturing, available horsepower, depth of cut, and coolant capabilities may significantly affect performance. Use this chart for half and full side mill & face mill cutters.

CHIP CLASS	MATERIAL BEING MACHINED	MATERIAL EXAMPLES	BRINELL HARDNESS	CHIP DESCRIPTION	SLITTING SAWS AND SIDE MILLING CUTTERS	
					SURFACE FEET PER MINUTE	INCHES PER TOOTH
					SFPM	IPT
20	**ALUMINUM ALLOY** CAST AND WROUGHT	308.0, 356.0, 360.0, 380.0, 383.0, 390.0, 2024, 3003, 4032, 5052, 6061, 7075	30 - 150 (500 kg)	DISCONTINUOUS FLAKY OR LONG STRINGY	1000 - 2000	.004-.008
	COPPER ALLOY TOUGH	101, 110, 115, 120, 130, 142, 155, 170, 172, 175, 195, 425, 610, 630, 655, 725, 805, 826, 910	40 - 200 (500 kg)	LONG CONTINUOUS	200 - 500	.004-.008
	LEAD ALLOY	Alloys 7, 8, 13, 15 1Sb, 4Sb, 6Sb, BSb, 9Sb	10 - 20 (500 kg)	DISCONTINUOUS TIGHTLY CURLED	300 - 1000	.004-.008
	PLASTIC	ABS, Acrylic, Allyl, Bakelite, Epoxy, Furan, Nylon, Polyethylene, Polystyrene, PVC	-	CONTINUOUS	1500 - 3000	.004-.008
	ZINC ALLOY	AC41 A, AG40A, AMS4803, 11 7RO 12, ZDC NO. 7 GRADES 903, 925	80 - 100	LONG TIGHTLY CURLED	750 - 1500	.005-.010
40	**ALUMINUM BRONZE**	614, 952-958	40 - 175	SHORT LOOSELY CURLED	200 - 600	.003-.006
	COPPER ALLOY/BRASS/BRONZE FREE MACHINING	268, 270, 314, 332, 335, 340, 342, 353, 356, 360, 370, 464-467, 485, 838, 945	10 - 100Rb	FLAT SMALL	400 - 800	.004-.008
	MAGNESIUM ALLOY	AM60A, AZ21A, AZ91B-C, HM31A, K1A, ZE41A, ZK40A	50 - 90 (500 kg)	FLAT SMALL	750 - 1500	.004-.008
	NICKEL SILVER	745, 752, 754, 757, 770, 973-978	10 - 100Rb	LOOSELY CURLED	200 - 400	.003-.006
60	**CAST IRON - DUCTILE** AUSTENITIC (NI-RESIST)	TYPES D-2, D-2B, D-2C, D-2M, D-3, D-3A, D-4, D-5, D-5B	120 - 275	DISCONTINUOUS TIGHTLY CURLED	75 - 150	.002-.004
	CAST IRON - DUCTILE FERRITIC & FERRITIC - PEARLITIC	GRADES 60-40-18, 65-45-12, 80-55-06, D4018, D4512, D5506	140 - 270	DISCONTINUOUS TIGHTLY CURLED	250 - 400	.003-.006
	CAST IRON - DUCTILE MARTENSITIC & PEARLITIC - MARTENSITIC	GRADES 100-70-03, 120-90-02, D7003, DQ&T	270 - 400	DISCONTINUOUS TIGHTLY CURLED	200 - 300	.003-.006
	CAST IRON - GRAY FERRITIC & FERRITIC - PEARLITIC	CLASSES 20, 25, 30, 35, 40 GRADES G1800, G2500, G3000	120 - 220	DISCONTINUOUS	250 - 425	.003-.006
	CAST IRON - GRAY PEARLITIC	CLASSES 45, 50, 55, 60 GRADES G3500, G4000	220 - 320	DISCONTINUOUS	120 - 300	.002-.004
	CAST IRON - MALLEABLE FERRITIC & PEARLITIC	GRADES 32510, 35018, 40010, 45008 GRADES M3210, M4504, M5003	110 - 240	DISCONTINUOUS	200 - 400	.003-.006
	CAST IRON - MALLEABLE TEMPERED MARTENSITE	GRADES 60004, 70003, 80002 GRADES M5003, M8501	200 - 320	DISCONTINUOUS	130 - 225	.002-.004
80	**STEEL - LOW & MEDIUM STRENGTH** FREE MACHINING	1108-1119, 1132-1151, 10L17, 10L18, 10L5O, 11L44, 12LI3, 12L14, 12L15	100 - 250	DISCONTINUOUS LOOSELY CURLED	250 - 500	.003-.006
	STEEL - LOW & MEDIUM STRENGTH WROUGHT	1005-1029, 1030-1050, 1513, 1518, 1524, 1552	100 - 375	CONTINUOUS STRINGY	200 - 400	.002-.004
100	**ALLOY STEEL - LOW & MEDIUM STRENGTH** FREE MACHINING	41L30, 41L40, 41L50, 86L20, 4142Se, 4145Te	100 - 275	DISCONTINUOUS TIGHTLY CURLED	200 - 400	.002-.004
	ALLOY STEEL - LOW & MEDIUM STRENGTH	1330, 1345, 1515, 4012, 4130, 4140, 4150, 4320, 4340, 4620, 5130, 8620, 8630, 8645, 9310	85 - 375	LOOSELY CURLED	150 - 300	.002-.005
	STAINLESS STEEL 400 SERIES	409, 410, 414, 420, 430, 436, 442, 446	135 - 325	DISCONTINUOUS TIGHTLY CURLED	200 - 400	.003-.006
	STAINLESS STEEL FREE MACHINING	203 EZ, 303, 303MA, 303Pb, 303 PLUS X, 303Se, 416, 416Se, 420F, 430F, 440F	135 - 275	SHORT TIGHTLY CURLED	250 - 500	.003-.006
120	**ALLOY STEEL - HIGH STRENGTH, MARAGING STEEL, NITRIDING STEEL, TOOL STEEL**	50100, 51100, 52100, GRADES 200-350, Nitralloy, SERIES A2, D2, H13, M50, P20, S7, W1	175 - 400	CONTINUOUS WIRY	75 - 150	.002-.004
140	**HIGH TEMP ALLOY** NICKEL & IRON	A-286; Hastelloy C; Inconel 600, 625, 718, 825; Monel 400; Nimonic 75, 80; Rene 41; Waspaloy	140 - 300	CONTINUOUS WIRY	50 - 150	.002-.004
	STAINLESS STEEL 300 SERIES	301, 302, 304, 309, 314, 316, 321, 330, 347, 385, Nitronic 32, 33, 40, 50, 60	135 - 375	WIRY LOOSELY CURLED	75 - 150	.002-.004
	STAINLESS STEEL PH SERIES	13-8 Mo, 15-5PH, 16-6PH, 17-4PH, 17-7PH, AM-350, AM-335	150 - 440	WIRY LOOSELY CURLED	75 - 150	.002-.004
	TITANIUM ALLOY	98.9, 99.0, 99.2, 99.5, Ti-6Al-4V, TI-6Al-6V2Sn, Ti-8Mn, Ti-10v-2Fe-3Al	110 - 380	CONTINUOUS WIRY	100 - 200	.002-.004

CARBIDE TIPPED MILLING CUTTER TECHNICAL INFORMATION



MILLING CUTTER PROBLEM SOLVING GUIDE – CARBIDE TIPPED

AVOID PROBLEMS BY CAREFUL ORIGINAL SET-UP

MACHINE CONDITION ❑ Tool holder in good condition and secure part holding fixture.
TOOL CONDITION ❑ Use cutting tool recommended for material being machined. Avoid excessive tool overhang.
FEEDS & SPEEDS ❑ Start with feeds and speeds recommended for material being machined.
COOLANT ❑ Where used, coolant flow must be adequate to avoid intermittent quenching and to flush chips promptly, avoiding the recutting of hardened chips.

MILLING PROBLEMS	POSSIBLE CAUSES	POSSIBLE SOLUTIONS
1. ROUGH FINISH	Dull cutting edge Wrong feeds & speeds	Resharpen to original tool geometry Increase speed – also try reduced feed
2. EXCESSIVE CUTTING EDGE WEAR	Wrong feeds & speeds Rough cutting edge Insufficient coolant	Increase feed (should always be over .001" per tooth) – especially when machining ductile or free machining materials. Also try reduced speed Lightly hone cutting edge with fine grit diamond hone Increase coolant flow – review type of coolant
3. CHIPPED CUTTING EDGE	Poor chip removal Recutting work hardened chips Vibration Incorrect carbide grade	Use tool with larger flute space – larger diameter or fewer flutes Increase coolant flow Increase rigidity of set-up, especially worn tool holders or arbors Change to tougher carbide grade
4. CHATTER MARKS	Insufficient machine horsepower Vibration	Use tool with fewer flutes as correct feeds & speeds must be maintained Consider climb milling Use larger diameter cutter Resharpen tool with more clearance
5. GLAZED FINISH	Feed too light Dull cutting edge Insufficient clearance	Increase feed Resharpen tool to original geometry Resharpen tool with more clearance
6. POOR TOOL LIFE	Excessive cratering Milling abrasive material Milling surface scale Milling hard material Insufficient chip room Delayed resharpening Thermal cracked carbide	Increase speed or decrease feed Change to harder grade of carbide Decrease speed and increase feed Increase coolant flow Climb milling better than conventional milling Conventional milling better than climb milling Reduce speed – rigidity very important Use larger diameter tool Prompt resharpening to original geometry will increase total tool life Maintain adequate coolant flow at all times Climb milling is cooler than conventional milling

SIDE MILLING CUTTERS - STAGGERED TOOTH CARBIDE TIPPED TYPE 547 FRACTIONAL

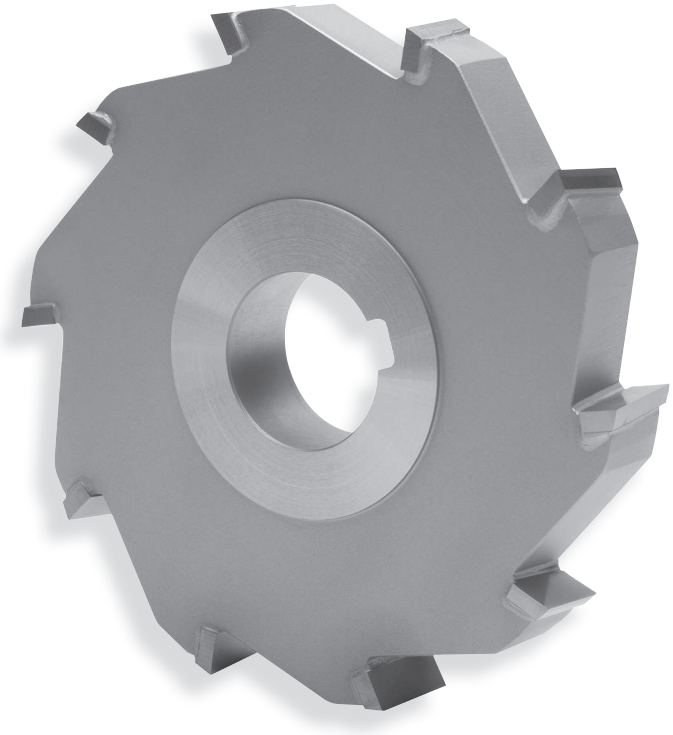
GENERAL PURPOSE

SUITABLE FOR MOST MATERIALS

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	547
	40	NON-FERROUS - SHORT CHIPS	547
	60	CAST IRONS	547
	80	LOW STRENGTH STEELS	547
	100	MEDIUM STRENGTH STEELS	547
	120	HIGH STRENGTH STEELS	547
	140	HIGH TEMPERATURE ALLOYS	547

TYPE 547 – GENERAL PURPOSE

- Alternating right and left hand axial rake.
- Carbide extends across the entire length of each tooth.
- Tool geometry and carbide grade appropriate for machining most materials including steels, stainless steels, cast irons, composites, aluminums and titaniums.



MODIFICATIONS (Prompt delivery)

- Alternate chamfer every other tooth
- Corner chamfer or corner radius on one side
- Corner chamfer or corner radius on both sides
- Reduced face width
- Closer tool diameter tolerance
- Chip breakers
- Matched tool diameter set(s)
- Reduced hub width
- Additional keyway
- Coatings available:

TITANIUM NITRIDE – TiN

TITANIUM CARBONITRIDE – TiCN

ZIRCONIUM NITRIDE – ZrN

AL TITANIUM NITRIDE – AlTiN

Tool diameter tolerance: plus 1/16", minus .000"
Face width tolerance: plus .001", minus .000"
Arbor hole tolerance: plus .001 ", minus .000"

TOOL DIAM.	FACE WIDTH		TYPE 547 FOR MOST MATERIALS			
	FRAC.	DEC.	NO. OF TEETH	1" ARBOR EDP NO.	1¼" ARBOR EDP NO.	PRICE
3	3/16	.1875	8	54710	-	$600.85
	1/4	.2500	8	54712	-	615.15
	5/16	.3125	8	54714	-	620.65
	3/8	.3750	8	54716	-	623.10
	1/2	.5000	8	54718	-	642.45
	5/8	.6250	8	54720	-	687.80
4	3/16	.1875	10	54722	-	652.80
	1/4	.2500	10	54724	-	660.95
	5/16	.3125	10	54726	-	668.95
	3/8	.3750	10	54728	-	677.00
	1/2	.5000	10	54730	-	686.50
	5/8	.6250	10	54732	-	699.30
	3/4	.7500	10	54734	-	707.20
6	1/4	.2500	14	-	54750	848.65
	5/16	.3125	14	-	54752	855.05
	3/8	.3750	14	-	54754	856.30
	1/2	.5000	14	-	54756	867.45
	5/8	.6250	14	-	54758	872.40
	3/4	.7500	14	-	54760	900.85
	1	1.0000	14	-	54762	964.55

SIDE MILLING CUTTERS
CARBIDE TIPPED TYPES 540, 541, 542, 543 FRACTIONAL

MATERIAL SPECIFIC

FOUR TYPES – FOR NON-FERROUS, CAST IRONS, STEELS, OR HIGH TEMPERATURE ALLOYS

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	540
	40	NON-FERROUS - SHORT CHIPS	540/541
	60	CAST IRONS	541
	80	LOW STRENGTH STEELS	542
	100	MEDIUM STRENGTH STEELS	542
	120	HIGH STRENGTH STEELS	542
	140	HIGH TEMPERATURE ALLOYS	543

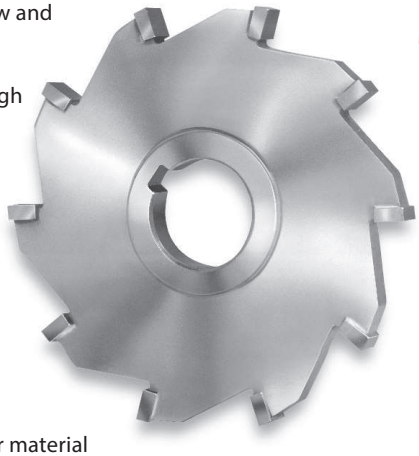
TYPE 540 – FOR NON-FERROUS MATERIALS
- Very large flute capacity assures good chip flow and permits high feed rates

TYPE 541 – FOR CAST IRONS
- Large flute capacity but more teeth permits high metal removal at moderate feeds and speeds

TYPE 542 – FOR STEELS
- Steel carbide grade permits longer production runs

TYPE 543 – FOR HIGH TEMP ALLOYS
- Larger number of teeth permits high metal removal at moderate feeds and speeds

ALL TYPES:
- For slotting, straddle milling, and face milling
- Tool diameter tolerance: plus 1/16", minus .000"
- Face width tolerance: plus .001", minus .000"
- Arbor hole tolerance: plus .001", minus .000"
- Tool geometry & carbide grade appropriate for material being machined



MODIFICATIONS (Prompt delivery)
- Alternate chamfer every other tooth
- Corner chamfer or corner radius on one side
- Corner chamfer or corner radius on both sides
- Full radius
- Reduced face width
- Closer tool diameter tolerance
- Chip breakers
- Matched tool diameter set(s)
- Reduced hub width
- Additional keyway
- Coatings available:

TITANIUM NITRIDE – TiN

TITANIUM CARBONITRIDE – TiCN

ZIRCONIUM NITRIDE – ZrN

AL TITANIUM NITRIDE – AlTiN

TOOL DIAM.	FACE WIDTH FRAC.	FACE WIDTH DEC.	TYPE 540 FOR NON-FERROUS NO. OF TEETH	1" ARBOR EDP NO.	1¼" ARBOR EDP NO.	PRICE	TYPE 541 FOR CAST IRONS NO. OF TEETH	1" ARBOR EDP NO.	1¼" ARBOR EDP NO.	PRICE	TYPE 542 FOR STEELS NO. OF TEETH	1" ARBOR EDP NO.	1¼" ARBOR EDP NO.	PRICE	TYPE 543 FOR HIGH TEMP ALLOYS NO. OF TEETH	1" ARBOR EDP NO.	1¼" ARBOR EDP NO.	PRICE
3	¼	.2500	4	54030	-	$114.75	6	54130	-	$143.55	6	54230	-	$141.75	8	54330	-	$176.80
	5/16	.3125	4	54031	-	120.50	6	54131	-	144.20	6	54231	-	143.65	8	54331	-	185.30
	3/8	.3750	4	54032	-	124.90	6	54132	-	147.05	6	54232	-	145.50	8	54332	-	187.80
	7/16	.4375	4	54033	-	130.00	6	54133	-	159.05	6	54233	-	162.25	-	-	-	-
	½	.5000	4	54034	-	136.30	6	54134	-	165.60	6	54234	-	164.45	8	54334	-	209.95
4	¼	.2500	4	54040	-	149.60	8	54140	-	185.45	8	54240	-	186.65	10	54340	-	221.10
	5/16	.3125	4	54041	-	153.85	8	54141	-	191.70	8	54241	-	198.20	10	54341	-	232.25
	3/8	.3750	4	54042	54043	157.85	8	54142	54143	201.45	8	54242	54243	198.20	10	54342	54343	237.50
	7/16	.4375	4	54074	-	158.60	8	54174	-	205.50	8	54274	-	204.10	10	54374	-	257.85
	½	.5000	4	54044	54045	158.60	8	54144	54145	212.25	8	54244	54245	211.20	10	54344	54345	259.80
	9/16	.5625	4	54094	-	172.40	8	54194	-	218.15	8	54294	-	221.65	-	-	-	
	5/8	.6250	4	54046	54047	185.00	8	54146	54147	236.45	8	54246	54247	259.10	10	54346	54347	273.60
	¾	.7500	4	54048	54049	207.30	8	54148	54149	236.45	8	54248	54249	262.40	10	54348	54349	281.80
5	¼	.2500	6	54050	-	209.00	10	54150	-	245.60	10	54250	-	245.75	-	-	-	-
	5/16	.3125	-	-	-	-	10	54151	-	245.60	10	54251	-	245.75	-	-	-	-
	3/8	.3750	-	-	-	-	10	-	54153	251.55	10	-	54253	258.00	-	-	-	-
	7/16	.4375	6	-	54075	217.40	10	-	54175	252.80	10	-	54275	266.30	-	-	-	-
	½	.5000	6	54054	54055	220.00	10	54154	54155	268.35	10	54254	54255	266.35	12	54354	54355	298.45
	9/16	.5625	6	-	54095	227.05	10	-	54195	272.95	10	-	54295	278.10		-	-	-
	5/8	.6250	6	-	54057	238.85	10	-	54157	290.50	10	-	54257	326.40	12	-	54357	325.95
	¾	.7500	6	54058	54059	254.65	10	54158	54159	328.95	10	54258	54259	361.25	12	54358	54359	365.55
	1	1.0000	6	-	54015	255.05	10	-	54115	357.95	10	-	54215	381.00	-	-	-	-
6	3/8	.3750	6	54062	-	224.25	12	-	54163	309.05	12	-	54263	326.50	-	-	-	-
	½	.5000	6	54064	54065	245.60	12	54164	54165	328.20	12	54264	54265	336.25	14	54364	54365	383.95
	5/8	.6250	6	-	54067	269.15	12	-	54167	358.65	12	-	54267	365.80	14	-	54367	387.05
	¾	.7500	6	54068	54069	309.55	12	54168	54169	402.40	12	54268	54269	416.70	14	54368	54369	417.65
	1	1.0000	6	-	54016	354.80	12		54116	406.65	12	-	54216	425.15	-			-
				1¼" ARBOR	1½" ARBOR			1¼" ARBOR	1½" ARBOR			1¼" ARBOR	1½" ARBOR			1¼" ARBOR	1½" ARBOR	
8	¾	.7500	8	54088	54089	402.70	12	54188	54189	422.30	12	54288	54289	438.10	14	54388	-	447.80
	1	1.0000	8	54080	54081	437.00	12	54180	54181	440.15	12	54280	54281	455.95	-	-	-	-

SLITTING SAWS - COARSE TOOTH CARBIDE TIPPED TYPES 550, 552, 554, 558 FRACTIONAL

MATERIAL SPECIFIC

FOUR TYPES – FOR NON-FERROUS, CAST IRONS, STEELS, OR HIGH TEMPERATURE ALLOYS

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	550/551
	40	NON-FERROUS - SHORT CHIPS	550/551/552/553
	60	CAST IRONS	552/553
	80	LOW STRENGTH STEELS	554/556
	100	MEDIUM STRENGTH STEELS	554/556
	120	HIGH STRENGTH STEELS	554/556
	140	HIGH TEMPERATURE ALLOYS	558/559

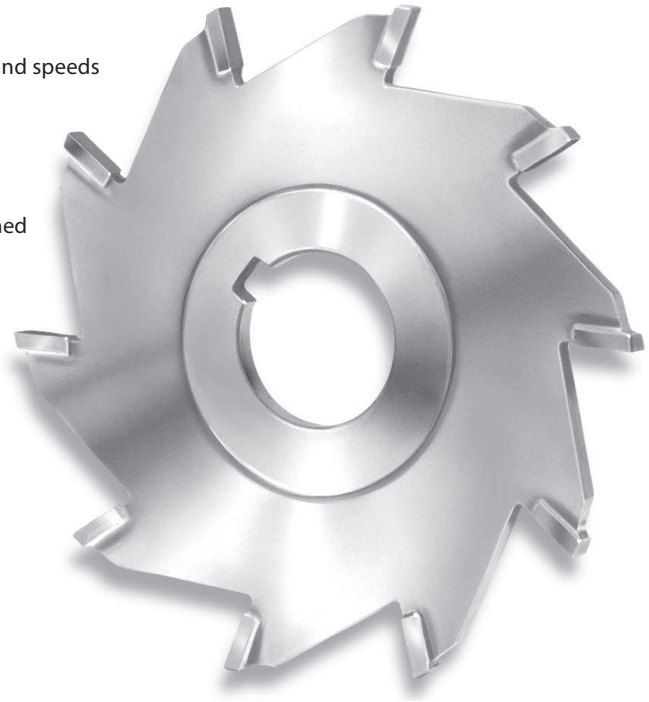
TYPE 550 – FOR NON-FERROUS MATERIALS
- Very large flute capacity assures good chip flow and permits high feed rates

TYPE 552 – FOR CAST IRONS
- Large flute capacity but more teeth permits high metal removal at moderate feeds and speeds

TYPE 554 – FOR STEELS
- Steel carbide grade permits longer production runs

TYPE 558 – FOR HIGH TEMPERATURE ALLOYS
- Larger number of teeth permits high metal removal at moderate feeds and speeds

ALL TYPES:
- For slitting, slotting, milling, and cut-off operations
- Tool diameter tolerance: plus 1/16", minus .000"
- Face width tolerance: plus .001", minus .000"
- Arbor hole tolerance: plus .001 ", minus .000"
- Tool geometry and carbide grade appropriate for material being machined



MODIFICATIONS (Prompt delivery)
- Alternate chamfer every other tooth
- Corner chamfer or corner radius on one side
- Corner chamfer or corner radius on both sides
- Full radius
- Reduced face width
- Closer tool diameter tolerance
- Chip breakers
- Matched tool diameter set(s)
- Reduced hub width
- Additional keyway
- Coatings available:

TITANIUM NITRIDE – TiN

TITANIUM CARBONITRIDE – TiCN

ZIRCONIUM NITRIDE – ZrN

AL TITANIUM NITRIDE – AlTiN

CUTTERS

TOOL DIAM.	FACE WIDTH		ARBOR HOLE	TYPE 550 FOR NON-FERROUS			TYPE 552 FOR CAST IRONS			TYPE 554 FOR STEELS			TYPE 558 FOR HIGH TEMP ALLOYS		
	FRAC.	DEC.		NO. OF TEETH	EDP NO.	PRICE	NO. OF TEETH	EDP NO.	PRICE	NO. OF TEETH	EDP NO.	PRICE	NO. OF TEETH	EDP NO.	PRICE
3	3/32	.0938	1	6	55032	$136.10	6	55232	$156.65	8	55432	$155.30	8	55832	$145.50
	1/8	.1250	1	6	55034	140.20	6	55234	165.90	8	55434	173.80	8	55834	151.05
	3/16	.1875	1	6	55036	145.75	6	55236	175.45	8	55436	175.45	8	55836	156.90
	1/4	.2500	1	6	55037	99.10	6	55237	143.85	8	55437	143.85	8	55837	172.65
	5/16	.3125	1	6	55031	104.10	6	55231	143.85	8	55431	143.85	8	55831	172.65
	3/8	.3750	1	6	55038	106.15	6	55238	146.15	8	55438	146.15	8	55838	175.45
4	3/32	.0938	1	6	55042	167.10	8	55242	200.85	8	55442	200.85	10	55842	209.35
	1/8	.1250	1	6	55044	172.05	8	55244	203.50	8	55444	203.50	10	55844	212.00
	3/16	.1875	1	6	55046	174.65	8	55246	219.30	8	55446	219.30	10	55846	214.90
	1/4	.2500	1	6	55047	127.40	8	55247	186.25	8	55447	186.25	10	55847	223.60
	5/16	.3125	1	6	55041	130.95	8	55241	193.45	8	55441	193.45	10	55841	232.05
	3/8	.3750	1	6	55048	134.45	8	55248	200.50	8	55448	200.50	10	55848	240.55
	3/8	.3750	1 1/4	6	55049	134.45	8	55249	200.50	8	55449	200.50	10	55849	240.55
5	3/32	.0938	1	8	55052	180.80	10	55252	269.65	10	55452	269.65	12	55852	284.60
	1/8	.1250	1	8	55054	180.80	10	55254	290.00	10	55454	290.00	12	55854	290.50
	3/16	.1875	1	-	-	-	10	55256	326.50	10	55456	326.50	12	55856	302.10
6	1/8	.1250	1 1/4	8	55063	246.20	12	55263	353.95	12	55463	353.95	14	55863	339.85
	3/16	.1875	1 1/4	8	55065	324.45	12	55265	365.60	12	55465	365.60	14	55865	348.60
	1/4	.2500	1 1/4	8	55067	336.05	12	55267	373.25	12	55467	373.25	14	55867	354.30
8	1/8	.1250	1 1/4	10	55083	314.70	-	-	-	-	-	-	-	-	-
	3/16	.1875	1 1/4	-	-	-	16	55285	503.15	16	55485	503.15	-	-	-
	1/4	.2500	1 1/4	-	-	-	16	55287	522.35	16	55487	522.35	-	-	-

HANNIBAL CARBIDE TOOL, INC. • TEL 800-451-9436 • FAX 800-633-7302 • sales@hannibalcarbide.com

SLITTING SAWS - STANDARD TOOTH CARBIDE TIPPED TYPES 551, 553, 556, 559 FRACTIONAL

MATERIAL SPECIFIC

FOUR TYPES – FOR NON-FERROUS, CAST IRONS, STEELS, OR HIGH TEMPERATURE ALLOYS

TYPE 551 – FOR NON-FERROUS MATERIALS
TYPE 553 – FOR CAST IRONS
TYPE 556 – FOR STEELS
TYPE 559 – FOR HIGH TEMPERATURE ALLOYS

- Similar to slitting saws on page 164, except designed with more teeth for better finishes and higher feed rates
- For descriptions and tolerances, see page 164

Use the tool selector on page 164 to determine which tool is appropriate for the material you are cutting.

MODIFICATIONS
(See list on page 164)

TOOL DIAM.	FACE WIDTH		TYPE 551 FOR NON-FERROUS				TYPE 553 FOR CAST IRONS				TYPE 556 FOR STEELS				TYPE 559 FOR HIGH TEMP ALLOYS			
	FRAC.	DEC.	NO. OF TEETH	1" ARBOR EDP NO.	1¼" ARBOR EDP NO.	PRICE	NO. OF TEETH	1" ARBOR EDP NO.	1¼" ARBOR EDP NO.	PRICE	NO. OF TEETH	1" ARBOR EDP NO.	1¼" ARBOR EDP NO.	PRICE	NO. OF TEETH	1" ARBOR EDP NO.	1¼" ARBOR EDP NO.	PRICE
3	1/16	.0625	12	55198	-	$214.45	12	55398	-	$214.45	16	55698	-	$256.40	12	55998	-	$241.20
	5/64	.0781	12	55100	-	253.60	12	55300	-	253.60	16	55600	-	310.05	12	55900	-	270.20
	3/32	.0938	12	55102	-	214.45	12	55302	-	214.45	16	55602	-	256.40	12	55902	-	241.20
	7/64	.1094	12	55104	-	213.65	12	55304	-	213.65	16	55604	-	236.60	12	55904	-	230.25
	1/8	.1250	12	55106	55107	172.40	12	55306	55307	172.40	16	55606	-	214.40	12	55906	55907	219.90
	5/32	.1562	12	55108	-	205.45	12	55308	-	205.45	16	55608	-	225.20	12	55908	-	225.20
	3/16	.1875	12	55109	-	183.75	12	55309	-	183.75	16	55609	-	236.05	12	55909	-	230.60
	7/32	.2188	12	55110	-	212.60	12	55310	-	212.60	16	55610	-	246.85	12	55910	-	237.90
	1/4	.2500	12	55111	-	223.50	12	55311	-	223.50	16	55611	-	257.80	12	55911	-	245.05
	5/16	.3125	12	55112	-	245.05	12	55312	-	245.05	16	55612	-	282.60	12	55912	-	268.45
	3/8	.3750	12	55113	-	266.70	12	55313	-	266.70	16	55613	-	307.55	12	55913	-	293.65
	7/16	.4375	-	-	-	-	-	-	-	-	16	55614	-	341.75	12	55914	-	319.10
	1/2	.5000	-	-	-	-	-	-	-	-	16	55615	-	379.75	12	55915	-	344.40
4	1/16	.0625	14	55116	55117	249.70	14	55316	-	249.70	20	55616	-	310.05	14	55916	55917	274.30
	5/64	.0781	14	55118	55119	294.95	14	55318	55319	294.95	20	55618	55619	339.25	14	55918	55919	314.30
	3/32	.0938	14	55120	55121	249.70	14	55320	55321	249.70	20	55620	55621	310.05	14	55920	55921	274.30
	7/64	.1094	14	55122	55123	255.00	14	55322	55323	255.00	20	55622	55623	293.20	14	55922	55923	325.25
	1/8	.1250	14	55124	55125	225.20	14	55324	55325	225.20	20	55624	55625	273.90	14	55924	55925	273.90
	5/32	.1562	14	55126	55127	255.80	14	55326	55327	255.80	20	55626	55627	294.25	14	55926	55927	281.10
	3/16	.1875	14	55128	55129	239.70	14	55328	55329	239.70	20	55628	55629	295.55	14	55928	55929	290.05
	7/32	.2188	14	55130	55131	272.10	14	55330	55331	272.10	20	55630	55631	312.90	14	55930	55931	299.20
	1/4	.2500	14	55132	55133	277.35	14	55332	55333	277.35	20	55632	55633	317.00	14	55932	55933	306.35
	5/16	.3125	14	55134	55135	299.20	14	55334	55335	299.20	20	55634	55635	343.95	14	55934	55935	327.95
	3/8	.3750	14	55136	55137	320.75	14	55336	55337	320.75	20	55636	55637	368.85	14	55936	55937	353.10
	7/16	.4375	-	-	-	-	-	-	-	-	20	55638	-	409.80	14	55938	-	378.55
	1/2	.5000	-	-	-	-	-	-	-	-	20	55640	-	455.40	14	55940	-	403.95
5	5/64	.0781	16	55142	55143	365.35	16	55342	55343	365.35	24	55642	55643	420.10	16	55942	55943	387.25
	3/32	.0938	16	55144	55145	301.45	16	55344	55345	301.45	24	55644	55645	423.05	16	55944	55945	332.15
	7/64	.1094	16	55146	55147	343.20	16	55346	55347	343.20	24	55646	55647	394.70	16	55946	55947	365.35
	1/8	.1250	16	55148	55149	278.45	16	55348	55349	278.45	24	55648	55649	342.25	16	55948	55949	322.55
	5/32	.1562	16	55150	55151	304.50	16	55350	55351	304.50	24	55650	55651	350.15	16	55950	55951	333.20
	3/16	.1875	16	55152	55153	311.85	16	55352	55353	311.85	24	55652	55653	374.75	16	55952	55953	351.35
	7/32	.2188	16	55154	55155	335.10	16	55354	55355	335.10	24	55654	55655	385.40	16	55954	55955	369.40
	1/4	.2500	16	55156	55157	349.60	16	55356	55357	349.60	24	55656	55657	402.00	16	55956	55957	387.30
	5/16	.3125	16	55158	55159	380.10	16	55358	55359	380.10	24	55658	55659	437.20	16	55958	55959	417.95
	3/8	.3750	16	55160	55161	410.80	16	55360	55361	410.80	24	55660	55661	472.35	16	55960	55961	450.45
	7/16	.4375	-	-	-	-	-	-	-	-	24	55662	-	524.90	16	55962	-	475.85
	1/2	.5000	-	-	-	-	-	-	-	-	24	55664	-	583.20	16	55964	-	501.20
6	5/64	.0781	18	55166	55167	410.75	18	55366	55367	410.75	28	55666	55667	472.30	18	55966	55967	435.50
	3/32	.0938	18	55168	55169	365.80	18	55368	55369	365.80	28	55668	55669	432.70	18	55968	55969	401.05
	7/64	.1094	18	55170	55171	412.15	18	55370	55371	412.15	28	55670	55671	473.95	18	55970	55971	437.00
	1/8	.1250	18	55172	55173	348.65	18	55372	55373	348.65	28	55672	55673	454.00	18	55972	55973	412.55
	5/32	.1562	18	55174	55175	394.50	18	55374	55375	394.50	28	55674	55675	453.80	18	55974	55975	430.55
	3/16	.1875	18	55176	55177	381.95	18	55376	55377	381.95	28	55676	55677	486.80	18	55976	55977	448.55
	7/32	.2188	18	55178	55179	430.55	18	55378	55379	430.55	28	55678	55679	495.20	18	55978	55979	466.60
	1/4	.2500	18	55180	55181	448.60	18	55380	55381	448.60	28	55680	55681	529.30	18	55980	55981	491.50
	5/16	.3125	18	55182	55183	466.70	18	55382	55383	466.70	28	55682	55683	536.70	18	55982	55983	513.45
	3/8	.3750	18	55184	55185	484.65	18	55384	55385	484.65	28	55684	55685	557.30	18	55984	55985	533.25
	7/16	.4375	-	-	-	-	-	-	-	-	28	55690	-	619.15	18	55990	-	558.60
	1/2	.5000	-	-	-	-	-	-	-	-	28	55692	-	688.00	18	55992	-	584.05
8	1/8	.1250	24	-	55186	578.85	24	-	55386	578.85	24	-	55686	611.90	24	-	55986	611.90
	5/32	.1562	24	-	55187	585.75	24	-	55387	585.75	24	-	55687	618.85	24	-	55987	618.85
	3/16	.1875	24	-	55188	592.65	24	-	55388	592.65	24	-	55688	625.70	24	-	55988	625.70
	1/4	.2500	24	-	55189	628.40	24	-	55389	628.40	24	-	55689	661.55	24	-	55989	661.55

3" MILLING CUTTERS & SLITTING SAWS CARBIDE TIPPED TYPE 556

MATERIAL SPECIFIC

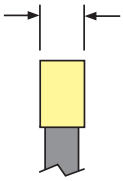
FOR STEEL

Modified width between .0600" and .5312"

TYPE 556

Cutter Notes (All cutters on page)

- 16 Teeth
- C-5 Carbide
- 1° - 3° Positve Radial Rake
- Width Tolerance: +.001"/-.000"
- OD tolerance: +.0313"/-.000"
- 1" Arbor hole +.001"/-.000"
- ANSI standard keyway dimensions
- Add 5% to grind down hub width
- Add 5% to match OD's on cutter sets within .001"
- Not designed to be used on heat treated materials greater than 475 Brinell (50Rc)



Width Grind

TOOL DIAM.	HUB WIDTH	EDP NO.	FINISHED TO MODIFIED FACE WIDTH						
			MODIFIED FACE WIDTH RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
				1	2	3	4	5	6
3	.0555	55698D	0.0600 - 0.0703	$312.40	$291.30	$287.35	$285.40	$284.20	$256.40
3	.0711	55600D	0.0704 - 0.0859	365.95	344.85	341.00	339.10	337.90	310.05
3	.0867	55602D	0.0860 - 0.1015	312.40	291.30	287.35	285.40	284.20	256.40
3	.1024	55604D	0.1016 - 0.1171	292.50	271.35	267.50	265.60	264.35	236.60
3	.1180	55606D	0.1172 - 0.1406	270.30	249.20	245.35	243.45	242.15	214.40
3	.1562	55608D	0.1407 - 0.1718	281.15	260.05	256.20	254.25	252.95	225.20
3	.1875	55609D	0.1719 - 0.2031	292.00	270.90	267.05	265.10	263.85	236.05
3	.2188	55610D	0.2032 - 0.2343	302.80	281.70	277.90	275.90	274.70	246.85
3	.2500	55611D	0.2344 - 0.2812	313.70	292.60	288.75	286.85	285.55	257.80
3	.3125	55612D	0.2813 - 0.3437	338.55	317.40	313.60	311.65	310.40	282.65
3	.3750	55613D	0.3438 - 0.4062	363.55	342.45	338.55	336.60	335.35	307.55
3	.4375	55614D	0.4063 - 0.4687	397.65	376.55	372.75	370.80	369.55	341.75
3	.5000	55615D	0.4688 - 0.5312	435.65	414.55	410.75	408.80	407.55	379.75

Corner Radius or Chamfer on ONE Side

TOOL DIAM.	HUB WIDTH	EDP NO.	ONE RADIUS OR CHAMFER FINISHED TO MODIFIED FACE WIDTH						
			MODIFIED FACE WIDTH RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
				1	2	3	4	5	6
3	.0555	55698R1	0.0600 - 0.0703	$326.50	$295.60	$291.30	$289.05	$287.70	$287.00
3	.0711	55600R1	0.0704 - 0.0859	380.15	349.20	344.90	342.70	341.35	340.65
3	.0867	55602R1	0.0860 - 0.1015	326.50	295.60	291.30	289.05	287.70	287.00
3	.1024	55604R1	0.1016 - 0.1171	306.65	275.70	271.40	269.20	267.85	267.10
3	.1180	55606R1	0.1172 - 0.1406	284.45	253.55	249.25	247.05	245.65	244.90
3	.1562	55608R1	0.1407 - 0.1718	295.25	264.40	260.10	257.90	256.45	255.80
3	.1875	55609R1	0.1719 - 0.2031	306.15	275.25	270.95	268.70	267.35	266.65
3	.2188	55610R1	0.2032 - 0.2343	317.00	286.05	281.75	279.50	278.20	277.45
3	.2500	55611R1	0.2344 - 0.2812	327.85	296.95	292.65	290.45	289.05	288.30
3	.3125	55612R1	0.2813 - 0.3437	352.70	321.75	317.45	315.25	313.90	313.20
3	.3750	55613R1	0.3438 - 0.4062	377.60	346.80	342.50	340.25	338.85	338.15
3	.4375	55614R1	0.4063 - 0.4687	411.85	380.90	376.60	374.40	373.05	372.40
3	.5000	55615R1	0.4688 - 0.5312	449.85	418.95	414.65	412.45	411.00	410.40

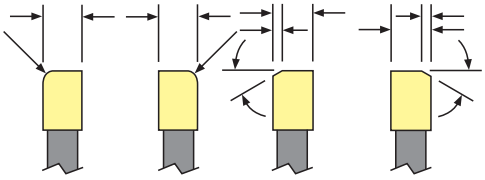
Specify right or left side for radius or chamfer

Radius Notes

- Maximum radius on one side is .2656"
- Full radius and maximum radius on both sides is ½ the width of the cutter
- A non-tangent radii must be quoted

Chamfer Notes

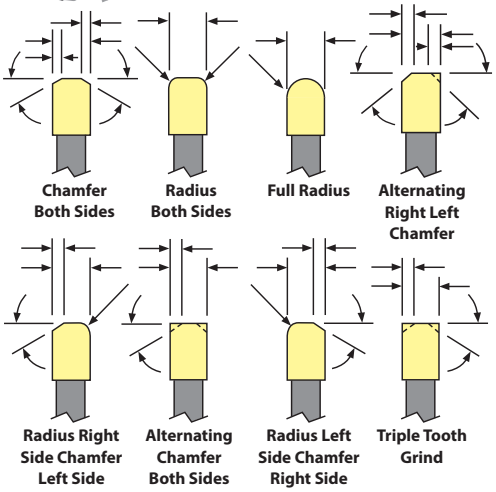
- Chamfer Angles can range from 0° to 45°
- Chamfer is measured off the OD
- Maximum chamfer is the LESSER of ⅓ the width of the cutter OR .2656" length of angle when measured across the OD
- Chamfer Angle Tolerance: +/- ½°
- Chamfers greater than 45° must be quoted



Radius Left Side | Radius Right Side | Chamfer Left Side | Chamfer Right Side

Corner Radius or Chamfer on BOTH Sides OR a Full Radius

- Price Increases 5% for Alternating Chamfers



Chamfer Both Sides | Radius Both Sides | Full Radius | Alternating Right Left Chamfer

Radius Right Side Chamfer Left Side | Alternating Chamfer Both Sides | Radius Left Side Chamfer Right Side | Triple Tooth Grind

TOOL DIAM.	HUB WIDTH	EDP NO.	RADII, CHAMFERS, OR COMBO FINISHED TO MODIFIED FACE WIDTH						
			MODIFIED FACE WIDTH RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
				1	2	3	4	5	6
3	.0555	55698R2	0.0600 - 0.0703	$334.25	$300.00	$295.15	$292.65	$291.20	$290.40
3	.0711	55600R2	0.0704 - 0.0859	387.95	353.60	348.75	346.30	344.80	343.95
3	.0867	55602R2	0.0860 - 0.1015	334.25	300.00	295.15	292.65	291.20	290.40
3	.1024	55604R2	0.1016 - 0.1171	314.40	280.10	275.25	272.80	271.30	270.50
3	.1180	55606R2	0.1172 - 0.1406	292.25	257.90	253.10	250.65	249.10	248.30
3	.1562	55608R2	0.1407 - 0.1718	303.05	268.70	263.95	261.50	259.95	259.15
3	.1875	55609R2	0.1719 - 0.2031	313.90	279.60	274.80	272.35	270.80	270.05
3	.2188	55610R2	0.2032 - 0.2343	324.80	290.45	285.60	283.15	281.65	280.80
3	.2500	55611R2	0.2344 - 0.2812	335.65	301.30	296.50	294.05	292.50	291.70
3	.3125	55612R2	0.2813 - 0.3437	360.50	326.15	321.35	318.85	317.35	316.55
3	.3750	55613R2	0.3438 - 0.4062	385.40	351.05	346.30	343.85	342.35	341.55
3	.4375	55614R2	0.4063 - 0.4687	419.65	385.30	380.50	378.05	376.50	375.70
3	.5000	55615R2	0.4688 - 0.5312	457.65	423.25	418.50	416.05	414.50	413.70

CUTTERS

4" MILLING CUTTERS & SLITTING SAWS CARBIDE TIPPED TYPE 556

MATERIAL SPECIFIC

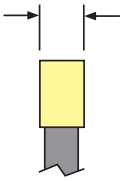
FOR STEEL

Modified width between .0600" and .5312"

TYPE 556

Cutter Notes (All cutters on page)

- 20 Teeth
- C-5 Carbide
- 1° - 3° Positve Radial Rake
- Width Tolerance: +.001"/-.000"
- OD tolerance: +.0313"/-.000"
- 1" Arbor hole +.001"/-.000"
- ANSI standard keyway dimensions
- Add 5% to grind down hub width
- Add 5% to match OD's on cutter sets within .001"
- Not designed to be used on heat treated materials greater than 475 Brinell (50Rc)



Width Grind

TOOL DIAM.	HUB WIDTH	EDP NO.	FINISHED TO MODIFIED FACE WIDTH						
			MODIFIED FACE WIDTH RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
				1	2	3	4	5	6
4	.0545	55616D	0.0600 - 0.0703	$376.05	$351.65	$347.10	$344.70	$343.30	$310.05
4	.0701	55618D	0.0704 - 0.0859	405.20	380.85	376.25	373.90	372.50	339.25
4	.0858	55620D	0.0860 - 0.1015	376.05	351.65	347.10	344.70	343.30	310.05
4	.1014	55622D	0.1016 - 0.1171	359.25	334.85	330.30	327.90	326.45	293.20
4	.1170	55624D	0.1172 - 0.1406	339.85	315.45	310.90	308.50	307.15	273.85
4	.1562	55626D	0.1407 - 0.1718	360.30	335.90	331.35	328.95	327.55	294.30
4	.1875	55628D	0.1719 - 0.2031	361.45	337.10	332.50	330.15	328.65	295.40
4	.2188	55630D	0.2032 - 0.2343	378.90	354.55	349.95	347.55	346.20	312.95
4	.2500	55632D	0.2344 - 0.2812	383.00	358.60	354.05	351.65	350.30	317.00
4	.3125	55634D	0.2813 - 0.3437	409.90	385.60	380.95	378.65	377.20	343.95
4	.3750	55636D	0.3438 - 0.4062	434.85	410.50	405.95	403.55	402.05	368.85
4	.4375	55638D	0.4063 - 0.4687	475.85	451.45	446.90	444.45	443.05	409.80
4	.5000	55640D	0.4688 - 0.5312	521.35	497.05	492.40	490.05	488.60	455.40

Corner Radius or Chamfer on ONE Side

TOOL DIAM.	HUB WIDTH	EDP NO.	ONE RADIUS OR CHAMFER FINISHED TO MODIFIED FACE WIDTH						
			MODIFIED FACE WIDTH RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
				1	2	3	4	5	6
4	.0545	55616R1	0.0600 - 0.0703	$391.30	$356.35	$351.35	$348.65	$347.05	$346.20
4	.0701	55618R1	0.0704 - 0.0859	420.50	385.60	380.50	377.80	376.25	375.35
4	.0858	55620R1	0.0860 - 0.1015	391.30	356.35	351.35	348.65	347.05	346.20
4	.1014	55622R1	0.1016 - 0.1171	374.45	339.55	334.55	331.85	330.25	329.40
4	.1170	55624R1	0.1172 - 0.1406	355.10	320.25	315.15	312.50	310.85	310.05
4	.1562	55626R1	0.1407 - 0.1718	375.55	340.65	335.60	332.90	331.35	330.45
4	.1875	55628R1	0.1719 - 0.2031	376.65	341.80	336.75	334.05	332.45	331.60
4	.2188	55630R1	0.2032 - 0.2343	394.20	359.30	354.20	351.55	349.95	349.10
4	.2500	55632R1	0.2344 - 0.2812	398.25	363.30	358.30	355.65	354.00	353.15
4	.3125	55634R1	0.2813 - 0.3437	425.20	390.35	385.20	382.55	380.95	380.10
4	.3750	55636R1	0.3438 - 0.4062	450.10	415.20	410.05	407.40	405.85	404.95
4	.4375	55638R1	0.4063 - 0.4687	491.05	456.15	451.10	448.45	446.80	446.00
4	.5000	55640R1	0.4688 - 0.5312	536.60	501.75	496.60	493.95	492.35	491.50

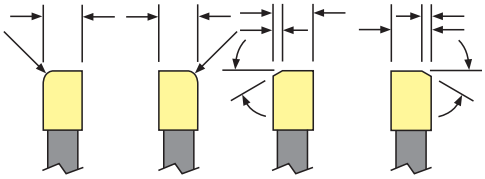
Specify right or left side for radius or chamfer

Radius Notes

- Maximum radius on one side is .2656"
- Full radius and maximum radius on both sides is ½ the width of the cutter
- A non-tangent radii must be quoted

Chamfer Notes

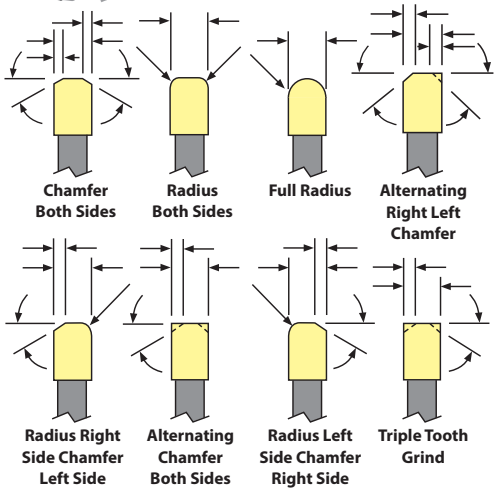
- Chamfer Angles can range from 0° to 45°
- Chamfer is measured off the OD
- Maximum chamfer is the LESSER of ⅓ the width of the cutter OR .2656" length of angle when measured across the OD
- Chamfer Angle Tolerance: +/- ½°
- Chamfers greater than 45° must be quoted



Radius Left Side | Radius Right Side | Chamfer Left Side | Chamfer Right Side

Corner Radius or Chamfer on BOTH Sides OR a Full Radius

- Price Increases 5% for Alternating Chamfers



Chamfer Both Sides | Radius Both Sides | Full Radius | Alternating Right Left Chamfer

Radius Right Side Chamfer Left Side | Alternating Chamfer Both Sides | Radius Left Side Chamfer Right Side | Triple Tooth Grind

TOOL DIAM.	HUB WIDTH	EDP NO.	RADII, CHAMFERS, OR COMBO FINISHED TO MODIFIED FACE WIDTH						
			MODIFIED FACE WIDTH RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
				1	2	3	4	5	6
4	.0545	55616R2	0.0600 - 0.0703	$399.60	$361.10	$355.50	$352.60	$350.80	$349.85
4	.0701	55618R2	0.0704 - 0.0859	428.75	390.35	384.75	381.75	380.00	379.05
4	.0858	55620R2	0.0860 - 0.1015	399.60	361.10	355.50	352.60	350.80	349.85
4	.1014	55622R2	0.1016 - 0.1171	382.80	344.30	338.65	335.80	334.00	333.05
4	.1170	55624R2	0.1172 - 0.1406	363.45	324.95	319.40	316.40	314.65	313.70
4	.1562	55626R2	0.1407 - 0.1718	383.90	345.35	339.80	336.85	335.05	334.10
4	.1875	55628R2	0.1719 - 0.2031	385.05	346.50	340.90	338.05	336.25	335.30
4	.2188	55630R2	0.2032 - 0.2343	402.55	364.00	358.45	355.45	353.70	352.75
4	.2500	55632R2	0.2344 - 0.2812	406.55	368.10	362.50	359.55	357.75	356.85
4	.3125	55634R2	0.2813 - 0.3437	433.55	395.05	389.45	386.50	384.80	383.75
4	.3750	55636R2	0.3438 - 0.4062	458.40	419.90	414.30	411.40	409.65	408.70
4	.4375	55638R2	0.4063 - 0.4687	499.40	460.90	455.25	452.35	450.60	449.65
4	.5000	55640R2	0.4688 - 0.5312	544.95	506.45	500.85	497.90	496.20	495.25

CUTTERS

5" MILLING CUTTERS & SLITTING SAWS CARBIDE TIPPED TYPE 556

MATERIAL SPECIFIC

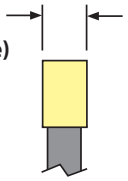
FOR STEEL

Modified width between .0704" and .5312"

TYPE 556

Cutter Notes (All cutters on page)

- 24 Teeth
- C-5 Carbide
- 1° - 3° Positve Radial Rake
- Width Tolerance: +.001"/-.000"
- OD tolerance: +.0313"/-.000"
- 1" Arbor hole +.001"/-.000"
- ANSI standard keyway dimensions
- Add 5% to grind down hub width
- Add 5% to match OD's on cutter sets within .001"
- Not designed to be used on heat treated materials greater than 475 Brinell (50Rc)



Width Grind

TOOL DIAM.	HUB WIDTH	EDP NO.	FINISHED TO MODIFIED FACE WIDTH						
			MODIFIED FACE WIDTH RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
				1	2	3	4	5	6
5	.0691	55642D	0.0704 - 0.0859	$487.55	$462.70	$458.05	$455.55	$454.10	$420.10
5	.0848	55644D	0.0860 - 0.1015	490.50	465.60	460.95	458.50	457.05	423.05
5	.1004	55646D	0.1016 - 0.1171	462.10	437.25	432.60	430.10	428.65	394.70
5	.1160	55648D	0.1172 - 0.1406	409.70	384.85	380.15	377.70	376.25	342.25
5	.1562	55650D	0.1407 - 0.1718	417.60	392.75	388.05	385.60	384.15	350.15
5	.1875	55652D	0.1719 - 0.2031	442.20	417.30	412.65	410.20	408.75	374.75
5	.2188	55654D	0.2032 - 0.2343	452.90	428.05	423.25	420.85	419.40	385.40
5	.2500	55656D	0.2344 - 0.2812	469.45	444.55	439.85	437.45	436.00	402.00
5	.3125	55658D	0.2813 - 0.3437	504.60	479.75	475.05	472.65	471.10	437.20
5	.3750	55660D	0.3438 - 0.4062	539.85	515.00	510.25	507.85	506.35	472.40
5	.4375	55662D	0.4063 - 0.4687	592.35	567.45	562.80	560.30	558.90	524.90
5	.5000	55664D	0.4688 - 0.5312	650.70	625.75	621.10	618.65	617.25	583.20

Corner Radius or Chamfer on ONE Side

TOOL DIAM.	HUB WIDTH	EDP NO.	ONE RADIUS OR CHAMFER FINISHED TO MODIFIED FACE WIDTH						
			MODIFIED FACE WIDTH RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
				1	2	3	4	5	6
5	.0691	55642R1	0.0704 - 0.0859	$503.00	$467.40	$462.20	$459.50	$457.85	$457.00
5	.0848	55644R1	0.0860 - 0.1015	506.00	470.40	465.20	462.50	460.85	459.95
5	.1004	55646R1	0.1016 - 0.1171	477.60	441.95	436.75	434.05	432.50	431.60
5	.1160	55648R1	0.1172 - 0.1406	425.15	389.55	384.30	381.65	380.00	379.15
5	.1562	55650R1	0.1407 - 0.1718	433.05	397.45	392.25	389.55	387.95	387.05
5	.1875	55652R1	0.1719 - 0.2031	457.65	422.05	416.90	414.15	412.55	411.65
5	.2188	55654R1	0.2032 - 0.2343	468.35	432.75	427.50	424.85	423.15	422.30
5	.2500	55656R1	0.2344 - 0.2812	484.95	449.35	444.10	441.40	439.75	438.85
5	.3125	55658R1	0.2813 - 0.3437	520.10	484.45	479.30	476.60	474.95	474.10
5	.3750	55660R1	0.3438 - 0.4062	555.35	519.70	514.45	511.75	510.10	509.30
5	.4375	55662R1	0.4063 - 0.4687	607.80	572.20	567.00	564.30	562.70	561.80
5	.5000	55664R1	0.4688 - 0.5312	666.10	630.50	625.30	622.60	621.00	620.10

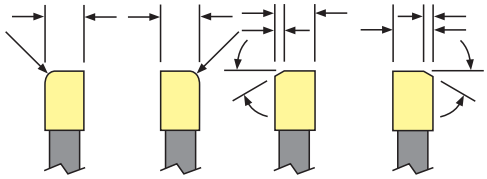
Specify right or left side for radius or chamfer

Radius Notes

- Maximum radius on one side is .2656"
- Full radius and maximum radius on both sides is ½ the width of the cutter
- A non-tangent radii must be quoted

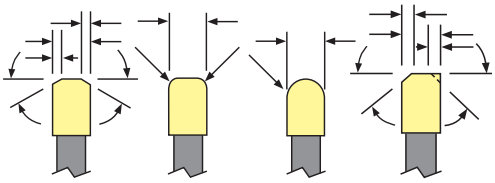
Chamfer Notes

- Chamfer Angles can range from 0° to 45°
- Chamfer is measured off the OD
- Maximum chamfer is the LESSER of ⅓ the width of the cutter OR .2656" length of angle when measured across the OD
- Chamfer Angle Tolerance: +/- ½°
- Chamfers greater than 45° must be quoted

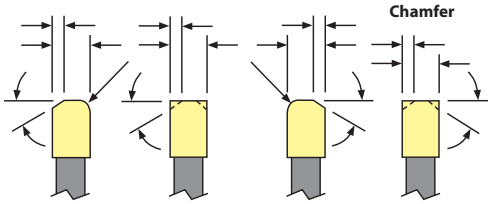


Radius Left Side | Radius Right Side | Chamfer Left Side | Chamfer Right Side

Corner Radius or Chamfer on BOTH Sides OR a Full Radius



Chamfer Both Sides | Radius Both Sides | Full Radius | Alternating Right Left Chamfer



Radius Right Side Chamfer Left Side | Alternating Chamfer Both Sides | Radius Left Side Chamfer Right Side | Triple Tooth Grind

- Price Increases 5% for Alternating Chamfers

TOOL DIAM.	HUB WIDTH	EDP NO.	RADII, CHAMFERS, OR COMBO FINISHED TO MODIFIED FACE WIDTH						
			MODIFIED FACE WIDTH RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
				1	2	3	4	5	6
5	.0691	55642R2	0.0704 - 0.0859	$519.60	$476.85	$470.65	$467.40	$465.45	$464.40
5	.0848	55644R2	0.0860 - 0.1015	522.60	479.80	473.60	470.30	468.35	467.35
5	.1004	55646R2	0.1016 - 0.1171	494.15	451.45	445.20	441.90	439.95	438.95
5	.1160	55648R2	0.1172 - 0.1406	441.75	399.00	392.80	389.50	387.55	386.55
5	.1562	55650R2	0.1407 - 0.1718	449.65	406.95	400.70	397.40	395.45	394.45
5	.1875	55652R2	0.1719 - 0.2031	474.25	431.55	425.25	422.05	420.10	419.00
5	.2188	55654R2	0.2032 - 0.2343	484.95	442.20	436.00	432.70	430.75	429.65
5	.2500	55656R2	0.2344 - 0.2812	501.50	458.75	452.50	449.30	447.30	446.25
5	.3125	55658R2	0.2813 - 0.3437	536.70	493.95	487.70	484.40	482.50	481.45
5	.3750	55660R2	0.3438 - 0.4062	571.85	529.15	522.90	519.65	517.70	516.65
5	.4375	55662R2	0.4063 - 0.4687	624.40	581.70	575.40	572.15	570.15	569.15
5	.5000	55664R2	0.4688 - 0.5312	682.70	640.00	633.70	630.45	628.55	627.50

6" MILLING CUTTERS & SLITTING SAWS CARBIDE TIPPED TYPE 556

MATERIAL SPECIFIC

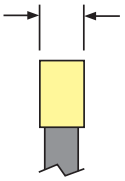
FOR STEEL

Modified width between .0704" and .5312"

TYPE 556

Cutter Notes (All cutters on page)

- 28 Teeth
- C-5 Carbide
- 1° - 3° Positve Radial Rake
- Width Tolerance: +.001"/-.000"
- OD tolerance: +.0313"/-.000"
- 1" Arbor hole +.001"/-.000"
- ANSI standard keyway dimensions
- Add 5% to grind down hub width
- Add 5% to match OD's on cutter sets within .001"
- Not designed to be used on heat treated materials greater than 475 Brinell (50Rc)



Width Grind

TOOL DIAM.	HUB WIDTH	EDP NO.	FINISHED TO MODIFIED FACE WIDTH						
			MODIFIED FACE WIDTH RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
				1	2	3	4	5	6
6	.0681	55666D	0.0704 - 0.0859	$547.90	$520.60	$515.30	$512.50	$510.90	$472.30
6	.0838	55668D	0.0860 - 0.1015	508.30	481.00	475.70	472.90	471.30	432.70
6	.0994	55670D	0.1016 - 0.1171	549.55	522.20	516.90	514.15	512.45	473.95
6	.1150	55672D	0.1172 - 0.1406	529.65	502.30	497.05	494.20	492.60	454.00
6	.1562	55674D	0.1407 - 0.1718	529.40	502.00	496.70	493.95	492.30	453.80
6	.1875	55676D	0.1719 - 0.2031	562.45	535.15	529.85	527.10	525.40	486.80
6	.2188	55678D	0.2032 - 0.2343	570.80	543.45	538.20	535.40	533.75	495.20
6	.2500	55680D	0.2344 - 0.2812	605.00	577.60	572.30	569.55	567.90	529.30
6	.3125	55682D	0.2813 - 0.3437	612.30	584.95	579.65	576.85	575.25	536.70
6	.3750	55684D	0.3438 - 0.4062	632.95	605.50	600.20	597.45	595.85	557.30
6	.4375	55690D	0.4063 - 0.4687	694.85	667.50	662.20	659.35	657.80	619.15
6	.5000	55692D	0.4688 - 0.5312	763.60	736.35	731.05	728.20	726.60	688.00

Corner Radius or Chamfer on ONE Side

TOOL DIAM.	HUB WIDTH	EDP NO.	ONE RADIUS OR CHAMFER FINISHED TO MODIFIED FACE WIDTH						
			MODIFIED FACE WIDTH RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
				1	2	3	4	5	6
6	.0681	55666R1	0.0704 - 0.0859	$564.25	$525.75	$519.90	$516.80	$515.00	$514.00
6	.0838	55668R1	0.0860 - 0.1015	524.60	486.15	480.30	477.20	475.35	474.35
6	.0994	55670R1	0.1016 - 0.1171	565.85	527.35	521.50	518.45	516.60	515.60
6	.1150	55672R1	0.1172 - 0.1406	545.90	507.50	501.60	498.50	496.65	495.65
6	.1562	55674R1	0.1407 - 0.1718	545.70	507.20	501.35	498.30	496.45	495.45
6	.1875	55676R1	0.1719 - 0.2031	578.75	540.30	534.40	531.30	529.50	528.50
6	.2188	55678R1	0.2032 - 0.2343	587.15	548.65	542.75	539.70	537.85	536.85
6	.2500	55680R1	0.2344 - 0.2812	621.25	582.80	576.85	573.85	572.05	571.00
6	.3125	55682R1	0.2813 - 0.3437	628.65	590.10	584.25	581.20	579.40	578.40
6	.3750	55684R1	0.3438 - 0.4062	649.20	610.70	604.85	601.80	599.95	598.95
6	.4375	55690R1	0.4063 - 0.4687	711.15	672.60	666.75	663.65	661.90	660.90
6	.5000	55692R1	0.4688 - 0.5312	779.95	741.45	735.60	732.50	730.65	729.70

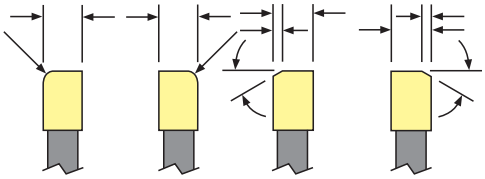
Specify right or left side for radius or chamfer

Radius Notes

- Maximum radius on one side is .2656"
- Full radius and maximum radius on both sides is ½ the width of the cutter
- A non-tangent radii must be quoted

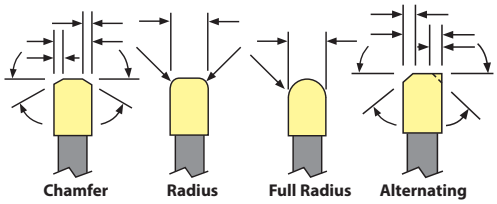
Chamfer Notes

- Chamfer Angles can range from 0° to 45°
- Chamfer is measured off the OD
- Maximum chamfer is the LESSER of ⅓ the width of the cutter OR .2656" length of angle when measured across the OD
- Chamfer Angle Tolerance: +/- ½°
- Chamfers greater than 45° must be quoted

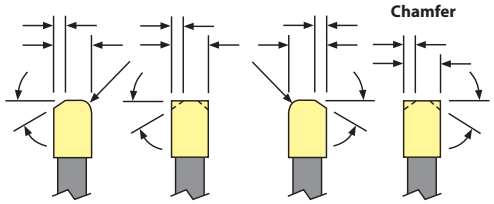


Radius Left Side | Radius Right Side | Chamfer Left Side | Chamfer Right Side

Corner Radius or Chamfer on BOTH Sides OR a Full Radius



Chamfer Both Sides | Radius Both Sides | Full Radius | Alternating Right Left Chamfer



Radius Right Side Chamfer Left Side | Alternating Chamfer Both Sides | Radius Left Side Chamfer Right Side | Triple Tooth Grind

- Price Increases 5% for Alternating Chamfers

TOOL DIAM.	HUB WIDTH	EDP NO.	RADII, CHAMFERS, OR COMBO FINISHED TO MODIFIED FACE WIDTH						
			MODIFIED FACE WIDTH RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
				1	2	3	4	5	6
6	.0681	55666R2	0.0704 - 0.0859	$581.95	$536.05	$529.00	$525.40	$523.20	$522.05
6	.0838	55668R2	0.0860 - 0.1015	542.30	496.40	489.40	485.75	483.55	482.40
6	.0994	55670R2	0.1016 - 0.1171	583.55	537.65	530.65	526.95	524.85	523.60
6	.1150	55672R2	0.1172 - 0.1406	563.60	517.70	510.70	507.05	504.95	503.70
6	.1562	55674R2	0.1407 - 0.1718	563.40	517.50	510.50	506.80	504.65	503.45
6	.1875	55676R2	0.1719 - 0.2031	596.45	550.55	543.50	539.85	537.75	536.50
6	.2188	55678R2	0.2032 - 0.2343	604.80	558.90	551.90	548.25	546.10	544.90
6	.2500	55680R2	0.2344 - 0.2812	638.90	593.00	586.05	582.35	580.20	579.00
6	.3125	55682R2	0.2813 - 0.3437	646.35	600.40	593.40	589.75	587.60	586.40
6	.3750	55684R2	0.3438 - 0.4062	666.90	621.00	614.00	610.30	608.20	606.95
6	.4375	55690R2	0.4063 - 0.4687	728.80	682.90	675.90	672.25	670.10	668.90
6	.5000	55692R2	0.4688 - 0.5312	797.65	751.70	744.70	741.05	738.95	737.70

3" MILLING CUTTERS & SLITTING SAWS CARBIDE TIPPED TYPE 559

GENERAL PURPOSE

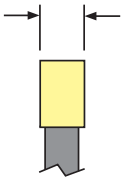
SUITABLE FOR MOST MATERIALS

Modified width between .0600" and .5312"

TYPE 559

Cutter Notes (All cutters on page)

- 12 Teeth
- C-2(m) Carbide
- 5° Positve Radial Rake
- Width Tolerance: +.001"/-.000"
- OD tolerance: +.0313"/-.000"
- 1" Arbor hole +.001"/-.000"
- ANSI standard keyway dimensions
- Add 5% to grind down hub width
- Add 5% to match OD's on cutter sets within .001"
- Not designed to be used on heat treated materials greater than 363 Brinell (39Rc)



Width Grind

TOOL DIAM.	HUB WIDTH	EDP NO.	FINISHED TO MODIFIED FACE WIDTH						
			MODIFIED FACE WIDTH RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
				1	2	3	4	5	6
3	.0555	55998D	0.0600 - 0.0703	$296.55	$275.10	$271.40	$269.45	$268.30	$241.20
3	.0711	55900D	0.0704 - 0.0859	325.55	304.10	300.40	298.45	297.20	270.20
3	.0867	55902D	0.0860 - 0.1015	296.55	275.10	271.40	269.45	268.30	241.20
3	.1024	55904D	0.1016 - 0.1171	285.55	264.20	260.45	258.50	257.30	230.25
3	.1180	55906D	0.1172 - 0.1406	275.25	253.80	250.05	248.10	246.95	219.90
3	.1562	55908D	0.1407 - 0.1718	280.55	259.20	255.45	253.50	252.35	225.20
3	.1875	55909D	0.1719 - 0.2031	285.95	264.50	260.75	258.85	257.70	230.60
3	.2188	55910D	0.2032 - 0.2343	293.20	271.90	268.15	266.15	265.00	237.90
3	.2500	55911D	0.2344 - 0.2812	300.50	279.10	275.30	273.35	272.20	245.05
3	.3125	55912D	0.2813 - 0.3437	323.85	302.45	298.70	296.80	295.65	268.45
3	.3750	55913D	0.3438 - 0.4062	349.00	327.60	323.85	321.85	320.70	293.65
3	.4375	55914D	0.4063 - 0.4687	374.40	353.00	349.25	347.30	346.15	319.10
3	.5000	55915D	0.4688 - 0.5312	399.85	378.40	374.65	372.75	371.60	344.40

Corner Radius or Chamfer on ONE Side

TOOL DIAM.	HUB WIDTH	EDP NO.	ONE RADIUS OR CHAMFER FINISHED TO MODIFIED FACE WIDTH						
			MODIFIED FACE WIDTH RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
				1	2	3	4	5	6
3	.0555	55998R1	0.0600 - 0.0703	$311.00	$279.35	$275.10	$273.00	$271.70	$271.05
3	.0711	55900R1	0.0704 - 0.0859	340.05	308.35	304.10	301.95	300.65	300.00
3	.0867	55902R1	0.0860 - 0.1015	311.00	279.35	275.10	273.00	271.70	271.05
3	.1024	55904R1	0.1016 - 0.1171	300.10	268.40	264.20	262.05	260.70	260.00
3	.1180	55906R1	0.1172 - 0.1406	289.70	258.00	253.80	251.65	250.35	249.65
3	.1562	55908R1	0.1407 - 0.1718	295.05	263.40	259.20	257.00	255.70	255.00
3	.1875	55909R1	0.1719 - 0.2031	300.45	268.70	264.50	262.40	261.15	260.40
3	.2188	55910R1	0.2032 - 0.2343	307.70	276.10	271.90	269.65	268.40	267.65
3	.2500	55911R1	0.2344 - 0.2812	314.95	283.25	279.10	276.90	275.60	274.90
3	.3125	55912R1	0.2813 - 0.3437	338.35	306.70	302.45	300.30	299.05	298.25
3	.3750	55913R1	0.3438 - 0.4062	363.55	331.80	327.60	325.40	324.15	323.45
3	.4375	55914R1	0.4063 - 0.4687	388.90	357.20	353.00	350.85	349.60	348.85
3	.5000	55915R1	0.4688 - 0.5312	414.30	382.60	378.40	376.30	374.90	374.25

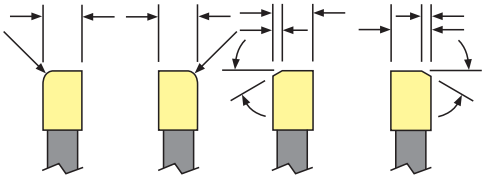
Specify right or left side for radius or chamfer

Radius Notes

- Maximum radius on one side is .2656"
- Full radius and maximum radius on both sides is ½ the width of the cutter
- A non-tangent radii must be quoted

Chamfer Notes

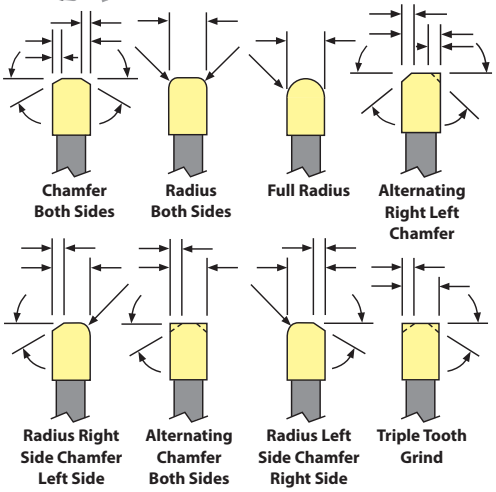
- Chamfer Angles can range from 0° to 45°
- Chamfer is measured off the OD
- Maximum chamfer is the LESSER of ⅓ the width of the cutter OR .2656" length of angle when measured across the OD
- Chamfer Angle Tolerance: +/- ½°
- Chamfers greater than 45° must be quoted



Radius Left Side | Radius Right Side | Chamfer Left Side | Chamfer Right Side

Corner Radius or Chamfer on BOTH Sides OR a Full Radius

- Price Increases 5% for Alternating Chamfers



Chamfer Both Sides | Radius Both Sides | Full Radius | Alternating Right Left Chamfer

Radius Right Side Chamfer Left Side | Alternating Chamfer Both Sides | Radius Left Side Chamfer Right Side | Triple Tooth Grind

TOOL DIAM.	HUB WIDTH	EDP NO.	RADII, CHAMFERS, OR COMBO FINISHED TO MODIFIED FACE WIDTH						
			MODIFIED FACE WIDTH RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
				1	2	3	4	5	6
3	.0555	55998R2	0.0600 - 0.0703	$318.75	$283.60	$279.00	$276.50	$275.05	$274.30
3	.0711	55900R2	0.0704 - 0.0859	347.80	312.60	307.95	305.50	304.00	303.20
3	.0867	55902R2	0.0860 - 0.1015	318.75	283.60	279.00	276.50	275.05	274.30
3	.1024	55904R2	0.1016 - 0.1171	307.90	272.65	268.00	265.60	264.10	263.35
3	.1180	55906R2	0.1172 - 0.1406	297.50	262.30	257.60	255.20	253.70	252.95
3	.1562	55908R2	0.1407 - 0.1718	302.85	267.60	262.95	260.55	259.10	258.30
3	.1875	55909R2	0.1719 - 0.2031	308.15	273.00	268.35	265.90	264.45	263.70
3	.2188	55910R2	0.2032 - 0.2343	315.55	280.30	275.65	273.25	271.75	271.05
3	.2500	55911R2	0.2344 - 0.2812	322.70	287.45	282.85	280.40	279.00	278.20
3	.3125	55912R2	0.2813 - 0.3437	346.10	310.90	306.20	303.85	302.40	301.60
3	.3750	55913R2	0.3438 - 0.4062	371.30	336.05	331.40	329.00	327.50	326.75
3	.4375	55914R2	0.4063 - 0.4687	396.60	361.50	356.85	354.35	352.95	352.15
3	.5000	55915R2	0.4688 - 0.5312	422.05	386.95	382.20	379.80	378.35	377.55

CUTTERS

4" MILLING CUTTERS & SLITTING SAWS CARBIDE TIPPED TYPE 559

GENERAL PURPOSE

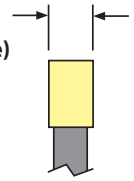
SUITABLE FOR MOST MATERIALS

Modified width between .0600" and .5312"

TYPE 559

Cutter Notes (All cutters on page)

- 14 Teeth
- C-2(m) Carbide
- 5° Positve Radial Rake
- Width Tolerance: +.001"/-.000"
- OD tolerance: +.0313"/-.000"
- 1" Arbor hole +.001"/-.000"
- ANSI standard keyway dimensions
- Add 5% to grind down hub width
- Add 5% to match OD's on cutter sets within .001"
- Not designed to be used on heat treated materials greater than 363 Brinell (39Rc)



Width Grind

TOOL DIAM.	HUB WIDTH	EDP NO.	FINISHED TO MODIFIED FACE WIDTH						
			MODIFIED FACE WIDTH RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
				1	2	3	4	5	6
4	.0545	55916D	0.0600 - 0.0703	$339.50	$314.95	$310.45	$308.15	$306.75	$274.35
4	.0701	55918D	0.0704 - 0.0859	379.55	354.90	350.40	348.10	346.75	314.30
4	.0858	55920D	0.0860 - 0.1015	339.50	314.95	310.45	308.15	306.75	274.35
4	.1014	55922D	0.1016 - 0.1171	390.50	365.90	361.40	359.15	357.70	325.25
4	.1170	55924D	0.1172 - 0.1406	339.15	314.50	309.95	307.65	306.30	273.90
4	.1562	55926D	0.1407 - 0.1718	346.30	321.70	317.20	314.95	313.50	281.10
4	.1875	55928D	0.1719 - 0.2031	355.25	330.65	326.15	323.90	322.45	290.05
4	.2188	55930D	0.2032 - 0.2343	364.40	339.80	335.30	333.00	331.55	299.15
4	.2500	55932D	0.2344 - 0.2812	371.60	346.95	342.45	340.15	338.70	306.35
4	.3125	55934D	0.2813 - 0.3437	393.10	368.50	364.00	361.70	360.30	327.95
4	.3750	55936D	0.3438 - 0.4062	418.40	393.80	389.30	387.00	385.50	353.10
4	.4375	55938D	0.4063 - 0.4687	443.75	419.20	414.65	412.35	410.90	378.55
4	.5000	55940D	0.4688 - 0.5312	469.20	444.50	440.05	437.75	436.35	403.95

Corner Radius or Chamfer on ONE Side

TOOL DIAM.	HUB WIDTH	EDP NO.	ONE RADIUS OR CHAMFER FINISHED TO MODIFIED FACE WIDTH						
			MODIFIED FACE WIDTH RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
				1	2	3	4	5	6
4	.0545	55916R1	0.0600 - 0.0703	$355.20	$319.55	$314.60	$311.95	$310.45	$309.65
4	.0701	55918R1	0.0704 - 0.0859	395.15	359.50	354.55	351.90	350.40	349.60
4	.0858	55920R1	0.0860 - 0.1015	355.20	319.55	314.60	311.95	310.45	309.65
4	.1014	55922R1	0.1016 - 0.1171	406.20	370.50	365.50	362.95	361.40	360.55
4	.1170	55924R1	0.1172 - 0.1406	354.80	319.10	314.10	311.55	309.95	309.15
4	.1562	55926R1	0.1407 - 0.1718	361.95	326.25	321.35	318.75	317.20	316.35
4	.1875	55928R1	0.1719 - 0.2031	370.95	335.30	330.30	327.70	326.15	325.30
4	.2188	55930R1	0.2032 - 0.2343	380.10	344.35	339.40	336.85	335.30	334.40
4	.2500	55932R1	0.2344 - 0.2812	387.20	351.55	346.55	343.95	342.45	341.60
4	.3125	55934R1	0.2813 - 0.3437	408.80	373.05	368.15	365.55	364.00	363.10
4	.3750	55936R1	0.3438 - 0.4062	434.00	398.35	393.35	390.75	389.30	388.40
4	.4375	55938R1	0.4063 - 0.4687	459.45	423.80	418.75	416.20	414.65	413.80
4	.5000	55940R1	0.4688 - 0.5312	484.85	449.20	444.20	441.60	440.05	439.25

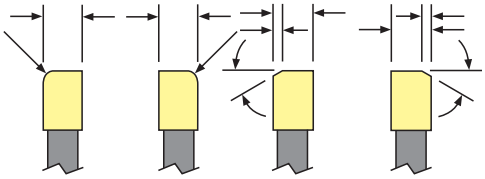
Specify right or left side for radius or chamfer

Radius Notes

- Maximum radius on one side is .2656"
- Full radius and maximum radius on both sides is ½ the width of the cutter
- A non-tangent radii must be quoted

Chamfer Notes

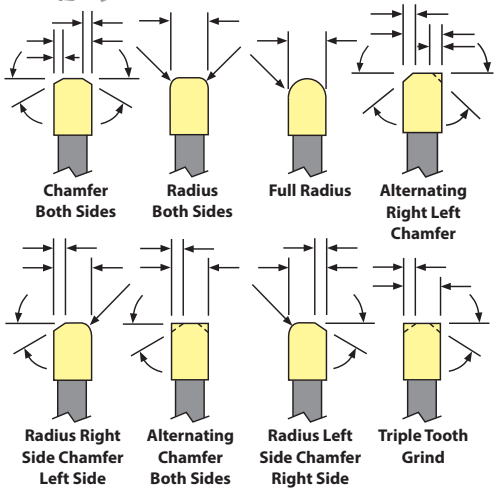
- Chamfer Angles can range from 0° to 45°
- Chamfer is measured off the OD
- Maximum chamfer is the LESSER of ⅓ the width of the cutter OR .2656" length of angle when measured across the OD
- Chamfer Angle Tolerance: +/- ½°
- Chamfers greater than 45° must be quoted



Radius Left Side | Radius Right Side | Chamfer Left Side | Chamfer Right Side

Corner Radius or Chamfer on BOTH Sides OR a Full Radius

- Price Increases 5% for Alternating Chamfers



Chamfer Both Sides | Radius Both Sides | Full Radius | Alternating Right Left Chamfer

Radius Right Side Chamfer Left Side | Alternating Chamfer Both Sides | Radius Left Side Chamfer Right Side | Triple Tooth Grind

TOOL DIAM.	HUB WIDTH	EDP NO.	RADII, CHAMFERS, OR COMBO FINISHED TO MODIFIED FACE WIDTH						
			MODIFIED FACE WIDTH RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
				1	2	3	4	5	6
4	.0545	55916R2	0.0600 - 0.0703	$363.55	$324.20	$318.65	$315.85	$314.10	$313.20
4	.0701	55918R2	0.0704 - 0.0859	403.40	364.10	358.60	355.80	354.05	353.10
4	.0858	55920R2	0.0860 - 0.1015	363.55	324.20	318.65	315.85	314.10	313.20
4	.1014	55922R2	0.1016 - 0.1171	414.45	375.15	369.60	366.80	365.05	364.10
4	.1170	55924R2	0.1172 - 0.1406	363.00	323.70	318.20	315.35	313.65	312.70
4	.1562	55926R2	0.1407 - 0.1718	370.25	330.95	325.35	322.60	320.80	319.90
4	.1875	55928R2	0.1719 - 0.2031	379.25	339.90	334.40	331.55	329.75	328.95
4	.2188	55930R2	0.2032 - 0.2343	388.35	349.00	343.50	340.70	339.00	338.05
4	.2500	55932R2	0.2344 - 0.2812	395.45	356.15	350.65	347.80	346.10	345.15
4	.3125	55934R2	0.2813 - 0.3437	417.05	377.75	372.20	369.40	367.65	366.75
4	.3750	55936R2	0.3438 - 0.4062	442.30	402.95	397.45	394.65	392.95	392.00
4	.4375	55938R2	0.4063 - 0.4687	467.70	428.40	422.90	420.00	418.30	417.45
4	.5000	55940R2	0.4688 - 0.5312	493.10	453.85	448.25	445.40	443.70	442.75

CUTTERS

5" MILLING CUTTERS & SLITTING SAWS CARBIDE TIPPED TYPE 559

GENERAL PURPOSE

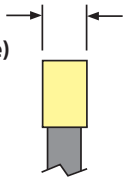
SUITABLE FOR MOST MATERIALS

Modified width between .0704" and .5312"

TYPE 559

Cutter Notes (All cutters on page)

- 16 Teeth
- C-2(m) Carbide
- 5° Positve Radial Rake
- Width Tolerance: +.001"/-.000"
- OD tolerance: +.0313"/-.000"
- 1" Arbor hole +.001"/-.000"
- ANSI standard keyway dimensions
- Add 5% to grind down hub width
- Add 5% to match OD's on cutter sets within .001"
- Not designed to be used on heat treated materials greater than 363 Brinell (39Rc)



Width Grind

TOOL DIAM.	HUB WIDTH	EDP NO.	FINISHED TO MODIFIED FACE WIDTH						
			MODIFIED FACE WIDTH RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
				1	2	3	4	5	6
5	.0691	55942D	0.0704 - 0.0859	$454.00	$428.75	$424.15	$421.85	$420.45	$387.25
5	.0848	55944D	0.0860 - 0.1015	398.90	373.70	369.15	366.80	365.40	332.15
5	.1004	55946D	0.1016 - 0.1171	432.00	406.85	402.20	399.90	398.45	365.35
5	.1160	55948D	0.1172 - 0.1406	389.30	364.00	359.50	357.10	355.75	322.55
5	.1562	55950D	0.1407 - 0.1718	399.95	374.75	370.25	367.80	366.40	333.20
5	.1875	55952D	0.1719 - 0.2031	418.05	392.90	388.35	386.00	384.55	351.35
5	.2188	55954D	0.2032 - 0.2343	436.15	410.90	406.35	404.00	402.55	369.40
5	.2500	55956D	0.2344 - 0.2812	454.05	428.80	424.30	421.95	420.55	387.30
5	.3125	55958D	0.2813 - 0.3437	484.65	459.45	454.90	452.50	451.10	417.95
5	.3750	55960D	0.3438 - 0.4062	517.10	491.90	487.40	485.00	483.55	450.45
5	.4375	55962D	0.4063 - 0.4687	542.50	517.35	512.85	510.45	509.00	475.85
5	.5000	55964D	0.4688 - 0.5312	567.95	542.75	538.20	535.85	534.40	501.20

Corner Radius or Chamfer on ONE Side

TOOL DIAM.	HUB WIDTH	EDP NO.	ONE RADIUS OR CHAMFER FINISHED TO MODIFIED FACE WIDTH						
			MODIFIED FACE WIDTH RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
				1	2	3	4	5	6
5	.0691	55942R1	0.0704 - 0.0859	$469.80	$433.40	$428.35	$425.65	$424.05	$423.25
5	.0848	55944R1	0.0860 - 0.1015	414.80	378.35	373.25	370.65	369.05	368.15
5	.1004	55946R1	0.1016 - 0.1171	447.85	411.50	406.35	403.75	402.10	401.30
5	.1160	55948R1	0.1172 - 0.1406	405.10	368.65	363.65	360.95	359.40	358.55
5	.1562	55950R1	0.1407 - 0.1718	415.85	379.35	374.30	371.70	370.05	369.25
5	.1875	55952R1	0.1719 - 0.2031	433.90	397.50	392.40	389.75	388.20	387.30
5	.2188	55954R1	0.2032 - 0.2343	451.95	415.50	410.45	407.85	406.20	405.35
5	.2500	55956R1	0.2344 - 0.2812	469.90	433.55	428.40	425.80	424.15	423.30
5	.3125	55958R1	0.2813 - 0.3437	500.50	464.05	459.00	456.35	454.80	453.95
5	.3750	55960R1	0.3438 - 0.4062	532.95	496.55	491.45	488.80	487.30	486.45
5	.4375	55962R1	0.4063 - 0.4687	558.40	522.00	516.85	514.25	512.65	511.80
5	.5000	55964R1	0.4688 - 0.5312	583.75	547.40	542.30	539.70	538.00	537.20

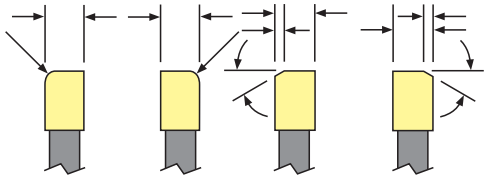
Specify right or left side for radius or chamfer

Radius Notes

- Maximum radius on one side is .2656"
- Full radius and maximum radius on both sides is ½ the width of the cutter
- A non-tangent radii must be quoted

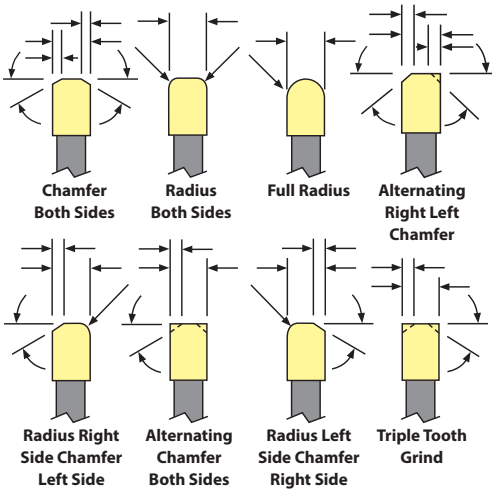
Chamfer Notes

- Chamfer Angles can range from 0° to 45°
- Chamfer is measured off the OD
- Maximum chamfer is the LESSER of ⅓ the width of the cutter OR .2656" length of angle when measured across the OD
- Chamfer Angle Tolerance: +/- ½°
- Chamfers greater than 45° must be quoted



Radius Left Side | Radius Right Side | Chamfer Left Side | Chamfer Right Side

Corner Radius or Chamfer on BOTH Sides OR a Full Radius



Chamfer Both Sides | Radius Both Sides | Full Radius | Alternating Right Left Chamfer

Radius Right Side Chamfer Left Side | Alternating Chamfer Both Sides | Radius Left Side Chamfer Right Side | Triple Tooth Grind

- Price Increases 5% for Alternating Chamfers

TOOL DIAM.	HUB WIDTH	EDP NO.	RADII, CHAMFERS, OR COMBO FINISHED TO MODIFIED FACE WIDTH						
			MODIFIED FACE WIDTH RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
				1	2	3	4	5	6
5	.0691	55942R2	0.0704 - 0.0859	$486.35	$442.65	$436.50	$433.35	$431.45	$430.45
5	.0848	55944R2	0.0860 - 0.1015	431.30	387.55	381.45	378.30	376.40	375.40
5	.1004	55946R2	0.1016 - 0.1171	464.35	420.65	414.55	411.40	409.55	408.45
5	.1160	55948R2	0.1172 - 0.1406	421.60	377.90	371.80	368.60	366.75	365.75
5	.1562	55950R2	0.1407 - 0.1718	432.30	388.60	382.50	379.35	377.45	376.40
5	.1875	55952R2	0.1719 - 0.2031	450.45	406.70	400.55	397.45	395.55	394.55
5	.2188	55954R2	0.2032 - 0.2343	468.40	424.80	418.65	415.50	413.60	412.60
5	.2500	55956R2	0.2344 - 0.2812	486.45	442.70	436.55	433.45	431.60	430.55
5	.3125	55958R2	0.2813 - 0.3437	516.95	473.30	467.20	464.00	462.10	461.10
5	.3750	55960R2	0.3438 - 0.4062	549.50	505.75	499.70	496.50	494.60	493.65
5	.4375	55962R2	0.4063 - 0.4687	574.95	531.15	525.05	521.95	520.05	519.05
5	.5000	55964R2	0.4688 - 0.5312	600.30	556.60	550.50	547.40	545.40	544.40

6" MILLING CUTTERS & SLITTING SAWS CARBIDE TIPPED TYPE 559

GENERAL PURPOSE

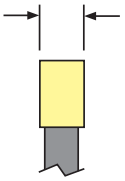
SUITABLE FOR MOST MATERIALS

Modified width between .0704" and .5312"

TYPE 559

Cutter Notes (All cutters on page)

- 18 Teeth
- C-2(m) Carbide
- 5° Positve Radial Rake
- Width Tolerance: +.001"/-.000"
- OD tolerance: +.0313"/-.000"
- 1" Arbor hole +.001"/-.000"
- ANSI standard keyway dimensions
- Add 5% to grind down hub width
- Add 5% to match OD's on cutter sets within .001"
- Not designed to be used on heat treated materials greater than 363 Brinell (39Rc)



Width Grind

TOOL DIAM.	HUB WIDTH	EDP NO.	FINISHED TO MODIFIED FACE WIDTH						
			MODIFIED FACE WIDTH RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
				1	2	3	4	5	6
6	.0681	55966D	0.0704 - 0.0859	$505.20	$478.85	$474.10	$471.65	$470.10	$435.50
6	.0838	55968D	0.0860 - 0.1015	470.70	444.40	439.65	437.20	435.65	401.05
6	.0994	55970D	0.1016 - 0.1171	506.65	480.40	475.55	473.10	471.65	437.00
6	.1150	55972D	0.1172 - 0.1406	482.15	455.90	451.10	448.60	447.15	412.55
6	.1562	55974D	0.1407 - 0.1718	500.15	473.95	469.15	466.65	465.20	430.55
6	.1875	55976D	0.1719 - 0.2031	518.25	491.90	487.25	484.65	483.15	448.55
6	.2188	55978D	0.2032 - 0.2343	536.25	509.95	505.20	502.70	501.20	466.60
6	.2500	55980D	0.2344 - 0.2812	561.15	534.90	530.05	527.60	526.15	491.50
6	.3125	55982D	0.2813 - 0.3437	583.15	556.80	552.10	549.60	548.15	513.45
6	.3750	55984D	0.3438 - 0.4062	602.90	576.55	571.85	569.35	567.85	533.20
6	.4375	55990D	0.4063 - 0.4687	628.25	601.95	597.20	594.70	593.25	558.60
6	.5000	55992D	0.4688 - 0.5312	653.65	627.40	622.60	620.15	618.65	584.05

Corner Radius or Chamfer on ONE Side

TOOL DIAM.	HUB WIDTH	EDP NO.	ONE RADIUS OR CHAMFER FINISHED TO MODIFIED FACE WIDTH						
			MODIFIED FACE WIDTH RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
				1	2	3	4	5	6
6	.0681	55966R1	0.0704 - 0.0859	$521.30	$483.45	$478.15	$475.45	$473.80	$472.90
6	.0838	55968R1	0.0860 - 0.1015	486.85	449.00	443.70	441.00	439.35	438.45
6	.0994	55970R1	0.1016 - 0.1171	522.85	484.95	479.65	476.90	475.25	474.40
6	.1150	55972R1	0.1172 - 0.1406	498.35	460.45	455.15	452.40	450.80	449.90
6	.1562	55974R1	0.1407 - 0.1718	516.40	478.55	473.20	470.55	468.85	467.95
6	.1875	55976R1	0.1719 - 0.2031	534.40	496.55	491.25	488.50	486.85	486.00
6	.2188	55978R1	0.2032 - 0.2343	552.40	514.60	509.35	506.50	504.95	504.05
6	.2500	55980R1	0.2344 - 0.2812	577.35	539.55	534.20	531.50	529.80	528.90
6	.3125	55982R1	0.2813 - 0.3437	599.30	561.50	556.25	553.45	551.80	550.90
6	.3750	55984R1	0.3438 - 0.4062	619.05	581.20	575.90	573.15	571.55	570.65
6	.4375	55990R1	0.4063 - 0.4687	644.45	606.65	601.35	598.60	596.90	596.05
6	.5000	55992R1	0.4688 - 0.5312	669.85	632.00	626.65	624.00	622.35	621.40

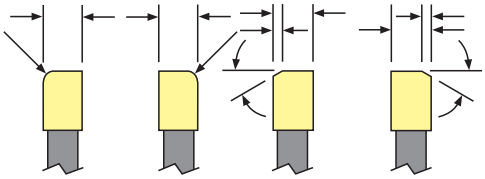
Specify right or left side for radius or chamfer

Radius Notes

- Maximum radius on one side is .2656"
- Full radius and maximum radius on both sides is ½ the width of the cutter
- A non-tangent radii must be quoted

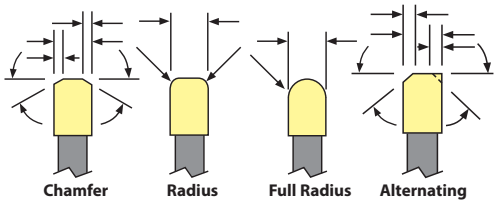
Chamfer Notes

- Chamfer Angles can range from 0° to 45°
- Chamfer is measured off the OD
- Maximum chamfer is the LESSER of ⅓ the width of the cutter OR .2656" length of angle when measured across the OD
- Chamfer Angle Tolerance: +/- ½°
- Chamfers greater than 45° must be quoted

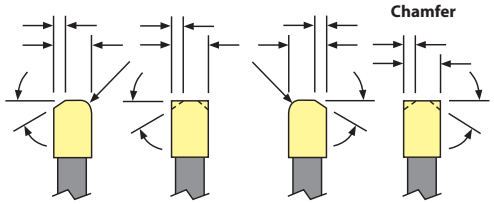


Radius Left Side | Radius Right Side | Chamfer Left Side | Chamfer Right Side

Corner Radius or Chamfer on BOTH Sides OR a Full Radius



Chamfer Both Sides | Radius Both Sides | Full Radius | Alternating Right Left Chamfer



Radius Right Side Chamfer Left Side | Alternating Chamfer Both Sides | Radius Left Side Chamfer Right Side | Triple Tooth Grind

- Price Increases 5% for Alternating Chamfers

TOOL DIAM.	HUB WIDTH	EDP NO.	RADII, CHAMFERS, OR COMBO FINISHED TO MODIFIED FACE WIDTH						
			MODIFIED FACE WIDTH RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
				1	2	3	4	5	6
6	.0681	55966R2	0.0704 - 0.0859	$537.85	$492.75	$486.45	$483.15	$481.15	$480.05
6	.0838	55968R2	0.0860 - 0.1015	503.40	458.30	451.95	448.65	446.70	445.60
6	.0994	55970R2	0.1016 - 0.1171	539.40	494.20	487.85	484.65	482.65	481.60
6	.1150	55972R2	0.1172 - 0.1406	514.90	469.75	463.40	460.15	458.20	457.10
6	.1562	55974R2	0.1407 - 0.1718	532.90	487.75	481.45	478.15	476.20	475.15
6	.1875	55976R2	0.1719 - 0.2031	550.90	505.75	499.45	496.25	494.30	493.20
6	.2188	55978R2	0.2032 - 0.2343	568.95	523.85	517.50	514.25	512.25	511.20
6	.2500	55980R2	0.2344 - 0.2812	593.85	548.70	542.40	539.10	537.15	536.15
6	.3125	55982R2	0.2813 - 0.3437	615.80	570.75	564.40	561.15	559.15	558.10
6	.3750	55984R2	0.3438 - 0.4062	635.50	590.40	584.10	580.90	578.90	577.85
6	.4375	55990R2	0.4063 - 0.4687	660.95	615.80	609.55	606.30	604.30	603.25
6	.5000	55992R2	0.4688 - 0.5312	686.40	641.25	634.95	631.75	629.75	628.65

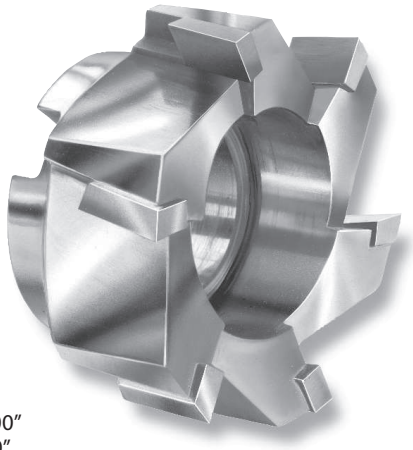
CUTTERS

SHELL END MILLS CARBIDE TIPPED TYPES 530, 531, 532 FRACTIONAL

MATERIAL SPECIFIC

THREE TYPES – FOR NON-FERROUS, CAST IRONS, OR STEELS

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	530
	40	NON-FERROUS - SHORT CHIPS	530/531
	60	CAST IRONS	531
	80	LOW STRENGTH STEELS	532
	100	MEDIUM STRENGTH STEELS	532
	120	HIGH STRENGTH STEELS	532
	140	HIGH TEMPERATURE ALLOYS	531



TYPE 530 – FOR NON-FERROUS
- Right spiral flutes

TYPE 531 – FOR CAST IRONS
- Right spiral flutes

TYPE 532 – FOR STEELS
- Left spiral flutes absorb the impact shock on entering steel

ALL TYPES:
- Large open flutes for easy chip flow
- Tool diameter tolerance: plus 1/16", minus .000"
- Arbor hole tolerance: plus .001", minus .000"
- Tool geometry & carbide grade appropriate for material being machined

MODIFICATIONS (Prompt delivery)
- Corner chamfer or corner radius
- Cutting diameter reduced for step
- Coatings available:

TITANIUM NITRIDE – TiN
TITANIUM CARBONITRIDE – TiCN
ZIRCONIUM NITRIDE – ZrN
AL TITANIUM NITRIDE – AlTiN

TOOL DIAM.	DIMENSIONS					TYPE 530 FOR NON-FERROUS			TYPE 531 FOR CAST IRONS			TYPE 532 FOR STEELS		
	ARBOR HOLE	LENGTH		DRIVE SLOTS		NO. OF TEETH	EDP NO.	PRICE	NO. OF TEETH	EDP NO.	PRICE	NO. OF TEETH	EDP NO.	PRICE
		CAR-BIDE	OVER-ALL	WIDTH	DEPTH									
1 1/4	1/2	1/2	1	1/4	5/32	4	53024	$171.60	4	53124	$171.60	4	53224	$178.50
1 1/2	1/2	1/2	1 1/8	1/4	5/32	4	53026	178.70	4	53126	178.70	4	53226	185.85
1 3/4	3/4	1/2	1 1/4	5/16	3/16	4	53028	222.70	4	53128	222.70	4	53228	231.55
2	3/4	5/8	1 3/8	5/16	3/16	4	53032	233.85	4	53132	248.80	4	53232	258.70
2 1/4	1	5/8	1 1/2	3/8	7/32	6	53036	247.05	6	53136	269.35	6	53236	280.15
2 1/2	1	5/8	1 5/8	3/8	7/32	6	53040	260.10	6	53140	293.60	6	53240	293.60
2 3/4	1	5/8	1 5/8	3/8	7/32	6	53044	274.50	6	53144	308.00	6	53244	308.00
3	1 1/4	3/4	1 3/4	1/2	9/32	6	53048	300.90	6	53148	335.00	6	53248	335.00
3 1/2	1 1/4	3/4	1 7/8	1/2	9/32	6	53056	368.30	8	53156	394.00	6	53256	416.45
4	1 1/2	3/4	2 1/4	5/8	3/8	6	53064	462.80	8	53164	487.40	6	53264	517.30

CUTTERS

ANGLE CUTTERS CARBIDE TIPPED TYPES 714, 716, 724, 726, 750, 752, 754 FRACTIONAL

FOR NON-FERROUS OR CAST IRONS

CHIP CLASS 20, 40, 60

TOOL DIAMETER	WIDTH	ARBOR HOLES	NO. OF TEETH	RIGHT 45° TYPE 714 EDP NO.	LEFT 45° TYPE 716 EDP NO.	RIGHT 60° TYPE 724 EDP NO.	LEFT 60° TYPE 726 EDP NO.	ALL TYPES PRICE
3	1/2	1	8	71408	71608	72408	72608	$336.50
4	1/2	1 1/4	10	71416	71616	72416	72616	416.45
4	3/4	1 1/4	10	71424	71624	72424	72624	451.80

SINGLE ANGLE CUTTERS
TYPE 714 - 45° RIGHT
TYPE 716 - 45° LEFT
TYPE 724 - 60° RIGHT
TYPE 726 - 60° LEFT

DOUBLE ANGLE CUTTERS
TYPE 750 - 45° INCLUDED • TYPE 752 - 60° INCLUDED • TYPE 754 - 90° INCLUDED

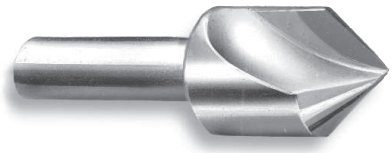
TOOL DIAMETER	WIDTH	ARBOR HOLES	NO. OF TEETH	45° TYPE 750 EDP NO.	60° TYPE 752 EDP NO.	90° TYPE 754 EDP NO.	ALL TYPES PRICE
2 3/4	1/2	1	8	-	75207	75407	$283.30
3	1/2	1	8	75008	75208	75408	353.30
4	1/2	1 1/4	10	75016	75216	75416	437.25
4	3/4	1 1/4	10	75024	75224	75424	474.30
4	1	1 1/4	10	-	75232	75432	555.10

ALL TYPES:
- Carbide tips brazed to alloy steel body
- General purpose cutters for cutting non-ferrous materials and cast irons
- Arbor hole tolerance: plus .001", minus .000"
- Tool geometry & carbide grade appropriate for material being machined

SPIRAL FLUTE COUNTERSINKS CARBIDE TIPPED TYPES 561, 563, 581, 583, 584, 585, 590, 591 FRACTIONAL

GENERAL PURPOSE

SINGLE OR THREE FLUTES: 60˚, 82˚, 90˚, 100˚ ANGLES



TYPE 561 – 60˚ SINGLE FLUTE
TYPE 581 – 82˚ SINGLE FLUTE
TYPE 591 – 90˚ SINGLE FLUTE
TYPE 584 – 100˚ SINGLE FLUTE

- Right spiral flute minimizes chatter
- Carbide tip brazed to tough hardened alloy steel body
- Not recommended for portable tool use (use "three flutes" type)

TYPE 563 – 60˚ THREE FLUTES
TYPE 583 – 82˚ THREE FLUTES
TYPE 590 – 90˚ THREE FLUTES
TYPE 585 – 100˚ THREE FLUTES

- Right spiral flutes minimizes chatter
- Carbide tips brazed to tough hardened alloy steel body
- Three flute design tends to center the tool in portable use and results in longer tool life

MODIFICATIONS (Prompt delivery)

- Modified included angle
- Reduced shank diameter
- Shank drive flat(s)
- 4 coatings available (listed on page 174)

TOOL DIAM.	SHANK DIAM.	MIN. CUT DIAM.	TYPE 561 60˚ ANGLE EDP NO.	TYPE 581 82˚ ANGLE EDP NO.	TYPE 591 90˚ ANGLE EDP NO.	TYPE 584 100˚ ANGLE EDP NO.	PRICE ALL TYPES
¼	3⁄16	1⁄16	56108	58108	59108	58408	$48.90
3⁄8	¼	5⁄64	56112	58112	59112	58412	48.90
½	3⁄8	3⁄32	56116	58116	59116	58416	58.05
¾	½	⅛	56124	58124	59124	58424	72.60
1	½	⅛	56132	58132	59132	58432	94.80
1 ¼	½	5⁄32	56140	58140	59140	58440	120.65
1 ½	½	3⁄16	56148	58148	59148	58448	135.30

TOOL DIAM.	SHANK DIAM.	MIN. CUT DIAM.	TYPE 563 60˚ ANGLE EDP NO.	TYPE 583 82˚ ANGLE EDP NO.	TYPE 590 90˚ ANGLE EDP NO.	TYPE 585 100˚ ANGLE EDP NO.	PRICE ALL TYPES
¼	3⁄16	5⁄64	56308	58308	59008	58508	$53.75
3⁄8	¼	7⁄64	56312	58312	59012	58512	53.75
½	3⁄8	9⁄64	56316	58316	59016	58516	63.85
5⁄8	3⁄8	9⁄64	56320	58320	59020	58520	67.15
¾	½	3⁄16	56324	58324	59024	58524	80.75
7⁄8	½	3⁄16	56328	58328	59028	58528	92.55
1	½	¼	56332	58332	59032	58532	100.95
1 ¼	½	5⁄16	56340	58340	59040	58540	125.60
1 ½	½	3⁄8	56348	58348	59048	58548	146.50

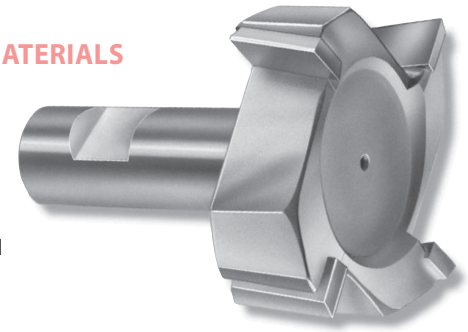
FACE MILLING CUTTERS - SHANK TYPE CARBIDE TIPPED TYPES 536, 537, 538 FRACTIONAL

MATERIAL SPECIFIC

CUTTERS

TYPE 536 – FOR NON-FERROUS MATERIALS
TYPE 537 – FOR CAST IRONS
TYPE 538 – FOR STEELS

- Carbide tips brazed to tough alloy steel body
- Straight shank with Weldon flats
- Tool geometry and carbide grade appropriate for material being machined



TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	536
	40	NON-FERROUS - SHORT CHIPS	536/537
	60	CAST IRONS	537
	80	LOW STRENGTH STEELS	538
	100	MEDIUM STRENGTH STEELS	538
	120	HIGH STRENGTH STEELS	538
	140	HIGH TEMPERATURE ALLOYS	537

MODIFICATIONS (Prompt delivery)

- Corner chamfer or corner radius
- Additional shank drive flat(s)
- 4 coatings available (listed on page 174)

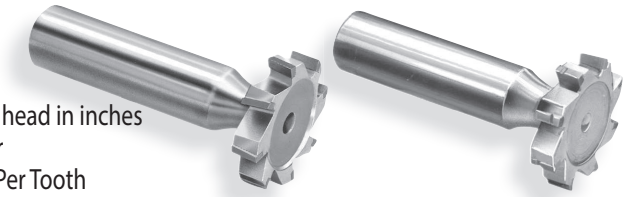
TOOL DIAM.	DIMENSIONS					NO. OF TEETH	TYPE 536 FOR NON-FERROUS		NO. OF TEETH	TYPE 537 FOR CAST IRONS		NO. OF TEETH	TYPE 538 FOR STEELS	
	SHANK DIAM.	TOOL WIDTH	CARBIDE DEPTH	LENGTH CAR-BIDE	LENGTH OVER-ALL		EDP NO.	PRICE		EDP NO.	PRICE		EDP NO.	PRICE
1 ½	¾	¾	¼	½	2 ⅞	4	53624	$159.95	4	53724	159.95	4	53824	$164.60
2	¾	¾	¼	½	2 ⅞	4	53632	195.55	4	53732	195.55	4	53832	200.15
2 ½	¾	¾	¼	½	2 ⅞	6	53640	220.20	6	53740	220.20	6	53840	226.10
3 ½	1 ¼	1 ⅛	5⁄16	⅝	4	6	53656	380.00	6	53756	380.00	8	53856	393.05
3 ½	1 ½	1 ⅛	5⁄16	⅝	4	6	53657	399.05	6	53757	399.05	8	53857	412.65
4	1 ½	1 ½	⅜	¾	5	8	53664	427.00	8	53764	427.00	8	53864	427.50

FEEDS & SPEEDS - KEYSEAT CUTTERS CARBIDE TIPPED

Speeds & feeds are starting recommendations only. Factors such as machine, fixture and tooling rigidity, horsepower available, coolant application and others will affect the performance significantly. Please read machine operators instructions and use all safety shields and glasses before performing these operations. **Use this chart for carbide tipped keyseat cutters types 700, 701, 702, and 703.**

IPM is based on catalog standards only using the mid SFPM and a 0.002 IPT chip load as a starting point. For all other conditions use the following formulas to calculate RPM and IPM from the ranges listed in the material group and brinell hardness section as a starting point.

IPM = Inches Per Minute
RPM = Rotations Per Minute
SFPM = Surface Feet Per Minute
Cutter Diameter = Diameter of the head in inches
RPM=(SFPM*3.82)/Cutter Diameter
IPM=IPT*RPM*#TeethIPT = Inches Per Tooth



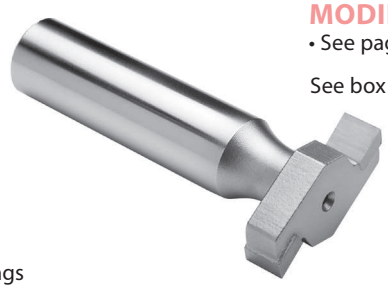
SPEEDS AND FEEDS FOR TYPE 704 ONLY:
Starting point for Aluminum slotting:
1K - 4K SFPM, .002 - .008 IPT. Reduce SFPM and IPT by 25% for widths under .0938.

CHIP CLASS	MATERIAL	BRINELL	SFPM	IPT	KEYSEAT CUTTER DIAMETER								
					½	⅝	¾	⅞	1	1 ⅛	1 ¼	1 ⅜	1 ½
					IPM	IPM	IPM	IPM	IPM	IPM	IPM	IPM	IPM
20	ALUMINUM ALLOY - WROUGHT	30-150 (500kg)	1200+	.002-.010	110	88	73	63	73	65	59	53	49
	MAGNESIUM ALLOY	50-90	1000+	.002-.010	92	73	61	52	61	54	49	44	41
	NON-METAL AND PLASTIC	–	1500+	.002-.006	138	110	92	79	92	81	73	67	61
	ZINC ALLOY - DIE CAST	80-100	750-1000	.002-.006	80	64	53	46	53	48	43	39	36
40	ALUMINUM BRONZE	40-175	200-600	.002-.006	37	29	24	21	24	22	20	18	16
	BRASS ALLOY - LEADED AND FREE CUTTING	10-100Rb	400-550	.002-.006	44	35	29	25	29	26	23	21	19
	NICKEL SILVER	10-100Rb	200-400	.002-.006	28	22	18	16	18	16	15	13	12
	COPPER ALLOY - TOUGH	40-200	200-500	.002-.006	32	26	21	18	21	19	17	16	14
60	DUCTILE CAST IRON - AUSTENITIC	120-275	75-150	.002-.004	10	8	7	6	7	6	6	5	5
	DUCTILE CAST IRON - FERRITIC	140-270	200-400	.002-.007	28	22	18	16	18	16	15	13	12
	DUCTILE CAST IRON - MARTENSITIC	270-440	150-350	.002-.007	23	18	15	13	15	14	12	11	10
	GRAY - PEARLITIC	220-320	150-300	.002-.007	21	17	14	12	14	12	11	10	9
	GRAY - FERRITIC	110-240	220-410	.002-.006	29	23	19	17	19	17	15	14	13
	MALLEABLE CAST IRON - MARTENSITIC	200-320	130-300	.002-.004	20	16	13	11	13	12	11	10	9
80	LOW AND MEDIUM CARBON STEEL - FREE MACHINING	100-250	200-500	.001-.005	32	26	21	18	21	19	17	16	14
	LOW AND MEDIUM CARBON STEEL - WROUGHT	100-375	200-400	.001-.005	28	22	18	16	18	16	15	13	12
100	LOW AND MEDIUM CARBON ALLOY STEEL - FREE MACHINING	100-275	200-400	.001-.005	28	22	18	16	18	16	15	13	12
	LOW AND MEDIUM CARBON ALLOY STEEL	85-375	130-330	.001-.005	21	17	14	12	14	12	11	10	9
	STAINLESS STEEL - 400 SERIES	135-325	135-375	.002-.005	24	19	16	14	16	14	13	12	11
	STAINLESS STEEL - 400 SERIES FREE MACHINING	135-275	250-500	.002-.005	34	28	23	20	23	20	18	17	15
120	HIGH STRENGTH STEEL - WROUGHT & TOOL STEEL	175-400	75-200	.001-.004	13	28	23	20	23	20	18	17	15
140	HIGH TEMP ALLOYS NICKEL & IRON BASE ALLOY	140-300	50-150	.001-.004	9	7	6	5	6	5	5	4	4
	STAINLESS STEEL - 300 SERIES	135-375	75-175	.001-.004	11	9	8	7	8	7	6	6	5
	STAINLESS STEEL - PH SERIES	150-440	75-175	.001-.004	11	9	8	7	8	7	6	6	5
	TITANIUM ALLOY	110-380	75-200	.002-.006	13	10	8	7	8	7	7	6	6

KEYSEAT CUTTERS
CHIP CLASS 20, 40 - CARBIDE TIPPED TYPE 704 FRACTIONAL

MATERIAL SPECIFIC

HIGH PERFORMANCE



MODIFICATIONS (Prompt delivery)
• See page 178

See box on page 176 for speeds and feeds

*TOOL DIAM.	SHANK DIAM.
Up to 1 ½"	½"
1 ¾" to 2 ½"	¾"

TYPE 704 - HIGH PERFORMANCE - FOR ALUMINUM
- Carbide tips brazed to tough hardened alloy steel body
- Face width tolerance: plus .0005", minus .0005"
- Tool diameter tolerance: plus .015", plus .020"

USE:
- Specifically designed for use in aluminum and non-ferrous materials
- High volume flute capacity for milling, slotting, grooving, snap & O-rings

AMERICAN STANDARD NO.	TOOL DIAM.	DIMENSIONS				TYPE 704 EDP NO.	PRICE EACH	MODIFIED FACE WIDTH RANGE
		FACE WIDTH	NECK DIAM.	OVER-ALL LEN.	NO. OF TEETH			
-	5/8	1/16	.160	2 1/16	2	7042002	$112.45	.0575 - .0787
305	5/8	3/32	.191	2 3/32	2	7040305	112.45	.0788 - .1099
405	5/8	1/8	.223	2 1/8	2	7040405	112.45	.1100 - .1400
505	5/8	5/32	.252	2 5/32	2	7040505	112.45	.1401 - .1713
605	5/8	3/16	.279	2 3/16	2	7040605	112.45	.1714 - .2025
-	5/8	7/32	.342	2 7/32	2	7042007	112.45	.2026 - .2339
-	5/8	1/4	.342	2 1/4	2	7042008	112.45	.2340 - .2650
-	3/4	1/16	.160	2 1/16	2	7042402	118.10	.0575 - .0787
-	3/4	3/32	.191	2 3/32	2	7042403	118.10	.0788 - .1099
406	3/4	1/8	.217	2 1/8	2	7040406	118.10	.1100 - .1400
506	3/4	5/32	.246	2 5/32	2	7040506	118.10	.1401 - .1713
606	3/4	3/16	.279	2 3/16	2	7040606	118.10	.1714 - .2025
-	3/4	7/32	.342	2 7/32	2	7042407	118.10	.2026 - .2339
806	3/4	1/4	.342	2 1/4	2	7040806	118.10	.2340 - .2650
-	7/8	1/16	.160	2 1/16	2	7042802	126.55	.0575 - .0787
-	7/8	3/32	.191	2 3/32	2	7042803	126.55	.0788 - .1099
-	7/8	1/8	.217	2 1/8	2	7042804	126.55	.1100 - .1400
507	7/8	5/32	.246	2 5/32	2	7040507	126.55	.1401 - .1713
607	7/8	3/16	.279	2 3/16	2	7040607	126.55	.1714 - .2025
707	7/8	7/32	.312	2 7/32	2	7040707	126.55	.2026 - .2339
807	7/8	1/4	.342	2 1/4	2	7040807	126.55	.2340 - .2650
-	1	3/32	.191	2 3/32	2	7043203	133.55	.0788 - .1088
-	1	1/8	.217	2 1/8	2	7043204	133.55	.1089 - .1400
-	1	5/32	.246	2 5/32	2	7043205	133.55	.1401 - .1713
608	1	3/16	.279	2 3/16	2	7040608	133.55	.1714 - .2025
708	1	7/32	.312	2 7/32	2	7040708	133.55	.2026 - .2339
808	1	1/4	.342	2 1/4	2	7040808	133.55	.2340 - .2650
-	1	9/32	.401	2 9/32	2	7043209	133.55	.2651 - .2968
1008	1	5/16	.401	2 5/16	2	7041008	133.55	.2969 - .3281
-	1	11/32	.467	2 11/32	2	7043211	133.55	.3282 - .3593
1208	1	3/8	.467	2 3/8	2	7041208	133.55	.3594 - .3900
-	1 1/8	3/32	.217	2 3/32	2	7043603	133.55	.0788 - .1088
-	1 1/8	1/8	.246	2 1/8	2	7043604	133.55	.1089 - .1400
-	1 1/8	5/32	.279	2 5/32	2	7043605	133.55	.1401 - .1713
609	1 1/8	3/16	.312	2 3/16	2	7040609	133.55	.1714 - .2025
709	1 1/8	7/32	.342	2 7/32	2	7040709	133.55	.2026 - .2339
809	1 1/8	1/4	.374	2 1/4	2	7040809	133.55	.2340 - .2650
-	1 1/8	9/32	.435	2 9/32	2	7043609	133.55	.2651 - .2968
1009	1 1/8	5/16	.435	2 5/16	2	7041009	133.55	.2969 - .3281
-	1 1/8	11/32	.467	2 11/32	2	7043611	133.55	.3282 - .3593
-	1 1/8	3/8	.467	2 3/8	2	7043612	133.55	.3594 - .3900
-	1 1/4	3/32	.217	2 3/32	3	7044003	140.55	.0788 - .1088
-	1 1/4	1/8	.246	2 1/8	3	7044004	140.55	.1089 - .1400
-	1 1/4	5/32	.279	2 5/32	3	7044005	140.55	.1401 - .1713
610	1 1/4	3/16	.312	2 3/16	3	7040610	140.55	.1714 - .2025
710	1 1/4	7/32	.342	2 7/32	3	7040710	140.55	.2026 - .2339
810	1 1/4	1/4	.374	2 1/4	3	7040810	140.55	.2340 - .2650
-	1 1/4	9/32	.435	2 9/32	3	7044009	140.55	.2651 - .2968
1010	1 1/4	5/16	.435	2 5/16	3	7041010	140.55	.2969 - .3281
-	1 1/4	11/32	.467	2 11/32	3	7044011	140.55	.3282 - .3593
1210	1 1/4	3/8	.467	2 3/8	3	7041210	140.55	.3594 - .3900

AMERICAN STANDARD NO.	TOOL DIAM.	DIMENSIONS				TYPE 704 EDP NO.	PRICE EACH	MODIFIED FACE WIDTH RANGE
		FACE WIDTH	NECK DIAM.	OVER-ALL LEN.	NO. OF TEETH			
-	1 3/8	3/32	.312	2 3/32	3	7044403	$154.60	.0788 - .1088
-	1 3/8	1/8	.342	2 1/8	3	7044404	154.60	.1089 - .1400
-	1 3/8	5/32	.374	2 5/32	3	7044405	154.60	.1401 - .1713
-	1 3/8	3/16	.401	2 3/16	3	7044406	154.60	.1714 - .2025
-	1 3/8	7/32	.401	2 7/32	3	7044407	154.60	.2026 - .2339
811	1 3/8	1/4	.401	2 1/4	3	7040811	154.60	.2340 - .2650
-	1 3/8	9/32	.467	2 9/32	3	7044409	154.60	.2651 - .2968
1011	1 3/8	5/16	.467	2 5/16	3	7041011	154.60	.2969 - .3281
-	1 3/8	11/32	.467	2 11/32	3	7044411	154.60	.3282 - .3593
1211	1 3/8	3/8	.467	2 3/8	3	7041211	154.60	.3594 - .3900
-	1 1/2	3/32	.435	2 3/32	3	7044803	175.75	.0788 - .1088
-	1 1/2	1/8	.435	2 1/8	3	7044804	175.75	.1089 - .1400
-	1 1/2	5/32	.435	2 5/32	3	7044805	175.75	.1401 - .1713
-	1 1/2	3/16	.435	2 3/16	3	7044806	175.75	.1714 - .2025
-	1 1/2	7/32	.435	2 7/32	3	7044807	175.75	.2026 - .2339
812	1 1/2	1/4	.435	2 1/4	3	7040812	175.75	.2340 - .2650
-	1 1/2	9/32	.467	2 9/32	3	7044809	175.75	.2651 - .2968
1012	1 1/2	5/16	.467	2 5/16	3	7041012	175.75	.2969 - .3281
-	1 1/2	11/32	.467	2 11/32	3	7044811	175.75	.3282 - .3593
1212	1 1/2	3/8	.467	2 3/8	3	7041212	210.85	.3594 - .3900
-	1 1/2	13/32	.467	2 13/32	3	7044813	210.85	.3901 - .4219
-	1 1/2	7/16	.467	2 7/16	3	7044814	210.85	.4220 - .4531
-	1 1/2	15/32	.467	2 15/32	3	7044815	210.85	.4532 - .4843
-	1 1/2	1/2	.467	2 1/2	3	7044816	210.85	.4844 - .5150
-	1 3/4	1/8	.718	3 1/8	4	7045604	194.00	.1089 - .1400
-	1 3/4	5/32	.718	3 5/32	4	7045605	194.00	.1401 - .1713
-	1 3/4	3/16	.718	3 3/16	4	7045606	194.00	.1714 - .2025
-	1 3/4	7/32	.718	3 7/32	4	7045607	194.00	.2026 - .2339
-	1 3/4	1/4	.718	3 1/4	4	7045608	194.00	.2340 - .2650
-	1 3/4	9/32	.718	3 9/32	4	7045609	194.00	.2651 - .2968
-	1 3/4	5/16	.718	3 5/16	4	7045610	194.00	.2969 - .3281
-	1 3/4	11/32	.718	3 11/32	4	7045611	194.00	.3282 - .3593
-	1 3/4	3/8	.718	3 3/8	4	7045612	227.80	.3594 - .3900
-	1 3/4	13/32	.718	3 13/32	4	7045613	227.80	.3901 - .4219
-	1 3/4	7/16	.718	3 7/16	4	7045614	227.80	.4220 - .4531
-	1 3/4	15/32	.718	3 15/32	4	7045615	227.80	.4532 - .4843
-	1 3/4	1/2	.718	3 1/2	4	7045616	227.80	.4844 - .5150
-	2	1/8	.718	3 1/8	4	7046404	224.90	.1089 - .1400
-	2	5/32	.718	3 5/32	4	7046405	224.90	.1401 - .1713
-	2	3/16	.718	3 3/16	4	7046406	224.90	.1714 - .2025
-	2	7/32	.718	3 7/32	4	7046407	224.90	.2026 - .2339
-	2	1/4	.718	3 1/4	4	7046408	224.90	.2340 - .2650
-	2	9/32	.718	3 9/32	4	7046409	224.90	.2651 - .2968
-	2	5/16	.718	3 5/16	4	7046410	224.90	.2969 - .3281
-	2	11/32	.718	3 11/32	4	7046411	224.90	.3282 - .3593
-	2	3/8	.718	3 3/8	4	7046412	260.10	.3594 - .3900
-	2	13/32	.718	3 13/32	4	7046413	260.10	.3901 - .4219
-	2	7/16	.718	3 7/16	4	7046414	260.10	.4220 - .4531
-	2	15/32	.718	3 15/32	4	7046415	260.10	.4532 - .4843
-	2	1/2	.718	3 1/2	4	7046416	260.10	.4844 - .5150
-	-	-	-	-	-	-	-	-

*Contact Hannibal for price and availability on tool diameters greater than 2"

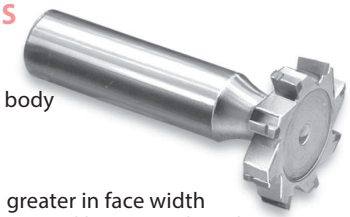
CUTTERS

KEYSEAT CUTTERS
CHIP CLASS 20, 40, 60, 140 - CARBIDE TIPPED TYPE 700

MATERIAL SPECIFIC

STRAIGHT TOOTH
FOR NON-FERROUS & CAST IRONS

TYPE 700 - FOR NON-FERROUS MATERIALS AND CAST IRONS



- Woodruff type
- Carbide tips brazed to tough hardened alloy steel body
- Straight shank: ½" diameter, 2" long
- Tool diameter tolerance: plus .020", plus .015"
- Face width tolerance: plus .0000", minus .0005"
- Chip breakers on all straight tooth cutters 5⁄32" and greater in face width
- Tool geometry and carbide grade appropriate for material being machined
- Decimal size cutters DO NOT have chip breakers

MODIFICATIONS (Prompt delivery)

- Modified tool diameter
- Metric tool diameter
- Modified face width
- Metric face width
- Reduced neck diameter
- Shank drive flat(s)
- Coatings available:
  - TITANIUM NITRIDE – TiN
  - TITANIUM CARBONITRIDE – TiCN
  - ZIRCONIUM NITRIDE – ZrN
  - AL TITANIUM NITRIDE – AlTiN
- Corner chamfer or corner radius on one or both sides
- Shortened shank or reduced shank diameter

AMERICAN STANDARD NO.	TOOL DIAM.	DIMENSIONS				TYPE 700 FOR N-F/CI EDP NO.	PRICE EACH	FINISHED TO MODIFIED FACE WIDTH						
		FACE WIDTH	NECK DIAM.	OVERALL LENGTH	NO. OF TEETH			MODIFIED FACE WIDTH RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
									1	2	3	4	5-7	8-14*
204	½	1⁄16	.130	2 1⁄16	6	7000204	$91.75	.0575 - .0787	$123.55	$109.80	$105.25	$103.05	$100.70	$98.80
304	½	3⁄32	.160	2 3⁄32	6	7000304	91.75	.0788 - .1088	123.55	109.80	105.25	103.05	100.70	98.80
404	½	⅛	.191	2 ⅛	6	7000404	91.75	.1089 - .1400	123.55	109.80	105.25	103.05	100.70	98.80
305	⅝	3⁄32	.191	2 3⁄32	6	7000305	95.05	.0788 - .1088	127.00	113.25	108.65	106.40	104.10	102.25
405	⅝	⅛	.223	2 ⅛	6	7000405	95.05	.1089 - .1400	127.00	113.25	108.65	106.40	104.10	102.25
505	⅝	5⁄32	.252	2 5⁄32	6	7000505	95.05	.1401 - .1713	127.00	113.25	108.65	106.40	104.10	102.25
605	⅝	3⁄16	.279	2 3⁄16	6	7000605	95.05	.1714 - .2025	127.00	113.25	108.65	106.40	104.10	102.25
406	¾	⅛	.217	2 ⅛	6	7000406	99.20	.1100 - .1400	131.35	117.65	113.00	110.80	108.50	106.60
506	¾	5⁄32	.246	2 5⁄32	6	7000506	99.20	.1401 - .1713	131.35	117.65	113.00	110.80	108.50	106.60
606	¾	3⁄16	.279	2 3⁄16	6	7000606	99.20	.1714 - .2025	131.35	117.65	113.00	110.80	108.50	106.60
-	¾	7⁄32	.342	2 7⁄32	6	7002407	108.65	.2026 - .2339	131.35	117.65	113.00	110.80	108.50	106.60
806	¾	¼	.342	2 ¼	6	7000806	99.20	.2340 - .2650	131.35	117.65	113.00	110.80	108.50	106.60
507	⅞	5⁄32	.246	2 5⁄32	6	7000507	103.90	.1401 - .1713	136.25	122.55	117.90	115.75	113.40	111.50
607	⅞	3⁄16	.279	2 3⁄16	6	7000607	103.90	.1714 - .2025	136.25	122.55	117.90	115.75	113.40	111.50
707	⅞	7⁄32	.312	2 7⁄32	6	7000707	103.90	.2026 - .2339	136.25	122.55	117.90	115.75	113.40	111.50
807	⅞	¼	.342	2 ¼	6	7000807	103.90	.2340 - .2650	136.25	122.55	117.90	115.75	113.40	111.50
608	1	3⁄16	.279	2 3⁄16	8	7000608	117.20	.1714 - .2025	150.20	136.50	131.85	129.65	127.30	125.45
708	1	7⁄32	.312	2 7⁄32	8	7000708	117.20	.2026 - .2339	150.20	136.50	131.85	129.65	127.30	125.45
808	1	¼	.342	2 ¼	8	7000808	117.20	.2340 - .2650	150.20	136.50	131.85	129.65	127.30	125.45
-	1	9⁄32	.401	2 9⁄32	8	7003209	128.35	.2651 - .2968	150.20	136.50	131.85	129.65	127.30	125.45
1008	1	5⁄16	.401	2 5⁄16	8	7001008	117.20	.2969 - .3281	150.20	136.50	131.85	129.65	127.30	125.45
-	1	11⁄32	.467	2 11⁄32	8	7003211	128.35	.3282 - .3593	150.20	136.50	131.85	129.65	127.30	125.45
1208	1	⅜	.467	2 ⅜	8	7001208	117.20	.3594 - .3900	150.20	136.50	131.85	129.65	127.30	125.45
609	1 ⅛	3⁄16	.312	2 3⁄16	8	7000609	123.10	.1714 - .2025	156.35	142.70	138.05	135.85	133.50	131.65
709	1 ⅛	7⁄32	.342	2 7⁄32	8	7000709	123.10	.2026 - .2339	156.35	142.70	138.05	135.85	133.50	131.65
809	1 ⅛	¼	.374	2 ¼	8	7000809	123.10	.2340 - .2650	156.35	142.70	138.05	135.85	133.50	131.65
-	1 ⅛	9⁄32	.435	2 9⁄32	8	7003609	134.85	.2651 - .2968	156.35	142.70	138.05	135.85	133.50	131.65
1009	1 ⅛	5⁄16	.435	2 5⁄16	8	7001009	123.10	.2969 - .3281	156.35	142.70	138.05	135.85	133.50	131.65
610	1 ¼	3⁄16	.312	2 3⁄16	8	7000610	129.25	.1714 - .2025	162.80	149.15	144.50	142.30	139.95	138.05
710	1 ¼	7⁄32	.342	2 7⁄32	8	7000710	129.25	.2026 - .2339	162.80	149.15	144.50	142.30	139.95	138.05
810	1 ¼	¼	.374	2 ¼	8	7000810	129.25	.2340 - .2650	162.80	149.15	144.50	142.30	139.95	138.05
-	1 ¼	9⁄32	.435	2 9⁄32	8	7004009	141.55	.2651 - .2968	162.80	149.15	144.50	142.30	139.95	138.05
1010	1 ¼	5⁄16	.435	2 5⁄16	8	7001010	129.25	.2969 - .3281	162.80	149.15	144.50	142.30	139.95	138.05
-	1 ¼	11⁄32	.467	2 11⁄32	8	7004011	141.55	.3282 - .3593	162.80	149.15	144.50	142.30	139.95	138.05
1210	1 ¼	⅜	.467	2 ⅜	8	7001210	129.25	.3594 - .3900	162.80	149.15	144.50	142.30	139.95	138.05
811	1 ⅜	¼	.401	2 ¼	8	7000811	135.80	.2340 - .2650	169.65	155.95	151.35	149.15	146.80	144.95
-	1 ⅜	9⁄32	.467	2 9⁄32	8	7004409	148.70	.2651 - .2968	169.65	155.95	151.35	149.15	146.80	144.95
1011	1 ⅜	5⁄16	.467	2 5⁄16	8	7001011	135.80	.2969 - .3281	169.65	155.95	151.35	149.15	146.80	144.95
-	1 ⅜	11⁄32	.467	2 11⁄32	8	7004411	148.70	.3282 - .3593	169.65	155.95	151.35	149.15	146.80	144.95
1211	1 ⅜	⅜	.467	2 ⅜	8	7001211	135.80	.3594 - .3900	169.65	155.95	151.35	149.15	146.80	144.95
812	1 ½	¼	.435	2 ¼	8	7000812	142.55	.2340 - .2650	176.75	163.10	158.45	156.25	153.90	152.05
-	1 ½	9⁄32	.467	2 9⁄32	8	7004809	156.15	.2651 - .2968	176.75	163.10	158.45	156.25	153.90	152.05
1012	1 ½	5⁄16	.467	2 5⁄16	8	7001012	142.55	.2969 - .3281	176.75	163.10	158.45	156.25	153.90	152.05
-	1 ½	11⁄32	.467	2 11⁄32	8	7004811	156.15	.3282 - .3593	176.75	163.10	158.45	156.25	153.90	152.05
1212	1 ½	⅜	.467	2 ⅜	8	7001212	142.55	.3594 - .3900	176.75	163.10	158.45	156.25	153.90	152.05
-	1 ½	13⁄32	.467	2 13⁄32	8	7004813	156.15	.3901 - .4219	176.75	163.10	158.45	156.25	153.90	152.05
-	1 ½	7⁄16	.467	2 7⁄16	8	7004814	156.15	.4220 - .4531	176.75	163.10	158.45	156.25	153.90	152.05
-	1 ½	15⁄32	.467	2 15⁄32	8	7004815	156.15	.4532 - .4843	176.75	163.10	158.45	156.25	153.90	152.05
-	1 ½	½	.467	2 ½	8	7004816	156.15	.4844 - .5150	176.75	163.10	158.45	156.25	153.90	152.05

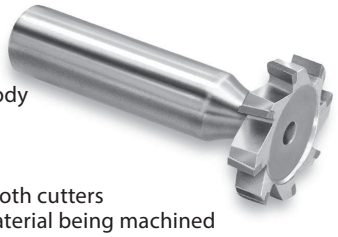
*Quantities of 15 or more - price of fractional size in same size range

KEYSEAT CUTTERS
CHIP CLASS 20, 40, 60, 140 - CARBIDE TIPPED TYPE 701

MATERIAL SPECIFIC

STAGGERED TOOTH FOR NON-FERROUS & CAST IRONS

TYPE 701 - FOR NON-FERROUS MATERIALS AND CAST IRONS



- Woodruff type
- Carbide tips brazed to tough hardened alloy steel body
- Straight shank: ½" diameter, 2" long
- Tool diameter tolerance: plus .020", plus .015"
- Face width tolerance: plus .0000", minus .0005"
- Alternate right and left axial rake on all staggered tooth cutters
- Tool geometry and carbide grade appropriate for material being machined

MODIFICATIONS (Prompt delivery)

- Modified tool diameter
- Metric tool diameter
- Modified face width
- Metric face width
- Reduced neck diameter
- Shank drive flat(s)
- Coatings available:
- Corner chamfer or corner radius on one or both sides
- Shortened shank or reduced shank diameter

TITANIUM NITRIDE – TiN
TITANIUM CARBONITRIDE – TiCN
ZIRCONIUM NITRIDE – ZrN
AL TITANIUM NITRIDE – AlTiN

AMERICAN STANDARD NO.	TOOL DIAM.	DIMENSIONS				TYPE 701 FOR N-F/CI EDP NO.	PRICE EACH	FINISHED TO MODIFIED FACE WIDTH						
		FACE WIDTH	NECK DIAM.	OVERALL LENGTH	NO. OF TEETH			MODIFIED FACE WIDTH RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
									1	2	3	4	5-7	8-14*
204	½	1/16	.130	2 1/16	6	7010204	$107.95	.0575 - .0787	$140.50	$126.80	$122.15	$120.00	$117.65	$115.75
304	½	3/32	.160	2 3/32	6	7010304	107.95	.0788 - .1088	140.50	126.80	122.15	120.00	117.65	115.75
404	½	⅛	.191	2 ⅛	6	7010404	107.95	.1089 - .1400	140.50	126.80	122.15	120.00	117.65	115.75
305	⅝	3/32	.191	2 3/32	6	7010305	111.80	.0788 - .1088	144.55	130.85	126.25	124.00	121.70	119.80
405	⅝	⅛	.223	2 ⅛	6	7010405	111.80	.1089 - .1400	144.55	130.85	126.25	124.00	121.70	119.80
505	⅝	5/32	.252	2 5/32	6	7010505	111.80	.1401 - .1713	144.55	130.85	126.25	124.00	121.70	119.80
605	⅝	3/16	.279	2 3/16	6	7010605	111.80	.1714 - .2025	144.55	130.85	126.25	124.00	121.70	119.80
406	¾	⅛	.217	2 ⅛	6	7010406	116.80	.1100 - .1400	149.80	136.10	131.45	129.25	126.95	125.10
506	¾	5/32	.246	2 5/32	6	7010506	116.80	.1401 - .1713	149.80	136.10	131.45	129.25	126.95	125.10
606	¾	3/16	.279	2 3/16	6	7010606	116.80	.1714 - .2025	149.80	136.10	131.45	129.25	126.95	125.10
-	¾	7/32	.342	2 7/32	6	7012407	127.95	.2026 - .2339	149.80	136.10	131.45	129.25	126.95	125.10
806	¾	¼	.342	2 ¼	6	7010806	116.80	.2340 - .2650	149.80	136.10	131.45	129.25	126.95	125.10
507	⅞	5/32	.246	2 5/32	6	7010507	122.15	.1401 - .1713	155.40	141.65	137.05	134.85	132.50	130.65
607	⅞	3/16	.279	2 3/16	6	7010607	122.15	.1714 - .2025	155.40	141.65	137.05	134.85	132.50	130.65
707	⅞	7/32	.312	2 7/32	6	7010707	122.15	.2026 - .2339	155.40	141.65	137.05	134.85	132.50	130.65
807	⅞	¼	.342	2 ¼	6	7010807	122.15	.2340 - .2650	155.40	141.65	137.05	134.85	132.50	130.65
608	1	3/16	.279	2 3/16	8	7010608	137.85	.1714 - .2025	171.85	158.10	153.50	151.25	148.95	147.10
708	1	7/32	.312	2 7/32	8	7010708	137.85	.2026 - .2339	171.85	158.10	153.50	151.25	148.95	147.10
808	1	¼	.342	2 ¼	8	7010808	137.85	.2340 - .2650	171.85	158.10	153.50	151.25	148.95	147.10
-	1	9/32	.401	2 9/32	8	7013209	151.00	.2651 - .2968	171.85	158.10	153.50	151.25	148.95	147.10
1008	1	5/16	.401	2 5/16	8	7011008	137.85	.2969 - .3281	171.85	158.10	153.50	151.25	148.95	147.10
-	1	11/32	.467	2 11/32	8	7013211	151.00	.3282 - .3593	171.85	158.10	153.50	151.25	148.95	147.10
1208	1	⅜	.467	2 ⅜	8	7011208	137.85	.3594 - .3900	171.85	158.10	153.50	151.25	148.95	147.10
609	1 ⅛	3/16	.312	2 3/16	8	7010609	144.70	.1714 - .2025	179.00	165.25	160.65	158.45	156.15	154.25
709	1 ⅛	7/32	.342	2 7/32	8	7010709	144.70	.2026 - .2339	179.00	165.25	160.65	158.45	156.15	154.25
809	1 ⅛	¼	.374	2 ¼	8	7010809	144.70	.2340 - .2650	179.00	165.25	160.65	158.45	156.15	154.25
-	1 ⅛	9/32	.435	2 9/32	8	7013609	158.45	.2651 - .2968	179.00	165.25	160.65	158.45	156.15	154.25
1009	1 ⅛	5/16	.435	2 5/16	8	7011009	144.70	.2969 - .3281	179.00	165.25	160.65	158.45	156.15	154.25
610	1 ¼	3/16	.312	2 3/16	8	7010610	152.00	.1714 - .2025	186.60	172.90	168.30	166.05	163.70	161.85
710	1 ¼	7/32	.342	2 7/32	8	7010710	152.00	.2026 - .2339	186.60	172.90	168.30	166.05	163.70	161.85
810	1 ¼	¼	.374	2 ¼	8	7010810	152.00	.2340 - .2650	186.60	172.90	168.30	166.05	163.70	161.85
-	1 ¼	9/32	.435	2 9/32	8	7014009	166.45	.2651 - .2968	186.60	172.90	168.30	166.05	163.70	161.85
1010	1 ¼	5/16	.435	2 5/16	8	7011010	152.00	.2969 - .3281	186.60	172.90	168.30	166.05	163.70	161.85
-	1 ¼	11/32	.467	2 11/32	8	7014011	166.45	.3282 - .3593	186.60	172.90	168.30	166.05	163.70	161.85
1210	1 ¼	⅜	.467	2 ⅜	8	7011210	152.00	.3594 - .3900	186.60	172.90	168.30	166.05	163.70	161.85
811	1 ⅜	¼	.401	2 ¼	8	7010811	159.65	.2340 - .2650	194.65	181.00	176.40	174.15	171.85	169.90
-	1 ⅜	9/32	.467	2 9/32	8	7014409	174.85	.2651 - .2968	194.65	181.00	176.40	174.15	171.85	169.90
1011	1 ⅜	5/16	.467	2 5/16	8	7011011	159.65	.2969 - .3281	194.65	181.00	176.40	174.15	171.85	169.90
-	1 ⅜	11/32	.467	2 11/32	8	7014411	174.85	.3282 - .3593	194.65	181.00	176.40	174.15	171.85	169.90
1211	1 ⅜	⅜	.467	2 ⅜	8	7011211	159.65	.3594 - .3900	194.65	181.00	176.40	174.15	171.85	169.90
812	1 ½	¼	.435	2 ¼	8	7010812	167.70	.2340 - .2650	203.05	189.35	184.70	182.55	180.20	178.30
-	1 ½	9/32	.467	2 9/32	8	7014809	183.65	.2651 - .2968	203.05	189.35	184.70	182.55	180.20	178.30
1012	1 ½	5/16	.467	2 5/16	8	7011012	167.70	.2969 - .3281	203.05	189.35	184.70	182.55	180.20	178.30
-	1 ½	11/32	.467	2 11/32	8	7014811	183.65	.3282 - .3593	203.05	189.35	184.70	182.55	180.20	178.30
1212	1 ½	⅜	.467	2 ⅜	8	7011212	167.70	.3594 - .3900	203.05	189.35	184.70	182.55	180.20	178.30
-	1 ½	13/32	.467	2 13/32	8	7014813	183.65	.3901 - .4219	203.05	189.35	184.70	182.55	180.20	178.30
-	1 ½	7/16	.467	2 7/16	8	7014814	183.65	.4220 - .4531	203.05	189.35	184.70	182.55	180.20	178.30
-	1 ½	15/32	.467	2 15/32	8	7014815	183.65	.4532 - .4843	203.05	189.35	184.70	182.55	180.20	178.30
-	1 ½	½	.467	2 ½	8	7014816	183.65	.4844 - .5150	203.05	189.35	184.70	182.55	180.20	178.30

*Quantities of 15 or more - price of fractional size in same size range

KEYSEAT CUTTERS
CHIP CLASS 80, 100, 120 - CARBIDE TIPPED TYPE 702

MATERIAL SPECIFIC

STRAIGHT TOOTH FOR STEEL

TYPE 702 - FOR STEELS

- Woodruff type
- Carbide tips brazed to tough hardened alloy steel body
- Straight shank: ½" diameter, 2" long
- Tool diameter tolerance: plus .020", plus .015"
- Face width tolerance: plus .0000", minus .0005"
- Chip breakers on all straight tooth cutters 5⁄32" and greater in face width
- Tool geometry and carbide grade appropriate for material being machined
- Decimal size cutters DO NOT have chip breakers

MODIFICATIONS (Prompt delivery)

- Modified tool diameter
- Metric tool diameter
- Modified face width
- Metric face width
- Reduced neck diameter
- Shank drive flat(s)
- Coatings available:
  - TITANIUM NITRIDE – TiN
  - TITANIUM CARBONITRIDE – TiCN
  - ZIRCONIUM NITRIDE – ZrN
  - AL TITANIUM NITRIDE – AlTiN
- Corner chamfer or corner radius on one or both sides
- Shortened shank or reduced shank diameter

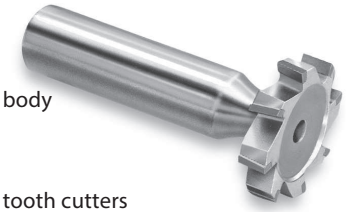
AMERICAN STANDARD NO.	TOOL DIAM.	DIMENSIONS				TYPE 702 FOR STEEL EDP NO.	PRICE EACH	FINISHED TO MODIFIED FACE WIDTH						
		FACE WIDTH	NECK DIAM.	OVERALL LENGTH	NO. OF TEETH			MODIFIED FACE WIDTH RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
									1	2	3	4	5-7	8-14*
204	½	1⁄16	.130	2 1⁄16	6	7020204	$106.00	.0575 - .0787	$139.85	$125.45	$120.60	$118.25	$115.80	$113.85
304	½	3⁄32	.160	2 3⁄32	6	7020304	106.00	.0788 - .1088	139.85	125.45	120.60	118.25	115.80	113.85
404	½	⅛	.191	2 ⅛	6	7020404	106.00	.1089 - .1400	139.85	125.45	120.60	118.25	115.80	113.85
305	⅝	3⁄32	.191	2 3⁄32	6	7020305	109.80	.0788 - .1088	143.75	129.35	124.55	122.20	119.80	117.80
405	⅝	⅛	.223	2 ⅛	6	7020405	109.80	.1089 - .1400	143.75	129.35	124.55	122.20	119.80	117.80
505	⅝	5⁄32	.252	2 5⁄32	6	7020505	109.80	.1401 - .1713	143.75	129.35	124.55	122.20	119.80	117.80
605	⅝	3⁄16	.279	2 3⁄16	6	7020605	109.80	.1714 - .2025	143.75	129.35	124.55	122.20	119.80	117.80
406	¾	⅛	.217	2 ⅛	6	7020406	114.60	.1100 - .1400	148.90	134.45	129.60	127.25	124.80	122.85
506	¾	5⁄32	.246	2 5⁄32	6	7020506	114.60	.1401 - .1713	148.90	134.45	129.60	127.25	124.80	122.85
606	¾	3⁄16	.279	2 3⁄16	6	7020606	114.60	.1714 - .2025	148.90	134.45	129.60	127.25	124.80	122.85
-	¾	7⁄32	.342	2 7⁄32	6	7022407	125.50	.2026 - .2339	148.90	134.45	129.60	127.25	124.80	122.85
806	¾	¼	.342	2 ¼	6	7020806	114.60	.2340 - .2650	148.90	134.45	129.60	127.25	124.80	122.85
507	⅞	5⁄32	.246	2 5⁄32	6	7020507	120.05	.1401 - .1713	154.50	140.10	135.25	132.90	130.50	128.45
607	⅞	3⁄16	.279	2 3⁄16	6	7020607	120.05	.1714 - .2025	154.50	140.10	135.25	132.90	130.50	128.45
707	⅞	7⁄32	.312	2 7⁄32	6	7020707	120.05	.2026 - .2339	154.50	140.10	135.25	132.90	130.50	128.45
807	⅞	¼	.342	2 ¼	6	7020807	120.05	.2340 - .2650	154.50	140.10	135.25	132.90	130.50	128.45
608	1	3⁄16	.279	2 3⁄16	8	7020608	135.40	.1714 - .2025	170.55	156.20	151.30	149.05	146.60	144.60
708	1	7⁄32	.312	2 7⁄32	8	7020708	135.40	.2026 - .2339	170.55	156.20	151.30	149.05	146.60	144.60
808	1	¼	.342	2 ¼	8	7020808	135.40	.2340 - .2650	170.55	156.20	151.30	149.05	146.60	144.60
-	1	9⁄32	.401	2 9⁄32	8	7023209	148.30	.2651 - .2968	170.55	156.20	151.30	149.05	146.60	144.60
1008	1	5⁄16	.401	2 5⁄16	8	7021008	135.40	.2969 - .3281	170.55	156.20	151.30	149.05	146.60	144.60
-	1	11⁄32	.467	2 11⁄32	8	7023211	148.30	.3282 - .3593	170.55	156.20	151.30	149.05	146.60	144.60
1208	1	⅜	.467	2 ⅜	8	7021208	135.40	.3594 - .3900	170.55	156.20	151.30	149.05	146.60	144.60
609	1 ⅛	3⁄16	.312	2 3⁄16	8	7020609	142.20	.1714 - .2025	177.75	163.35	158.45	156.20	153.75	151.75
709	1 ⅛	7⁄32	.342	2 7⁄32	8	7020709	142.20	.2026 - .2339	177.75	163.35	158.45	156.20	153.75	151.75
809	1 ⅛	¼	.374	2 ¼	8	7020809	142.20	.2340 - .2650	177.75	163.35	158.45	156.20	153.75	151.75
-	1 ⅛	9⁄32	.435	2 9⁄32	8	7023609	155.70	.2651 - .2968	177.75	163.35	158.45	156.20	153.75	151.75
1009	1 ⅛	5⁄16	.435	2 5⁄16	8	7021009	142.20	.2969 - .3281	177.75	163.35	158.45	156.20	153.75	151.75
610	1 ¼	3⁄16	.312	2 3⁄16	8	7020610	149.30	.1714 - .2025	185.20	170.75	165.95	163.60	161.15	159.20
710	1 ¼	7⁄32	.342	2 7⁄32	8	7020710	149.30	.2026 - .2339	185.20	170.75	165.95	163.60	161.15	159.20
810	1 ¼	¼	.374	2 ¼	8	7020810	149.30	.2340 - .2650	185.20	170.75	165.95	163.60	161.15	159.20
-	1 ¼	9⁄32	.435	2 9⁄32	8	7024009	163.50	.2651 - .2968	185.20	170.75	165.95	163.60	161.15	159.20
1010	1 ¼	5⁄16	.435	2 5⁄16	8	7021010	149.30	.2969 - .3281	185.20	170.75	165.95	163.60	161.15	159.20
-	1 ¼	11⁄32	.467	2 11⁄32	8	7024011	163.50	.3282 - .3593	185.20	170.75	165.95	163.60	161.15	159.20
1210	1 ¼	⅜	.467	2 ⅜	8	7021210	149.30	.3594 - .3900	185.20	170.75	165.95	163.60	161.15	159.20
811	1 ⅜	¼	.401	2 ¼	8	7020811	156.85	.2340 - .2650	193.15	178.70	173.85	171.50	169.05	167.10
-	1 ⅜	9⁄32	.467	2 9⁄32	8	7024409	171.75	.2651 - .2968	193.15	178.70	173.85	171.50	169.05	167.10
1011	1 ⅜	5⁄16	.467	2 5⁄16	8	7021011	156.85	.2969 - .3281	193.15	178.70	173.85	171.50	169.05	167.10
-	1 ⅜	11⁄32	.467	2 11⁄32	8	7024411	171.75	.3282 - .3593	193.15	178.70	173.85	171.50	169.05	167.10
1211	1 ⅜	⅜	.467	2 ⅜	8	7021211	156.85	.3594 - .3900	193.15	178.70	173.85	171.50	169.05	167.10
812	1 ½	¼	.435	2 ¼	8	7020812	164.65	.2340 - .2650	201.30	186.95	182.10	179.80	177.30	175.40
-	1 ½	9⁄32	.467	2 9⁄32	8	7024809	180.35	.2651 - .2968	201.30	186.95	182.10	179.80	177.30	175.40
1012	1 ½	5⁄16	.467	2 5⁄16	8	7021012	164.65	.2969 - .3281	201.30	186.95	182.10	179.80	177.30	175.40
-	1 ½	11⁄32	.467	2 11⁄32	8	7024811	180.35	.3282 - .3593	201.30	186.95	182.10	179.80	177.30	175.40
1212	1 ½	⅜	.467	2 ⅜	8	7021212	164.65	.3594 - .3900	201.30	186.95	182.10	179.80	177.30	175.40
-	1 ½	13⁄32	.467	2 13⁄32	8	7024813	180.35	.3901 - .4219	201.30	186.95	182.10	179.80	177.30	175.40
-	1 ½	7⁄16	.467	2 7⁄16	8	7024814	180.35	.4220 - .4531	201.30	186.95	182.10	179.80	177.30	175.40
-	1 ½	15⁄32	.467	2 15⁄32	8	7024815	180.35	.4532 - .4843	201.30	186.95	182.10	179.80	177.30	175.40
-	1 ½	½	.467	2 ½	8	7024816	180.35	.4844 - .5150	201.30	186.95	182.10	179.80	177.30	175.40

*Quantities of 15 or more - price of fractional size in same size range

KEYSEAT CUTTERS
CHIP CLASS 80, 100, 120 - CARBIDE TIPPED TYPE 703

MATERIAL SPECIFIC

STAGGERED TOOTH FOR STEEL



TYPE 703 - FOR STEELS

- Woodruff type
- Carbide tips brazed to tough hardened alloy steel body
- Straight shank: ½" diameter, 2" long
- Tool diameter tolerance: plus .020", plus .015"
- Face width tolerance: plus .0000", minus .0005"
- Alternate right and left axial rake on all staggered tooth cutters
- Tool geometry and carbide grade appropriate for material being machined

MODIFICATIONS (Prompt delivery)

- Modified tool diameter
- Metric tool diameter
- Modified face width
- Metric face width
- Reduced neck diameter
- Shank drive flat(s)
- Coatings available:
  - TITANIUM NITRIDE – TiN
  - TITANIUM CARBONITRIDE – TiCN
  - ZIRCONIUM NITRIDE – ZrN
  - AL TITANIUM NITRIDE – AlTiN
- Corner chamfer or corner radius on one or both sides
- Shortened shank or reduced shank diameter

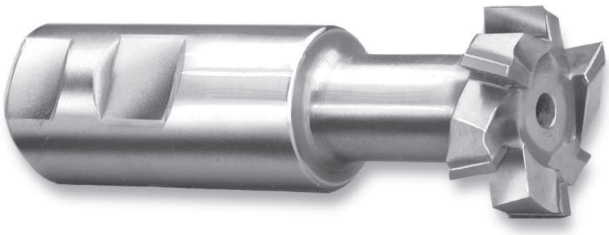
AMERICAN STANDARD NO.	TOOL DIAM.	DIMENSIONS				TYPE 703 FOR STEEL EDP NO.	PRICE EACH	FINISHED TO MODIFIED FACE WIDTH						
		FACE WIDTH	NECK DIAM.	OVERALL LENGTH	NO. OF TEETH			MODIFIED FACE WIDTH RANGE	PRICE EACH - BASED ON QUANTITY ORDERED					
									1	2	3	4	5-7	8-14*
204	½	1/16	.130	2 1/16	6	7030204	$124.70	.0575 - .0787	$159.40	$145.00	$140.20	$137.85	$135.40	$133.45
304	½	3/32	.160	2 3/32	6	7030304	124.70	.0788 - .1088	159.40	145.00	140.20	137.85	135.40	133.45
404	½	1/8	.191	2 1/8	6	7030404	124.70	.1089 - .1400	159.40	145.00	140.20	137.85	135.40	133.45
305	5/8	3/32	.191	2 3/32	6	7030305	129.10	.0788 - .1088	164.05	149.65	144.85	142.50	140.10	138.10
405	5/8	1/8	.223	2 1/8	6	7030405	129.10	.1089 - .1400	164.05	149.65	144.85	142.50	140.10	138.10
505	5/8	5/32	.252	2 5/32	6	7030505	129.10	.1401 - .1713	164.05	149.65	144.85	142.50	140.10	138.10
605	5/8	3/16	.279	2 3/16	6	7030605	129.10	.1714 - .2025	164.05	149.65	144.85	142.50	140.10	138.10
406	¾	1/8	.217	2 1/8	6	7030406	134.90	.1100 - .1400	170.15	155.75	150.95	148.60	146.10	144.15
506	¾	5/32	.246	2 5/32	6	7030506	134.90	.1401 - .1713	170.15	155.75	150.95	148.60	146.10	144.15
606	¾	3/16	.279	2 3/16	6	7030606	134.90	.1714 - .2025	170.15	155.75	150.95	148.60	146.10	144.15
-	¾	7/32	.342	2 7/32	6	7032407	147.75	.2026 - .2339	170.15	155.75	150.95	148.60	146.10	144.15
806	¾	¼	.342	2 ¼	6	7030806	134.90	.2340 - .2650	170.15	155.75	150.95	148.60	146.10	144.15
507	⅞	5/32	.246	2 5/32	6	7030507	141.15	.1401 - .1713	176.60	162.20	157.35	154.95	152.55	150.65
607	⅞	3/16	.279	2 3/16	6	7030607	141.15	.1714 - .2025	176.60	162.20	157.35	154.95	152.55	150.65
707	⅞	7/32	.312	2 7/32	6	7030707	141.15	.2026 - .2339	176.60	162.20	157.35	154.95	152.55	150.65
807	⅞	¼	.342	2 ¼	6	7030807	141.15	.2340 - .2650	176.60	162.20	157.35	154.95	152.55	150.65
608	1	3/16	.279	2 3/16	8	7030608	159.20	.1714 - .2025	195.55	181.20	176.35	174.00	171.55	169.60
708	1	7/32	.312	2 7/32	8	7030708	159.20	.2026 - .2339	195.55	181.20	176.35	174.00	171.55	169.60
808	1	¼	.342	2 ¼	8	7030808	159.20	.2340 - .2650	195.55	181.20	176.35	174.00	171.55	169.60
-	1	9/32	.401	2 9/32	8	7033209	174.40	.2651 - .2968	195.55	181.20	176.35	174.00	171.55	169.60
1008	1	5/16	.401	2 5/16	8	7031008	159.20	.2969 - .3281	195.55	181.20	176.35	174.00	171.55	169.60
-	1	11/32	.467	2 11/32	8	7033211	174.40	.3282 - .3593	195.55	181.20	176.35	174.00	171.55	169.60
1208	1	3/8	.467	2 3/8	8	7031208	159.20	.3594 - .3900	195.55	181.20	176.35	174.00	171.55	169.60
609	1 1/8	3/16	.312	2 3/16	8	7030609	167.10	.1714 - .2025	203.85	189.40	184.60	182.30	179.90	177.85
709	1 1/8	7/32	.342	2 7/32	8	7030709	167.10	.2026 - .2339	203.85	189.40	184.60	182.30	179.90	177.85
809	1 1/8	¼	.374	2 ¼	8	7030809	167.10	.2340 - .2650	203.85	189.40	184.60	182.30	179.90	177.85
-	1 1/8	9/32	.435	2 9/32	8	7033609	183.00	.2651 - .2968	203.85	189.40	184.60	182.30	179.90	177.85
1009	1 1/8	5/16	.435	2 5/16	8	7031009	167.10	.2969 - .3281	203.85	189.40	184.60	182.30	179.90	177.85
610	1 ¼	3/16	.312	2 3/16	8	7030610	175.55	.1714 - .2025	212.65	198.20	193.45	191.10	188.70	186.70
710	1 ¼	7/32	.342	2 7/32	8	7030710	175.55	.2026 - .2339	212.65	198.20	193.45	191.10	188.70	186.70
810	1 ¼	¼	.374	2 ¼	8	7030810	175.55	.2340 - .2650	212.65	198.20	193.45	191.10	188.70	186.70
-	1 ¼	9/32	.435	2 9/32	8	7034009	192.30	.2651 - .2968	212.65	198.20	193.45	191.10	188.70	186.70
1010	1 ¼	5/16	.435	2 5/16	8	7031010	175.55	.2969 - .3281	212.65	198.20	193.45	191.10	188.70	186.70
-	1 ¼	11/32	.467	2 11/32	8	7034011	192.30	.3282 - .3593	212.65	198.20	193.45	191.10	188.70	186.70
1210	1 ¼	3/8	.467	2 3/8	8	7031210	175.55	.3594 - .3900	212.65	198.20	193.45	191.10	188.70	186.70
811	1 ⅜	¼	.401	2 ¼	8	7030811	184.45	.2340 - .2650	221.95	207.65	202.70	200.45	198.00	196.00
-	1 ⅜	9/32	.467	2 9/32	8	7034409	201.95	.2651 - .2968	221.95	207.65	202.70	200.45	198.00	196.00
1011	1 ⅜	5/16	.467	2 5/16	8	7031011	184.45	.2969 - .3281	221.95	207.65	202.70	200.45	198.00	196.00
-	1 ⅜	11/32	.467	2 11/32	8	7034411	201.95	.3282 - .3593	221.95	207.65	202.70	200.45	198.00	196.00
1211	1 ⅜	3/8	.467	2 3/8	8	7031211	184.45	.3594 - .3900	221.95	207.65	202.70	200.45	198.00	196.00
812	1 ½	¼	.435	2 ¼	8	7030812	193.65	.2340 - .2650	231.65	217.25	212.40	210.10	207.65	205.70
-	1 ½	9/32	.467	2 9/32	8	7034809	212.10	.2651 - .2968	231.65	217.25	212.40	210.10	207.65	205.70
1012	1 ½	5/16	.467	2 5/16	8	7031012	193.65	.2969 - .3281	231.65	217.25	212.40	210.10	207.65	205.70
-	1 ½	11/32	.467	2 11/32	8	7034811	212.10	.3282 - .3593	231.65	217.25	212.40	210.10	207.65	205.70
1212	1 ½	3/8	.467	2 3/8	8	7031212	193.65	.3594 - .3900	231.65	217.25	212.40	210.10	207.65	205.70
-	1 ½	13/32	.467	2 13/32	8	7034813	212.10	.3901 - .4219	231.65	217.25	212.40	210.10	207.65	205.70
-	1 ½	7/16	.467	2 7/16	8	7034814	212.10	.4220 - .4531	231.65	217.25	212.40	210.10	207.65	205.70
-	1 ½	15/32	.467	2 15/32	8	7034815	212.10	.4532 - .4843	231.65	217.25	212.40	210.10	207.65	205.70
-	1 ½	½	.467	2 ½	8	7034816	212.10	.4844 - .5150	231.65	217.25	212.40	210.10	207.65	205.70

*Quantities of 15 or more - price of fractional size in same size range

CUTTERS

T-SLOT CUTTERS CARBIDE TIPPED TYPES 720 & 721 FRACTIONAL

MATERIAL SPECIFIC



TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	720
	40	NON-FERROUS - SHORT CHIPS	720
	60	CAST IRONS	720
	80	LOW STRENGTH STEELS	721
	100	MEDIUM STRENGTH STEELS	721
	120	HIGH STRENGTH STEELS	721
	140	HIGH TEMPERATURE ALLOYS	720

TYPE 720 – FOR NON-FERROUS & CAST IRONS
TYPE 721 – FOR STEELS

- Alternate right and left axial rake
- Straight shank with Weldon flats
- Tool diameter tolerance: plus .000", minus .010"
- Tool geometry & carbide grade appropriate for material being machined

MODIFICATIONS (Prompt delivery)

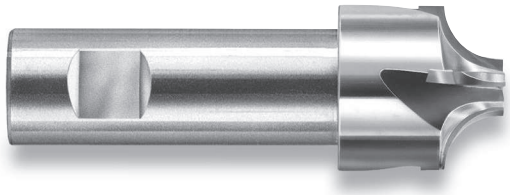
- Modified tool width
- Metric tool width
- Reduced neck diameter
- Shortened shank or reduced shank diameter
- Additional shank drive flat(s)
- Coolant outlets
- 4 coatings available (see bottom of page)

BOLT DIAM.	TOOL DIAM.	DIMENSIONS						TYPE 720 FOR NON-FERROUS/CAST IRONS		TYPE 721 FOR STEELS	
		TOOL WIDTH	SHANK DIAM.	NECK. DIAM.	LENGTH UNDERCUT	LENGTH OVERALL	NO. OF TEETH	EDP NO.	PRICE	EDP NO.	PRICE
1/4	9/16	15/64	1/2	17/64	35/64	2 19/32	6	72008	$121.55	72108	$131.25
5/16	21/32	17/64	1/2	21/64	39/64	2 11/16	6	72010	120.05	72110	129.65
3/8	25/32	21/64	3/4	13/32	55/64	3 1/4	6	72012	151.05	72112	163.20
1/2	31/32	25/64	3/4	17/32	63/64	3 7/16	6	72016	164.25	72116	177.35
5/8	1 1/4	31/64	1	21/32	1 9/64	3 15/16	6	72020	218.00	72120	235.50
3/4	1 15/32	5/8	1	25/32	1 1/2	4 7/16	6	72024	243.60	72124	263.05
1	1 27/32	53/64	1 1/4	1 1/32	1 43/64	4 13/16	8	72032	347.80	72132	375.65
1 1/4	2 7/32	1 3/32	1 1/4	1 7/32	1 31/32	5 3/8	8	72040	438.90	72140	474.05
1 1/2	2 21/32	1 11/32	1 1/4	1 17/32	2 1/8	5 29/32	8	72048	508.25	72148	548.95

CUTTERS

CORNER ROUNDING END MILLS CARBIDE TIPPED TYPES 740 & 741 FRACTIONAL

MATERIAL SPECIFIC



TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	740
	40	NON-FERROUS - SHORT CHIPS	740
	60	CAST IRONS	740
	80	LOW STRENGTH STEELS	741
	100	MEDIUM STRENGTH STEELS	741
	120	HIGH STRENGTH STEELS	741
	140	HIGH TEMPERATURE ALLOYS	740

TYPE 740 – FOR NON-FERROUS & CAST IRONS
TYPE 741 – FOR STEELS

- All sizes have 3 flutes.
- Straight shank with Weldon flats
- Tool geometry & carbide grade appropriate for material being machined

USE:

- For milling round corners on square edges

MODIFICATIONS (Prompt delivery)

- Shortened shank or reduced shank diameter
- Additional shank drive flat(s)
- Coatings available:

TITANIUM NITRIDE – TiN

TITANIUM CARBONITRIDE – TiCN

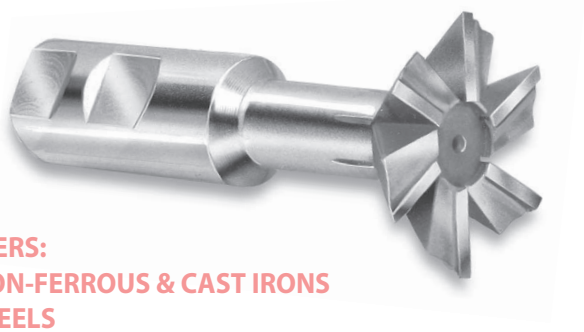
ZIRCONIUM NITRIDE – ZrN

AL TITANIUM NITRIDE – AlTiN

CIRCLE RADIUS	TOOL DIAMETER	DIMENSIONS				TYPE 740 FOR N-F/CI		TYPE 741 FOR STEELS	
		SHANK DIAM.	END DIAM.	LENGTH CAR-BIDE	LENGTH OVER-ALL	EDP NO.	PRICE	EDP NO.	PRICE
1/16	7/16	3/8	17/64	13/32	2 3/4	74002	$111.50	74102	$120.50
3/32	1/2	3/8	17/64	13/32	2 3/4	74003	111.50	74103	120.50
1/8	5/8	1/2	19/64	13/32	3	74004	115.45	74104	124.60
5/32	3/4	1/2	23/64	13/32	3	74005	122.45	74105	132.20
3/16	7/8	3/4	13/32	13/32	3 1/4	74006	129.55	74106	139.85
1/4	1	3/4	13/32	15/32	3 1/4	74008	147.65	74108	159.40
5/16	1 1/8	7/8	13/32	19/32	3 1/2	74010	151.65	74110	163.80
3/8	1 1/4	7/8	13/32	25/32	3 3/4	74012	157.55	74112	170.20
7/16	1 3/8	1	13/32	7/8	4	74014	175.45	74114	189.50
1/2	1 1/2	1	13/32	1	4	74016	195.25	74116	210.95
5/8	2	1 1/4	21/32	1 7/32	4 1/4	74020	240.30	74120	259.55

DOVETAIL CUTTERS CARBIDE TIPPED TYPES 734, 735, 736, & 737 FRACTIONAL

MATERIAL SPECIFIC



TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	734 or 736
	40	NON-FERROUS - SHORT CHIPS	734 or 736
	60	CAST IRONS	734 or 736
	80	LOW STRENGTH STEELS	735 or 737
	100	MEDIUM STRENGTH STEELS	735 or 737
	120	HIGH STRENGTH STEELS	735 or 737
	140	HIGH TEMPERATURE ALLOYS	734 or 736

45˚ DOVETAIL CUTTERS:

TYPE 734 – FOR NON-FERROUS & CAST IRONS

TYPE 735 – FOR STEELS

60˚ DOVETAIL CUTTERS:

TYPE 736 – FOR NON-FERROUS & CAST IRONS

TYPE 737 – FOR STEELS

- Right hand cut
- Straight shank with Weldon flats
- .015" - .020" corner radius
- Tool diameter tolerance: plus .015", minus .000"
- Tool geometry & carbide grade appropriate for material being machined

MODIFICATIONS (Prompt delivery)

- Reduced neck diameter
- Shortened shank or reduced shank diameter
- Additional shank drive flat(s)
- Coatings available:

TITANIUM NITRIDE – TiN

TITANIUM CARBONITRIDE – TiCN

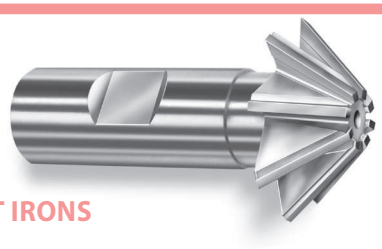
ZIRCONIUM NITRIDE – ZrN

AL TITANIUM NITRIDE – AlTiN

TOOL DIAM.	DIMENSIONS				45˚ ANGLE					60˚ ANGLE				
	SHANK DIAM.	NECK DIAM.	OVER-ALL LENGTH	NO. OF TEETH	TOOL WIDTH	TYPE 734 FOR N-F/CI		TYPE 735 FOR STEELS		TOOL WIDTH	TYPE 736 FOR N-F/CI		TYPE 737 FOR STEELS	
						EDP NO.	PRICE	EDP NO.	PRICE		EDP NO.	PRICE	EDP NO.	PRICE
½	⅜	3⁄16	2 ⅛	3	5⁄32	73416	$114.25	73516	$123.50	7⁄32	73616	$114.25	73716	$123.50
¾	⅜	¼	2 ¼	3	¼	73424	123.30	73524	133.10	¼	73624	123.30	73724	133.10
1	½	⅜	2 ½	4	5⁄16	73432	131.85	73532	142.45	⅜	73632	131.85	73732	142.45
1 ¼	⅝	½	2 ¾	4	⅜	73440	149.90	73540	161.95	½	73640	149.90	73740	161.95
1 ½	¾	½	3 ¼	4	½	73448	175.15	73548	189.20	⅝	73648	175.15	73748	189.20
2	1	¾	4 ¼	6	⅝	73464	281.45	73564	303.95	¾	73664	281.45	73764	303.95
2 ½	1 ¼	1	4 ⅜	6	¾	73480	380.60	73580	410.95	⅞	73680	380.60	73780	410.95
3	1 ¼	1	4 ½	6	1	73496	448.80	73596	484.75	1 ⅛	73696	448.80	73796	484.75

CHAMFER MILLING CUTTERS CARBIDE TIPPED TYPES 730, 731, 732, & 733 FRACTIONAL

MATERIAL SPECIFIC



TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	730 or 732
	40	NON-FERROUS - SHORT CHIPS	730 or 732
	60	CAST IRONS	730 or 732
	80	LOW STRENGTH STEELS	731 or 733
	100	MEDIUM STRENGTH STEELS	731 or 733
	120	HIGH STRENGTH STEELS	731 or 733
	140	HIGH TEMPERATURE ALLOYS	730 or 732

45° CHAMFER MILLING CUTTERS:

TYPE 730 – FOR NON-FERROUS & CAST IRONS

TYPE 731 – FOR STEELS

60° CHAMFER MILLING CUTTERS:

TYPE 732 – FOR NON-FERROUS & CAST IRONS

TYPE 733 – FOR STEELS

- Right hand cut
- Straight shank with Weldon flats
- Tool diameter tolerance: plus .015", minus .000"
- Tool geometry & carbide grade appropriate for material being machined

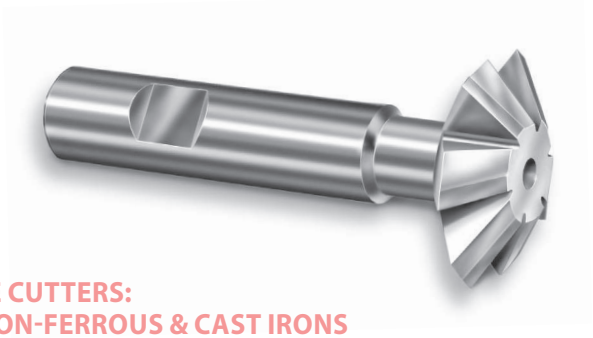
MODIFICATIONS (Prompt delivery)

- Reduced neck diameter
- Shortened shank or reduced shank diameter
- Additional shank drive flat(s)
- 4 coatings available (see top of page)

TOOL DIAM.	DIMENSIONS			45˚ ANGLE					60˚ ANGLE				
	SHANK DIAM.	OVER-ALL LENGTH	NO. OF TEETH	TOOL WIDTH	TYPE 730 FOR N-F/CI		TYPE 731 FOR STEELS		TOOL WIDTH	TYPE 732 FOR N-F/CI		TYPE 733 FOR STEELS	
					EDP NO.	PRICE	EDP NO.	PRICE		EDP NO.	PRICE	EDP NO.	PRICE
½	⅜	2 ⅛	4	⅛	73016	$148.65	73116	$163.45	7⁄32	73216	$148.65	73316	$163.45
¾	⅜	2 ⅛	6	3⁄16	73024	160.25	73124	176.20	5⁄16	73224	160.25	73324	176.20
1	½	2 ½	6	5⁄16	73032	188.00	73132	206.75	7⁄16	73232	188.00	73332	206.75
1 ½	¾	2 ¾	8	½	73048	238.25	73148	262.20	⅝	73248	238.25	73348	262.20

DOUBLE ANGLE CUTTERS CARBIDE TIPPED TYPES 746, 747, 748, & 749 FRACTIONAL

MATERIAL SPECIFIC



TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	746 or 748
	40	NON-FERROUS - SHORT CHIPS	746 or 748
	60	CAST IRONS	746 or 748
	80	LOW STRENGTH STEELS	747 or 749
	100	MEDIUM STRENGTH STEELS	747 or 749
	120	HIGH STRENGTH STEELS	747 or 749
	140	HIGH TEMPERATURE ALLOYS	746 or 748

60° DOUBLE ANGLE CUTTERS:
TYPE 746 – FOR NON-FERROUS & CAST IRONS
TYPE 747 – FOR STEELS
90° DOUBLE ANGLE CUTTERS:
TYPE 748 – FOR NON-FERROUS & CAST IRONS
TYPE 749 – FOR STEELS

- Right hand cut
- Straight shank with Weldon flats
- .010" - .020" corner radius
- Tool diameter tolerance: plus .015", minus .000"
- Tool geometry & carbide grade appropriate for material being machined

MODIFICATIONS (Prompt delivery)

- Reduced neck diameter
- Shortened shank or reduced shank diameter
- Additional shank drive flat(s)
- Coatings available:

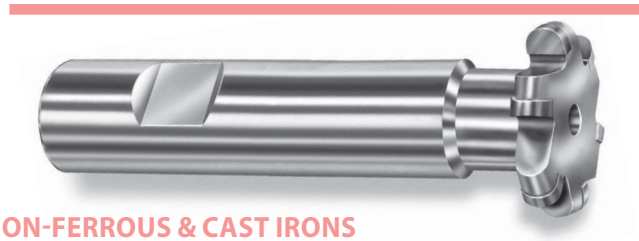
TITANIUM NITRIDE – TiN
TITANIUM CARBONITRIDE – TiCN
ZIRCONIUM NITRIDE – ZrN
AL TITANIUM NITRIDE – AlTiN

TOOL DIAMETER	DIMENSIONS		60° ANGLE						90° ANGLE					
	SHANK DIAM.	NO. OF TEETH	TOOL WIDTH	OVER-ALL LENGTH	TYPE 746 FOR N-F/CI		TYPE 747 FOR STEELS		TOOL WIDTH	OVER-ALL LENGTH	TYPE 748 FOR N-F/CI		TYPE 749 FOR STEELS	
					EDP NO.	PRICE	EDP NO.	PRICE			EDP NO.	PRICE	EDP NO.	PRICE
¾	⅜	6	3/16	2 ⅜	74624	$132.50	74724	$145.80	¼	2 ⅜	74824	$132.50	74924	$145.80
1	½	6	5/16	2 27/32	74632	156.50	74732	172.20	⅜	2 29/32	74832	156.50	74932	172.20
1 ⅜	⅝	6	7/16	3 7/32	74644	181.30	74744	199.50	½	3 9/32	74844	181.30	74944	199.50
1 ½	⅝	6	½	3 ⅜	74648	190.45	74748	209.45	9/16	3 7/16	74848	190.45	74948	209.45
1 ⅞	¾	6	⅝	3 25/32	74660	289.15	74760	318.10	⅝	3 25/32	74860	289.15	74960	318.10
2 ¼	⅞	6	¾	4 5/32	74672	391.40	74772	430.50	¾	4 5/32	74872	391.40	74972	430.50

CUTTERS

RADIUS CUTTERS CARBIDE TIPPED TYPES 718 & 719 FRACTIONAL

MATERIAL SPECIFIC



TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	718
	40	NON-FERROUS - SHORT CHIPS	718
	60	CAST IRONS	718
	80	LOW STRENGTH STEELS	719
	100	MEDIUM STRENGTH STEELS	719
	120	HIGH STRENGTH STEELS	719
	140	HIGH TEMPERATURE ALLOYS	718

RADIUS CUTTERS:
TYPE 718 – FOR NON-FERROUS & CAST IRONS
TYPE 719 – FOR STEELS

- Right hand cut; Convex radius
- Straight shank with Weldon flats
- Tool geometry & carbide grade appropriate for material being machined
- Tool diameter tolerance: plus .005", minus .000"
- Tool radius tolerance thru ⅛" radius: plus .001", minus .001"
  over ⅛" radius: plus .002", minus .002"

MODIFICATIONS (Prompt delivery)

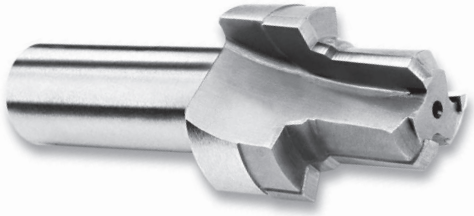
- Reduced neck diameter
- Shortened shank or reduced shank diameter
- Additional shank drive flat(s)
- Coatings available:

TITANIUM NITRIDE – TiN
TITANIUM CARBONITRIDE – TiCN
ZIRCONIUM NITRIDE – ZrN
AL TITANIUM NITRIDE – AlTiN

TOOL RADIUS	TOOL DIAMETER	DIMENSIONS				TYPE 718 FOR N-F/CI		TYPE 719 FOR STEELS	
		TOOL WIDTH	SHANK DIAM.	OVER-ALL LENGTH	NO. OF TEETH	EDP NO.	PRICE	EDP NO.	PRICE
1/32	¾	1/16	½	3	6	71801	$176.05	71901	$193.70
1/16	¾	⅛	½	3	6	71802	176.05	71902	193.70
3/32	⅞	3/16	½	3	6	71803	192.50	71903	211.65
⅛	1 ¼	¼	¾	3 ½	6	71804	209.45	71904	230.45
5/32	1 5/16	5/16	¾	3 ½	6	71805	241.05	71905	265.15
3/16	1 ⅜	⅜	¾	3 ½	6	71806	255.10	71906	280.60
¼	1 ½	½	¾	4	6	71808	264.05	71908	290.50

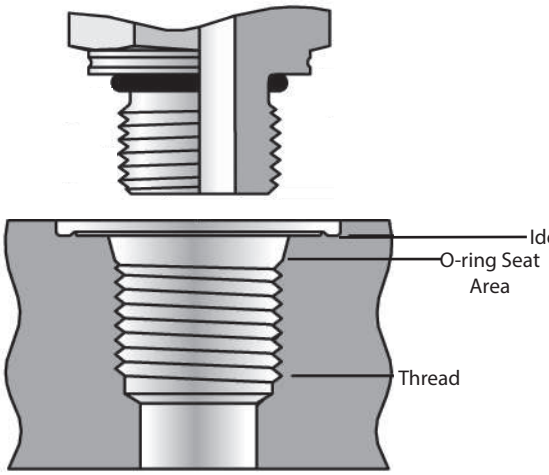
PORT CONTOUR TOOLS
CARBIDE TIPPED

PORTING TOOLS GUIDE



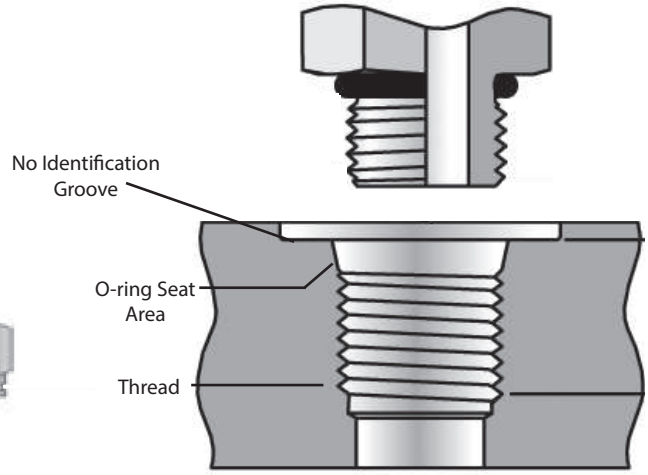
Port Contour Cutter

Porting tools are used to cut a contour per required specification. The reamer portion sizes the thread diameter prior to threading, while the o-ring seat and spotface are machined in one pass. Hannibal is stocking Port Cutters made to SAE, ISO and MS specifications.
The ISO spec calls for an identification groove. This groove identifies the port as metric.



ISO Port

Typical Fitting



SAE or MS Port

When ordering you must know the required specification and either the tube size or thread size.

Ordering Examples:

Order by Tube Size: **SAE - # 4 TUBE SIZE**

OR

Order by Thread Size: **ISO - M 14 X 1.5 THREADS**

PORT CONTOUR TECHNICAL INFO:

- Appropriate carbide grade for material being machined
- 3 flute design allows for smooth chip flow
- Positive axial rake allows for improved shearing action and better chip evacuation
- Negative radial rake reduces chatter and provides cutting edge strength

PORT CONTOUR CUTTERS
CARBIDE TIPPED TYPES 780 & 781 FRACTIONAL

MATERIAL SPECIFIC

INDEX

S.A.E. PORTS - MS16142 • J514F • J1926
STRAIGHT SHANK - TWO TYPES:
FOR NON-FERROUS & CAST IRONS OR
FOR STEELS

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	780
	40	NON-FERROUS - SHORT CHIPS	780
	60	CAST IRONS	780
	80	LOW STRENGTH STEELS	781
	100	MEDIUM STRENGTH STEELS	781
	120	HIGH STRENGTH STEELS	781
	140	HIGH TEMPERATURE ALLOYS	780

MODIFICATIONS (Prompt delivery)

- Reamer diameter
- Spotface diameter
- Reamer length
- Shank style
- Port ID groove
- Coatings available:
- Weldon flats
- Whistle notch
- Tang
- Shank length
- Metric tool diameter

TITANIUM NITRIDE – TiN

TITANIUM CARBONITRIDE – TiCN

ZIRCONIUM NITRIDE – ZrN

AL TITANIUM NITRIDE – AlTiN

CUTTERS

S.A.E. PORTS - MS16142 • J514F • J1926
TYPE 780 - FOR NON-FERROUS MATERIALS AND CAST IRONS
TYPE 781 - FOR STEELS

- 5° axial rake
- Negative radial rake
- Heat treated bodies
- All tolerances within military specs

USE:

- In a single operation, a port contour cutter can produce the form and finish required on internal straight thread o-ring ports

TUBE NO.	TUBE SIZE	DIMENSIONS THREAD SIZE	DIAMETER REAMER	DIAMETER SPOTFACE	DIAMETER SHANK	SEALING SEAT ANGLE	LENGTH SHANK	LENGTH REAMER	LENGTH HEAD	LENGTH OVERALL	TYPE 780 N-F/CI EDP NO.	TYPE 781 STEEL EDP NO.	BOTH TYPES PRICE
2	1/8	5/16-24	.2720	.6820	.5000	12°	2	.4730	1 1/8	3 1/8	78002	78102	$281.40
3	3/16	3/8-24	.3350	.7600	.5000	12°	2	.4730	1 1/4	3 1/4	78003	78103	281.40
4	1/4	7/16-20	.3890	.8380	.5000	12°	2	.5520	1 1/4	3 1/4	78004	78104	281.40
5	5/16	1/2-20	.4520	.9160	.5000	12°	2	.5520	1 1/4	3 1/4	78005	78105	290.25
6	3/8	9/16-18	.5090	.9790	.5000	12°	2	.6140	1 1/4	3 1/4	78006	78106	290.25
8	1/2	3/4-16	.6890	1.1980	.7500	15°	2	.6930	1 3/8	3 3/8	78008	78108	317.65
10	5/8	7/8-14	.8060	1.3540	.7500	15°	2	.7860	1 5/8	3 5/8	78010	78110	359.25
12	3/4	1 1/16-12	.9810	1.6350	.7500	15°	2 1/4	.9110	1 7/8	4 1/8	78012	78112	387.55
14	7/8	1 3/16-12	1.1060	1.7750	.7500	15°	2 1/4	.9110	1 7/8	4 1/8	78014	78114	393.80
16	1	1 5/16-12	1.2310	1.9200	.7500	15°	2 1/4	.9110	1 7/8	4 1/8	78016	78116	423.85
20	1 1/4	1 5/8-12	1.5440	2.2800	1.0000	15°	2 1/4	.9110	2	4 1/4	78020	78120	466.95
24	1 1/2	1 7/8-12	1.7940	2.5700	1.0000	15°	2 1/4	.9110	2	4 1/4	78024	78124	574.25
32	2	2 1/2-12	2.4190	3.4900	1.0000	15°	2 1/4	.9110	2 1/4	4 1/2	78032	78132	749.95

PORT CONTOUR CUTTERS CARBIDE TIPPED TYPES 786, 787, 792, & 793

MATERIAL SPECIFIC

ISO 6149-1 METRIC PORT WITHOUT I.D. GROOVE STRAIGHT SHANK - TWO TYPES: FOR NON-FERROUS & CAST IRONS OR FOR STEELS

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	786
	40	NON-FERROUS - SHORT CHIPS	786
	60	CAST IRONS	786
	80	LOW STRENGTH STEELS	787
	100	MEDIUM STRENGTH STEELS	787
	120	HIGH STRENGTH STEELS	787
	140	HIGH TEMPERATURE ALLOYS	786

ISO 6149-1 METRIC PORT WITHOUT I.D. GROOVE
TYPE 786 - FOR NON-FERROUS MATERIALS AND CAST IRONS
TYPE 787 - FOR STEELS

NOTE: For general information, use, modifications and coatings, see page 186

THREAD SIZE	DIMENSIONS									TYPE 786 N-F/CI EDP NO.	TYPE 787 STEEL EDP NO.	BOTH TYPES PRICE
	DIAMETER			NO. OF FLTS	SEALING SEAT ANGLE	LENGTH						
	REAMER	SPOTFACE	SHANK			SHANK	REAMER	HEAD	OVERALL			
M 8X1	.2770	.6690	.5000	3	12°	2	.4530	1 ⅛	3 ⅛	786080	787080	$302.50
M 10X1	.3560	.7870	.5000	3	12°	2	.4530	1 ¼	3 ¼	786100	787100	302.50
M 12X1.5	.4150	.9060	.5000	3	15°	2	.5510	1 ¼	3 ¼	786120	787120	316.85
M 14X1.5	.4930	.9840	.5000	3	15°	2	.5510	1 ¼	3 ¼	786140	787140	316.85
M 16X1.5	.5720	1.1020	.5000	3	15°	2	.6100	1 ¼	3 ¼	786160	787160	348.90
M 18X1.5	.6510	1.1810	.7500	3	15°	2	.6690	1 ⅜	3 ⅜	786180	787180	348.90
M 20X1.5	.7300	1.2600	.7500	3	15°	2	.6890	1 ⅜	3 ⅜	786200	787200	362.35
M 22X1.5	.8080	1.3390	.7500	3	15°	2	.7090	1 ⅝	3 ⅝	786220	787220	375.80
M 27X2	.9850	1.5750	.7500	3	15°	2 ¼	.8660	1 ⅞	4 ⅛	786270	787270	406.20
M 33X2	1.2210	1.9290	.7500	3	15°	2 ¼	.8660	1 ⅞	4 ⅛	786330	787330	467.20
M 42X2	1.5760	2.3620	1.0000	3	15°	2 ¼	.8860	1 ⅞	4 ⅛	786420	787420	510.55
M 48X2	1.8120	2.5890	1.0000	4	15°	2 ¼	.9840	2	4 ¼	786480	787480	539.75
M 60X2	2.2840	2.9920	1.0000	4	15°	2 ¼	1.0830	2	4 ¼	786600	787600	610.55

MS 33649 INTEGRAL REAMER PILOT STRAIGHT SHANK - TWO TYPES: FOR NON-FERROUS & CAST IRONS OR FOR STEELS

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	TOOL TYPE
	20	NON-FERROUS - LONG CHIPS	792
	40	NON-FERROUS - SHORT CHIPS	792
	60	CAST IRONS	792
	80	LOW STRENGTH STEELS	793
	100	MEDIUM STRENGTH STEELS	793
	120	HIGH STRENGTH STEELS	793
	140	HIGH TEMPERATURE ALLOYS	792

MS 33649 INTEGRAL REAMER PILOT
TYPE 792 - FOR NON-FERROUS MATERIALS AND CAST IRONS
TYPE 793 - FOR STEELS

NOTE: For general information, use, modifications and coatings, see page 186

TUBE		DIMENSIONS								TYPE 792 N-F/CI EDP NO.	TYPE 793 STEEL EDP NO.	BOTH TYPES PRICE
NO.	SIZE	THREAD SIZE	DIAMETER			LENGTH						
			REAMER	SPOTFACE	SHANK	SHANK	REAMER	HEAD	OVERALL			
1	1/16	¼-28	.2150	.6500	.5000	2	.4070	1	3	79201	79301	$328.65
2	⅛	5/16-24	.2750	.7420	.5000	2	.5820	1 ⅛	3 ⅛	79202	79302	328.65
3	3/16	⅜-24	.3390	.8050	.5000	2	.5880	1 ¼	3 ¼	79203	79303	311.80
4	¼	7/16-20	.3930	.8880	.5000	2	.6610	1 ¼	3 ¼	79204	79304	320.25
5	5/16	½-20	.4550	.9500	.5000	2	.6610	1 ¼	3 ¼	79205	79305	328.65
6	⅜	9/16-18	.5120	1.0120	.5000	2	.7140	1 ½	3 ½	79206	79306	345.50
7	7/16	⅝-18	.5750	1.1050	.5000	2	.7300	1 ½	3 ½	79207	79307	353.95
8	½	¾-16	.6930	1.2400	.7500	2	.8390	1 ⅝	3 ⅝	79208	79308	362.35
9	9/16	13/16-16	.7560	1.3020	.7500	2	.8550	1 ⅝	3 ⅝	79209	79309	370.80
10	⅝	⅞-14	.8100	1.4150	.7500	2 ¼	.9350	1 ⅞	4 ⅛	79210	79310	379.20
11	11/16	1-12	.9250	1.6020	.7500	2 ¼	1.0690	2 ⅛	4 ⅜	79211	79311	412.90
12	¾	1 1/16-12	.9870	1.6650	.7500	2 ¼	1.0690	2 ⅛	4 ⅜	79212	79312	438.20
14	⅞	1 3/16-12	1.1120	1.7900	.7500	2 ¼	1.0690	2 ⅛	4 ⅜	79214	79314	500.60
16	1	1 5/16-12	1.2370	1.9650	.7500	2 ¼	1.0690	2 ⅛	4 ⅜	79216	79316	562.05
18	1 ⅛	1 ½-12	1.4250	2.0900	.7500	2 ¼	1.1210	2 ¼	4 ½	79218	79318	605.75
20	1 ¼	1 ⅝-12	1.5500	2.3100	1.0000	2 ¼	1.1210	2 ¼	4 ½	79220	79320	705.75
24	1 ½	1 ⅞-12	1.8000	2.6000	1.0000	2 ¼	1.1320	2 ¼	4 ½	79224	79324	854.50
32	2	2 ½-12	2.4250	3.5200	1.0000	2 ½	1.3730	2 ½	5	79232	79332	1215.20

CARBIDE TIPPED END MILLS TECHNICAL INFORMATION

TOOL SELECTOR	CHIP CLASS	MATERIAL MACHINED	PAGE #
	20	NON-FERROUS - LONG CHIPS	189-191
	40	NON-FERROUS - SHORT CHIPS	189-191
	60	CAST IRONS	189-191
	80	LOW STRENGTH STEELS	189,192
	100	MEDIUM STRENGTH STEELS	189,192
	120	HIGH STRENGTH STEELS	189,192
	140	HIGH TEMPERATURE ALLOYS	189,191

END MILL BASICS

END MILLS have cutting edges on both the end and sides, permitting end cutting and peripheral cutting. Center cutting types permit plunge and traverse milling.

CUTTING EDGE: Select **sharp edged** for faster speeds. Select radial edged for longer tool life.

SHANK DIAMETER: Select **largest diameter** available to maximize rigidity and minimize axial deflection and chatter.

NUMBER OF FLUTES: Select **fewer flutes** for milling softer materials at higher feeds and speeds where more chip space is required or when machine horsepower is limited.

Select **more flutes** for milling tougher materials at reduced feeds and speeds or for increased table feeds using the same cutting speeds.

TOOL DIAMETER: Select **largest practical diameter** to maximize rigidity, minimize chatter and improve tool life. If machine spindle speed is limited, the largest practical diameter permits higher cutting speeds

COATINGS are especially effective (see "Coating Selector" on page 10).

FLUTE AXIAL RELATIONSHIP:
Select **straight flutes** for a wide variety of applications.

Select **right spiral flutes** for improved cutting action and easier chip removal.

Select **left spiral flutes** for use in absorbing impact shock when entering steel workpiece – maintains constant hold down pressure and minimizes chatter. Useful in profiling applications where recutting chips causes premature cutter dulling.

Select **high spiral** (15° or more) to **dramatically** improve cutting action, finish, chip removal, and tool life. High spirals distribute impact load more evenly throughout the tool's entire revolution.

END MILL SPECIFICATIONS AND TOLERANCES

- Geometry, carbide grade, O.D. relief and end clearance appropriate for material being machined
- Flute long carbide tips brazed to tough hardened alloy steel body
- Spiral flute carbide tips formed to true helix angles
- Straight shanks have standard Weldon drive flats
- Non-center cutting end mills have the ends cleared to depth of carbide
- Precision ground cutting edges
- USCTI
- Tool diameter tolerance:
  Radial edged: plus .002", minus .000"
  Sharp edged: plus .005", minus .000"
- Shank diameter tolerance:
  minus .0001", minus .0005"

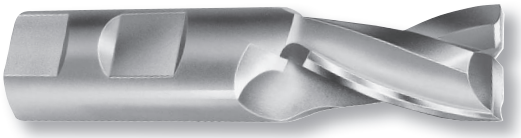
END MILL PROBLEM SOLVING GUIDE — CARBIDE TIPPED

MILLING PROBLEMS	POSSIBLE CAUSES	POSSIBLE SOLUTIONS
1. ROUGH FINISH	Dull cutting edge Wrong feeds & speeds	Resharpen to original tool geometry Increase speed—also try reduced feed
2. EXCESSIVE CUTTING EDGE WATER	Wrong feeds & speeds Rough cutting edge Insufficient coolant	Increase feed (should always be over .001" per tooth) — especially when machining ductile or free machining materials. Also try reduced speed Lightly hone cutting edge with fine grit diamond hone Increase coolant flow — review type of coolant
3. CHIPPED CUTTING EDGE	Poor chip removal Recutting work hardened chips Vibration Incorrect carbide grade	Use tool with larger flute space — larger diameter or fewer flutes Increase coolant flow Increase rigidity of set-up, especially worn tool holders Change to appropriate carbide grade
4. CHATTER MARKS	Insufficient machine horsepower Vibration	Use tool with fewer flutes as correct feeds & speeds must be maintained Consider climb milling Use larger diameter cutter Resharpen tool with more clearance
5. GLAZED FINISH	Feed too light Dull cutting edge Insufficient clearance	Increase feed Resharpen tool to original geometry Resharpen tool with more clearance
6. POOR TOOL LIFE	Excessive cratering Milling abrasive material Milling surface scale Milling hard material Insufficient chip room Delayed resharpening Thermal cracked carbide	Increase speed or decrease feed Change to harder grade of carbide Decrease speed and increase feed Increase coolant flow Climb milling better than conventional milling Conventional milling better than climb milling Reduce speed — rigidity very important Use larger diameter tool Prompt resharpening to original geometry will increase total tool life Maintain adequate coolant flow at all times Climb milling is cooler than conventional milling

END MILLS INDEX AND COMPARISON CHART

DESCRIPTION	HANNIBAL PAGE	HANNIBAL TOOL TYPE	FULLERTON	PUTNAM	MORSE	NIAGARA
CENTER CUTTING END MILLS						
Straight Flutes						
For Non-Ferrous & Cast Irons	**189**	314	60SK	SKM	5935	4800
For Steels	**189**	312	60SKS	–	5936	4780
25° Right Spiral Flutes						
For Non-Ferrous & Cast Irons	**189**	318	60CS	–	5966	–
HIGH SPIRAL SHEAR CUTTING END MILLS						
15° Right Spiral Flutes						
For Non-Ferrous & Cast Irons	**191**	375	–	HLS	5962	4840
For Cast Irons & High Temp Alloys	**191**	320	–	–	–	–
For Steels	**192**	350	60GSS	HES	5960	4820
25° Right Spiral Flutes			–	–	–	–
For Non-Ferrous (Sharp Edged)	**191**	327	–	–	–	–
For Non-Ferrous	**191**	325	60FS	HNS	5958	4860
SLOW SPIRAL END MILLS						
6° Right Spiral Flutes						
For Non-Ferrous (Sharp Edged)	**190**	307	–	–	–	–
For Non-Ferrous & Cast Irons	**190**	306	60RS	RSEM	5921	–
For Steels	**192**	308	60RSS	–	–	–
6° Left Spiral Flutes for Steels	**192**	310	60LSS	LSEM	5964	–
STRAIGHT FLUTES END MILLS						
Sharp Edged						
For Non-Ferrous (4 Flutes)	**190**	305	–	–	–	–
Radial Edged						
For Non-Ferrous & Cast Irons (2 Flutes)	**190**	302	60TF	TFEM	5923	4700
For Non-Ferrous & Cast Irons (4 or 6 Flts.)	**190**	304	60EM	EM	5925	4750
For Steels (2 Flutes)	**192**	300	60TFS	–	5927	–

CENTER CUTTING TYPE TYPES 318, 312, 314 FRACTIONAL



25° RIGHT SPIRAL FLUTES
TYPE 318 - FOR NON-FERROUS & CAST IRONS

- Larger flute capacity for heavy milling
- Center cutting design for plunge, slot, profile and peripheral milling including splines, keyways, and spotfacing
- Radial edged for longer tool life
- Detailed specifications on page 188

TOOL DIAMETER FRAC.	TOOL DIAMETER DECIMAL	DIMENSIONS SHANK DIAM.	LENGTH CARBIDE	LENGTH OVERALL	NO. OF FLUTES	TYPE 318 FOR NON-FERR. EDP NO.	TYPE 318 FOR NON-FERR. PRICE
½	.5000	½	1	3	2	31816	$139.30
⅝	.6250	⅝	1 ¼	3 ⅜	2	31820	155.70
¾	.7500	¾	1 ¼	3 ⅜	2	31824	165.00
⅞	.8750	⅞	1 ½	3 ¾	2	31828	181.45
1	1.0000	1	1 ½	4	2	31832	208.55
1 ¼	1.2500	1 ¼	1 ¾	4 ¼	2	31840	283.45
1 ½	1.5000	1 ½	2	4 ¾	2	31848	330.75

THREE STRAIGHT FLUTES
TYPE 312 - FOR STEELS
TYPE 314 - FOR NON-FERROUS & CAST IRONS

- Three straight flutes provide generous capacity for chips
- Center cutting design for plunge, slot, profile, and peripheral milling including splines, keyways, and spotfacing
- Radial edged for longer tool life
- Detailed specifications on page 188

MODIFICATIONS (See list on page 190)

TOOL DIAMETER FRAC.	TOOL DIAMETER DECIMAL	DIMENSIONS SHANK DIAM.	LENGTH CAR-BIDE	LENGTH OVER-ALL	NO. OF FLTS	TYPE 314 FOR NON-FERR. & C.I. EDP NO.	TYPE 314 FOR NON-FERR. & C.I. PRICE	TYPE 312 FOR STEELS EDP NO.	TYPE 312 FOR STEELS PRICE
⅜	.3750	⅜	½	2 ½	3	31412	$83.30	31212	$86.60
7⁄16	.4375	⅜	¾	2 ½	3	31414	85.15	31214	88.50
½	.5000	½	¾	3	3	31416	87.40	31216	90.65
9⁄16	.5625	½	¾	3	3	31418	90.75	31218	94.30
⅝	.6250	⅝	¾	3 ¼	3	31420	106.25	31220	110.25
¾	.7500	⅝	¾	3 ⅜	3	31424	111.15	31224	115.45
⅞	.8750	⅞	¾	3 ¾	3	31428	129.75	31228	134.80
1	1.0000	⅞	¾	3 ¾	3	31432	142.55	31232	148.05
1 ⅛	1.1250	1	¾	4	3	31436	152.70	31236	158.50
1 ¼	1.2500	1	¾	4	3	31440	176.90	31240	183.80
1 ½	1.5000	1 ¼	¾	4	3	31448	210.35	31248	218.45

END MILLS FOR NON-FERROUS & CAST IRONS CARBIDE TIPPED TYPES 302, 304, 305, 306, 307, FRACTIONAL

MATERIAL SPECIFIC

BASIC TYPES

MODIFICATIONS (Prompt delivery)

- Modified tool diameter
- Metric tool diameter
- Cutting diameter reduced for step or pilot
- Corner chamfer or corner radius
- Shortened shank or reduced shank diam.
- Additional shank drive flat(s)
- Coolant outlets (except on Type 318)
- Coatings available:

TITANIUM NITRIDE – TiN

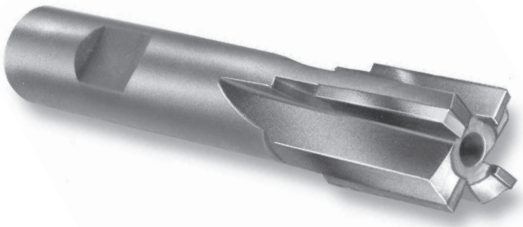
TITANIUM CARBONITRIDE – TiCN

ZIRCONIUM NITRIDE – ZrN

AL TITANIUM NITRIDE – AlTiN

RADIAL EDGED WITH TWO STRAIGHT FLUTES TYPE 302 - FOR NON-FERROUS MATERIALS & CAST IRONS

- Two large flutes for easy chip removal
- Use when machine horsepower is too low for high chip capacity end mills



RADIAL EDGED WITH FOUR OR SIX STRAIGHT FLUTES TYPE 304 - FOR NON-FERROUS MATERIALS & CAST IRONS

- More flutes for improved finish
- Use when machine horsepower allows for a higher chip capacity end mill

SHARP EDGED WITH FOUR STRAIGHT FLUTES TYPE 305 - FOR NON-FERROUS MATERIALS

- Four flutes for improved finish
- Use when machine horsepower allows for a higher capacity end mill

RADIAL EDGED WITH 6° RIGHT SPIRAL FLUTES TYPE 306 - FOR NON-FERROUS MATERIALS & CAST IRONS

- Spiral flutes aid in chip removal, permitting heavier feeds and faster speeds
- Radial edged for tough aluminum alloys and castings

SHARP EDGED WITH 6° RIGHT SPIRAL FLUTES TYPE 307 - FOR NON-FERROUS MATERIALS

- Same as Type 306 above, but sharp edged for improved finish

ALL TYPES:

• Detailed specifications on page 188

TOOL DIAMETER		DIMENSIONS			TYPE 302 2 STRAIGHT FLUTES			TYPE 304 4 OR 6 STRAIGHT FLUTES			TYPE 305 SHARP EDGED 4 STRAIGHT FLTS			TYPE 306 RADIAL EDGED 6° RIGHT SPIRAL			TYPE 307 SHARP EDGED 6° RIGHT SPIRAL		
			LENGTH																
FRAC.	DEC.	SHANK DIAM.	CAR-BIDE	OVER-ALL	NO. OF FLTS	EDP NO.	PRICE	NO. OF FLTS	EDP NO.	PRICE	NO. OF FLTS	EDP NO.	PRICE	NO. OF FLTS	EDP NO.	PRICE	NO. OF FLTS	EDP NO.	PRICE
1/4	.2500	3/8	1/2	2 1/2	2	30208	$47.25	4	30408	$47.70	4	30508	$47.70	2	30608	$48.30	2	30708	$51.20
5/16	.3125	3/8	5/8	2 1/2	2	30210	49.05	4	30410	50.95	-	-	-	2	30610	50.05	-	-	-
3/8	.3750	3/8	5/8	2 1/2	2	30212	52.60	4	30412	53.70	-	-	-	2	30612	53.55	-	-	-
7/16	.4375	3/8	1	2 11/16	2	30214	52.60	4	30414	53.70	4	30514	51.65	2	30614	53.55	2	30714	56.80
1/2	.5000	1/2	1	3 1/4	2	30216	53.90	4	30416	54.95	4	30516	54.85	2	30616	55.00	2	30716	58.20
9/16	.5625	1/2	1	3 3/8	2	30218	59.60	4	30418	61.70	4	30518	61.55	2	30618	60.90	2	30718	64.40
5/8	.6250	1/2	1	3 3/8	2	30220	59.60	4	30420	64.60	4	30520	64.50	4	30620	63.25	4	30720	66.95
11/16	.6875	5/8	1	3 3/8	2	30222	64.50	4	30422	71.15	4	30522	70.95	-	-	-	-	-	-
3/4	.7500	5/8	1	3 5/8	2	30224	66.95	4	30424	66.50	4	30524	73.70	4	30624	72.25	4	30724	76.45
13/16	.8125	5/8	1	3 5/8	2	30226	80.90	4	30426	78.55	4	30526	84.35	-	-	-	-	-	-
7/8	.8750	5/8	1 1/4	4	2	30228	81.45	4	30428	78.55	4	30528	87.20	4	30628	96.60	4	30728	102.35
15/16	.9375	7/8	1 1/4	4	2	30230	87.20	4	30430	87.25	4	30530	92.80	-	-	-	-	-	-
1	1.0000	7/8	1 1/4	4	2	30232	87.45	4	30432	90.80	4	30532	100.65	4	30632	111.60	4	30732	118.20
1 1/8	1.1250	1	1 1/4	4 1/4	2	30236	89.75	4	30436	102.95	4	30536	114.05	4	30636	126.55	-	-	-
1 1/4	1.2500	1	1 1/4	4 1/4	2	30240	108.20	4	30440	115.80	4	30540	128.25	4	30640	142.25	4	30740	150.40
1 1/2	1.5000	1 1/4	1 1/2	4 1/2	2	30248	134.00	4	30448	149.25	4	30548	158.85	4	30648	176.10	4	30748	179.60
1 3/4	1.7500	1 1/4	1 1/2	4 1/2	2	30256	158.85	6	30456	192.40	-	-	-	6	30656	227.30	-	-	-
2	2.0000	1 1/4	1 1/2	4 1/2	2	30264	177.20	6	30464	221.65	-	-	-	6	30664	261.75	6	30764	266.75

END MILLS FOR NON-FERROUS & CAST IRONS CARBIDE TIPPED TYPES 325, 327, 375, 320 FRACTIONAL

MATERIAL SPECIFIC

HIGH SPIRAL SHEAR CUTTING TYPES

MODIFICATIONS (Prompt delivery)

- Modified tool diameter
- Metric tool diameter
- Cutting diameter reduced for step or pilot
- Corner chamfer or corner radius
- Shortened shank or reduced shank diam.
- Additional shank drive flat(s)
- Coolant outlets
- Coatings available:

TITANIUM NITRIDE – TiN

TITANIUM CARBONITRIDE – TiCN

ZIRCONIUM NITRIDE – ZrN

AL TITANIUM NITRIDE – AlTiN

SHARP EDGED WITH 25° RIGHT SPIRAL FLUTES TYPE 327 - FOR NON-FERROUS MATERIALS

- Higher spiral permits faster chip removal
- Spiral flutes distribute the milling impact load evenly, improving finish and increasing tool life

RADIAL EDGED WITH 25° RIGHT SPIRAL FLUTES TYPE 325 - FOR NON-FERROUS MATERIALS

- Same as Type 327 above, but radial edged for tough aluminum alloys and castings

RADIAL EDGED WITH 15° RIGHT SPIRAL FLUTES TYPE 375 - FOR NON-FERROUS MATERIALS & CAST IRONS

- 15° spiral flutes for improved chip removal
- Radial edged for tough aluminum alloys and castings
- Spiral flutes distribute the milling impact load evenly, improving finish and increasing tool life

RADIAL EDGED WITH 15° RIGHT SPIRAL FLUTES TYPE 320 - FOR CAST IRONS & HIGH TEMP ALLOYS

- 15° spiral flutes for improved chip removal
- More flutes than Type 375 for use where less feed per tooth is required, but table feed is maintained for same productivity

ALL TYPES:

- Detailed specifications on page 188

TOOL DIAMETER		DIMENSIONS			TYPE 327 OR 325 - 25° RIGHT SPIRAL FOR NON-FERROUS				TYPE 375 - 15° RIGHT SPIRAL FOR NON-FERROUS & CAST IRON			TYPE 320 - 15° RIGHT SPIRAL FOR CAST IRON & HIGH TEMP ALLOYS		
FRAC.	DECIMAL	SHANK DIAM.	LENGTH CARBIDE	LENGTH OVERALL	NO. OF FLTS	TYPE 327 SHARP EDP NO.	TYPE 325 RADIAL EDP NO.	PRICE	NO. OF FLTS	TYPE 375 RADIAL EDP NO.	PRICE	NO. OF FLTS	TYPE 320 RADIAL EDP NO.	PRICE
½	.5000	⅜	1	3	2	-	32516	$86.40	2	37516	$79.60	-	-	-
½	.5000	½	1	3	2	-	32517	86.40	2	37517	79.60	4	32017	$86.40
9⁄16	.5625	½	1	3	2	-	32518	92.80	2	37518	85.60	-	-	-
⅝	.6250	½	1 ¼	3 ¼	2	-	32520	99.90	2	37520	92.00	-	-	-
⅝	.6250	⅝	1 ¼	3 ⅜	2	32721	32521	99.90	2	37521	92.00	4	32021	99.90
11⁄16	.6875	½	1 ¼	3 ¼	2	-	32522	104.10	2	37522	95.90	-	-	-
11⁄16	.6875	⅝	1 ¼	3 ⅜	2	-	32523	104.10	2	37523	95.90	4	32023	104.10
¾	.7500	½	1 ¼	3 ¼	2	32724	32524	111.15	2	37524	102.40	-	-	-
¾	.7500	⅝	1 ¼	3 ⅜	2	32725	32525	111.15	2	37525	102.40	4	32025	111.15
13⁄16	.8125	⅝	1 ½	3 ⅝	2	32726	32526	119.90	2	37526	110.50	4	32026	119.90
⅞	.8750	⅝	1 ½	3 ⅝	2	-	32528	127.25	2	37528	117.35	-	-	-
⅞	.8750	⅞	1 ½	3 ¾	2	-	32529	127.25	2	37529	117.35	4	32029	127.25
15⁄16	.9375	⅝	1 ½	3 ¾	2	-	32530	143.95	3	37530	173.70	-	-	-
15⁄16	.9375	⅞	1 ½	3 ¾	2	-	32531	143.95	3	37531	173.70	-	-	-
1	1.0000	⅞	1 ½	3 ¾	2	32732	32532	146.95	3	37532	164.45	-	-	-
1	1.0000	1	1 ½	4	2	32733	32533	146.95	3	37533	164.45	6	32033	178.50
1 ⅛	1.1250	1	1 ¾	4 ¼	2	-	32536	160.90	3	37536	193.65	6	32036	210.10
1 ¼	1.2500	1	1 ¾	4 ¼	3	32740	32540	213.45	4	37540	221.90	6	32040	240.80
1 ⅜	1.3750	1	1 ¾	4 ¼	3	32744	32544	231.40	4	37544	259.15	6	32044	281.30
1 ½	1.5000	1 ¼	2	4 ½	3	32748	32548	258.45	4	37548	255.35	6	32048	277.10
1 ⅝	1.6250	1 ¼	2	4 ½	3	-	32552	305.90	4	37552	312.30	-	-	-
1 ¾	1.7500	1 ¼	2	4 ½	3	-	32556	328.20	4	37556	333.00	8	32056	348.40
1 ⅞	1.8750	1 ¼	2	4 ½	3	-	32560	353.30	4	37560	356.20	-	-	-
2	2.0000	1 ¼	2	4 ½	3	32764	32564	377.70	4	37564	376.25	8	32064	393.65

END MILLS

END MILLS FOR STEELS
CARBIDE TIPPED TYPES 300, 308, 350, FRACTIONAL

MATERIAL SPECIFIC

BASIC TYPES

MODIFICATIONS (See list on page 191)

TYPE 300 - TWO STRAIGHT FLUTES

- Two large flutes for easy chip removal
- Use when machine horsepower is too low for high chip capacity end mills

TYPE 308 - 6° RIGHT SPIRAL FLUTES

- Spiral flutes aid in chip removal, permitting heavier feeds and faster speeds

TYPE 310 - 6° LEFT SPIRAL FLUTES

- Left spiral flutes maintain a constant pressure on the workpiece and absorb the impact shock on entering steel
- Left hand helix best when milling tough steel alloys
- For peripheral milling

ALL TYPES:

- Radial edged for longer tool life
- Detailed specifications on page 188

TOOL DIAMETER		DIMENSIONS			TYPE 300 - 2 STRAIGHT FLUTES			TYPE 308 OR TYPE 310 - 6° SPIRAL FLUTES			
			LENGTH								
FRAC.	DECIMAL	SHANK DIAM.	CARBIDE	OVERALL	NO. OF FLTS	EDP NO.	PRICE	NO. OF FLTS	TYPE 308 RIGHT EDP NO.	TYPE 310 LEFT EDP NO.	PRICE
¼	.2500	⅜	½	2 ½	2	30008	$54.30	2	30808	31008	$55.90
5⁄16	.3125	⅜	⅝	2 ½	2	30010	56.55	2	30810	31010	60.30
⅜	.3750	⅜	⅝	2 ½	2	30012	60.40	2	30812	31012	63.90
7⁄16	.4375	⅜	1	2 11⁄16	2	30014	60.40	2	30814	31014	63.90
½	.5000	½	1	3 ¼	2	30016	61.80	4	30816	31016	68.85
9⁄16	.5625	½	1	3 ⅜	2	30018	68.50	4	30818	31018	74.00
⅝	.6250	½	1	3 ⅜	2	30020	68.50	4	30820	31020	91.30
¾	.7500	⅝	1	3 ⅝	2	30024	76.90	4	30824	31024	101.75
⅞	.8750	⅝	1 ¼	4	2	30028	90.85	4	30828	31028	122.55
1	1.0000	⅞	1 ¼	4	2	30032	100.45	6	30832	31032	140.90
1 ⅛	1.1250	1	1 ¼	4 ¼	2	30036	102.85	6	30836	31036	149.45
1 ¼	1.2500	1	1 ¼	4 ¼	2	30040	114.70	6	30840	31040	180.60
1 ½	1.5000	1 ¼	1 ½	4 ½	2	30048	147.75	6	30848	31048	219.65
1 ¾	1.7500	1 ¼	1 ½	4 ½	2	30056	165.70	8	30856	31056	264.50
2	2.0000	1 ¼	1 ½	4 ½	2	30064	197.85	8	30864	31064	295.30

HIGH SPIRAL SHEAR CUTTING TYPES

TYPE 350 - 15° RIGHT SPIRAL FLUTES

- 15° right spiral flutes for improved chip removal
- Spiral flutes distribute the milling impact load evenly, improving finish and increasing tool life
- Radial edged for longer tool life
- Detailed specifications on page 188

TOOL DIAMETER		DIMENSIONS			TYPE 350 - 15° RIGHT SPIRAL 4 TO 8 FLUTES		
			LENGTH				
FRAC.	DECIMAL	SHANK DIAM.	CARBIDE	OVERALL	NO. OF FLTS	EDP NO.	PRICE
½	.5000	⅜	1	3	4	35016	$86.40
½	.5000	½	1	3	4	35017	86.40
9⁄16	.5625	½	1	3	4	35018	92.80
⅝	.6250	½	1 ¼	3 ¼	4	35020	99.90
⅝	.6250	⅝	1 ¼	3 ⅜	4	35021	99.90
11⁄16	.6875	½	1 ¼	3 ¼	4	35022	104.10
11⁄16	.6875	⅝	1 ¼	3 ⅜	4	35023	104.10
¾	.7500	½	1 ¼	3 ¼	4	35024	111.15
¾	.7500	⅝	1 ¼	3 ⅜	4	35025	111.15
13⁄16	.8125	⅝	1 ½	3 ⅝	4	35026	119.90
⅞	.8750	⅝	1 ½	3 ⅝	4	35028	127.25
⅞	.8750	⅞	1 ½	3 ¾	4	35029	127.25
15⁄16	.9375	⅝	1 ½	3 ¾	4	35030	188.50
15⁄16	.9375	⅞	1 ½	3 ¾	4	35031	188.50
1	1.0000	⅞	1 ½	3 ¾	6	35032	178.50
1	1.0000	1	1 ½	4	6	35033	178.50
1 ⅛	1.1250	1	1 ¾	4 ¼	6	35036	210.10
1 ¼	1.2500	1	1 ¾	4 ¼	6	35040	240.80
1 ⅜	1.3750	1	1 ¾	4 ¼	6	35044	281.30
1 ½	1.5000	1 ¼	2	4 ½	6	35048	277.10
1 ⅝	1.6250	1 ¼	2	4 ½	8	35052	369.40
1 ¾	1.7500	1 ¼	2	4 ½	8	35056	393.95
1 ⅞	1.8750	1 ¼	2	4 ½	8	35060	421.30
2	2.0000	1 ¼	2	4 ½	8	35064	444.95

BRAZED SINGLE POINT TOOLS
CARBIDE TIPPED

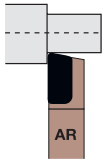
MATERIAL SPECIFIC

FINISH GROUND
READY FOR USE

883/PREMIUM C2 FOR NON-FERROUS & CAST IRONS
370/PREMIUM C5-C6 FOR STEELS

0° SIDE CUTTING EDGE ANGLE
For machining to a square shoulder

TOOL STYLE	883/PREMIUM C2*		370/PREMIUM C5-C6*		SHANK DIMENSIONS			STD. PKG. QTY.
	EDP NO.	PRICE	EDP NO.	PRICE	W	H	L	
AR-4	11104	$10.20	11204	$7.45	¼	¼	2	12
AR-5	11105	9.00	11205	7.90	5/16	5/16	2 ¼	12
AR-6	11106	9.15	11206	8.05	⅜	⅜	2 ½	12
AR-7	11107	9.85	11207	8.75	7/16	7/16	3	12
AR-8	11108	8.45	11208	8.45	½	½	3 ½	12
AR-10	11110	12.55	11210	11.60	⅝	⅝	4	12
AR-12	11112	16.10	11212	14.45	¾	¾	4 ½	12
AR-16	11116	29.55	11216	28.80	1	1	7	6
AR-20	11120	CALL US	11220	CALL US	1 ¼	1 ¼	8	1
AR-44	11144	CALL US	11244	CALL US	½	1	7	12



For turning to a square shoulder

*Some sizes not available in premium grade carbide. Prices subject to change.

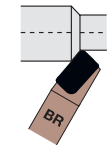
0° SIDE CUTTING EDGE ANGLE
For machining to a square shoulder

TOOL STYLE	883/PREMIUM C2*		370/PREMIUM C5-C6*		SHANK DIMENSIONS			STD. PKG. QTY.
	EDP NO.	PRICE	EDP NO.	PRICE	W	H	L	
AL-4	11404	$10.20	11504	$7.45	¼	¼	2	12
AL-5	11405	9.00	11505	7.90	5/16	5/16	2 ¼	12
AL-6	11406	9.15	11506	8.05	⅜	⅜	2 ½	12
AL-7	11407	9.85	11507	8.75	7/16	7/16	3	12
AL-8	11408	8.45	11508	8.45	½	½	3 ½	12
AL-10	11410	11.90	11510	11.60	⅝	⅝	4	12
AL-12	11412	15.35	11512	15.25	¾	¾	4 ½	12
AL-16	11416	29.95	11516	29.95	1	1	7	6
AL-20	-	-	11520	CALL US	1 ¼	1 ¼	8	1
AL-44	11444	CALL US	11544	CALL US	½	1	7	12

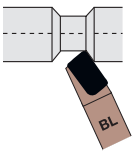
*Some sizes not available in premium grade carbide. Prices subject to change.

15° SIDE CUTTING EDGE ANGLE
For interrupted or irregular cuts

TOOL STYLE	883/PREMIUM C2*		370/PREMIUM C5-C6*		SHANK DIMENSIONS			STD. PKG. QTY.
	EDP NO.	PRICE	EDP NO.	PRICE	W	H	L	
BR-4	12104	$10.20	12204	$7.45	¼	¼	2	12
BR-5	12105	9.00	12205	7.90	5/16	5/16	2 ¼	12
BR-6	12106	9.15	12206	8.05	⅜	⅜	2 ½	12
BR-7	12107	9.85	12207	8.75	7/16	7/16	3	12
BR-8	12108	8.45	12208	8.45	½	½	3 ½	12
BR-10	12110	12.55	12210	11.60	⅝	⅝	4	12
BR-12	12112	16.10	12212	14.45	¾	¾	4 ½	12
BR-16	12116	29.55	12216	28.80	1	1	7	6
BR-20	12120	CALL US	12220	CALL US	1 ¼	1 ¼	8	1
BR-44	12144	CALL US	12244	CALL US	½	1	7	12



For turning where square shoulder is not required



*Some sizes not available in premium grade carbide. Prices subject to change.

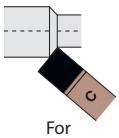
15° SIDE CUTTING EDGE ANGLE
For interrupted or irregular cuts

TOOL STYLE	883/PREMIUM C2*		370/PREMIUM C5-C6*		SHANK DIMENSIONS			STD. PKG. QTY.
	EDP NO.	PRICE	EDP NO.	PRICE	W	H	L	
BL-4	12404	$10.20	12504	$7.45	¼	¼	2	12
BL-5	12405	9.00	12505	7.90	5/16	5/16	2 ¼	12
BL-6	12406	9.15	12506	8.05	⅜	⅜	2 ½	12
BL-7	12407	9.85	12507	8.75	7/16	7/16	3	12
BL-8	12408	8.45	12508	8.45	½	½	3 ½	12
BL-10	12410	11.90	12510	11.60	⅝	⅝	4	12
BL-12	12412	15.35	12512	15.25	¾	¾	4 ½	12
BL-16	12416	29.95	12516	29.95	1	1	7	6
BL-20	12420	CALL US	12520	CALL US	1 ¼	1 ¼	8	1
BL-44	12444	CALL US	12544	CALL US	½	1	7	12

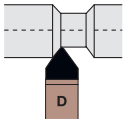
*Some sizes not available in premium grade carbide. Prices subject to change.

0° SQUARE NOSE
No nose radius

TOOL STYLE	883/PREMIUM C2*		370/PREMIUM C5-C6*		SHANK DIMENSIONS			STD. PKG. QTY.
	EDP NO.	PRICE	EDP NO.	PRICE	W	H	L	
C-4	13704	$6.70	13804	$6.70	¼	¼	2	12
C-5	13705	7.40	13805	7.15	5/16	5/16	2 ¼	12
C-6	13706	9.60	13806	7.90	⅜	⅜	2 ½	12
C-7	13707	7.30	13807	10.10	7/16	7/16	3	12
C-8	13708	11.75	13808	10.90	½	½	3 ½	12
C-10	13710	13.25	13810	14.45	⅝	⅝	4	12
C-12	13712	18.25	13812	20.70	¾	¾	4 ½	12
C-16	13716	37.85	13816	36.40	1	1	7	6
C-20	13720	CALL US	13820	CALL US	1 ¼	1 ¼	8	1
C-44	13744	CALL US	13844	CALL US	½	1	7	12



For undercutting or chamfering



For chamfering

*Some sizes not available in premium grade carbide. Prices subject to change.

40° SIDE CUTTING EDGE ANGLE
80° pointed nose

TOOL STYLE	883/PREMIUM C2*		370/PREMIUM C5-C6*		SHANK DIMENSIONS			STD. PKG. QTY.
	EDP NO.	PRICE	EDP NO.	PRICE	W	H	L	
D-4	14704	$6.25	14804	$6.25	¼	¼	2	12
D-5	14705	7.20	14805	7.45	5/16	5/16	2 ¼	12
D-6	14706	7.40	14806	7.95	⅜	⅜	2 ½	12
D-7	14707	10.10	14807	12.25	7/16	7/16	3	12
D-8	14708	9.70	14808	10.30	½	½	3 ½	12
D-10	14710	13.55	14810	15.05	⅝	⅝	4	12
D-12	14712	19.40	14812	17.05	¾	¾	4 ½	12
D-16	14716	28.85	14816	29.75	1	1	7	6

*Some sizes not available in premium grade carbide. Prices subject to change.

BRAZED SINGLE POINT TOOLS
CARBIDE TIPPED

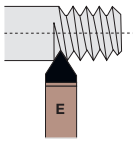
MATERIAL SPECIFIC

FINISH GROUND
READY FOR USE

883/PREMIUM C2 FOR NON-FERROUS & CAST IRONS
370/PREMIUM C5-C6 FOR STEELS

TOOL STYLE	883/PREMIUM C2*		370/PREMIUM C5-C6*		SHANK DIMENSIONS			STD. PKG. QTY.
	EDP NO.	PRICE	EDP NO.	PRICE	W	H	L	
E-4	15704	$6.25	15804	$6.25	¼	¼	2	12
E-5	15705	6.80	15805	6.80	5/16	5/16	2 ¼	12
E-6	15706	7.10	15806	6.90	⅜	⅜	2 ½	12
E-7	15707	10.95	15807	13.15	7/16	7/16	3	12
E-8	15708	16.25	15808	8.70	½	½	3 ½	12
E-10	15710	13.45	15810	12.20	⅝	⅝	4	12
E-12	15712	16.75	15812	16.95	¾	¾	4 ½	12
E-16	15716	29.35	15816	28.25	1	1	7	6

*Some sizes not available in premium grade carbide. Prices subject to change.



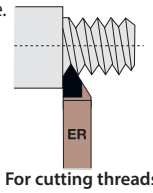
For cutting threads

60° INCLUDED ANGLE;
30° SIDE CUTTING EDGE ANGLE
For threading, chamfering, notching, or undercutting

30° SIDE CUTTING EDGE ANGLE
Offset for threading or boring

TOOL STYLE	883/PREMIUM C2*		370/PREMIUM C5-C6*		SHANK DIMENSIONS			STD. PKG. QTY.
	EDP NO.	PRICE	EDP NO.	PRICE	W	H	L	
ER-4	15104	$7.75	15204	$6.25	¼	¼	2	12
ER-5	15105	7.75	15205	6.95	5/16	5/16	2 ¼	12
ER-6	15106	7.85	15206	7.15	⅜	⅜	2 ½	12
ER-8	15108	13.90	15208	13.90	½	½	3 ½	12
ER-10	15110	15.15	15210	15.15	⅝	⅝	4	12
ER-12	15112	16.40	15212	17.80	¾	¾	4 ½	12

*Some sizes not available in premium grade carbide. Prices subject to change.

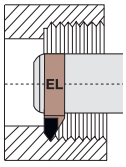


For cutting threads

30° SIDE CUTTING EDGE ANGLE
Offset for threading or boring

TOOL STYLE	883/PREMIUM C2*		370/PREMIUM C5-C6*		SHANK DIMENSIONS			STD. PKG. QTY.
	EDP NO.	PRICE	EDP NO.	PRICE	W	H	L	
EL-4	15404	$8.90	15504	$6.25	¼	¼	2	12
EL-5	15405	8.90	15505	8.55	5/16	5/16	2 ¼	12
EL-6	15406	8.90	15506	8.65	⅜	⅜	2 ½	12
EL-8	15408	13.90	15508	15.30	½	½	3 ½	12
EL-10	15410	15.15	15510	16.70	⅝	⅝	4	12
EL-12	15412	16.40	15512	17.80	¾	¾	4 ½	12

*Some sizes not available in premium grade carbide. Prices subject to change.

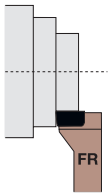


For bore threading in a 90° bar

0° END CUTTING EDGE ANGLE
Offset for facing to a square shoulder or close to chuck jaws

TOOL STYLE	883/PREMIUM C2*		370/PREMIUM C5-C6*		SHANK DIMENSIONS			STD. PKG. QTY.
	EDP NO.	PRICE	EDP NO.	PRICE	W	H	L	
FR-8	16108	$11.65	16208	$11.50	½	½	3 ½	12
FR-10	16110	16.90	16210	16.05	⅝	⅝	4	12
FR-12	16112	21.85	16212	21.55	¾	¾	4 ½	6
FR-16	16116	45.70	16216	48.05	1	1	7	4
FR-44	16144	CALL US	16244	CALL US	½	1	6	6

*Some sizes not available in premium grade carbide. Prices subject to change.



For facing to a square shoulder

0° END CUTTING EDGE ANGLE
Offset for facing to a square shoulder or close to chuck jaws

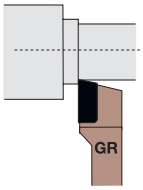
TOOL STYLE	883/PREMIUM C2*		370/PREMIUM C5-C6*		SHANK DIMENSIONS			STD. PKG. QTY.
	EDP NO.	PRICE	EDP NO.	PRICE	W	H	L	
FL-8	16408	$11.75	16508	$11.15	½	½	3 ½	12
FL-10	16410	17.65	16510	16.05	⅝	⅝	4	12
FL-12	16412	22.65	16512	20.05	¾	¾	4 ½	6
FL-16	16416	42.60	16516	48.05	1	1	7	4
FL-44	16444	CALL US	16544	CALL US	½	1	6	6

*Some sizes not available in premium grade carbide. Prices subject to change.

0° SIDE CUTTING EDGE ANGLE
Offset for facing or turning to a square shoulder or close to chuck jaws

TOOL STYLE	883/PREMIUM C2*		370/PREMIUM C5-C6*		SHANK DIMENSIONS			STD. PKG. QTY.
	EDP NO.	PRICE	EDP NO.	PRICE	W	H	L	
GR-8	17108	$11.75	17208	$11.15	½	½	3 ½	12
GR-10	17110	17.65	17210	16.05	⅝	⅝	4	12
GR-12	17112	22.65	17212	20.05	¾	¾	4 ½	6
GR-16	17116	47.75	17216	48.05	1	1	7	4
GR-20	17120	CALL US	17220	CALL US	1 ¼	1 ¼	8	1
GR-44	17144	CALL US	17244	CALL US	½	1	6	6

*Some sizes not available in premium grade carbide. Prices subject to change.



For turning to a square shoulder

0° SIDE CUTTING EDGE ANGLE
Offset for facing or turning to a square shoulder or close to chuck jaws

TOOL STYLE	883/PREMIUM C2*		370/PREMIUM C5-C6*		SHANK DIMENSIONS			STD. PKG. QTY.
	EDP NO.	PRICE	EDP NO.	PRICE	W	H	L	
GL-8	17408	$11.65	17508	$11.50	½	½	3 ½	12
GL-10	17410	16.90	17510	16.05	⅝	⅝	4	12
GL-12	17412	21.85	17512	21.55	¾	¾	4 ½	6
GL-16	17416	46.30	17516	48.05	1	1	7	4
GL-20	17420	CALL US	17520	CALL US	1 ¼	1 ¼	8	1
GL-44	17444	CALL US	17544	CALL US	½	1	6	6

*Some sizes not available in premium grade carbide. Prices subject to change.

BRAZED CUT-OFF TOOLS
CARBIDE TIPPED

MATERIAL SPECIFIC

883/PREMIUM C2 FOR NON-FERROUS & CAST IRONS
370/PREMIUM C5-C6 FOR STEELS

STANDARD CUT-OFF TOOL

For stock cut-off of solid bars
Finish ground - ready for use

TOOL STYLE	CUT-OFF WIDTH	883/PREMIUM C2*		370/PREMIUM C5-C6*		SHANK DIMENSIONS		
		EDP NO.	PRICE	EDP NO.	PRICE	W	H	L
CT-111	1/8	10111	$15.10	10211	$15.70	1/2	1	5
CT-122	3/16	10122	15.55	10222	16.00	1/2	1	5
CT-121	1/4	10133	16.05	10233	16.60	1/2	1	5
CT-120	5/16	10144	16.00	10244	16.60	1/2	1	5
CT-130	3/8	10155	19.40	10255	20.65	5/8	1 1/4	5
CT-140	3/8	10166	21.50	10266	22.25	3/4	1 1/2	6

*Some sizes not available in premium grade carbide. Prices subject to change.

Standard packaging quantity is 6

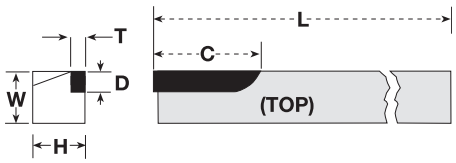
STANDARD CUT-OFF TOOL

For stock cut-off of solid bars
Finish ground - ready for use

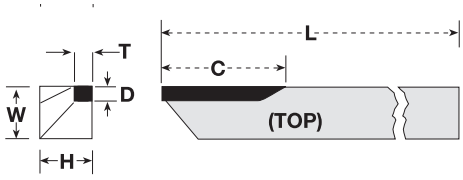
TOOL STYLE	CUT-OFF WIDTH	883/PREMIUM C2*		370/PREMIUM C5-C6*		SHANK DIMENSIONS		
		EDP NO.	PRICE	EDP NO.	PRICE	W	H	L
CTL-111	1/8	10411	$15.10	10511	$15.70	1/2	1	5
CTL-122	3/16	10422	15.55	10522	16.00	1/2	1	5
CTL-121	1/4	10433	16.05	10533	16.60	1/2	1	5
CTL-120	5/16	10444	16.00	10544	16.60	1/2	1	5
CTL-130	3/8	10455	19.40	10555	20.65	5/8	1 1/4	5
CTL-140	3/8	10466	21.50	10566	22.25	3/4	1 1/2	6

*Some sizes not available in premium grade carbide. Prices subject to change.

Standard packaging quantity is 6



H = Tool Height
W = Tool Width
L = Overall Tool Length
T = Carbide Thickness
D = Cut-off Width
C = Carbide Length



S.A. SERIES SWISS AUTOMATIC TOOL

Requires finish grind for cut-off, forming or turning

TOOL STYLE	C2 CARBIDE*		SHANK DIMENSIONS			CARBIDE DIMENSIONS		
	EDP NO.	PRICE	"W"	"H"	"L"	"T"	"D"	"C"
SA6T	19901	$13.65	1/4	1/4	6	3/32	1/8	1 1/4
SA7T	19902	14.65	9/32	9/32	6	3/32	1/8	1 1/4
SA8T	19903	15.95	5/16	5/16	6	3/32	3/16	1 1/4
SA9T	19904	16.95	3/8	3/8	6	3/32	3/16	1 1/4
SA10T	19905	18.35	13/32	13/32	6	3/32	3/16	1 1/4
SA11T	19906	19.05	7/16	7/16	6	1/8	1/4	1
SA11.5T	19907	19.10	15/32	15/32	6	1/8	1/4	1
SA12T	19908	20.30	1/2	1/2	6	1/8	1/4	1

*Prices subject to change

Standard packaging quantity is 10

S.A. SERIES SWISS AUTOMATIC TOOL

Requires finish grind for cut-off, forming or turning

TOOL STYLE	C2 CARBIDE*		SHANK DIMENSIONS			CARBIDE DIMENSIONS		
	EDP NO.	PRICE	"W"	"H"	"L"	"T"	"D"	"C"
SA6C	19921	$13.65	1/4	1/4	6	1/8	3/32	1 1/4
SA7C	19922	14.65	9/32	9/32	6	1/8	3/32	1 1/4
SA8C	19923	15.95	5/16	5/16	6	1/8	3/32	1 1/4
SA9C	19924	16.95	3/8	3/8	6	1/8	3/32	1 1/4
SA10C	19925	18.35	13/32	13/32	6	1/8	3/32	1 1/4
SA11C	19926	19.05	7/16	7/16	6	3/32	1/8	1 1/4
SA11.5C	19927	19.10	15/32	15/32	6	3/32	1/8	1 1/4
SA12C	19928	20.30	1/2	1/2	6	3/32	1/8	1 1/4

*Prices subject to change

Standard packaging quantity is 10

CATALOG INDEX
ALPHABETICAL BY PRODUCT SECTION

REAMERS - CARBIDE TIPPED

REAMERS - SOLID CARBIDE

REAMERS - SOLID CARBIDE (CONTINUED)

DRILLS

CATALOG INDEX (CONTINUED)
ALPHABETICAL BY PRODUCT SECTION

INDEX

CATALOG INDEX
NUMERICAL BY TOOL TYPE

INDEX

GENERAL INFORMATION

SELECTED DISTRIBUTION
To ensure exceptional service & technical application support, Hannibal only sells through selected distributors, your communications link with us. If you require direct technical assistance, contact our Engineering and Technical Service Team.
Phone: 800-451-9436
Fax: 800-633-7302
E-mail: sales@hannibalcarbide.com

STOCK STATUS
Because of our exceptionally broad product listing of over 20,000 line items, our distributors seldom stock our tools unless they have a consistent demand for particular tools requiring same day delivery. HANNIBAL maintains a 99% line item order fill rate. We have a huge inventory of finished tools ready to meet your needs.

SHIPPING
Normal procedure is to ship all distributor orders by UPS, unless requested otherwise. Our lost shipment insurance does not cover shipments sent "freight collect."

ORDERING
The only description required to order a standard tool is the EDP number. However, as a cross-check, orders should include a brief description of the tool.

MODIFICATIONS
Many standard tools ordered include requests for one or more modifications. On each page of this catalog is a list of the modifications most commonly requested. Just phone, fax, or e-mail us for an immediate quote. Modified tools are delivered promptly and are competitively priced.

APPLICATIONS ENGINEERING
HANNIBAL prides itself on the ability to solve end user tooling problems. We will suggest solutions including tool designs that have been used successfully to solve similar problems. Our proven applications engineering capability is reflected in the fact that some of the largest machine tool builders select HANNIBAL to design and produce the original cutting tools used in producing engines and transmissions.

FREE TECHNICAL REAMING GUIDE AVAILABLE
For technical reaming information see pages 23-29 or contact us to request your free hard copy, or PDF version of "HANNIBAL'S Guide to Cost Effective Reaming." It is continuously updated to include the latest reamer technical developments, including:
Reamer Stock Removal Chart • Titanium Coatings • Flute Geometry • Reamer Nomenclature & Definitions • Avoiding Reaming Problems • Runout Concerns • Developing Optimum Feeds & Speeds

QUALITY TOOLS
20% of HANNIBAL'S sales are special order tools made to end user's specifications and prints for the very demanding automotive, diesel engine, aircraft engine, aerospace, and construction equipment industries. To meet these stringent requirements, our engineers and tool makers work daily with exacting tolerances and procedures.

QUALITY APPROVED
Our plants have consistently passed quality system inspections by key engineering, production, and purchasing executives of our major tool users. HANNIBAL was Ford Q101 certified in 1989 and was originally ISO Certified on August 18, 1999 and continues to maintain ISO 9001 certifications.

TOLERANCES AND SPECIFICATIONS
All our tools are manufactured to one or more of the following specifications:

USCTI - United States Cutting Tool Institute
NAS - National Aerospace Standards
ISO - International Organization for Standardization
ASME/ANSI - American National Standards Institute, and affiliate of American Society of Mechanical Engineers

TOOL PERFORMANCE
While price is always a consideration, the real measure of the tool's value is its in-plant performance. HANNIBAL'S tool performance is proven wherever accurate records are kept, such as the aerospace and automotive industries. Here our tools earn "excellent" ratings... and that is why we are one of the fastest growing tool companies in the world.

PEOPLE
HANNIBAL'S engineers, technicians, tool makers, and sales & support staff are continually focused on the goal of producing the world's best carbide tipped tools. Our experienced tool makers sincerely want to do their very best every day making every effort to manufacture tools that will meet your exacting needs.

HANNIBAL

ACKNOWLEDGEMENTS
Cover Design – Poole Advertising
Printing – Crescent Printing Company

SERVICING THE GLOBE

- Phone Coverage 7 a.m. - 5 p.m. CDT
- Design & Manufacture Special Tools
- Comprehensive Tooling Solutions
- Experienced Technical Support
- Exceptional Customer Services
- Same Day Shipment Available
- No Charge for Drop Shipments
- 24-Hour Quote Turn Around
- Digital Catalog Available
- No Minimum Order Size
- Reliable Deliveries
- Consistent Quality
- ISO 9001 Certified
- Made in USA

HANNIBAL

Hannibal Carbide Tool, Inc

P.O. Box 954 • 5000 Paris Gravel Road • Hannibal, MO 63401

Phone 800-451-9436 • Fax 800-633-7302

www.hannibalcarbide.com • sales@hannibalcarbide.com