M.A. FORD®
High Performance Cutting Tools

*Where **high performance** is the **standard**®*

HP Drill Section
Product Catalog
2020

www.maford.com

Including

M.A. FORD®
High Performance Cutting Tools
ADVANCED PRODUCT GROUP

M.A. FORD®
High Performance Cutting Tools

*Where **high performance** is the **standard**®*

For 100 years, M.A. FORD® has been at the cutting edge of tooling design and manufacturing and has developed an enviable global reputation for performance and precision in advanced solid carbide tooling, serving over 60 countries worldwide.

Our innovative cutting geometries, materials and coating technologies are providing effective manufacturing solutions to an expanding and increasingly diverse range of industries from agriculture and construction to aerospace, power generation and automotive, to name but a few.

M.A. FORD® – Where high performance is the standard.®

⚠ **WARNING:** This product can expose you to chemicals including nickel, cobalt, and lead, which are known to the State of California to cause cancer, and chemicals including lead which are known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

www.maford.com Phone: 800-553-8024 or 563-391-6220 Email: sales@maford.com

Series Number by Page

HP Drills		
Series No.	Cat. Pg.	Tech Pg.
207CE	81	161
229	83	161
2MDCL	80	159
2XDCE	72	155
2XDCL	69	150
2XDCR	64	150
2XDCS	60	150
2XDSR	55	150
2XDSS	50	150
305	87	162
CDACR	42	144
CXDCL	38	140
CXDCR	33	140
CXDCS	29	140
CXDSR	25	140
CXDSS	20	140
HPDCR	76	158
HPDSR	76	158
MPDCS	46	146
MXDCL	49	146
MXDCR	48	146
MXDSR	47	146

GP Drills		
Series No.	Cat. Pg.	Tech Pg.
200S	73,134	157,164
402	133	174
405	136	174

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Twister XD® Drills Page 45-72 *(continued)*

Series	Tool Illustration	Coolant	Size Range	Length	Drill Point Angle	Helix Angle	Material Group	Page
2XDCS	 Single Margin		#31 - 5/8" 3.0mm - 16.0mm	3X	140° - 142°	30°		60-63
2XDCR	 Single Margin		#31 - 3/4" 3.0mm - 20.0mm	5X	140° - 142°	30°		64-68
2XDCL	 Single Margin		#31 - 1/2" 3.0mm - 12.0mm	7X+	140° - 142°	30°		69-71
2XDCE	 Length varies depending on size Double Margin on Tip		1/4" - 1/2" 5.0mm - 12.7mm		140° - 142°	30°		72
Technical Information								138-176

Twister® Spot Drills Page 73-74

Series	Tool Illustration	Coolant	Size Range	Length	Drill Point Angle	Helix Angle	Material Group	Page
200S			1/8" - 5/8" 3.0mm - 16.0mm	3X	145°	Straight Flute		73
403			3/16" - 1/2" 5.0mm - 12.0mm	3X+	120°	21°		74
404			3/16" - 1/2" 5.0mm - 12.0mm	3X+	90°	21°		74
Technical Information								138-176

Twister® HP Drills Page 76-92

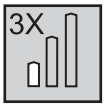
Series	Tool Illustration	Coolant	Size Range	Length	Drill Point Angle	Helix Angle	Material Group	Page
HP Drill Selection Chart								16
HPDSR	 Job Shop Drill Single Margin		3.0mm - 16.0mm	5X	140°	30°		76-79
HPDCR	 Job Shop Drill Single Margin		3.0mm - 16.0mm	5X	140°	30°		76-79
2MDCL	 Micro Drill Single Margin		2.0mm - 2.95mm	10X	140°	15°		80
207CE			3/32" - 3/8"	3X	Brad & Spur	35°		81-82
229	 3 Flute Drill Single Margin		3/64" - 3/4" 2.0mm - 16.0mm	5X	144° ≤12mm 150° >12mm	30°		83-86
305	 Micro Drill Length varies depending on size Single Margin		#102 - 1/8" 0.1mm - 3.0mm	3-10X	135°	12°		87-92
Technical Information								138-176

Icon Glossary

Drill Icons


Solid Carbide


Coolant Fed



Drill Length

Drill Point Angle

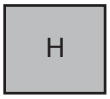
Helix Angle

Coatings

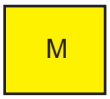
DIN Specs

Workpiece Material Group

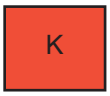
Steels



Hardened Steels (35-65Rc)



Stainless Steels



Cast Iron

Special Alloys

Non-Ferrous

HP Drill Selection Chart See Page 16, 137.
Drill Terminology See Page 176.

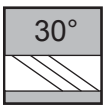
End Mill Icons

Number of Flutes


Center Cutting

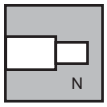

Lengths

Coatings



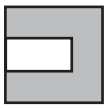
Helix Angle


Ball Nose

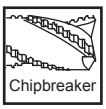


Neck Relief


Corner Radius


Shank

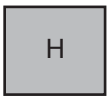
Shank/DIN



Chipbreaker

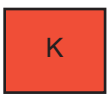
Workpiece Material Group

Steels



Hardened Steels (35-65Rc)

Stainless Steels



Cast Iron

Special Alloys

Non-Ferrous

End Mill Terminology See Page 384.

The "Perfect Storm" for High Performance Drilling

Cyclone

Cyclone XD

Cyclone Series CXDSS **Cyclone Series CXDCS**
Cyclone Series CXDSR **Cyclone Series CXDCR** **Cyclone Series CXDCL**

Cyclone DA
Drill for Aluminum and Similar Materials

Cyclone Series CDACR

Twister® XD
Xtreme High Performance Drilling

NEW **Twister XD® Series MPDCS**
Twister XD® Series MXDSR
NEW **Twister XD® Series MXDCR**
NEW **Twister XD® Series MXDCL**
Twister XD® Series 2XDSS
Twister XD® Series 2XDSR
Twister XD® Series 2XDCS
Twister XD® Series 2XDCR
Twister XD® Series 2XDCL
Twister XD® Series 2XDCE
Twister® Series 200S, 403 & 404 - Spot Drills

Twister® High Performance Drills

Twister® HPD Series HPDCR & HPDSR
Twister® MD Series 2MDCL
Twister® HP Series 207CE
Twister® AL Series 229
Twister® Micro-Tuff® Series 305

All HP Drill shanks are manufactured to h6 nominal diameters for heat shrink shank applications.

For HP Drill Selection Chart, See Page 16.

ISO 9001:2015 Certified

*Where **high performance** is the **standard**®*

For product information, call your local distributor.

High Performance Drill Selection Chart

Our industry leading high performance drill with the same high quality that helped set the standard.

Multipurpose high quality drill for most drilling applications adding stability, hole quality, tool life, and finish (excludes some work hardening materials).

An economical choice perfect for job shop and batch production work requiring a high performance drill option.

Series	Drill Lgth	Size Range Inch	Size Range mm	Margin	D1 Tol.	D2 Tol.	Helix	Point Angle	Coolant Fed	DIN	Coating	Application Recommendations							
												TEMA* Sizes	Steel	Hardened Steel	Stainless Steel	PH Stainless Steel	Cast Iron	Titanium	High Temp Alloys
CXDSS	3X	#31-3/4	3.0-20.0	Double	m7	h6	30°	140°	N	6537K	ALtima® Plus	X	1st	2nd	2nd	2nd	1st	2nd	2nd
CXDSR	5X	#31-5/8	3.0-16.0	Double	m7	h6	30°	140°	N	6537L	ALtima® Plus	X	1st	2nd	2nd	2nd	1st	2nd	2nd
CXDCS	3X	#31-5/8	3.0-16.0	Double	m7	h6	30°	140°	Y	6537K	ALtima® Plus	X	1st	2nd	1st	2nd	1st	1st	2nd
CXDCR	5X	#31-3/4	3.0-20.0	Double	m7	h6	30°	140°	Y	6537L	ALtima® Plus	X	1st	2nd	1st	2nd	1st	1st	2nd
CXDCL	8X	#31-5/8	3.0-16.0	Double	m7	h6	30°	140°	Y		ALtima® Plus	X	1st	2nd	1st	2nd	1st	1st	2nd
2XDSS	3X	#31-3/4	2.5-20.0	Single	h7	h6	30°	142°	N		ALtima®	X	2nd	1st	1st	1st	2nd	1st	1st
2XDSR	5X	1/64-5/8	0.5-16.0	Single	h7	h6	30°	142°	N		ALtima®	X	2nd	1st	1st	1st	2nd	1st	1st
2XDCS	3X	#31-5/8	3.0-16.0	Single	h7	h6	30°	142°	Y	6537K	ALtima®	X	2nd	1st	1st	1st	2nd	2nd	1st
2XDCR	5X	#31-3/4	3.0-20.0	Single	h7	h6	30°	142°	Y		ALtima®	X	2nd	1st	1st	1st	2nd	2nd	1st
2XDCL	7X+	#31-1/2	3.0-12.0	Single	h7	h6	30°	142°	Y		ALtima®	X	2nd	1st	1st	1st	2nd	2nd	1st
2XDCE	12X-25X**	1/4 - 1/2	5.0-12.0	Double	h7	h6	30°	142°	Y		ALtima®		2nd	1st	1st	1st	2nd	2nd	1st
HPDSR	5X	#31-5/8	3.0-16.0	Single	h7	h6	30°	140°	N	6537L	ALtima®		3rd	3rd	3rd	3rd	3rd	3rd	3rd
HPDCR	5X	#31-5/8	3.0-16.0	Single	h7	h6	30°	140°	Y	6537L	ALtima®		3rd	3rd	3rd	3rd	3rd	3rd	3rd

Note: For drilling applications involving cross holes and/or optimal hole finishes, use the CXD style drill.
*TEMA - Tubular Exchange Manufacturer's Association
**Length varies depending on size.

Inch	
D1	Tolerance (m7)
.0000 - .1181	+.00008/+.00047
.1182 - .2362	+.00016/+.00063
.2363 - .3937	+.00024/+.00083
.3938 - .7087	+.00027/+.00098
.7088 - .7500	+.00031/+.00114

Inch	
D1	Tolerance (h7)
.0000 - .1181	+0/-.00039
.1182 - .2362	+0/-.00047
.2363 - .3937	+0/-.00059
.3938 - .7087	+0/-.00071
.7088 - .7500	+0/-.00083

Inch	
D2	Tolerance (h6)
.0000 - .1181	+0/-.00024
.1182 - .2362	+0/-.00031
.2363 - .3937	+0/-.00035
.3938 - .7087	+0/-.00043
.7088 - .7500	+0/-.00051

Metric (mm)	
D1	Tolerance (m7)
0 - 3.0	+.002/+.012
3.01 - 6.0	+.004/+.016
6.01 - 10.0	+.006/+.021
10.01 - 18.0	+.007/+.025
18.01 - 20.0	+.008/+.029

Metric (mm)	
D1	Tolerance (h7)
0 - 3.0	+0/-.010
3.01 - 6.0	+0/-.012
6.01 - 10.0	+0/-.015
10.01 - 18.0	+0/-.018
18.01 - 20.0	+0/-.021

Metric (mm)	
D2	Tolerance (h6)
0 - 3.0	+0/-.006
3.01 - 6.0	+0/-.008
6.01 - 10.0	+0/-.009
10.01 - 18.0	+0/-.011
18.01 - 20.0	+0/-.013

M.A. Ford® Coating	Microhardness (HV)	Maximum Service Temp.	Friction Coefficient
ALtima®	3100	1100° C / 2012° F	0.42
ALtima® Plus	3200	1100° C / 2012° F	0.25

The "Perfect Storm" for High Performance Drilling

CXD ADVANCED DRILLING FEATURES AND BENEFITS

- **New lower thrust point geometry**
  - Refined edge protection for better performance in titanium and stainless steel (coolant through), and carbon steels

- **Enhanced double margin design**
  - Back margin location allows for quicker engagement in hole
  - Improved hole finishes
  - Improved location when drilling through cross holes

- **ALtima® Plus AlTiN multi-layer coating**
  - Higher heat resistance means higher RPM capabilities
  - Optimized coating structure lengthens drill life and reduces chipping and wear

- **Enhanced surface finish technology pre and post coating**
  - Pre-treatment enhances coating adhesion
  - Post-treatment enhances chip evacuation

CXD Case Studies:

Size: .758" (19.25mm)
Work material: 1018 steel plate
Machine: Haas VF-5
Competitor: X
RPM (n): 1940
vc-SFM: 385 m/min: 117
(f) IPR: .0135 mm/Rev: .34
Hole Depth: 1.5" (38mm)
M.A. Ford® Holes Produced: 3000
Competitor X Holes Produced: 2000
Total Drill Cost Savings During Test: $3,810

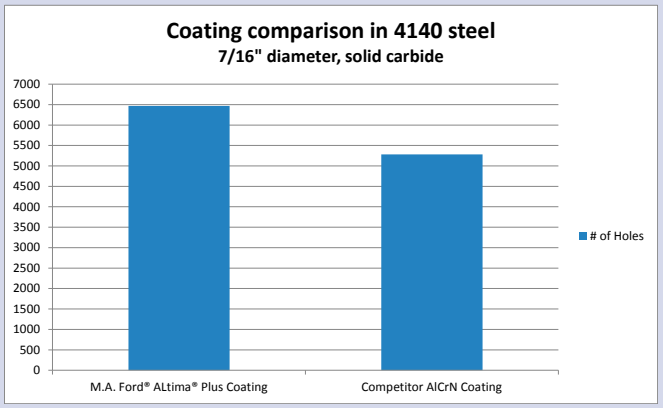
Size: 11/32"
Work material: 304 stainless steel modified
Machine: Mazak CNC lathe
Competitor: Y
RPM (n): 2228
vc-SFM: 200 m/min: 61
(f) IPR: .008 mm/Rev: .20
Hole Depth: 1.8" (45mm)
M.A. Ford® Holes Produced: 382
(ran out of parts)
Customer was very pleased with the CXD drill.
The CXD drill showed no chipping along cutting edges and flutes. The Competitor Y tool showed heavy chipping on cutting edges and flutes at same point of tool life.

ALtima® Plus Multi-Layer AlTiN Coating

M.A. Ford® 7/16" solid carbide drill
Workpiece Material: 4140 Steel
Coating: **M.A. Ford® ALtima® Plus**
Competitor Coating: AlCrN

22.5% more

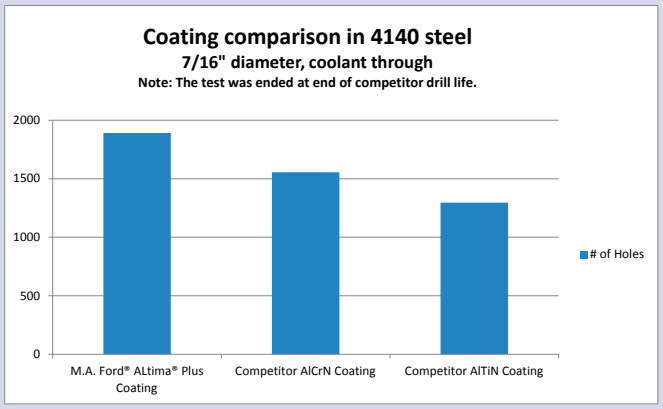
	M.A. Ford® **ALtima® Plus**	Competitor AlCrN
Number of Holes Produced	**6468**	5280



M.A. Ford® 7/16" coolant through carbide drill
Workpiece Material: 4140 Steel
Coating: **M.A. Ford® ALtima® Plus**
Competitor Coating: AlCrN
Competitor Coating: AlTiN

46% more

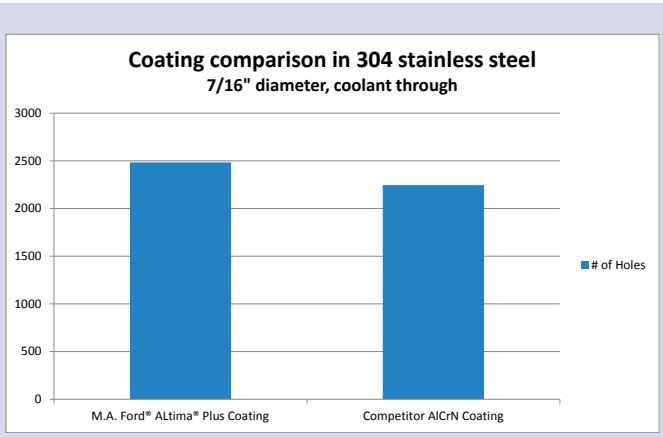
	M.A. Ford® ALtima® Plus	Competitor AlCrN	Competitor AlTiN
Number of Holes Produced	**1890**	1556	1296



M.A. Ford® 7/16" coolant through carbide drill
Workpiece Material: 304 Stainless Steel
Coating: **M.A. Ford® ALtima® Plus**
Competitor Coating: AlCrN

11% more

	M.A. Ford® ALtima® Plus	Competitor AlCrN
Number of Holes Produced	**2484**	2245

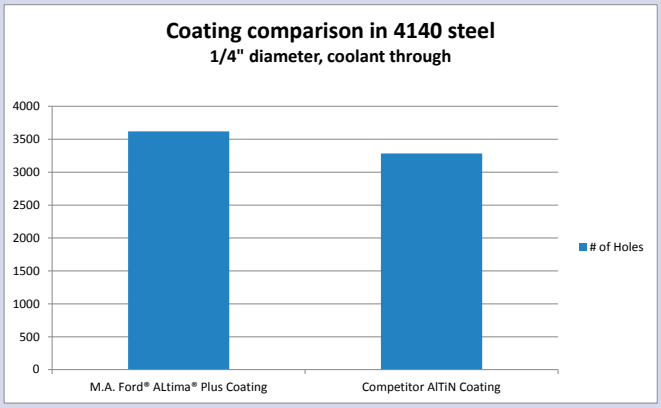


ALtima® Plus Multi-Layer AlTiN Coating

M.A. Ford® 1/4" coolant through carbide drill
Workpiece Material: 4140 Steel
Coating: **M.A. Ford® ALtima® Plus**
Competitor Coating: AlTiN

10% more

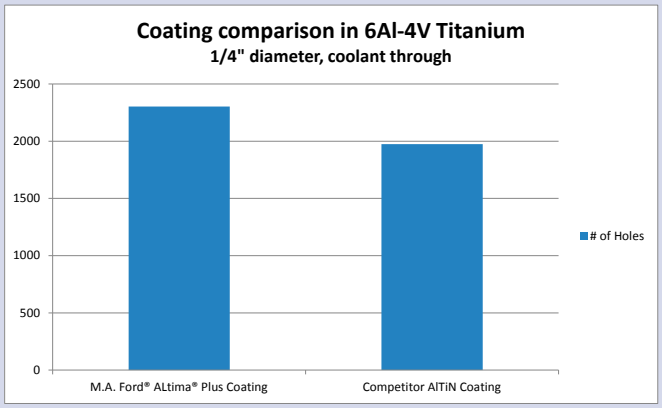
	M.A. Ford® **ALtima® Plus**	Competitor AlTiN
Number of Holes Produced	**3619**	3284



M.A. Ford® 1/4" coolant through carbide drill
Workpiece Material: 6Al-4V Titanium
Coating: **M.A. Ford® ALtima® Plus**
Competitor Coating: AlTiN

17% more

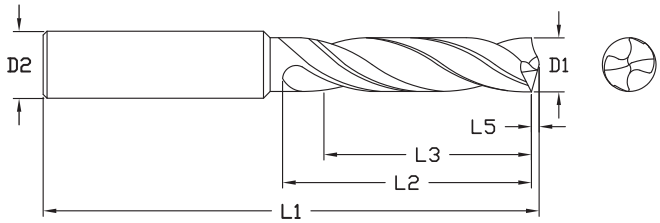
	M.A. Ford® **ALtima® Plus**	Competitor AlTiN
Number of Holes Produced	**2303**	1974



Improved Productivity • Lower Cost Per Hole

Cyclone Series CXDSS

Designed for high performance drilling in a broad range of materials.



- Double Margin.

ALtima® Plus		Diameter				Shank		OAL		Flute Length		Drill Length		Point Length	
		D1 (m7)				D2 (h6)		L1		L2 (Max.)		L3 Ref.		L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
CXDSS 0300AP	06615			3.0	.1181		3.0		62		20		14		0.46
CXDSS1200AP	06616		#31		.1200	1/8		2.44		0.787		0.551		0.019	
CXDSS 0310AP	06617			3.1	.1220		4.0		62		20		14		0.48
CXDSS1250AP	06618	1/8			.1250	1/8		2.44		0.787		0.551		0.019	
CXDSS 0320AP	06619			3.2	.1260		4.0		62		20		14		0.50
CXDSS1285AP	06620		#30		.1285	5/32		2.44		0.787		0.551		0.020	
CXDSS 0330AP	06621			3.3	.1299		4.0		62		20		14		0.51
CXDSS 0340AP	06622			3.4	.1339		4.0		62		20		14		0.53
CXDSS1360AP	06623		#29		.1360	5/32		2.44		0.787		0.551		0.021	
CXDSS 0350AP	06624			3.5	.1378		4.0		62		20		14		0.54
CXDSS1406AP	06625	9/64			.1406	5/32		2.44		0.787		0.551		0.022	
CXDSS 0360AP	06626			3.6	.1417		4.0		62		20		14		0.56
CXDSS 0370AP	06627			3.7	.1457		4.0		62		20		14		0.57
CXDSS 0380AP	06628			3.8	.1496		4.0		66		24		17		0.59
CXDSS1520AP	06629		#24		.1520	5/32		2.60		0.945		0.669		0.024	
CXDSS 0390AP	06630			3.9	.1535		4.0		66		24		17		0.60
CXDSS1562AP	06631	5/32			.1562	5/32		2.60		0.945		0.669		0.024	
CXDSS 0400AP	06632			4.0	.1575		4.0		66		24		17		0.62
CXDSS1590AP	06633		#21		.1590	3/16		2.60		0.945		0.669		0.025	
CXDSS 0410AP	06634			4.1	.1614		5.0		66		24		17		0.64
CXDSS 0420AP	06635			4.2	.1654		5.0		66		24		17		0.65
CXDSS 0430AP	06636			4.3	.1693		5.0		66		24		17		0.67
CXDSS1719AP	06637	11/64			.1719	3/16		2.60		0.945		0.669		0.027	
CXDSS 0440AP	06638			4.4	.1732		5.0		66		24		17		0.68
CXDSS 0450AP	06639			4.5	.1772		5.0		66		24		17		0.70
CXDSS 0460AP	06640			4.6	.1811		5.0		66		24		17		0.71
CXDSS 0470AP	06641			4.7	.1850		5.0		66		24		17		0.73
CXDSS1875AP	06642	3/16			.1875	3/16		2.60		1.102		0.787		0.029	
CXDSS 0480AP	06643			4.8	.1890		5.0		66		28		20		0.74
CXDSS 0490AP	06644			4.9	.1929		5.0		66		28		20		0.76

Inch	
D1	Tolerance (m7)
.0000 - .1181	+.00008/+.00047
.1182 - .2362	+.00016/+.00063
.2363 - .3937	+.00024/+.00083
.3938 - .7087	+.00027/+.00098
.7088 - .7500	+.00031/+.00114

Inch	
D2	Tolerance (h6)
.0000 - .1181	+0/-.00024
.1182 - .2362	+0/-.00031
.2363 - .3937	+0/-.00035
.3938 - .7087	+0/-.00043
.7088 - .7500	+0/-.00051

Metric (mm)	
D1	Tolerance (m7)
0 - 3.0	+.002/+.012
3.01 - 6.0	+.004/+.016
6.01 - 10.0	+.006/+.021
10.01 - 18.0	+.007/+.025
18.01 - 20.0	+.008/+.029

Metric (mm)	
D2	Tolerance (h6)
0 - 3.0	+0/-.006
3.01 - 6.0	+0/-.008
6.01 - 10.0	+0/-.009
10.01 - 18.0	+0/-.011
18.01 - 20.0	+0/-.013

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Series CXDSS Continued

ALtima® Plus		Diameter D1 (m7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
CXDSS 0500AP	06645			5.0	.1968		5.0		66		28		20		0.77
CXDSS 0510AP	06646			5.1	.2008		6.0		66		28		20		0.79
CXDSS2031AP	06647	13/64			.2031	1/4		2.60		1.102		0.787		0.031	
CXDSS 0520AP	06648			5.2	.2047		6.0		66		28		20		0.81
CXDSS 0530AP	06649			5.3	.2087		6.0		66		28		20		0.82
CXDSS 0540AP	06650			5.4	.2126		6.0		66		28		20		0.84
CXDSS 0550AP	06651			5.5	.2165		6.0		66		28		20		0.85
CXDSS2187AP	06652	7/32			.2187	1/4		2.60		1.102		0.787		0.034	
CXDSS 0560AP	07091			5.6	.2205		6.0		66		28		20		0.86
CXDSS2210AP	06653		#2		.2210	1/4		2.60		1.102		0.787		0.034	
CXDSS 0570AP	06654			5.7	.2244		6.0		66		28		20		0.88
CXDSS 0580AP	06655			5.8	.2283		6.0		66		28		20		0.90
CXDSS 0590AP	06656			5.9	.2323		6.0		66		28		20		0.91
CXDSS2344AP	06657	15/64			.2344	1/4		2.60		1.102		0.787		0.036	
CXDSS 0600AP	06658			6.0	.2362		6.0		66		28		20		0.93
CXDSS 0610AP	06659			6.1	.2402		8.0		79		34		24		0.95
CXDSS2420AP	06660		C		.2420	1/4		3.11		1.339		0.945		0.037	
CXDSS 0620AP	06661			6.2	.2441		8.0		79		34		24		0.96
CXDSS2460AP	06662		D		.2460	1/4		3.11		1.339		0.945		0.038	
CXDSS 0630AP	06663			6.3	.2480		8.0		79		34		24		0.98
CXDSS2500AP	06664	1/4			.2500	1/4		3.11		1.339		0.945		0.039	
CXDSS 0640AP	06665			6.4	.2520		8.0		79		34		24		0.99
CXDSS 0650AP	06666			6.5	.2559		8.0		79		34		24		1.01
CXDSS2570AP	06667		F		.2570	5/16		3.11		1.339		0.945		0.040	
CXDSS 0660AP	06668			6.6	.2598		8.0		79		34		24		1.03
CXDSS2610AP	06669		G		.2610	5/16		3.11		1.339		0.945		0.040	
CXDSS 0670AP	06670			6.7	.2638		8.0		79		34		24		1.04
CXDSS2656AP	06671	17/64			.2656	5/16		3.11		1.339		0.945		0.041	
CXDSS 0680AP	06672			6.8	.2677		8.0		79		34		24		1.05
CXDSS 0690AP	06673			6.9	.2717		8.0		79		34		24		1.07
CXDSS 0700AP	06674			7.0	.2756		8.0		79		34		24		1.08
CXDSS 0710AP	06675			7.1	.2795		8.0		79		41		29		1.10
CXDSS2812AP	06676	9/32			.2812	5/16		3.11		1.614		1.142		0.044	
CXDSS 0720AP	06677			7.2	.2835		8.0		79		41		29		1.12
CXDSS 0730AP	06678			7.3	.2874		8.0		79		41		29		1.13
CXDSS 0740AP	06679			7.4	.2913		8.0		79		41		29		1.15
CXDSS 0750AP	06680			7.5	.2953		8.0		79		41		29		1.16
CXDSS2969AP	06681	19/64			.2969	5/16		3.11		1.614		1.142		0.046	
CXDSS 0760AP	06682			7.6	.2992		8.0		79		41		29		1.18
CXDSS 0770AP	06683			7.7	.3031		8.0		79		41		29		1.19
CXDSS 0780AP	06684			7.8	.3071		8.0		79		41		29		1.21
CXDSS 0790AP	06685			7.9	.3110		8.0		79		41		29		1.22

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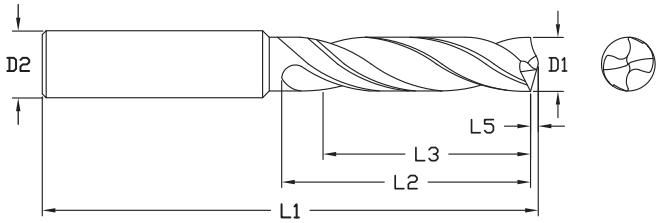
Series CXDSS Continued



ALtima® Plus		Diameter D1 (m7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
CXDSS3125AP	06686	5/16			.3125	5/16		3.11		1.614		1.142		0.048	
CXDSS 0800AP	06687			8.0	.3150		8.0		79		41		29		1.24
CXDSS 0810AP	06688			8.1	.3189		10.0		89		47		35		1.26
CXDSS 0820AP	06689			8.2	.3228		10.0		89		47		35		1.27
CXDSS 0830AP	06690			8.3	.3268		10.0		89		47		35		1.29
CXDSS3281AP	06691	21/64			.3281	3/8		3.50		1.850		1.378		0.051	
CXDSS 0840AP	06692			8.4	.3307		10.0		89		47		35		1.31
CXDSS3320AP	06693		Q		.3320	3/8		3.50		1.850		1.378		0.051	
CXDSS 0850AP	06694			8.5	.3346		10.0		89		47		35		1.32
CXDSS 0860AP	06695			8.6	.3386		10.0		89		47		35		1.33
CXDSS 0870AP	06696			8.7	.3425		10.0		89		47		35		1.35
CXDSS3438AP	06697	11/32			.3438	3/8		3.50		1.850		1.378		0.053	
CXDSS 0880AP	06698			8.8	.3465		10.0		89		47		35		1.36
CXDSS 0890AP	06699			8.9	.3504		10.0		89		47		35		1.38
CXDSS 0900AP	06700			9.0	.3543		10.0		89		47		35		1.39
CXDSS 0910AP	06701			9.1	.3583		10.0		89		47		35		1.41
CXDSS3594AP	06702	23/64			.3594	3/8		3.50		1.850		1.378		0.056	
CXDSS 0920AP	06703			9.2	.3622		10.0		89		47		35		1.43
CXDSS 0925AP	06704			9.25	.3642		10.0		89		47		35		1.43
CXDSS 0930AP	06705			9.3	.3661		10.0		89		47		35		1.44
CXDSS 0940AP	06706			9.4	.3701		10.0		89		47		35		1.46
CXDSS 0950AP	06707			9.5	.3740		10.0		89		47		35		1.47
CXDSS3750AP	06708	3/8			.3750	3/8		3.50		1.850		1.378		0.058	
CXDSS 0960AP	06709			9.6	.3780		10.0		89		47		35		1.49
CXDSS 0970AP	06710			9.7	.3819		10.0		89		47		35		1.50
CXDSS 0980AP	06711			9.8	.3858		10.0		89		47		35		1.52
CXDSS 0990AP	06712			9.9	.3898		10.0		89		47		35		1.53
CXDSS3906AP	06713	25/64			.3906	7/16		3.50		1.850		1.378		0.061	
CXDSS 1000AP	06714			10.0	.3937		10.0		89		47		35		1.55
CXDSS 1010AP	06715			10.1	.3976		12.0		102		55		40		1.56
CXDSS 1020AP	06716			10.2	.4016		12.0		102		55		40		1.58
CXDSS 1030AP	06717			10.3	.4055		12.0		102		55		40		1.60
CXDSS4062AP	06718	13/32			.4062	7/16		4.02		2.165		1.575		0.063	
CXDSS 1040AP	06719			10.4	.4094		12.0		102		55		40		1.61
CXDSS 1050AP	06720			10.5	.4134		12.0		102		55		40		1.63
CXDSS 1060AP	06721			10.6	.4173		12.0		102		55		40		1.64
CXDSS 1070AP	06722			10.7	.4213		12.0		102		55		40		1.66
CXDSS4219AP	06723	27/64			.4219	7/16		4.02		2.165		1.575		0.065	

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Series CXDSS Continued

ALtima® Plus		Diameter D1 (m7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
CXDSS 1080AP	06724			10.8	.4252		12.0		102		55		40		1.67
CXDSS 1090AP	06725			10.9	.4291		12.0		102		55		40		1.69
CXDSS 1100AP	06726			11.0	.4331		12.0		102		55		40		1.70
CXDSS 1110AP	06727			11.1	.4370		12.0		102		55		40		1.72
CXDSS4375AP	06728	7/16			.4375	7/16		4.02		2.165		1.575		0.068	
CXDSS 1120AP	06729			11.2	.4409		12.0		102		55		40		1.74
CXDSS 1130AP	06730			11.3	.4449		12.0		102		55		40		1.75
CXDSS 1140AP	06731			11.4	.4488		12.0		102		55		40		1.77
CXDSS 1150AP	06732			11.5	.4527		12.0		102		55		40		1.78
CXDSS 1160AP	06733			11.6	.4567		12.0		102		55		40		1.80
CXDSS 1170AP	06734			11.7	.4606		12.0		102		55		40		1.81
CXDSS 1180AP	06735			11.8	.4646		12.0		102		55		40		1.83
CXDSS 1190AP	06736			11.9	.4685		12.0		102		55		40		1.84
CXDSS4688AP	06737	15/32			.4688	1/2		4.02		2.165		1.575		0.073	
CXDSS 1200AP	06738			12.0	.4724		12.0		102		55		40		1.86
CXDSS 1210AP	06739			12.1	.4764		14.0		107		60		43		1.87
CXDSS4844AP	06740	31/64			.4844	1/2		4.21		2.362		1.693		0.075	
CXDSS 1250AP	06741			12.5	.4921		14.0		107		60		43		1.94
CXDSS5000AP	06742	1/2			.5000	1/2		4.21		2.362		1.693		0.077	
CXDSS 1280AP	06743			12.8	.5039		14.0		107		60		43		1.98
CXDSS 1283AP	06744			12.83	.5051		14.0		107		60		43		1.99
CXDSS 1290AP	06745			12.9	.5079		14.0		107		60		43		2.00
CXDSS 1300AP	06746			13.0	.5118		14.0		107		60		43		2.01
CXDSS5156AP	06747	33/64			.5156	9/16		4.21		2.362		1.693		0.080	
CXDSS5312AP	06748	17/32			.5312	9/16		4.21		2.362		1.693		0.082	
CXDSS 1350AP	06750			13.5	.5315		14.0		107		60		43		2.09
CXDSS 1370AP	06751			13.7	.5394		14.0		107		60		43		2.12
CXDSS5469AP	06752	35/64			.5469	9/16		4.21		2.362		1.693		0.085	
CXDSS 1400AP	06753			14.0	.5512		14.0		107		60		43		2.17
CXDSS5625AP	06754	9/16			.5625	9/16		4.53		2.559		1.772		0.087	
CXDSS 1450AP	06755			14.5	.5709		16.0		115		65		45		2.25
CXDSS 1470AP	06756			14.7	.5787		16.0		115		65		45		2.28
CXDSS 1500AP	06757			15.0	.5905		16.0		115		65		45		2.32
CXDSS5938AP	06758	19/32			.5938	5/8		4.53		2.559		1.772		0.092	
CXDSS 1530AP	06759			15.3	.6024		16.0		115		65		45		2.37
CXDSS 1550AP	06760			15.5	.6102		16.0		115		65		45		2.40
CXDSS 1570AP	06761			15.7	.6181		16.0		115		65		45		2.43
CXDSS6250AP	06762	5/8			.6250	5/8		4.53		2.559		1.772		0.097	
CXDSS 1600AP	06763			16.0	.6299		16.0		115		65		45		2.48
CXDSS 1608AP	06764			16.08	.6331		18.0		123		73		51		2.49

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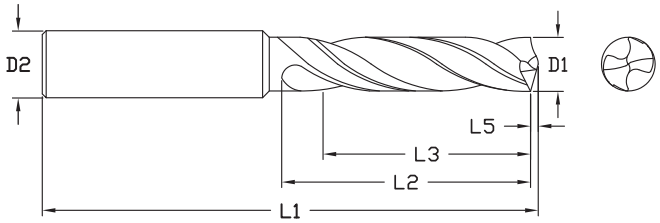
Series CXDSS Continued



ALtima® Plus		Diameter D1 (m7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
CXDSS 1630AP	06765			16.3	.6417		18.0		123		73		51		2.53
CXDSS 1650AP	06766			16.5	.6496		18.0		123		73		51		2.56
CXDSS6562AP	06767	21/32			.6562	11/16		4.84		2.874		2.008		0.102	
CXDSS 1700AP	06768			17.0	.6693		18.0		123		73		51		2.63
CXDSS6875AP	06769	11/16			.6875	11/16		4.84		2.874		2.008		0.107	
CXDSS 1750AP	06770			17.5	.6890		18.0		123		73		51		2.71
CXDSS 1800AP	06771			18.0	.7087		18.0		123		73		51		2.79
CXDSS 1850AP	06772			18.5	.7283		20.0		131		79		55		2.87
CXDSS7500AP	06773	3/4			.7500	3/4		5.16		3.11		2.165		0.116	
CXDSS 1916AP	06774			19.16	.7543		20.0		131		79		55		2.97
CXDSS 1925AP	06775			19.25	.7579		20.0		131		79		55		2.98
CXDSS 1930AP	06776			19.3	.7598		20.0		131		79		55		2.99
CXDSS 1950AP	06777			19.5	.7677		20.0		131		79		55		3.02
CXDSS 2000AP	06778			20.0	.7874		20.0		131		79		55		3.10

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ALtima® Plus
Advanced High Performance Coating

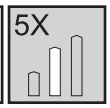
Coating Properties

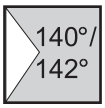
MA Ford® Coating	MA Ford® Tool Number Designation	Microhardness (HV)	Maximum Service Temp.	Friction Coefficient
ALtima® Plus	AP	3200	1100° C / 2012° F	0.25

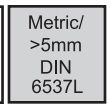
Safety Note

Always wear the appropriate personal protective equipment such as safety glasses and protective clothing when using solid carbide or HSS cutting tools. Machines should be fully guarded. Technical data provided should be considered advisory only as variations may be necesary depending on the particular application.

Cyclone Series CXDSR

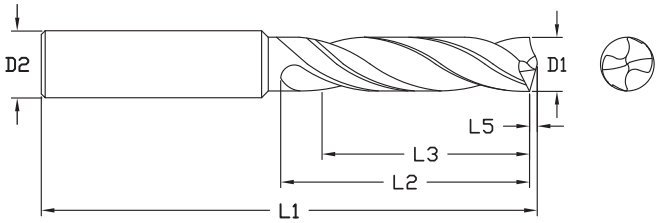





Designed for high performance drilling in a broad range of materials.

- Double Margin.



ALtima® Plus		Diameter D1 (m7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
CXDSR 0300AP	06467			3.0	.1181		3.0		66		28		23		0.46
CXDSR1200AP	06468		#31		.1200	1/8		2.60		1.102		0.906		0.019	
CXDSR 0310AP	06469			3.1	.1220		4.0		66		28		23		0.48
CXDSR1250AP	06470	1/8			.1250	1/8		2.60		1.102		0.906		0.019	
CXDSR 0320AP	06471			3.2	.1260		4.0		66		28		23		0.50
CXDSR1285AP	06472		#30		.1285	5/32		2.60		1.102		0.906		0.020	
CXDSR 0330AP	06473			3.3	.1299		4.0		66		28		23		0.51
CXDSR 0340AP	06474			3.4	.1339		4.0		66		28		23		0.53
CXDSR1360AP	06475		#29		.1360	5/32		2.60		1.102		0.906		0.021	
CXDSR 0350AP	06476			3.5	.1378		4.0		66		28		23		0.54
CXDSR1406AP	06477	9/64			.1406	5/32		2.60		1.102		0.906		0.022	
CXDSR 0360AP	06478			3.6	.1417		4.0		66		28		23		0.56
CXDSR 0370AP	06479			3.7	.1457		4.0		66		28		23		0.57
CXDSR 0380AP	06480			3.8	.1496		4.0		74		36		29		0.59
CXDSR1520AP	06481		#24		.1520	5/32		2.91		1.417		1.142		0.024	
CXDSR 0390AP	06482			3.9	.1535		4.0		74		36		29		0.60
CXDSR1562AP	06483	5/32			.1562	5/32		2.91		1.417		1.142		0.024	
CXDSR 0400AP	06484			4.0	.1575		4.0		74		36		29		0.62
CXDSR1590AP	06485		#21		.1590	3/16		2.91		1.417		1.142		0.025	
CXDSR 0410AP	06486			4.1	.1614		5.0		74		36		29		0.64
CXDSR 0420AP	06487			4.2	.1654		5.0		74		36		29		0.65
CXDSR 0430AP	06488			4.3	.1693		5.0		74		36		29		0.67
CXDSR1719AP	06489	11/64			.1719	3/16		2.91		1.417		1.142		0.027	
CXDSR 0440AP	06490			4.4	.1732		5.0		74		36		29		0.68
CXDSR 0450AP	06491			4.5	.1772		5.0		74		36		29		0.70
CXDSR 0460AP	06492			4.6	.1811		5.0		74		36		29		0.71
CXDSR 0470AP	06493			4.7	.1850		5.0		74		36		29		0.73
CXDSR1875AP	06494	3/16			.1875	3/16		3.23		1.732		1.378		0.029	
CXDSR 0480AP	06495			4.8	.1890		5.0		82		44		35		0.74
CXDSR 0490AP	06496			4.9	.1929		5.0		82		44		35		0.76
CXDSR 0500AP	06497			5.0	.1968		5.0		82		44		35		0.77
CXDSR 0510AP	06498			5.1	.2008		6.0		82		44		35		0.79

Inch	
D1	Tolerance (m7)
.0000 - .1181	+.00008/+.00047
.1182 - .2362	+.00016/+.00063
.2363 - .3937	+.00024/+.00083
.3938 - .7087	+.00027/+.00098

Inch	
D2	Tolerance (h6)
.0000 - .1181	+0/-.00024
.1182 - .2362	+0/-.00031
.2363 - .3937	+0/-.00035
.3938 - .7087	+0/-.00043

Metric (mm)	
D1	Tolerance (m7)
0 - 3.0	+.002/+.012
3.01 - 6.0	+.004/+.016
6.01 - 10.0	+.006/+.021
10.01 - 18.0	+.007/+.025

Metric (mm)	
D2	Tolerance (h6)
0 - 3.0	+0/-.006
3.01 - 6.0	+0/-.008
6.01 - 10.0	+0/-.009
10.01 - 18.0	+0/-.011

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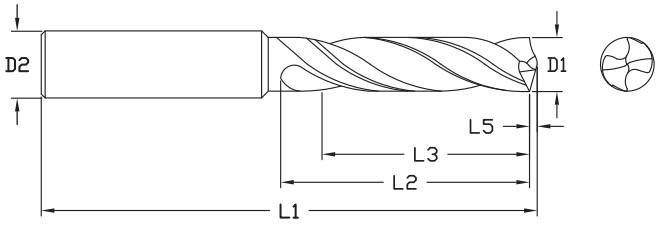
Series CXDSR Continued



ALtima® Plus		Diameter D1 (m7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
CXDSR2031AP	06499	13/64			.2031	1/4		3.23		1.732		1.378		0.031	
CXDSR 0520AP	06500			5.2	.2047		6.0		82		44		35		0.81
CXDSR 0530AP	06501			5.3	.2087		6.0		82		44		35		0.82
CXDSR 0540AP	06502			5.4	.2126		6.0		82		44		35		0.84
CXDSR 0550AP	06503			5.5	.2165		6.0		82		44		35		0.85
CXDSR2187AP	06504	7/32			.2187	1/4		3.23		1.732		1.378		0.034	
CXDSR 0560AP	07092			5.6	.2205		6.0		82		44		35		0.86
CXDSR2210AP	06505		#2		.2210	1/4		3.23		1.732		1.378		0.034	
CXDSR 0570AP	06506			5.7	.2244		6.0		82		44		35		0.88
CXDSR 0580AP	06507			5.8	.2283		6.0		82		44		35		0.90
CXDSR 0590AP	06508			5.9	.2323		6.0		82		44		35		0.91
CXDSR2344AP	06509	15/64			.2344	1/4		3.23		1.732		1.378		0.036	
CXDSR 0600AP	06510			6.0	.2362		6.0		82		44		35		0.93
CXDSR 0610AP	06511			6.1	.2402		8.0		91		53		43		0.95
CXDSR2420AP	06512		C		.2420	1/4		3.58		2.087		1.693		0.037	
CXDSR 0620AP	06513			6.2	.2441		8.0		91		53		43		0.96
CXDSR2460AP	06514		D		.2460	1/4		3.58		2.087		1.693		0.038	
CXDSR 0630AP	06515			6.3	.2480		8.0		91		53		43		0.98
CXDSR2500AP	06516	1/4			.2500	1/4		3.58		2.087		1.693		0.039	
CXDSR 0640AP	06517			6.4	.2520		8.0		91		53		43		0.99
CXDSR 0650AP	06518			6.5	.2559		8.0		91		53		43		1.01
CXDSR2570AP	06519		F		.2570	5/16		3.58		2.087		1.693		0.040	
CXDSR 0660AP	06520			6.6	.2598		8.0		91		53		43		1.03
CXDSR2610AP	06521		G		.2610	5/16		3.58		2.087		1.693		0.040	
CXDSR 0670AP	06522			6.7	.2638		8.0		91		53		43		1.04
CXDSR2656AP	06523	17/64			.2656	5/16		3.58		2.087		1.693		0.041	
CXDSR 0680AP	06524			6.8	.2677		8.0		91		53		43		1.05
CXDSR 0690AP	06525			6.9	.2717		8.0		91		53		43		1.07
CXDSR 0700AP	06526			7.0	.2756		8.0		91		53		43		1.08
CXDSR 0710AP	06527			7.1	.2795		8.0		91		53		43		1.10
CXDSR2812AP	06528	9/32			.2812	5/16		3.58		2.087		1.693		0.044	
CXDSR 0720AP	06529			7.2	.2835		8.0		91		53		43		1.12
CXDSR 0730AP	06530			7.3	.2874		8.0		91		53		43		1.13
CXDSR 0740AP	06531			7.4	.2913		8.0		91		53		43		1.15
CXDSR 0750AP	06532			7.5	.2953		8.0		91		53		43		1.16
CXDSR2969AP	06533	19/64			.2969	5/16		3.58		2.087		1.693		0.046	
CXDSR 0760AP	06534			7.6	.2992		8.0		91		53		43		1.18
CXDSR 0770AP	06535			7.7	.3031		8.0		91		53		43		1.19

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Series CXDSR Continued

ALtima® Plus		Diameter D1 (m7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
CXDSR 0780AP	06536			7.8	.3071		8.0		91		53		43		1.21
CXDSR 0790AP	06537			7.9	.3110		8.0		91		53		43		1.22
CXDSR3125AP	06538	5/16			.3125	5/16		3.58		2.087		1.693		0.048	
CXDSR 0800AP	06539			8.0	.3150		8.0		91		53		43		1.24
CXDSR 0810AP	06540			8.1	.3189		10.0		103		61		49		1.26
CXDSR 0820AP	06541			8.2	.3228		10.0		103		61		49		1.27
CXDSR 0830AP	06542			8.3	.3268		10.0		103		61		49		1.29
CXDSR3281AP	06543	21/64			.3281	3/8		4.06		2.402		1.929		0.051	
CXDSR 0840AP	06544			8.4	.3307		10.0		103		61		49		1.31
CXDSR3320AP	06545		Q		.3320	3/8		4.06		2.402		1.929		0.051	
CXDSR 0850AP	06546			8.5	.3346		10.0		103		61		49		1.32
CXDSR 0860AP	06547			8.6	.3386		10.0		103		61		49		1.33
CXDSR 0870AP	06548			8.7	.3425		10.0		103		61		49		1.35
CXDSR3438AP	06549	11/32			.3438	3/8		4.06		2.402		1.929		0.053	
CXDSR 0880AP	06550			8.8	.3465		10.0		103		61		49		1.36
CXDSR 0890AP	06551			8.9	.3504		10.0		103		61		49		1.38
CXDSR 0900AP	06552			9.0	.3543		10.0		103		61		49		1.39
CXDSR 0910AP	06553			9.1	.3583		10.0		103		61		49		1.41
CXDSR3594AP	06554	23/64			.3594	3/8		4.06		2.402		1.929		0.056	
CXDSR 0920AP	06555			9.2	.3622		10.0		103		61		49		1.43
CXDSR 0925AP	06556			9.25	.3642		10.0		103		61		49		1.43
CXDSR 0930AP	06557			9.3	.3661		10.0		103		61		49		1.44
CXDSR 0940AP	06558			9.4	.3701		10.0		103		61		49		1.46
CXDSR 0950AP	06559			9.5	.3740		10.0		103		61		49		1.47
CXDSR3750AP	06560	3/8			.3750	3/8		4.06		2.402		1.929		0.058	
CXDSR 0960AP	06561			9.6	.3780		10.0		103		61		49		1.49
CXDSR 0970AP	06562			9.7	.3819		10.0		103		61		49		1.50
CXDSR 0980AP	06563			9.8	.3858		10.0		103		61		49		1.52
CXDSR 0990AP	06564			9.9	.3898		10.0		103		61		49		1.53
CXDSR3906AP	06565	25/64			.3906	7/16		4.06		2.402		1.929		0.061	
CXDSR 1000AP	06566			10.0	.3937		10.0		103		61		49		1.55
CXDSR 1010AP	06567			10.1	.3976		12.0		118		71		56		1.56
CXDSR 1020AP	06568			10.2	.4016		12.0		118		71		56		1.58
CXDSR 1030AP	06569			10.3	.4055		12.0		118		71		56		1.60
CXDSR4062AP	06570	13/32			.4062	7/16		4.65		2.795		2.205		0.063	
CXDSR 1040AP	06571			10.4	.4094		12.0		118		71		56		1.61
CXDSR 1050AP	06572			10.5	.4134		12.0		118		71		56		1.63
CXDSR 1060AP	06573			10.6	.4173		12.0		118		71		56		1.64
CXDSR 1070AP	06574			10.7	.4213		12.0		118		71		56		1.66
CXDSR4219AP	06575	27/64			.4219	7/16		4.65		2.795		2.205		0.065	
CXDSR 1080AP	06576			10.8	.4252		12.0		118		71		56		1.67
CXDSR 1090AP	06577			10.9	.4291		12.0		118		71		56		1.69

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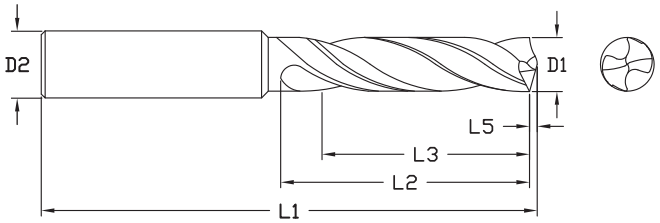
Series CXDSR Continued



ALtima® Plus		Diameter D1 (m7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
CXDSR 1100AP	06578			11.0	.4331		12.0		118		71		56		1.70
CXDSR 1110AP	06579			11.1	.4370		12.0		118		71		56		1.72
CXDSR4375AP	06580	7/16			.4375	7/16		4.65		2.795		2.205		0.068	
CXDSR 1120AP	06581			11.2	.4409		12.0		118		71		56		1.74
CXDSR 1130AP	06582			11.3	.4449		12.0		118		71		56		1.75
CXDSR 1140AP	06583			11.4	.4488		12.0		118		71		56		1.77
CXDSR 1150AP	06584			11.5	.4527		12.0		118		71		56		1.78
CXDSR 1160AP	06585			11.6	.4567		12.0		118		71		56		1.80
CXDSR 1170AP	06586			11.7	.4606		12.0		118		71		56		1.81
CXDSR 1180AP	06587			11.8	.4646		12.0		118		71		56		1.83
CXDSR 1190AP	06588			11.9	.4685		12.0		118		71		56		1.84
CXDSR4688AP	06589	15/32			.4688	1/2		4.65		2.795		2.205		0.073	
CXDSR 1200AP	06590			12.0	.4724		12.0		118		71		56		1.86
CXDSR 1210AP	06591			12.1	.4764		14.0		124		77		60		1.87
CXDSR4844AP	06592	31/64			.4844	1/2		4.88		3.031		2.362		0.075	
CXDSR 1250AP	06593			12.5	.4921		14.0		124		77		60		1.94
CXDSR5000AP	06594	1/2			.5000	1/2		4.88		3.031		2.362		0.077	
CXDSR 1280AP	06595			12.8	.5039		14.0		124		77		60		1.98
CXDSR 1283AP	06596			12.83	.5051		14.0		124		77		60		1.99
CXDSR 1290AP	06597			12.9	.5079		14.0		124		77		60		2.00
CXDSR 1300AP	06598			13.0	.5118		14.0		124		77		60		2.01
CXDSR5156AP	06599	33/64			.5156	9/16		4.88		3.031		2.362		0.080	
CXDSR5312AP	06600	17/32			.5312	9/16		4.88		3.031		2.362		0.082	
CXDSR 1350AP	06601			13.5	.5315		14.0		124		77		60		2.09
CXDSR 1370AP	06602			13.7	.5394		14.0		124		77		60		2.12
CXDSR5469AP	06603	35/64			.5469	9/16		4.88		3.031		2.362		0.085	
CXDSR 1400AP	06604			14.0	.5512		14.0		124		77		60		2.17
CXDSR5625AP	06605	9/16			.5625	9/16		5.24		3.268		2.480		0.087	
CXDSR 1450AP	06606			14.5	.5709		16.0		133		83		63		2.25
CXDSR 1470AP	06607			14.7	.5787		16.0		133		83		63		2.28
CXDSR 1500AP	06608			15.0	.5905		16.0		133		83		63		2.32
CXDSR5938AP	06609	19/32			.5938	5/8		5.24		3.268		2.480		0.092	
CXDSR 1530AP	06610			15.3	.6024		16.0		133		83		63		2.37
CXDSR 1550AP	06611			15.5	.6102		16.0		133		83		63		2.40
CXDSR 1570AP	06612			15.7	.6181		16.0		133		83		63		2.43
CXDSR6250AP	06613	5/8			.6250	5/8		5.24		3.268		2.480		0.097	
CXDSR 1600AP	06614			16.0	.6299		16.0		133		83		63		2.48

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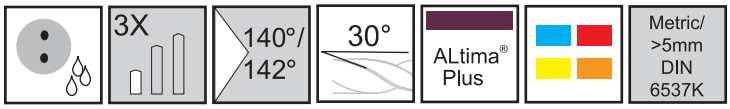
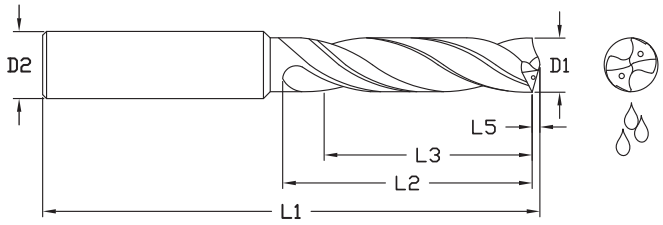
Cyclone Series CXDCS



Designed for high performance drilling in a broad range of materials.

- Double Margin.



ALtima® Plus		Diameter D1 (m7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
CXDCS 0300AP	06779			3.0	.1181		3.0		62		20		14		0.46
CXDCS1200AP	06780		#31		.1200	1/8		2.44		0.787		0.551		0.019	
CXDCS 0310AP	06781			3.1	.1220		4.0		62		20		14		0.48
CXDCS1250AP	06782	1/8			.1250	1/8		2.44		0.787		0.551		0.019	
CXDCS 0320AP	06783			3.2	.1260		4.0		62		20		14		0.50
CXDCS1285AP	06784		#30		.1285	5/32		2.44		0.787		0.551		0.020	
CXDCS 0330AP	06785			3.3	.1299		4.0		62		20		14		0.51
CXDCS 0340AP	06786			3.4	.1339		4.0		62		20		14		0.53
CXDCS1360AP	06787		#29		.1360	5/32		2.44		0.787		0.551		0.021	
CXDCS 0350AP	06788			3.5	.1378		4.0		62		20		14		0.54
CXDCS1406AP	06789	9/64			.1406	5/32		2.44		0.787		0.551		0.022	
CXDCS 0360AP	06790			3.6	.1417		4.0		62		20		14		0.56
CXDCS 0370AP	06791			3.7	.1457		4.0		62		20		14		0.57
CXDCS 0380AP	06792			3.8	.1496		4.0		66		24		17		0.59
CXDCS1520AP	06793		#24		.1520	5/32		2.60		0.945		0.669		0.024	
CXDCS 0390AP	06794			3.9	.1535		4.0		66		24		17		0.60
CXDCS1562AP	06795	5/32			.1562	5/32		2.60		0.945		0.669		0.024	
CXDCS 0400AP	06796			4.0	.1575		4.0		66		24		17		0.62
CXDCS1590AP	06797		#21		.1590	3/16		2.60		0.945		0.669		0.025	
CXDCS 0410AP	06798			4.1	.1614		5.0		66		24		17		0.64
CXDCS 0420AP	06799			4.2	.1654		5.0		66		24		17		0.65
CXDCS 0430AP	06800			4.3	.1693		5.0		66		24		17		0.67
CXDCS1719AP	06801	11/64			.1719	3/16		2.60		0.945		0.669		0.027	
CXDCS 0440AP	06802			4.4	.1732		5.0		66		24		17		0.68
CXDCS 0450AP	06803			4.5	.1772		5.0		66		24		17		0.70
CXDCS 0460AP	06804			4.6	.1811		5.0		66		24		17		0.71
CXDCS 0470AP	06805			4.7	.1850		5.0		66		24		17		0.73
CXDCS1875AP	06806	3/16			.1875	3/16		2.60		1.102		0.787		0.029	
CXDCS 0480AP	06807			4.8	.1890		5.0		66		28		20		0.74
CXDCS 0490AP	06808			4.9	.1929		5.0		66		28		20		0.76
CXDCS 0500AP	06809			5.0	.1968		5.0		66		28		20		0.77
CXDCS 0510AP	06810			5.1	.2008		6.0		66		28		20		0.79

Inch	
D1	Tolerance (m7)
.0000 - .1181	+.00008/+.00047
.1182 - .2362	+.00016/+.00063
.2363 - .3937	+.00024/+.00083
.3938 - .7087	+.00027/+.00098

Inch	
D2	Tolerance (h6)
.0000 - .1181	+0/-.00024
.1182 - .2362	+0/-.00031
.2363 - .3937	+0/-.00035
.3938 - .7087	+0/-.00043

Metric (mm)	
D1	Tolerance (m7)
0 - 3.0	+.002/+.012
3.01 - 6.0	+.004/+.016
6.01 - 10.0	+.006/+.021
10.01 - 18.0	+.007/+.025

Metric (mm)	
D2	Tolerance (h6)
0 - 3.0	+0/-.006
3.01 - 6.0	+0/-.008
6.01 - 10.0	+0/-.009
10.01 - 18.0	+0/-.011

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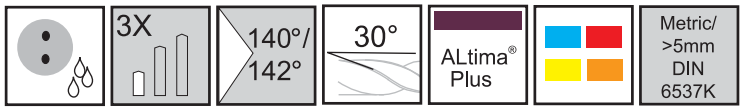
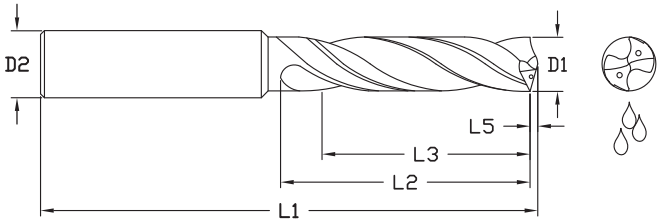
Series CXDCS Continued





ALtima® Plus		Diameter D1 (m7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
CXDCS2031AP	06811	13/64			.2031	1/4		2.60		1.102		0.787		0.031	
CXDCS 0520AP	06812			5.2	.2047		6.0		66		28		20		0.81
CXDCS 0530AP	06813			5.3	.2087		6.0		66		28		20		0.82
CXDCS 0540AP	06814			5.4	.2126		6.0		66		28		20		0.84
CXDCS 0550AP	06815			5.5	.2165		6.0		66		28		20		0.85
CXDCS2187AP	06816	7/32			.2187	1/4		2.60		1.102		0.787		0.034	
CXDCS 0560AP	07093			5.6	.2205		6.0		66		28		20		0.86
CXDCS2210AP	06817		#2		.2210	1/4		2.60		1.102		0.787		0.034	
CXDCS 0570AP	06818			5.7	.2244		6.0		66		28		20		0.88
CXDCS 0580AP	06819			5.8	.2283		6.0		66		28		20		0.90
CXDCS 0590AP	06820			5.9	.2323		6.0		66		28		20		0.91
CXDCS2344AP	06821	15/64			.2344	1/4		2.60		1.102		0.787		0.036	
CXDCS 0600AP	06822			6.0	.2362		6.0		66		28		20		0.93
CXDCS 0610AP	06823			6.1	.2402		8.0		79		34		24		0.95
CXDCS2420AP	06824		C		.2420	1/4		3.11		1.339		0.945		0.037	
CXDCS 0620AP	06825			6.2	.2441		8.0		79		34		24		0.96
CXDCS2460AP	06826		D		.2460	1/4		3.11		1.339		0.945		0.038	
CXDCS 0630AP	06827			6.3	.2480		8.0		79		34		24		0.98
CXDCS2500AP	06828	1/4			.2500	1/4		3.11		1.339		0.945		0.039	
CXDCS 0640AP	06829			6.4	.2520		8.0		79		34		24		0.99
CXDCS 0650AP	06830			6.5	.2559		8.0		79		34		24		1.01
CXDCS2570AP	06831		F		.2570	5/16		3.11		1.339		0.945		0.040	
CXDCS 0660AP	06832			6.6	.2598		8.0		79		34		24		1.03
CXDCS2610AP	06833		G		.2610	5/16		3.11		1.339		0.945		0.040	
CXDCS 0670AP	06834			6.7	.2638		8.0		79		34		24		1.04
CXDCS2656AP	06835	17/64			.2656	5/16		3.11		1.339		0.945		0.041	
CXDCS 0680AP	06836			6.8	.2677		8.0		79		34		24		1.05
CXDCS 0690AP	06837			6.9	.2717		8.0		79		34		24		1.07
CXDCS 0700AP	06838			7.0	.2756		8.0		79		34		24		1.08
CXDCS 0710AP	06839			7.1	.2795		8.0		79		41		29		1.10
CXDCS2812AP	06840	9/32			.2812	5/16		3.11		1.614		1.142		0.044	
CXDCS 0720AP	06841			7.2	.2835		8.0		79		41		29		1.12
CXDCS 0730AP	06842			7.3	.2874		8.0		79		41		29		1.13
CXDCS 0740AP	06843			7.4	.2913		8.0		79		41		29		1.15
CXDCS 0750AP	06844			7.5	.2953		8.0		79		41		29		1.16
CXDCS2969AP	06845	19/64			.2969	5/16		3.11		1.614		1.142		0.046	
CXDCS 0760AP	06846			7.6	.2992		8.0		79		41		29		1.18
CXDCS 0770AP	06847			7.7	.3031		8.0		79		41		29		1.19
CXDCS 0780AP	06848			7.8	.3071		8.0		79		41		29		1.21
CXDCS 0790AP	06849			7.9	.3110		8.0		79		41		29		1.22

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Series CXDCS Continued

ALtima® Plus		Diameter D1 (m7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
CXDCS3125AP	06850	5/16			.3125	5/16		3.11		1.614		1.142		0.048	
CXDCS 0800AP	06851			8.0	.3150		8.0		79		41		29		1.24
CXDCS 0810AP	06852			8.1	.3189		10.0		89		47		35		1.26
CXDCS 0820AP	06853			8.2	.3228		10.0		89		47		35		1.27
CXDCS 0830AP	06854			8.3	.3268		10.0		89		47		35		1.29
CXDCS3281AP	06855	21/64			.3281	3/8		3.50		1.850		1.378		0.051	
CXDCS 0840AP	06856			8.4	.3307		10.0		89		47		35		1.31
CXDCS3320AP	06857		Q		.3320	3/8		3.50		1.850		1.378		0.051	
CXDCS 0850AP	06858			8.5	.3346		10.0		89		47		35		1.32
CXDCS 0860AP	06859			8.6	.3386		10.0		89		47		35		1.33
CXDCS 0870AP	06860			8.7	.3425		10.0		89		47		35		1.35
CXDCS3438AP	06861	11/32			.3438	3/8		3.50		1.850		1.378		0.053	
CXDCS 0880AP	06862			8.8	.3465		10.0		89		47		35		1.36
CXDCS 0890AP	06863			8.9	.3504		10.0		89		47		35		1.38
CXDCS 0900AP	06864			9.0	.3543		10.0		89		47		35		1.39
CXDCS 0910AP	06865			9.1	.3583		10.0		89		47		35		1.41
CXDCS3594AP	06866	23/64			.3594	3/8		3.50		1.850		1.378		0.056	
CXDCS 0920AP	06867			9.2	.3622		10.0		89		47		35		1.43
CXDCS 0925AP	06868			9.25	.3642		10.0		89		47		35		1.43
CXDCS 0930AP	06869			9.3	.3661		10.0		89		47		35		1.44
CXDCS 0940AP	06870			9.4	.3701		10.0		89		47		35		1.46
CXDCS 0950AP	06871			9.5	.3740		10.0		89		47		35		1.47
CXDCS3750AP	06872	3/8			.3750	3/8		3.50		1.850		1.378		0.058	
CXDCS 0960AP	06873			9.6	.3780		10.0		89		47		35		1.49
CXDCS 0970AP	06874			9.7	.3819		10.0		89		47		35		1.50
CXDCS 0980AP	06875			9.8	.3858		10.0		89		47		35		1.52
CXDCS 0990AP	06876			9.9	.3898		10.0		89		47		35		1.53
CXDCS3906AP	06877	25/64			.3906	7/16		3.50		1.850		1.378		0.061	
CXDCS 1000AP	06878			10.0	.3937		10.0		89		47		35		1.55
CXDCS 1010AP	06879			10.1	.3976		12.0		102		55		40		1.56
CXDCS 1015AP	07095			10.15	.3996		12.0		102		55		40		1.57
CXDCS 1020AP	06880			10.2	.4016		12.0		102		55		40		1.58
CXDCS 1030AP	06881			10.3	.4055		12.0		102		55		40		1.60
CXDCS4062AP	06882	13/32			.4062	7/16		4.02		2.165		1.575		0.063	
CXDCS 1040AP	06883			10.4	.4094		12.0		102		55		40		1.61
CXDCS 1050AP	06884			10.5	.4134		12.0		102		55		40		1.63
CXDCS 1060AP	06885			10.6	.4173		12.0		102		55		40		1.64
CXDCS 1070AP	06886			10.7	.4213		12.0		102		55		40		1.66
CXDCS4219AP	06887	27/64			.4219	7/16		4.02		2.165		1.575		0.065	
CXDCS 1080AP	06888			10.8	.4252		12.0		102		55		40		1.67
CXDCS 1090AP	06889			10.9	.4291		12.0		102		55		40		1.69
CXDCS 1100AP	06890			11.0	.4331		12.0		102		55		40		1.70
CXDCS 1110AP	06891			11.1	.4370		12.0		102		55		40		1.72
CXDCS4375AP	06892	7/16			.4375	7/16		4.02		2.165		1.575		0.068	

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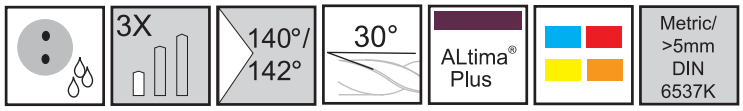
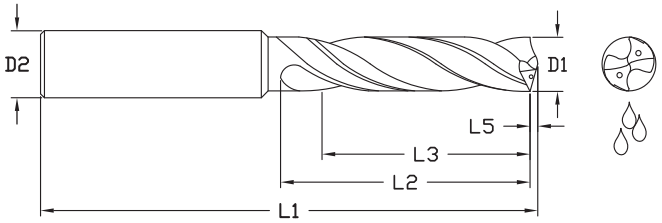
Series CXDCS Continued





ALtima® Plus		Diameter D1 (m7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
CXDCS 1120AP	06893			11.2	.4409		12.0		102		55		40		1.74
CXDCS 1130AP	06894			11.3	.4449		12.0		102		55		40		1.75
CXDCS 1140AP	06895			11.4	.4488		12.0		102		55		40		1.77
CXDCS 1150AP	06896			11.5	.4527		12.0		102		55		40		1.78
CXDCS 1155AP	07090			11.55	.4547		12.0		102		55		40		1.79
CXDCS 1160AP	06897			11.6	.4567		12.0		102		55		40		1.80
CXDCS 1170AP	06898			11.7	.4606		12.0		102		55		40		1.81
CXDCS 1180AP	06899			11.8	.4646		12.0		102		55		40		1.83
CXDCS 1190AP	06900			11.9	.4685		12.0		102		55		40		1.84
CXDCS4688AP	06901	15/32			.4688	1/2		4.02		2.165		1.575		0.073	
CXDCS 1200AP	06902			12.0	.4724		12.0		102		55		40		1.86
CXDCS 1210AP	06903			12.1	.4764		14.0		107		60		43		1.87
CXDCS4844AP	06904	31/64			.4844	1/2		4.21		2.362		1.693		0.075	
CXDCS 1250AP	06905			12.5	.4921		14.0		107		60		43		1.94
CXDCS5000AP	06906	1/2			.5000	1/2		4.21		2.362		1.693		0.077	
CXDCS 1280AP	06907			12.8	.5039		14.0		107		60		43		1.98
CXDCS 1283AP	06908			12.83	.5051		14.0		107		60		43		1.99
CXDCS 1290AP	06909			12.9	.5079		14.0		107		60		43		2.00
CXDCS 1300AP	06910			13.0	.5118		14.0		107		60		43		2.01
CXDCS5156AP	06911	33/64			.5156	9/16		4.21		2.362		1.693		0.080	
CXDCS 1320AP	07096			13.2	.5197		14.0		107		60		43		2.06
CXDCS5312AP	07089	17/32			.5312	9/16		4.21		2.362		1.693		0.082	
CXDCS 1350AP	06912			13.5	.5315		14.0		107		60		43		2.09
CXDCS 1370AP	06913			13.7	.5394		14.0		107		60		43		2.12
CXDCS5469AP	06914	35/64			.5469	9/16		4.21		2.362		1.693		0.085	
CXDCS 1400AP	06915			14.0	.5512		14.0		107		60		43		2.17
CXDCS5625AP	06916	9/16			.5625	9/16		4.53		2.559		1.772		0.087	
CXDCS 1450AP	06917			14.5	.5709		16.0		115		65		45		2.25
CXDCS 1470AP	06918			14.7	.5787		16.0		115		65		45		2.28
CXDCS 1475AP	07097			14.75	.5807		16.0		115		65		45		2.30
CXDCS 1500AP	06919			15.0	.5905		16.0		115		65		45		2.32
CXDCS5938AP	06920	19/32			.5938	5/8		4.53		2.559		1.772		0.092	
CXDCS 1530AP	06921			15.3	.6024		16.0		115		65		45		2.37
CXDCS 1550AP	06922			15.5	.6102		16.0		115		65		45		2.40
CXDCS 1570AP	06923			15.7	.6181		16.0		115		65		45		2.43
CXDCS6250AP	06924	5/8			.6250	5/8		4.53		2.559		1.772		0.097	
CXDCS 1600AP	06925			16.0	.6299		16.0		115		65		45		2.48

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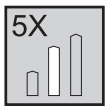
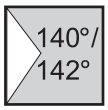
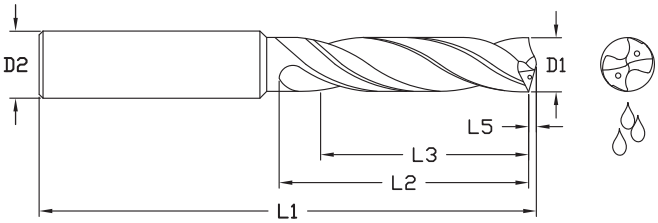
Cyclone Series CXDCR




Designed for high performance drilling in a broad range of materials.



- Double Margin.

ALtima® Plus		Diameter D1 (m7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
CXDCR 0300AP	06926			3.0	.1181		3.0		66		28		23		0.46
CXDCR1200AP	06927		#31		.1200	1/8		2.60		1.102		0.906		0.019	
CXDCR 0310AP	06928			3.1	.1220		4.0		66		28		23		0.48
CXDCR1250AP	06929	1/8			.1250	1/8		2.60		1.102		0.906		0.019	
CXDCR 0320AP	06930			3.2	.1260		4.0		66		28		23		0.50
CXDCR1285AP	06931		#30		.1285	5/32		2.60		1.102		0.906		0.020	
CXDCR 0330AP	06932			3.3	.1299		4.0		66		28		23		0.51
CXDCR 0340AP	06933			3.4	.1339		4.0		66		28		23		0.53
CXDCR1360AP	06934		#29		.1360	5/32		2.60		1.102		0.906		0.021	
CXDCR 0350AP	06935			3.5	.1378		4.0		66		28		23		0.54
CXDCR1406AP	06936	9/64			.1406	5/32		2.60		1.102		0.906		0.022	
CXDCR 0360AP	06937			3.6	.1417		4.0		66		28		23		0.56
CXDCR 0370AP	06938			3.7	.1457		4.0		66		28		23		0.57
CXDCR 0380AP	06939			3.8	.1496		4.0		74		36		29		0.59
CXDCR1520AP	06940		#24		.1520	5/32		2.91		1.417		1.142		0.024	
CXDCR 0390AP	06941			3.9	.1535		4.0		74		36		29		0.60
CXDCR1562AP	06942	5/32			.1562	5/32		2.91		1.417		1.142		0.024	
CXDCR 0400AP	06943			4.0	.1575		4.0		74		36		29		0.62
CXDCR1590AP	06944		#21		.1590	3/16		2.91		1.417		1.142		0.025	
CXDCR 0410AP	06945			4.1	.1614		5.0		74		36		29		0.64
CXDCR 0420AP	06946			4.2	.1654		5.0		74		36		29		0.65
CXDCR 0430AP	06947			4.3	.1693		5.0		74		36		29		0.67
CXDCR1719AP	06948	11/64			.1719	3/16		2.91		1.417		1.142		0.027	
CXDCR 0440AP	06949			4.4	.1732		5.0		74		36		29		0.68
CXDCR 0450AP	06950			4.5	.1772		5.0		74		36		29		0.70
CXDCR 0460AP	06951			4.6	.1811		5.0		74		36		29		0.71
CXDCR 0470AP	06952			4.7	.1850		5.0		74		36		29		0.73
CXDCR1875AP	06953	3/16			.1875	3/16		3.23		1.732		1.378		0.029	
CXDCR 0480AP	06954			4.8	.1890		5.0		82		44		35		0.74
CXDCR 0490AP	06955			4.9	.1929		5.0		82		44		35		0.76

Inch	
D1	Tolerance (m7)
.0000 - .1181	+.00008/+.00047
.1182 - .2362	+.00016/+.00063
.2363 - .3937	+.00024/+.00083
.3938 - .7087	+.00027/+.00098
.7088 - .7500	+.00031/+.00114

Inch	
D2	Tolerance (h6)
.0000 - .1181	+0/-.00024
.1182 - .2362	+0/-.00031
.2363 - .3937	+0/-.00035
.3938 - .7087	+0/-.00043
.7088 - .7500	+0/-.00051

Metric (mm)	
D1	Tolerance (m7)
0 - 3.0	+.002/+.012
3.01 - 6.0	+.004/+.016
6.01 - 10.0	+.006/+.021
10.01 - 18.0	+.007/+.025
18.01 - 20.0	+.008/+.029

Metric (mm)	
D2	Tolerance (h6)
0 - 3.0	+0/-.006
3.01 - 6.0	+0/-.008
6.01 - 10.0	+0/-.009
10.01 - 18.0	+0/-.011
18.01 - 20.0	+0/-.013

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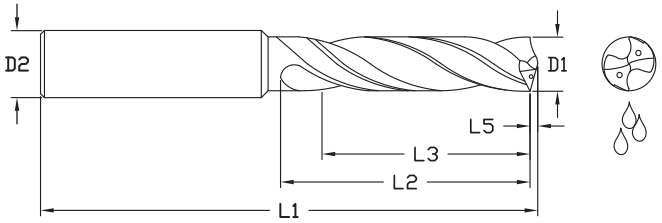
Series CXDCR Continued



ALtima® Plus		Diameter D1 (m7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
CXDCR 0500AP	06956			5.0	.1968		5.0		82		44		35		0.77
CXDCR 0510AP	06957			5.1	.2008		6.0		82		44		35		0.79
CXDCR2031AP	06958	13/64			.2031	1/4		3.23		1.732		1.378		0.031	
CXDCR 0520AP	06959			5.2	.2047		6.0		82		44		35		0.81
CXDCR 0530AP	06960			5.3	.2087		6.0		82		44		35		0.82
CXDCR 0540AP	06961			5.4	.2126		6.0		82		44		35		0.84
CXDCR 0550AP	06962			5.5	.2165		6.0		82		44		35		0.85
CXDCR2187AP	06963	7/32			.2187	1/4		3.23		1.732		1.378		0.034	
CXDCR 0560AP	07094			5.6	.2205		6.0		82		44		35		0.86
CXDCR2210AP	06964		#2		.2210	1/4		3.23		1.732		1.378		0.034	
CXDCR 0570AP	06965			5.7	.2244		6.0		82		44		35		0.88
CXDCR 0580AP	06966			5.8	.2283		6.0		82		44		35		0.90
CXDCR 0590AP	06967			5.9	.2323		6.0		82		44		35		0.91
CXDCR2344AP	06968	15/64			.2344	1/4		3.23		1.732		1.378		0.036	
CXDCR 0600AP	06969			6.0	.2362		6.0		82		44		35		0.93
CXDCR 0610AP	06970			6.1	.2402		8.0		91		53		43		0.95
CXDCR2420AP	06971		C		.2420	1/4		3.58		2.087		1.693		0.037	
CXDCR 0620AP	06972			6.2	.2441		8.0		91		53		43		0.96
CXDCR2460AP	06973		D		.2460	1/4		3.58		2.087		1.693		0.038	
CXDCR 0630AP	06974			6.3	.2480		8.0		91		53		43		0.98
CXDCR2500AP	06975	1/4			.2500	1/4		3.58		2.087		1.693		0.039	
CXDCR 0640AP	06976			6.4	.2520		8.0		91		53		43		0.99
CXDCR 0650AP	06977			6.5	.2559		8.0		91		53		43		1.01
CXDCR2570AP	06978		F		.2570	5/16		3.58		2.087		1.693		0.040	
CXDCR 0660AP	06979			6.6	.2598		8.0		91		53		43		1.03
CXDCR2610AP	06980		G		.2610	5/16		3.58		2.087		1.693		0.040	
CXDCR 0670AP	06981			6.7	.2638		8.0		91		53		43		1.04
CXDCR2656AP	06982	17/64			.2656	5/16		3.58		2.087		1.693		0.041	
CXDCR 0680AP	06983			6.8	.2677		8.0		91		53		43		1.05
CXDCR 0690AP	06984			6.9	.2717		8.0		91		53		43		1.07
CXDCR 0700AP	06985			7.0	.2756		8.0		91		53		43		1.08
CXDCR 0710AP	06986			7.1	.2795		8.0		91		53		43		1.10
CXDCR2812AP	06987	9/32			.2812	5/16		3.58		2.087		1.693		0.044	
CXDCR 0720AP	06988			7.2	.2835		8.0		91		53		43		1.12
CXDCR 0730AP	06989			7.3	.2874		8.0		91		53		43		1.13
CXDCR 0740AP	06990			7.4	.2913		8.0		91		53		43		1.15

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Series CXDCR Continued

ALtima® Plus		Diameter D1 (m7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
CXDCR 0750AP	06991			7.5	.2953		8.0		91		53		43		1.16
CXDCR2969AP	06992	19/64			.2969	5/16		3.58		2.087		1.693		0.046	
CXDCR 0760AP	06993			7.6	.2992		8.0		91		53		43		1.18
CXDCR 0770AP	06994			7.7	.3031		8.0		91		53		43		1.19
CXDCR 0780AP	06995			7.8	.3071		8.0		91		53		43		1.21
CXDCR 0790AP	06996			7.9	.3110		8.0		91		53		43		1.22
CXDCR3125AP	06997	5/16			.3125	5/16		3.58		2.087		1.693		0.048	
CXDCR 0800AP	06998			8.0	.3150		8.0		91		53		43		1.24
CXDCR 0810AP	06999			8.1	.3189		10.0		103		61		49		1.26
CXDCR 0820AP	07000			8.2	.3228		10.0		103		61		49		1.27
CXDCR 0830AP	07001			8.3	.3268		10.0		103		61		49		1.29
CXDCR3281AP	07002	21/64			.3281	3/8		4.06		2.402		1.929		0.051	
CXDCR 0840AP	07003			8.4	.3307		10.0		103		61		49		1.31
CXDCR3320AP	07004		Q		.3320	3/8		4.06		2.402		1.929		0.051	
CXDCR 0850AP	07005			8.5	.3346		10.0		103		61		49		1.32
CXDCR 0860AP	07006			8.6	.3386		10.0		103		61		49		1.33
CXDCR 0870AP	07007			8.7	.3425		10.0		103		61		49		1.35
CXDCR3438AP	07008	11/32			.3438	3/8		4.06		2.402		1.929		0.053	
CXDCR 0880AP	07009			8.8	.3465		10.0		103		61		49		1.36
CXDCR 0890AP	07010			8.9	.3504		10.0		103		61		49		1.38
CXDCR 0900AP	07011			9.0	.3543		10.0		103		61		49		1.39
CXDCR 0910AP	07012			9.1	.3583		10.0		103		61		49		1.41
CXDCR3594AP	07013	23/64			.3594	3/8		4.06		2.402		1.929		0.056	
CXDCR 0920AP	07014			9.2	.3622		10.0		103		61		49		1.43
CXDCR 0925AP	07015			9.25	.3642		10.0		103		61		49		1.43
CXDCR 0930AP	07016			9.3	.3661		10.0		103		61		49		1.44
CXDCR 0940AP	07017			9.4	.3701		10.0		103		61		49		1.46
CXDCR 0950AP	07018			9.5	.3740		10.0		103		61		49		1.47
CXDCR3750AP	07019	3/8			.3750	3/8		4.06		2.402		1.929		0.058	
CXDCR 0960AP	07020			9.6	.3780		10.0		103		61		49		1.49
CXDCR 0970AP	07021			9.7	.3819		10.0		103		61		49		1.50
CXDCR 0980AP	07022			9.8	.3858		10.0		103		61		49		1.52
CXDCR 0990AP	07023			9.9	.3898		10.0		103		61		49		1.53
CXDCR3906AP	07024	25/64			.3906	7/16		4.06		2.402		1.929		0.061	
CXDCR 1000AP	07025			10.0	.3937		10.0		103		61		49		1.55
CXDCR 1010AP	07026			10.1	.3976		12.0		118		71		56		1.56
CXDCR 1020AP	07027			10.2	.4016		12.0		118		71		56		1.58
CXDCR 1030AP	07028			10.3	.4055		12.0		118		71		56		1.60
CXDCR4062AP	07029	13/32			.4062	7/16		4.65		2.795		2.205		0.063	
CXDCR 1040AP	07030			10.4	.4094		12.0		118		71		56		1.61

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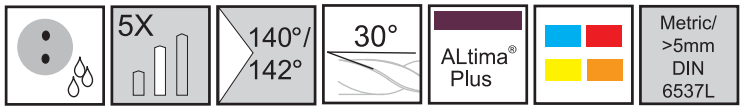
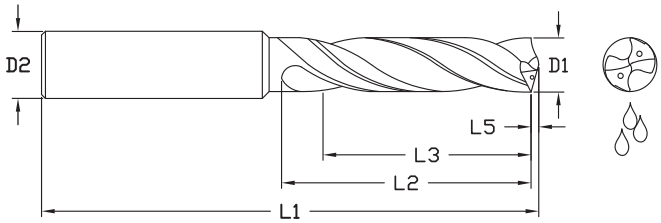
Series CXDCR Continued





ALtima® Plus		Diameter D1 (m7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
CXDCR 1050AP	07031			10.5	.4134		12.0		118		71		56		1.63
CXDCR 1060AP	07032			10.6	.4173		12.0		118		71		56		1.64
CXDCR 1070AP	07033			10.7	.4213		12.0		118		71		56		1.66
CXDCR4219AP	07034	27/64			.4219	7/16		4.65		2.795		2.205		0.065	
CXDCR 1080AP	07035			10.8	.4252		12.0		118		71		56		1.67
CXDCR 1090AP	07036			10.9	.4291		12.0		118		71		56		1.69
CXDCR 1100AP	07037			11.0	.4331		12.0		118		71		56		1.70
CXDCR 1110AP	07038			11.1	.4370		12.0		118		71		56		1.72
CXDCR4375AP	07039	7/16			.4375	7/16		4.65		2.795		2.205		0.068	
CXDCR 1120AP	07040			11.2	.4409		12.0		118		71		56		1.74
CXDCR 1130AP	07041			11.3	.4449		12.0		118		71		56		1.75
CXDCR 1140AP	07042			11.4	.4488		12.0		118		71		56		1.77
CXDCR 1150AP	07043			11.5	.4527		12.0		118		71		56		1.78
CXDCR 1160AP	07044			11.6	.4567		12.0		118		71		56		1.80
CXDCR 1170AP	07045			11.7	.4606		12.0		118		71		56		1.81
CXDCR 1180AP	07046			11.8	.4646		12.0		118		71		56		1.83
CXDCR 1190AP	07047			11.9	.4685		12.0		118		71		56		1.84
CXDCR4688AP	07048	15/32			.4688	1/2		4.65		2.795		2.205		0.073	
CXDCR 1200AP	07049			12.0	.4724		12.0		118		71		56		1.86
CXDCR 1210AP	07050			12.1	.4764		14.0		124		77		60		1.87
CXDCR4844AP	07051	31/64			.4844	1/2		4.88		3.031		2.362		0.075	
CXDCR 1250AP	07052			12.5	.4921		14.0		124		77		60		1.94
CXDCR5000AP	07053	1/2			.5000	1/2		4.88		3.031		2.362		0.077	
CXDCR 1280AP	07054			12.8	.5039		14.0		124		77		60		1.98
CXDCR 1283AP	07055			12.83	.5051		14.0		124		77		60		1.99
CXDCR 1290AP	07056			12.9	.5079		14.0		124		77		60		2.00
CXDCR 1300AP	07057			13.0	.5118		14.0		124		77		60		2.01
CXDCR5156AP	07058	33/64			.5156	9/16		4.88		3.031		2.362		0.080	
CXDCR5312AP	07059	17/32			.5312	9/16		4.88		3.031		2.362		0.082	
CXDCR 1350AP	07060			13.5	.5315		14.0		124		77		60		2.09
CXDCR 1370AP	07061			13.7	.5394		14.0		124		77		60		2.12
CXDCR5469AP	07062	35/64			.5469	9/16		4.88		3.031		2.362		0.085	
CXDCR 1400AP	07063			14.0	.5512		14.0		124		77		60		2.17
CXDCR5625AP	07064	9/16			.5625	9/16		5.24		3.268		2.480		0.087	
CXDCR 1450AP	07065			14.5	.5709		16.0		133		83		63		2.25
CXDCR 1470AP	07066			14.7	.5787		16.0		133		83		63		2.28

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Series CXDCR Continued

ALtima® Plus		Diameter D1 (m7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
CXDCR 1500AP	07067			15.0	.5905		16.0		133		83		63		2.32
CXDCR5938AP	07068	19/32			.5938	5/8		5.24		3.268		2.480		0.092	
CXDCR 1530AP	07069			15.3	.6024		16.0		133		83		63		2.37
CXDCR 1550AP	07070			15.5	.6102		16.0		133		83		63		2.40
CXDCR 1570AP	07071			15.7	.6181		16.0		133		83		63		2.43
CXDCR6250AP	07072	5/8			.6250	5/8		5.24		3.268		2.480		0.097	
CXDCR 1600AP	07073			16.0	.6299		16.0		133		83		63		2.48
CXDCR 1608AP	07074			16.08	.6331		18.0		143		93		71		2.49
CXDCR 1630AP	07075			16.3	.6417		18.0		143		93		71		2.53
CXDCR 1650AP	07076			16.5	.6496		18.0		143		93		71		2.56
CXDCR6562AP	07077	21/32			.6562	11/16		5.63		3.661		2.795		0.102	
CXDCR 1700AP	07078			17.0	.6693		18.0		143		93		71		2.63
CXDCR6875AP	07079	11/16			.6875	11/16		5.63		3.661		2.795		0.107	
CXDCR 1750AP	07080			17.5	.6890		18.0		143		93		71		2.71
CXDCR 1800AP	07081			18.0	.7087		18.0		143		93		71		2.79
CXDCR 1850AP	07082			18.5	.7283		20.0		153		101		77		2.87
CXDCR7500AP	07083	3/4			.7500	3/4		6.024		3.976		3.031		0.116	
CXDCR 1916AP	07084			19.16	.7543		20.0		153		101		77		2.97
CXDCR 1925AP	07085			19.25	.7579		20.0		153		101		77		2.98
CXDCR 1930AP	07086			19.3	.7598		20.0		153		101		77		2.99
CXDCR 1950AP	07087			19.5	.7677		20.0		153		101		77		3.02
CXDCR 2000AP	07088			20.0	.7874		20.0		153		101		77		3.10

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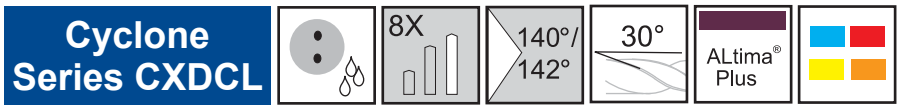
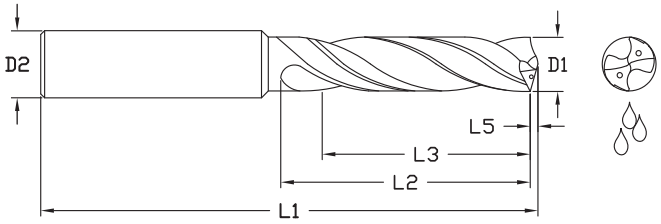
Made in USA

ISO 9001:2015 Certified

Cyclone Series CXDCL



Designed for high performance drilling in a broad range of materials.



- Double Margin.

ALtima® Plus		Diameter				Shank	OAL	Flute Length	Drill Length Ref.	Point Length
		D1 (m7)				D2 (h6)	L1	L2	L3	L5
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	mm	mm	mm	mm	mm
CXDCLM0300AP	07226			3.0	.1181	3	81	33	25	0.46
CXDCL1200AP	07227		#31	3.05	.1200	4	92	44	33	0.48
CXDCLM0310AP	07098			3.1	.1220	4	92	44	33	0.48
CXDCL1250AP	07099	1/8		3.18	.1250	4	92	44	33	0.48
CXDCLM0320AP	07100			3.2	.1260	4	92	44	33	0.50
CXDCLM0325AP	07101			3.25	.1280	4	92	44	33	0.51
CXDCL1285AP	07102		#30	3.26	.1285	4	92	44	33	0.51
CXDCLM0330AP	07103			3.3	.1299	4	92	44	33	0.51
CXDCLM0340AP	07104			3.4	.1339	4	92	44	33	0.53
CXDCL1360AP	07105		#29	3.45	.1360	4	92	44	33	0.53
CXDCLM0350AP	07106			3.5	.1378	4	92	44	33	0.54
CXDCL1406AP	07107	9/64		3.57	.1406	4	92	44	33	0.56
CXDCLM0360AP	07108			3.6	.1417	4	92	44	33	0.56
CXDCLM0370AP	07109			3.7	.1457	4	92	44	33	0.57
CXDCL1496AP	07110		#25	3.8	.1496	4	92	44	33	0.59
CXDCL1520AP	07111		#24	3.86	.1520	4	92	44	33	0.60
CXDCLM0390AP	07112			3.9	.1535	4	92	44	33	0.60
CXDCL1562AP	07113	5/32		3.97	.1562	4	92	44	33	0.61
CXDCLM0400AP	07114			4.0	.1575	4	92	44	33	0.62
CXDCL1590AP	07115		#21	4.04	.1590	5	100	45	34	0.63
CXDCLM0410AP	07116			4.1	.1614	5	100	45	34	0.64
CXDCLM0420AP	07117			4.2	.1654	5	100	45	34	0.65
CXDCLM0430AP	07118			4.3	.1693	5	100	45	34	0.67
CXDCL1719AP	07119	11/64		4.37	.1719	5	100	45	34	0.68
CXDCLM0440AP	07120			4.4	.1732	5	100	45	34	0.68
CXDCLM0450AP	07121			4.5	.1772	5	100	45	34	0.70
CXDCLM0460AP	07122			4.6	.1811	5	100	45	34	0.71
CXDCLM0465AP	07123			4.65	.1831	5	100	45	34	0.72
CXDCLM0470AP	07124			4.7	.1850	5	100	45	34	0.73
CXDCL1875AP	07125	3/16		4.76	.1875	5	100	45	34	0.74

Inch	
D1	Tolerance (m7)
.0000 - .1181	+.00008/+.00047
.1182 - .2362	+.00016/+.00063
.2363 - .3937	+.00024/+.00083
.3938 - .5000	+.00027/+.00098

Inch	
D2	Tolerance (h6)
.0000 - .1181	+0/-.00024
.1182 - .2362	+0/-.00031
.2363 - .3937	+0/-.00035
.3938 - .5000	+0/-.00043

Metric (mm)	
D1	Tolerance (m7)
0 - 3.0	+.002/+.012
3.01 - 6.0	+.004/+.016
6.01 - 10.0	+.006/+.021
10.01 - 12.7	+.007/+.025

Metric (mm)	
D2	Tolerance (h6)
0 - 3.0	+0/-.006
3.01 - 6.0	+0/-.008
6.01 - 10.0	+0/-.009
10.01 - 12.7	+0/-.011

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Series CXDCL Continued

ALtima® Plus		Diameter				Shank	OAL	Flute Length	Drill Length Ref.	Point Length
		D1 (m7)				D2 (h6)	L1	L2	L3	L5
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	mm	mm	mm	mm	mm
CXDCLM0480AP	07126			4.8	.1890	5	100	50	38	0.74
CXDCLM0490AP	07127			4.9	.1929	5	100	50	38	0.76
CXDCLM0500AP	07128			5.0	.1968	5	100	50	38	0.77
CXDCLM0510AP	07129			5.1	.2008	6	100	57	43	0.79
CXDCL2031AP	07130	13/64		5.16	.2031	6	100	57	43	0.79
CXDCLM0520AP	07131			5.2	.2047	6	100	57	43	0.81
CXDCLM0530AP	07132			5.3	.2087	6	100	57	43	0.82
CXDCLM0540AP	07133			5.4	.2126	6	100	57	43	0.84
CXDCLM0550AP	07134			5.5	.2165	6	100	57	43	0.85
CXDCL2187AP	07135	7/32		5.56	.2187	6	100	57	43	0.86
CXDCLM0560AP	07136			5.6	.2205	6	100	57	43	0.86
CXDCL2210AP	07137		#2	5.61	.2210	6	100	57	43	0.86
CXDCLM0570AP	07138			5.7	.2244	6	100	57	43	0.88
CXDCLM0580AP	07139			5.8	.2283	6	100	57	43	0.90
CXDCLM0590AP	07140			5.9	.2323	6	100	57	43	0.91
CXDCL2344AP	07141	15/64		5.95	.2344	6	100	57	43	0.91
CXDCLM0600AP	07142			6.0	.2362	6	100	57	43	0.93
CXDCLM0610AP	07143			6.1	.2402	8	118	76	57	0.95
CXDCL2420AP	07144		C	6.15	.2420	8	118	76	57	0.95
CXDCLM0620AP	07145			6.2	.2441	8	118	76	57	0.96
CXDCL2460AP	07146		D	6.25	.2460	8	118	76	57	0.97
CXDCLM0630AP	07147			6.3	.2480	8	118	76	57	0.98
CXDCL2500AP	07148	1/4		6.35	.2500	8	118	76	57	0.99
CXDCLM0640AP	07149			6.4	.2520	8	118	76	57	0.99
CXDCLM0650AP	07150			6.5	.2559	8	118	76	57	1.01
CXDCL2570AP	07151		F	6.53	.2570	8	118	76	57	1.03
CXDCLM0660AP	07152			6.6	.2598	8	118	76	57	1.03
CXDCL2610AP	07153		G	6.63	.2610	8	118	76	57	1.03
CXDCLM0670AP	07154			6.7	.2638	8	118	76	57	1.04
CXDCL2656AP	07155	17/64		6.75	.2656	8	118	76	57	1.04
CXDCLM0680AP	07156			6.8	.2677	8	118	76	57	1.05
CXDCLM0690AP	07157			6.9	.2717	8	118	76	57	1.07
CXDCLM0700AP	07158			7.0	.2756	8	118	76	57	1.08
CXDCLM0710AP	07159			7.1	.2795	8	118	76	57	1.10
CXDCL2812AP	07160	9/32		7.14	.2812	8	118	76	57	1.12
CXDCLM0720AP	07161			7.2	.2835	8	118	76	57	1.12
CXDCLM0730AP	07162			7.3	.2874	8	118	76	57	1.13
CXDCLM0740AP	07163			7.4	.2913	8	118	76	57	1.15
CXDCLM0750AP	07164			7.5	.2953	8	118	76	57	1.16
CXDCL2969AP	07165	19/64		7.54	.2969	8	118	76	57	1.17
CXDCLM0760AP	07166			7.6	.2992	8	118	76	57	1.18
CXDCLM0770AP	07167			7.7	.3031	8	118	76	57	1.19

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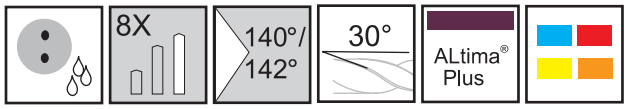
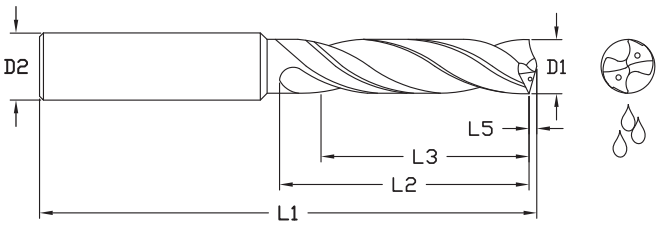
Series CXDCL Continued





ALtima® Plus		Diameter D1 (m7)				Shank D2 (h6)	OAL L1	Flute Length L2	Drill Length Ref. L3	Point Length L5
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	mm	mm	mm	mm	mm
CXDCLM0780AP	07168			7.8	.3071	8	118	76	57	1.21
CXDCLM0790AP	07169			7.9	.3110	8	118	76	57	1.22
CXDCL3125AP	07170	5/16		7.94	.3125	8	118	76	57	1.22
CXDCLM0800AP	07171			8.0	.3150	8	118	76	57	1.24
CXDCLM0810AP	07172			8.1	.3189	10	139	87	65	1.26
CXDCLM0820AP	07173			8.2	.3228	10	139	87	65	1.27
CXDCLM0830AP	07174			8.3	.3268	10	139	87	65	1.29
CXDCL3281AP	07175	21/64		8.33	.3281	10	139	87	65	1.30
CXDCLM0840AP	07176			8.4	.3307	10	139	87	65	1.31
CXDCL3320AP	07177		Q	8.43	.3320	10	139	87	65	1.31
CXDCLM0850AP	07178			8.5	.3346	10	139	87	65	1.32
CXDCLM0860AP	07179			8.6	.3386	10	139	87	65	1.33
CXDCLM0870AP	07180			8.7	.3425	10	139	87	65	1.35
CXDCL3438AP	07181	11/32		8.73	.3438	10	139	87	65	1.35
CXDCLM0880AP	07182			8.8	.3465	10	139	87	65	1.36
CXDCLM0890AP	07183			8.9	.3504	10	139	87	65	1.38
CXDCLM0900AP	07184			9.0	.3543	10	139	87	65	1.39
CXDCLM0910AP	07185			9.1	.3583	10	139	95	71	1.41
CXDCL3594AP	07186	23/64		9.13	.3594	10	139	95	71	1.42
CXDCLM0920AP	07187			9.2	.3622	10	139	95	71	1.43
CXDCLM0925AP	07188			9.25	.3642	10	139	95	71	1.43
CXDCLM0930AP	07189			9.3	.3661	10	139	95	71	1.44
CXDCL3680AP	07190		U	9.35	.3680	10	139	95	71	1.45
CXDCLM0940AP	07191			9.4	.3701	10	139	95	71	1.46
CXDCLM0950AP	07192			9.5	.3740	10	139	95	71	1.47
CXDCL3750AP	07193	3/8		9.52	.3750	10	139	95	71	1.47
CXDCLM0960AP	07194			9.6	.3780	10	139	95	71	1.49
CXDCLM0970AP	07195			9.7	.3819	10	139	95	71	1.50
CXDCL3858AP	07196		W	9.8	.3858	10	139	95	71	1.52
CXDCLM0990AP	07197			9.9	.3898	10	139	95	71	1.53
CXDCL3906AP	07198	25/64		9.92	.3906	10	139	95	71	1.55
CXDCLM1000AP	07199			10.0	.3937	10	139	95	71	1.55
CXDCLM1010AP	07200			10.1	.3976	12	155	106	80	1.56
CXDCLM1020AP	07201			10.2	.4016	12	155	106	80	1.58
CXDCLM1030AP	07202			10.3	.4055	12	155	106	80	1.60
CXDCL4062AP	07203	13/32		10.32	.4062	12	155	106	80	1.60
CXDCLM1040AP	07204			10.4	.4094	12	155	106	80	1.61
CXDCLM1050AP	07205			10.5	.4134	12	155	106	80	1.63
CXDCLM1060AP	07206			10.6	.4173	12	155	106	80	1.64
CXDCLM1070AP	07207			10.7	.4213	12	155	106	80	1.66

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Series CXDCL Continued

ALtima® Plus		Diameter D1 (m7)				Shank D2 (h6)	OAL L1	Flute Length L2	Drill Length Ref. L3	Point Length L5
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	mm	mm	mm	mm	mm
CXDCL4219AP	07208	27/64		10.72	.4219	12	155	106	80	1.65
CXDCLM1080AP	07209			10.8	.4252	12	155	106	80	1.67
CXDCLM1090AP	07210			10.9	.4291	12	155	106	80	1.69
CXDCLM1100AP	07211			11.0	.4331	12	155	106	80	1.70
CXDCLM1110AP	07212			11.1	.4370	12	163	114	86	1.72
CXDCL4375AP	07213	7/16		11.11	.4375	12	163	114	86	1.73
CXDCLM1120AP	07214			11.2	.4409	12	163	114	86	1.74
CXDCLM1130AP	07215			11.3	.4449	12	163	114	86	1.75
CXDCLM1140AP	07216			11.4	.4488	12	163	114	86	1.77
CXDCLM1150AP	07217			11.5	.4527	12	163	114	86	1.78
CXDCLM1160AP	07218			11.6	.4567	12	163	114	86	1.80
CXDCLM1170AP	07219			11.7	.4606	12	163	114	86	1.81
CXDCLM1180AP	07220			11.8	.4646	12	163	114	86	1.83
CXDCLM1190AP	07221			11.9	.4685	12	163	114	86	1.84
CXDCL4688AP	07222	15/32		11.91	.4688	12	163	114	86	1.85
CXDCLM1200AP	07223			12.0	.4724	12	163	114	86	1.86
CXDCLM1210AP	07228			12.1	.4764	14	182	133	112	1.87
CXDCL4844AP	07224	31/64		12.3	.4844	14	182	133	112	1.91
CXDCLM1250AP	07229			12.5	.4921	14	182	133	112	1.93
CXDCL5000AP	07225	1/2		12.7	.5000	14	182	133	112	1.95
CXDCLM1280AP	07230			12.8	.5039	14	182	133	112	1.98
CXDCLM1290AP	07231			12.9	.5079	14	182	133	112	1.99
CXDCLM1300AP	07232			13.0	.5118	14	182	133	112	2.01
CXDCL5156AP	07233	33/64		13.10	.5156	14	182	133	112	2.03
CXDCL5312AP	07234	17/32		13.49	.5312	14	182	133	112	2.09
CXDCLM1350AP	07235			13.5	.5315	14	182	133	112	2.09
CXDCLM1370AP	07236			13.7	.5394	14	182	133	112	2.12
CXDCL5469AP	07237	35/64		13.89	.5469	14	182	133	112	2.16
CXDCLM1400AP	07238			14.0	.5512	14	182	133	112	2.16
CXDCL5625AP	07239	9/16		14.29	.5625	16	204	152	128	2.22
CXDCLM1450AP	07240			14.5	.5709	16	204	152	128	2.24
CXDCLM1470AP	07241			14.7	.5787	16	204	152	128	2.27
CXDCLM1500AP	07242			15.0	.5906	16	204	152	128	2.32
CXDCL5938AP	07243	19/32		15.08	.5938	16	204	152	128	2.34
CXDCLM1530AP	07244			15.3	.6024	16	204	152	128	2.36
CXDCLM1550AP	07245			15.5	.6102	16	204	152	128	2.39
CXDCLM1570AP	07246			15.7	.6181	16	204	152	128	2.43
CXDCL6250AP	07247	5/8		15.88	.6250	16	204	152	128	2.46
CXDCLM1600AP	07248			16.0	.6299	16	204	152	128	2.47

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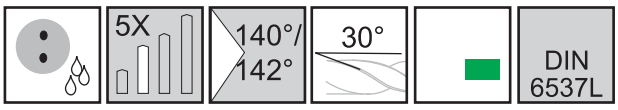
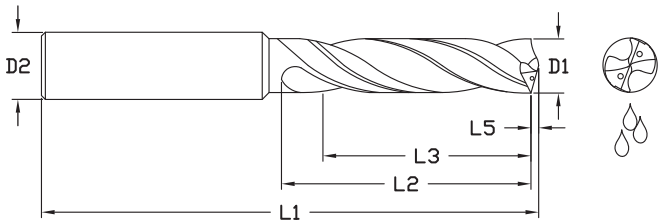
Safety Note

Always wear the appropriate personal protective equipment such as safety glasses and protective clothing when using solid carbide or HSS cutting tools. Machines should be fully guarded.

Cyclone Series CDACR





Features:

- 2 Flutes.
- Lower Thrust Point Geometry.
- Enhanced Double Margin Design.
- Coolant Fed.

Benefits:

- Reduced cutting forces allowing for heavier feed rates.
- Improved performance in Non-Ferrous materials.
- Back margin location allows for quicker engagement in hole.
- Improved hole finishes.
- Improved location when drilling through cross holes.
- Higher heat resistance means higher speed and feed capabilities.

CDA vs. CXD Style HP Drills:

The CDA provides a deeper flute depth than the CXD style drill for increased chip evacuation. Also, The CDA's point relief and edge protection is maximized for machining in non-ferrous materials.

		Diameter				Shank	OAL		Flute Length		Relief Length		Point Length	
		D1 (m7)				D2 (h6)	L1		L2 (max)		L3 (Ref)		L5	
Tool No.	EDP	Inch	Letter/Wire	mm	Decimal	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
CDACRM0300	07300			3.00	.1181	6		66		28		23		0.46
CDACR1200	07301		#31		.1200	6	2.60		1.102		0.905		0.018	
CDACRM0310	07302			3.10	.1220	6		66		28		23		0.48
CDACR1250	07303	1/8			.1250	6	2.60		1.102		0.905		0.019	
CDACRM0320	07304			3.20	.1260	6		66		28		23		0.49
CDACR1285	07305		#30		.1285	6	2.60		1.102		0.905		0.020	
CDACRM0330	07306			3.30	.1299	6		66		28		23		0.51
CDACRM0340	07307			3.40	.1339	6		66		28		23		0.52
CDACR1360	07308		#29		.1360	6	2.60		1.102		0.905		0.021	
CDACRM0350	07309			3.50	.1378	6		66		28		23		0.54
CDACR1406	07310	9/64			.1406	6	2.60		1.102		0.905		0.022	
CDACRM0360	07311			3.60	.1417	6		66		28		23		0.55
CDACR1440	07312		#27		.1440	6	2.60		1.102		0.905		0.022	
CDACRM0370	07313			3.70	.1457	6		66		28		23		0.57
CDACR1470	07314		#26		.1470	6	2.60		1.102		0.905		0.023	
CDACR1495	07315		#25		.1495	6	2.91		1.417		1.141		0.023	
CDACRM0380	07316			3.80	.1496	6		74		36		29		0.58
CDACR1520	07317		#24		.1520	6	2.91		1.417		1.141		0.023	
CDACRM0390	07318			3.90	.1535	6		74		36		29		0.60
CDACR1562	07319	5/32			.1562	6	2.91		1.417		1.141		0.024	
CDACRM0400	07320			4.00	.1575	6		74		36		29		0.61
CDACR1590	07321		#21		.1590	6	2.91		1.417		1.141		0.024	
CDACR1610	07322		#20		.1610	6	2.91		1.417		1.141		0.025	
CDACRM0410	07323			4.10	.1614	6		74		36		29		0.63
CDACRM0420	07324			4.20	.1654	6		74		36		29		0.64
CDACR1660	07325		#19		.1660	6	2.91		1.417		1.141		0.025	
CDACRM0430	07326			4.30	.1693	6		74		36		29		0.66
CDACR1719	07327	11/64			.1719	6	2.91		1.417		1.141		0.026	

Inch	
D1	Tolerance (m7)
.0000 - .1181	+.00008/+.00047
.1182 - .2362	+.00016/+.00063
.2363 - .3937	+.00024/+.00083
.3938 - .5000	+.00027/+.00098

Inch	
D2	Tolerance (h6)
.0000 - .1181	+0/-.00024
.1182 - .2362	+0/-.00031
.2363 - .3937	+0/-.00035
.3938 - .5000	+0/-.00043

Metric (mm)	
D1	Tolerance (m7)
0 - 3.0	+.002/+.012
3.01 - 6.0	+.004/+.016
6.01 - 10.0	+.006/+.021
10.01 - 12.7	+.007/+.025

Metric (mm)	
D2	Tolerance (h6)
0 - 3.0	+0/-.006
3.01 - 6.0	+0/-.008
6.01 - 10.0	+0/-.009
10.01 - 12.7	+0/-.011

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Series CDACR Continued

		Diameter				Shank	OAL		Flute Length		Relief Length		Point Length	
		D1 (m7)				D2 (h6)	L1		L2 (max)		L3 (Ref)		L5	
Tool No.	EDP	Inch	Letter/Wire	mm	Decimal	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
CDACR1730	07328		#17		.1730	6	2.91		1.417		1.141		0.027	
CDACRM0440	07329			4.40	.1732	6		74		36		29		0.67
CDACR1770	07330		#16		.1770	6	2.91		1.417		1.141		0.027	
CDACRM0450	07331			4.50	.1772	6		74		36		29		0.69
CDACRM0460	07332			4.60	.1811	6		74		36		29		0.71
CDACRM0470	07333			4.70	.1850	6		74		36		29		0.72
CDACR1875	07334	3/16			.1875	6	3.23		1.732		1.378		0.029	
CDACRM0480	07335			4.80	.1890	6		82		44		35		0.74
CDACR1910	07337		#11		.1910	6	3.23		1.732		1.378		0.029	
CDACRM0490	07338			4.90	.1929	6		82		44		35		0.75
CDACR1935	07339		#10		.1935	6	3.23		1.732		1.378		0.030	
CDACRM0500	07340			5.00	.1968	6		82		44		35		0.77
CDACRM0510	07341			5.10	.2008	6		82		44		35		0.78
CDACR2031	07342	13/64			.2031	6	3.23		1.732		1.378		0.031	
CDACRM0520	07343			5.20	.2047	6		82		44		35		0.80
CDACRM0530	07344			5.30	.2087	6		82		44		35		0.81
CDACRM0540	07345			5.40	.2126	6		82		44		35		0.83
CDACRM0550	07346			5.50	.2165	6		82		44		35		0.84
CDACR2187	07347	7/32			.2187	6	3.23		1.732		1.378		0.034	
CDACRM0560	07348			5.60	.2205	6		82		44		35		0.86
CDACRM0570	07349			5.70	.2244	6		82		44		35		0.87
CDACRM0580	07350			5.80	.2283	6		82		44		35		0.89
CDACRM0590	07351			5.90	.2323	6		82		44		35		0.90
CDACR2340	07352		A		.2340	6	3.23		1.732		1.378		0.036	
CDACRM0600	07353			6.00	.2362	6		82		44		35		0.92
CDACRM0610	07354			6.10	.2402	8		91		53		43		0.94
CDACRM0620	07355			6.20	.2441	8		91		53		43		0.95
CDACRM0630	07356			6.30	.2480	8		91		53		43		0.97
CDACR2500	07357	1/4			.2500	8	3.58		2.087		1.693		0.038	
CDACRM0640	07358			6.40	.2520	8		91		53		43		0.98
CDACRM0650	07359			6.50	.2559	8		91		53		43		1.00
CDACR2570	07360		F		.2570	8	3.58		2.087		1.693		0.039	
CDACRM0660	07406			6.60	.2598	8		91		53		43		1.01
CDACRM0670	07361			6.70	.2638	8		91		53		43		1.03
CDACR2656	07362	17/64			.2656	8	3.58		2.087		1.693		0.041	
CDACRM0680	07363			6.80	.2677	8		91		53		43		1.04
CDACRM0690	07364			6.90	.2717	8		91		53		43		1.06
CDACR2720	07365		I		.2720	8	3.58		2.087		1.693		0.042	
CDACRM0700	07366			7.00	.2756	8		91		53		43		1.07
CDACRM0710	07407			7.10	.2795	8		91		53		43		1.09
CDACR2812	07367	9/32			.2812	8	3.58		2.087		1.693		0.043	
CDACRM0720	07368			7.20	.2835	8		91		53		43		1.10
CDACRM0730	07369			7.30	.2874	8		91		53		43		1.12
CDACRM0740	07370			7.40	.2913	8		91		53		43		1.13
CDACRM0750	07371			7.50	.2953	8		91		53		43		1.15
CDACR2969	07372	19/64			.2969	8	3.58		2.087		1.693		0.046	
CDACRM0760	07408			7.60	.2992	8		91		53		43		1.17
CDACRM0770	07409			7.70	.3031	8		91		53		43		1.18
CDACRM0780	07373			7.80	.3071	8		91		53		43		1.20
CDACRM0790	07410			7.90	.3110	8		91		53		43		1.21
CDACR3125	07374	5/16			.3125	8	3.58		2.087		1.693		0.048	
CDACRM0800	07375			8.00	.3150	8		91		53		43		1.23
CDACRM0810	07376			8.10	.3189	10		103		61		49		1.24
CDACRM0820	07405			8.20	.3228	10		103		61		49		1.26
CDACRM0830	07411			8.30	.3268	10		103		61		49		1.27
CDACR3281	07377	21/64			.3281	10	4.06		2.402		1.929		0.050	

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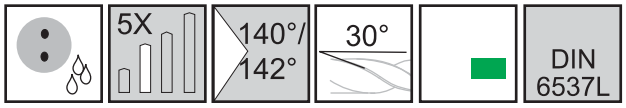
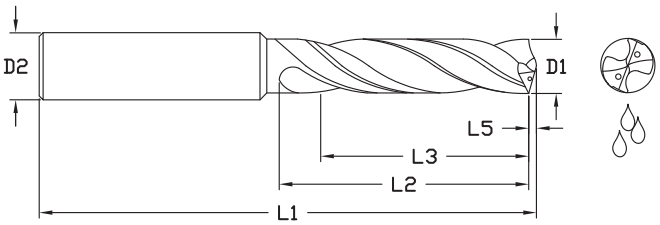
Series CDACR Continued





		Diameter				Shank	OAL		Flute Length		Relief Length		Point Length	
		D1 (m7)				D2 (h6)	L1		L2 (max)		L3 (Ref)		L5	
Tool No.	EDP	Inch	Letter/Wire	mm	Decimal	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
CDACRM0840	07378			8.40	.3307	10		103		61		49		1.29
CDACR3320	07379		Q		.3320	10	4.06		2.402		1.929		0.051	
CDACRM0850	07380			8.50	.3346	10		103		61		49		1.30
CDACRM0860	07412			8.60	.3386	10		103		61		49		1.32
CDACRM0870	07413			8.70	.3425	10		103		61		49		1.33
CDACR3438	07381	11/32			.3438	10	4.06		2.402		1.929		0.053	
CDACRM0880	07414			8.80	.3465	10		103		61		49		1.35
CDACRM0890	07415			8.90	.3504	10		103		61		49		1.36
CDACRM0900	07382			9.00	.3543	10		103		61		49		1.38
CDACRM0910	07416			9.10	.3583	10		103		61		49		1.40
CDACR3594	07383	23/64			.3594	10	4.06		2.402		1.929		0.055	
CDACRM0920	07417			9.20	.3622	10		103		61		49		1.41
CDACRM0930	07418			9.30	.3661	10		103		61		49		1.43
CDACR3680	07384		U		.3680	10	4.06		2.402		1.929		0.056	
CDACRM0940	07419			9.40	.3701	10		103		61		49		1.44
CDACRM0950	07385			9.50	.3740	10		103		61		49		1.46
CDACR3750	07386	3/8			.3750	10	4.06		2.402		1.929		0.057	
CDACRM0960	07420			9.60	.3780	10		103		61		49		1.47
CDACRM0970	07387			9.70	.3819	10		103		61		49		1.49
CDACRM0980	07421			9.80	.3858	10		103		61		49		1.50
CDACRM0990	07422			9.90	.3898	10		103		61		49		1.52
CDACR3906	07388	25/64			.3906	10	4.06		2.402		1.929		0.060	
CDACRM1000	07389			10.00	.3937	10		103		61		49		1.53
CDACRM1010	07423			10.10	.3976	12		118		71		56		1.55
CDACRM1020	07390			10.20	.4016	12		118		71		56		1.56
CDACRM1030	07424			10.30	.4055	12		118		71		56		1.58
CDACR4062	07391	13/32			.4062	12	4.65		2.795		2.205		0.062	
CDACRM1040	07392			10.40	.4094	12		118		71		56		1.59
CDACRM1050	07393			10.50	.4134	12		118		71		56		1.61
CDACRM1060	07394			10.60	.4173	12		118		71		56		1.63
CDACRM1070	07425			10.70	.4213	12		118		71		56		1.64
CDACR4219	07395	27/64			.4219	12	4.65		2.795		2.205		0.065	
CDACRM1080	07426			10.80	.4252	12		118		71		56		1.66
CDACRM1090	07427			10.90	.4291	12		118		71		56		1.67
CDACRM1100	07396			11.00	.4331	12		118		71		56		1.69
CDACRM1110	07428			11.10	.4370	12		118		71		56		1.70
CDACR4375	07397	7/16			.4375	12	4.65		2.795		2.205		0.067	
CDACRM1120	07429			11.20	.4409	12		118		71		56		1.72
CDACRM1130	07430			11.30	.4449	12		118		71		56		1.73
CDACRM1140	07431			11.40	.4488	12		118		71		56		1.75
CDACRM1150	07398			11.50	.4528	12		118		71		56		1.76
CDACR4531	07399	29/64			.4531	12	4.65		2.795		2.205		0.069	
CDACRM1160	07432			11.60	.4567	12		118		71		56		1.78
CDACRM1170	07433			11.70	.4606	12		118		71		56		1.79
CDACRM1180	07434			11.80	.4646	12		118		71		56		1.81
CDACRM1190	07435			11.90	.4685	12		118		71		56		1.82
CDACR4688	07400	15/32			.4688	12	4.65		2.795		2.205		0.072	
CDACRM1200	07401			12.00	.4724	12		118		71		56		1.84
CDACR4844	07402	31/64			.4844	14	4.88		3.031		2.362		0.074	
CDACRM1250	07403			12.50	.4921	14		124		77		60		1.92
CDACR5000	07404	1/2			.5000	14	4.88		3.031		2.362		0.077	

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Twister® XD

Xtreme High Performance Drilling

Features

- Advanced “Active Cut” Geometric Design.
- Redefined Critical Cut Zone Characteristics.
- High Efficiency Flute Profile.
- “State-of-the-Art” Proprietary Coating.
- Stable Low-Thrust Point Form.
- Coolant-Fed or Solid.
- Diameter Range - .5mm to 20.0mm, 1/64" to 3/4".
- Micro Pilot (2X), Micro (5X), Micro (12X), Stub (3X), Regular (5X), Long (7X+) and Extra Long (12X-25X).
- Engineered and Produced in the USA.

All HP Drill shanks are manufactured to h6 nominal diameters for heat shrink shank applications.

Benefits

- Extended Tool Life.
- Elevated Metal Removal Rates (MRR).
- Lower Cost Per Hole.
- Improved Hole/Part Quality.
- Increased Tool Reliability.
- Factory Trained Network of Application & Technical Specialists.
- Factory Reconditioning Service.
- Ideal Platform for Modification or an Engineered “Special” Tool.
- Compatibility to a Wide Range of Standard Toolholder Systems.

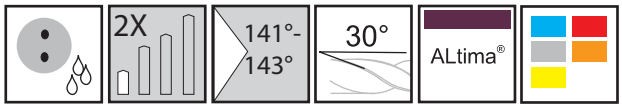
MXD Micro Drill sizes 0.50mm – 2.95mm
See page 46-49 for complete offering.

For HP Drill Selection Chart, See Page 16.

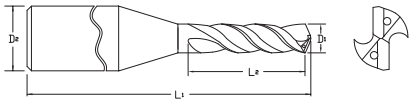
ISO 9001:2015 Certified

Twister® Micro Pilot Drill Series MPDCS

NEW



- 2 flute.
- Pilot Drill for MXDCL Series.
- Carbide coolant fed, ALtima® coated.
- Web thinned point helps to reduce cutting forces during the drilling operation.
- All sizes have honed cutting edges on the point which increases the strength of the cutting edges.
- Post coat polishing to improve chip evacuation.



ALtima®		Diameter		Shank	OAL	Flute Length
		D1		D2	L1	L2
Tool No.	EDP	mm	Decimal	mm	mm	mm
MPDCSM0100A	04874	1.00	.0394	3	45	4
MPDCSM0105A	04875	1.05	.0413	3	45	4
MPDCSM0110A	04876	1.10	.0433	3	45	4
MPDCSM0115A	04877	1.15	.0453	3	45	5
MPDCSM0120A	04878	1.20	.0472	3	45	5
MPDCSM0125A	04879	1.25	.0492	3	45	5
MPDCSM0130A	04880	1.30	.0512	3	45	5
MPDCSM0135A	04881	1.35	.0531	3	45	5
MPDCSM0140A	04882	1.40	.0551	3	45	6
MPDCSM0145A	04883	1.45	.0571	3	45	6
MPDCSM0150A	04884	1.50	.0591	3	45	6
MPDCSM0155A	04885	1.55	.0610	3	45	6
MPDCSM0160A	04886	1.60	.0630	3	45	6
MPDCSM0165A	04887	1.65	.0650	3	50	7
MPDCSM0170A	04888	1.70	.0669	3	50	7
MPDCSM0175A	04889	1.75	.0689	3	50	7
MPDCSM0180A	04890	1.80	.0709	3	50	7
MPDCSM0185A	04891	1.85	.0728	3	50	7
MPDCSM0190A	04892	1.90	.0748	3	50	8
MPDCSM0195A	04893	1.95	.0768	3	50	8
MPDCSM0200A	04894	2.00	.0787	3	50	8
MPDCSM0205A	04895	2.05	.0807	3	60	8
MPDCSM0210A	04896	2.10	.0827	3	60	8
MPDCSM0215A	04897	2.15	.0846	3	60	9
MPDCSM0220A	04898	2.20	.0866	3	60	9
MPDCSM0225A	04899	2.25	.0886	3	60	9

ALtima®		Diameter		Shank	OAL	Flute Length
		D1		D2	L1	L2
Tool No.	EDP	mm	Decimal	mm	mm	mm
MPDCSM0230A	04900	2.30	.0906	3	60	9
MPDCSM0235A	04901	2.35	.0925	3	60	9
MPDCSM0240A	04902	2.40	.0945	3	60	10
MPDCSM0245A	04903	2.45	.0965	3	60	10
MPDCSM0250A	04904	2.50	.0984	3	60	10
MPDCSM0255A	04905	2.55	.1004	3	60	10
MPDCSM0260A	04906	2.60	.1024	3	60	10
MPDCSM0265A	04907	2.65	.1043	3	60	11
MPDCSM0270A	04908	2.70	.1063	3	60	11
MPDCSM0275A	04909	2.75	.1083	3	60	11
MPDCSM0280A	04910	2.80	.1102	3	60	11
MPDCSM0285A	04911	2.85	.1122	3	60	11
MPDCSM0290A	04912	2.90	.1142	3	60	12
MPDCSM0295A	04913	2.95	.1161	3	60	12

Metric (mm)	
D1	Tolerance
1.00 - 2.95	+.004/+.014

Metric (mm)	
D2	Tolerance (h6)
3.00	+0/-.006

TECH
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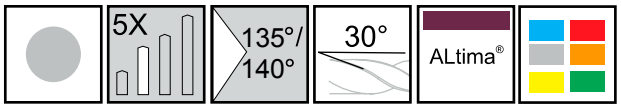
Made in USA

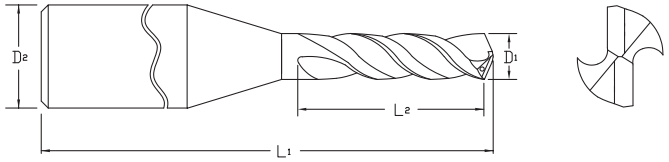
ISO 9001:2015 Certified

M.A. Ford® Phone: 800-553-8024 or 563-391-6220 • email: sales@maford.com • www.maford.com

Twister® Micro XD Series MXDSR



- Designed for high performance drilling in a broad range of materials.
- Web thinned point helps to reduce cutting forces during the drilling operation.
- 0.8mm diameters and above have honed cutting edges on the point which increases the strength of the cutting edges.
- All sizes have post coat polishing to improve chip evacuation.
- Coated with ALtima® Coating.



ALtima®		Diameter		Shank	OAL	Flute Length
		D1 (h7)		D2 (h6)	L1	L2
Tool No.	EDP	mm	Decimal	mm	mm	mm
MXDSRM0050A	04694	0.50	.0197	3	57	4
MXDSRM0055A	04696	0.55	.0217	3	57	4
MXDSRM0060A	04698	0.60	.0236	3	57	5
MXDSRM0065A	04700	0.65	.0256	3	57	5
MXDSRM0070A	04702	0.70	.0276	3	57	5
MXDSRM0075A	04704	0.75	.0295	3	57	6
MXDSRM0080A	04706	0.80	.0315	3	57	6
MXDSRM0085A	04708	0.85	.0335	3	57	7
MXDSRM0090A	04710	0.90	.0354	3	57	7
MXDSRM0095A	04712	0.95	.0374	3	57	7
MXDSRM0100A	04714	1.00	.0394	3	57	8
MXDSRM0105A	04716	1.05	.0413	3	57	8
MXDSRM0110A	04718	1.10	.0433	3	57	8
MXDSRM0115A	04720	1.15	.0453	3	57	9
MXDSRM0120A	04722	1.20	.0472	3	57	9
MXDSRM0125A	04724	1.25	.0492	3	57	9
MXDSRM0130A	04726	1.30	.0512	3	57	10
MXDSRM0135A	04728	1.35	.0531	3	57	10
MXDSRM0140A	04730	1.40	.0551	3	57	10
MXDSRM0145A	04732	1.45	.0571	3	57	11
MXDSRM0150A	04734	1.50	.0591	3	57	11
MXDSRM0155A	04736	1.55	.0610	3	57	12
MXDSRM0160A	04738	1.60	.0630	3	57	12
MXDSRM0165A	04740	1.65	.0650	3	57	12
MXDSRM0170A	04742	1.70	.0669	3	57	13
MXDSRM0175A	04744	1.75	.0689	3	57	13

ALtima®		Diameter		Shank	OAL	Flute Length
		D1 (h7)		D2 (h6)	L1	L2
Tool No.	EDP	mm	Decimal	mm	mm	mm
MXDSRM0180A	04746	1.80	.0709	3	57	13
MXDSRM0185A	04748	1.85	.0728	3	57	14
MXDSRM0190A	04750	1.90	.0748	3	57	14
MXDSRM0195A	04752	1.95	.0768	3	57	14
MXDSRM0200A	04754	2.00	.0787	3	57	15
MXDSRM0205A	04756	2.05	.0807	3	57	15
MXDSRM0210A	04758	2.10	.0827	3	57	15
MXDSRM0215A	04760	2.15	.0846	3	57	16
MXDSRM0220A	04762	2.20	.0866	3	57	16
MXDSRM0225A	04764	2.25	.0886	3	57	17
MXDSRM0230A	04766	2.30	.0906	3	57	17
MXDSRM0235A	04768	2.35	.0925	3	57	17
MXDSRM0240A	04770	2.40	.0945	3	57	18
MXDSRM0245A	04772	2.45	.0965	3	57	18
MXDSRM0250A	04774	2.50	.0984	3	57	18
MXDSRM0255A	04776	2.55	.1004	3	57	19
MXDSRM0260A	04778	2.60	.1024	3	57	19
MXDSRM0265A	04780	2.65	.1043	3	57	19
MXDSRM0270A	04782	2.70	.1063	3	57	20
MXDSRM0275A	04784	2.75	.1083	3	57	20
MXDSRM0280A	04786	2.80	.1102	3	57	20
MXDSRM0285A	04788	2.85	.1122	3	57	21
MXDSRM0290A	04790	2.90	.1142	3	57	21
MXDSRM0295A	04792	2.95	.1161	3	57	22

Metric (mm)	
D1	Tolerance (h7)
0 - 3.0	+0/-.010

Metric (mm)	
D2	Tolerance (h6)
0 - 3.0	+0/-.006

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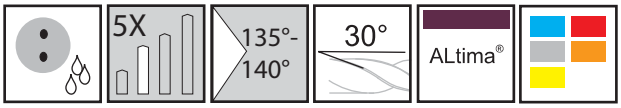
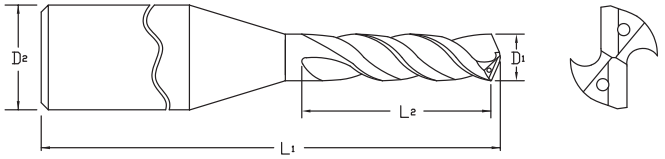
Twister® Micro XD Series MXDCR

NEW



- Designed for high performance drilling in a broad range of materials.
- Web thinned point helps to reduce cutting forces during the drilling operation.
- All sizes have honed cutting edges on the point which increases the strength of the cutting edges.
- Post coat polishing to improve chip evacuation.
- Coated with ALtima® Coating.
- Carbide coolant fed.



ALtima®		Diameter D1		Shank D2	OAL L1	Flute Length L2
Tool No.	EDP	mm	Decimal	mm	mm	mm
MXDCRM0100A	04794	1.00	.0394	3	57	8
MXDCRM0105A	04795	1.05	.0413	3	57	8
MXDCRM0110A	04796	1.10	.0433	3	57	8
MXDCRM0115A	04797	1.15	.0453	3	57	9
MXDCRM0120A	04798	1.20	.0472	3	57	9
MXDCRM0125A	04799	1.25	.0492	3	57	9
MXDCRM0130A	04800	1.30	.0512	3	57	10
MXDCRM0135A	04801	1.35	.0531	3	57	10
MXDCRM0140A	04802	1.40	.0551	3	57	10
MXDCRM0145A	04803	1.45	.0571	3	57	11
MXDCRM0150A	04804	1.50	.0591	3	57	11
MXDCRM0155A	04805	1.55	.0610	3	57	12
MXDCRM0160A	04806	1.60	.0630	3	57	12
MXDCRM0165A	04807	1.65	.0650	3	57	12
MXDCRM0170A	04808	1.70	.0669	3	57	13
MXDCRM0175A	04809	1.75	.0689	3	57	13
MXDCRM0180A	04810	1.80	.0709	3	57	13
MXDCRM0185A	04811	1.85	.0728	3	57	14
MXDCRM0190A	04812	1.90	.0748	3	57	14
MXDCRM0195A	04813	1.95	.0768	3	57	14
MXDCRM0200A	04814	2.00	.0787	3	57	15
MXDCRM0205A	04815	2.05	.0807	3	60	15
MXDCRM0210A	04816	2.10	.0827	3	60	15
MXDCRM0215A	04817	2.15	.0846	3	60	16

ALtima®		Diameter D1		Shank D2	OAL L1	Flute Length L2
Tool No.	EDP	mm	Decimal	mm	mm	mm
MXDCRM0220A	04818	2.20	.0866	3	60	16
MXDCRM0225A	04819	2.25	.0886	3	60	17
MXDCRM0230A	04820	2.30	.0906	3	60	17
MXDCRM0235A	04821	2.35	.0925	3	60	17
MXDCRM0240A	04822	2.40	.0945	3	60	18
MXDCRM0245A	04823	2.45	.0965	3	60	18
MXDCRM0250A	04824	2.50	.0984	3	60	18
MXDCRM0255A	04825	2.55	.1004	3	60	19
MXDCRM0260A	04826	2.60	.1024	3	60	19
MXDCRM0265A	04827	2.65	.1043	3	60	19
MXDCRM0270A	04828	2.70	.1063	3	60	20
MXDCRM0275A	04829	2.75	.1083	3	60	20
MXDCRM0280A	04830	2.80	.1102	3	60	20
MXDCRM0285A	04831	2.85	.1122	3	60	21
MXDCRM0290A	04832	2.90	.1142	3	60	21
MXDCRM0295A	04833	2.95	.1161	3	60	22

Metric (mm)	
D1	Tolerance (h7)
1.00- 2.95	+0/-.010

Metric (mm)	
D2	Tolerance (h6)
3.00	+0/-.006

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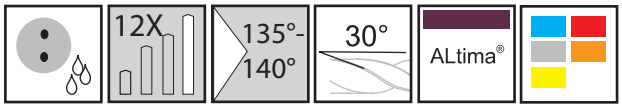
Twister® Micro XD Series MXDCL



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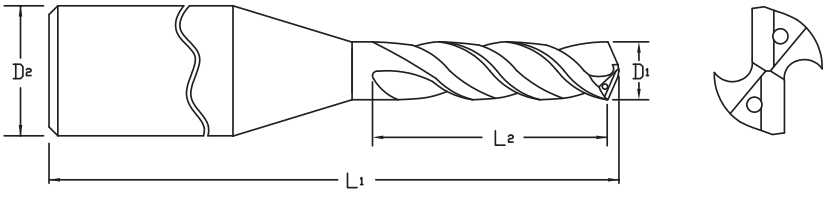
- Web thinned point helps to reduce cutting forces during the drilling operation.
- All sizes have honed cutting edges on the point which increases the strength of the cutting edges.
- Post coat polishing to improve chip evacuation.
- Coated with ALtima® Coating.
- Carbide coolant fed.



ALtima®		Diameter D1		Shank D2	OAL L1	Flute Length L2
Tool No.	EDP	mm	Decimal	mm	mm	mm
MXDCLM0100A	04834	1.00	.0394	3	60	16
MXDCLM0105A	04835	1.05	.0413	3	60	17
MXDCLM0110A	04836	1.10	.0433	3	60	18
MXDCLM0115A	04837	1.15	.0453	3	60	19
MXDCLM0120A	04838	1.20	.0472	3	65	20
MXDCLM0125A	04839	1.25	.0492	3	65	20
MXDCLM0130A	04840	1.30	.0512	3	65	21
MXDCLM0135A	04841	1.35	.0531	3	65	22
MXDCLM0140A	04842	1.40	.0551	3	65	23
MXDCLM0145A	04843	1.45	.0571	3	65	24
MXDCLM0150A	04844	1.50	.0591	3	65	24
MXDCLM0155A	04845	1.55	.0610	3	65	25
MXDCLM0160A	04846	1.60	.0630	3	70	26
MXDCLM0165A	04847	1.65	.0650	3	70	27
MXDCLM0170A	04848	1.70	.0669	3	70	28
MXDCLM0175A	04849	1.75	.0689	3	70	28
MXDCLM0180A	04850	1.80	.0709	3	70	29
MXDCLM0185A	04851	1.85	.0728	3	70	30
MXDCLM0190A	04852	1.90	.0748	3	75	31
MXDCLM0195A	04853	1.95	.0768	3	75	32
MXDCLM0200A	04854	2.00	.0787	3	75	32
MXDCLM0205A	04855	2.05	.0807	3	75	33
MXDCLM0210A	04856	2.10	.0827	3	75	34
MXDCLM0215A	04857	2.15	.0846	3	75	35

ALtima®		Diameter D1		Shank D2	OAL L1	Flute Length L2
Tool No.	EDP	mm	Decimal	mm	mm	mm
MXDCLM0220A	04858	2.20	.0866	3	75	36
MXDCLM0225A	04859	2.25	.0886	3	75	36
MXDCLM0230A	04860	2.30	.0906	3	75	37
MXDCLM0235A	04861	2.35	.0925	3	75	38
MXDCLM0240A	04862	2.40	.0945	3	75	39
MXDCLM0245A	04863	2.45	.0965	3	75	40
MXDCLM0250A	04864	2.50	.0984	3	75	40
MXDCLM0255A	04865	2.55	.1004	3	80	41
MXDCLM0260A	04866	2.60	.1024	3	80	42
MXDCLM0265A	04867	2.65	.1043	3	80	43
MXDCLM0270A	04868	2.70	.1063	3	80	44
MXDCLM0275A	04869	2.75	.1083	3	80	44
MXDCLM0280A	04870	2.80	.1102	3	80	45
MXDCLM0285A	04871	2.85	.1122	3	80	46
MXDCLM0290A	04872	2.90	.1142	3	85	47
MXDCLM0295A	04873	2.95	.1161	3	85	48

Metric (mm)	
D1	Tolerance (h7)
1.00- 2.95	+0/-.010

Metric (mm)	
D2	Tolerance (h6)
3.0	+0/-.006

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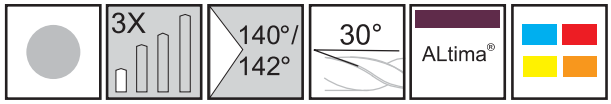
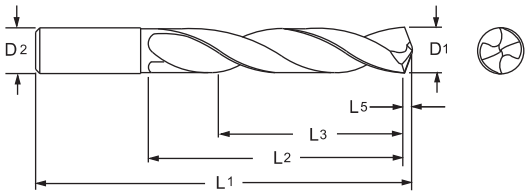
Twister XD® Series 2XDSS



Designed for high performance drilling in a broad range of materials.



ALtima®		Diameter D1 (h7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
2XDSS0984A	22601			2.5	.0984		2.5		43		14		11		0.39
2XDSS1142A	22602			2.9	.1142		2.9		46		16		12		0.45
2XDSS1181A	02100			3.0	.1181		3.0		57		16		13		0.46
2XDSS1200A	02102		31		.1200	1/8		2.25		0.750		0.60		0.019	
2XDSS1220A	02103			3.1	.1220		4.0		63		22		18		0.48
2XDSS1250A	02104	1/8			.1250	1/8		2.25		0.750		0.60		0.019	
2XDSS1260A	02106			3.2	.1260		4.0		63		22		18		0.50
2XDSS1285A	02108		30		.1285	5/32		2.5		0.875		0.70		0.020	
2XDSS1299A	02110			3.3	.1299		4.0		63		22		18		0.51
2XDSS1339A	02112			3.4	.1339		4.0		63		22		18		0.53
2XDSS1360A	02114		29		.1360	5/32		2.5		0.875		0.70		0.021	
2XDSS1378A	02116			3.5	.1378		4.0		63		22		18		0.54
2XDSS1406A	02118	9/64			.1406	5/32		2.5		0.875		0.70		0.022	
2XDSS1417A	02119			3.6	.1417		4.0		63		22		18		0.56
2XDSS1457A	02120			3.7	.1457		4.0		63		22		18		0.57
2XDSS1496A	02122			3.8	.1496		4.0		63		22		18		0.59
2XDSS1520A	02121		24		.1520	5/32		2.5		0.875		0.70		0.024	
2XDSS1535A	02123			3.9	.1535		4.0		63		22		18		0.60
2XDSS1562A	02124	5/32			.1562	5/32		2.5		0.875		0.70		0.024	
2XDSS1575A	02126			4.0	.1575		4.0		63		22		18		0.62
2XDSS1590A	02127		21		.1590	3/16		2.5		1.000		0.80		0.025	
2XDSS1614A	04000			4.1	.1614		5.0		63		26		21		0.64
2XDSS1654A	02128			4.2	.1654		5.0		63		26		21		0.65
2XDSS1693A	02129			4.3	.1693		5.0		63		26		21		0.67

Inch	
D1	Tolerance (h7)
.0000 - .1181	+0/-.00039
.1182 - .2362	+0/-.00047
.2363 - .3937	+0/-.00059
.3938 - .7087	+0/-.00071
.7088 - .7500	+0/-.00083

Inch	
D2	Tolerance (h6)
.0000 - .1181	+0/-.00024
.1182 - .2362	+0/-.00031
.2363 - .3937	+0/-.00035
.3938 - .7087	+0/-.00043
.7088 - .7500	+0/-.00051

Metric (mm)	
D1	Tolerance (h7)
0 - 3.0	+0/-.010
3.01 - 6.0	+0/-.012
6.01 - 10.0	+0/-.015
10.01 - 18.0	+0/-.018
18.01 - 20.0	+0/-.021

Metric (mm)	
D2	Tolerance (h6)
0 - 3.0	+0/-.006
3.01 - 6.0	+0/-.008
6.01 - 10.0	+0/-.009
10.01 - 18.0	+0/-.011
18.01 - 20.0	+0/-.013

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Series 2XDSS Continued

ALtima®		Diameter D1 (h7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
2XDSS1719A	02130	11/64			.1719	3/16		2.50		1.000		0.80		0.027	
2XDSS1732A	02131			4.4	.1732		5.0		63		26		21		0.68
2XDSS1772A	02132			4.5	.1772		5.0		63		26		21		0.70
2XDSS1811A	02134			4.6	.1811		5.0		63		26		21		0.71
2XDSS1850A	02135			4.7	.1850		5.0		63		26		21		0.73
2XDSS1875A	02136	3/16			.1875	3/16		2.50		1.000		0.80		0.029	
2XDSS1890A	02138			4.8	.1890		5.0		63		26		21		0.74
2XDSS1929A	02140			4.9	.1929		5.0		63		26		21		0.76
2XDSS1968A	02142			5.0	.1968		5.0		63		26		21		0.77
2XDSS2008A	02144			5.1	.2008		6.0		76		30		24		0.79
2XDSS2031A	02146	13/64			.2031	15/64		3.00		1.125		0.90		0.031	
2XDSS2047A	02148			5.2	.2047		6.0		76		30		24		0.81
2XDSS2087A	02150			5.3	.2087		6.0		76		30		24		0.82
2XDSS2126A	02152			5.4	.2126		6.0		76		30		24		0.84
2XDSS2165A	02154			5.5	.2165		6.0		76		30		24		0.85
2XDSS2187A	02156	7/32			.2187	15/64		3.00		1.125		0.90		0.034	
2XDSS2210A	02158		2		.2210	15/64		3.00		1.125		0.90		0.034	
2XDSS2244A	02160			5.7	.2244		6.0		76		30		24		0.88
2XDSS2283A	02162			5.8	.2283		6.0		76		30		24		0.90
2XDSS2323A	02164			5.9	.2323		6.0		76		30		24		0.91
2XDSS2344A	02166	15/64			.2344	15/64		3.00		1.125		0.90		0.036	
2XDSS2362A	02168			6.0	.2362		6.0		76		30		24		0.93
2XDSS2402A	02170			6.1	.2402		8.0		82		35		28		0.95
2XDSS2420A	02172		C		.2420	1/4		3.00		1.250		1.00		0.037	
2XDSS2441A	02174			6.2	.2441		8.0		82		35		28		0.96
2XDSS2460A	02176		D		.2460	1/4		3.00		1.250		1.00		0.038	
2XDSS2480A	02178			6.3	.2480		8.0		82		35		28		0.98
2XDSS2500A	02180	1/4			.2500	1/4		3.00		1.250		1.00		0.039	
2XDSS2520A	02182			6.4	.2520		8.0		82		35		28		0.99
2XDSS2559A	02184			6.5	.2559		8.0		82		35		28		1.01
2XDSS2570A	02186		F		.2570	5/16		3.25		1.375		1.10		0.040	
2XDSS2598A	02185			6.6	.2598		8.0		82		35		28		1.03
2XDSS2610A	02188		G		.2610	5/16		3.25		1.375		1.10		0.040	
2XDSS2638A	02189			6.7	.2638		8.0		82		35		28		1.04
2XDSS2656A	02190	17/64			.2656	5/16		3.25		1.375		1.10		0.041	
2XDSS2677A	02192			6.8	.2677		8.0		82		35		28		1.05
2XDSS2717A	02194			6.9	.2717		8.0		82		35		28		1.07
2XDSS2756A	02196			7.0	.2756		8.0		82		35		28		1.08
2XDSS2795A	02197			7.1	.2795		8.0		82		38		31		1.10
2XDSS2812A	02198	9/32			.2812	5/16		3.25		1.500		1.20		0.044	

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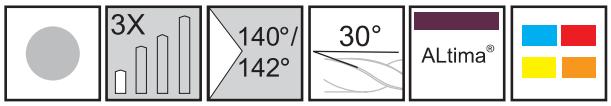
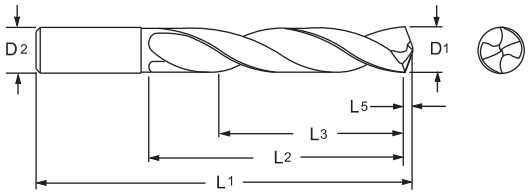
Series 2XDSS Continued





ALtima®		Diameter D1 (h7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
2XDSS2835A	02200			7.2	.2835		8.0		82		38		31		1.12
2XDSS2874A	02201			7.3	.2874		8.0		82		38		31		1.13
2XDSS2913A	02202			7.4	.2913		8.0		82		38		31		1.15
2XDSS2953A	02204			7.5	.2953		8.0		82		38		31		1.16
2XDSS2969A	02206	19/64			.2969	5/16		3.25		1.500		1.20		0.046	
2XDSS2992A	02208			7.6	.2992		8.0		82		38		31		1.18
2XDSS3031A	02210			7.7	.3031		8.0		82		38		31		1.19
2XDSS3071A	02212			7.8	.3071		8.0		82		38		31		1.21
2XDSS3110A	02213			7.9	.3110		8.0		82		38		31		1.22
2XDSS3125A	02214	5/16			.3125	5/16		3.25		1.500		1.20		0.048	
2XDSS3150A	02216			8.0	.3150		8.0		82		38		31		1.24
2XDSS3189A	02218			8.1	.3189		10.0		89		43		35		1.26
2XDSS3228A	02220			8.2	.3228		10.0		89		43		35		1.27
2XDSS3268A	02222			8.3	.3268		10.0		89		43		35		1.29
2XDSS3281A	02224	21/64			.3281	25/64		3.50		1.687		1.35		0.051	
2XDSS3307A	02223			8.4	.3307		10.0		89		43		35		1.31
2XDSS3320A	02225		Q		.3320	25/64		3.50		1.687		1.35		0.051	
2XDSS3346A	02226			8.5	.3346		10.0		89		43		35		1.32
2XDSS3386A	02227			8.6	.3386		10.0		89		43		35		1.33
2XDSS3425A	04001			8.7	.3425		10.0		89		43		35		1.35
2XDSS3438A	02228	11/32			.3438	25/64		3.50		1.687		1.35		0.053	
2XDSS3465A	02230			8.8	.3465		10.0		89		43		35		1.36
2XDSS3504A	02232			8.9	.3504		10.0		89		43		35		1.38
2XDSS3543A	02234			9.0	.3543		10.0		89		43		35		1.39
2XDSS3583A	02235			9.1	.3583		10.0		89		43		35		1.41
2XDSS3594A	02236	23/64			.3594	25/64		3.50		1.687		1.35		0.056	
2XDSS3622A	02238			9.2	.3622		10.0		89		43		35		1.43
2XDSS3642A	02240			9.25	.3642		10.0		89		43		35		1.43
2XDSS3661A	02242			9.3	.3661		10.0		89		43		35		1.44
2XDSS3701A	02243			9.4	.3701		10.0		89		43		35		1.46
2XDSS3740A	02244			9.5	.3740		10.0		89		43		35		1.47
2XDSS3750A	02246	3/8			.3750	25/64		3.50		1.687		1.35		0.058	
2XDSS3780A	02247			9.6	.3780		10.0		89		43		35		1.49
2XDSS3819A	02248			9.7	.3819		10.0		89		43		35		1.50
2XDSS3858A	02250			9.8	.3858		10.0		89		43		35		1.52
2XDSS3898A	02251			9.9	.3898		10.0		89		43		35		1.53

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Series 2XDSS Continued

ALtima®		Diameter D1 (h7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
2XDSS3906A	02252	25/64			.3906	25/64		3.50		1.687		1.35		0.061	
2XDSS3937A	02254			10.0	.3937		10.0		89		43		35		1.55
2XDSS3976A	02255			10.1	.3976		12.0		101		51		41		1.56
2XDSS4016A	02256			10.2	.4016		12.0		101		51		41		1.58
2XDSS4055A	02257			10.3	.4055		12.0		101		51		41		1.60
2XDSS4062A	02258	13/32			.4062	15/32		4.00		2.000		1.60		0.063	
2XDSS4094A	02259			10.4	.4094		12.0		101		51		41		1.61
2XDSS4134A	02260			10.5	.4134		12.0		101		51		41		1.63
2XDSS4173A	02261			10.6	.4173		12.0		101		51		41		1.64
2XDSS4213A	04002			10.7	.4213		12.0		101		51		41		1.66
2XDSS4219A	02262	27/64			.4219	15/32		4.00		2.00		1.60		0.065	
2XDSS4252A	02263			10.8	.4252		12.0		101		51		41		1.67
2XDSS4291A	04003			10.9	.4291		12.0		101		51		41		1.69
2XDSS4331A	02264			11.0	.4331		12.0		101		51		41		1.70
2XDSS4370A	02265			11.1	.4370		12.0		101		51		41		1.72
2XDSS4375A	02266	7/16			.4375	15/32		4.00		2.00		1.60		0.068	
2XDSS4409A	02268			11.2	.4409		12.0		101		51		41		1.74
2XDSS4449A	02269			11.3	.4449		12.0		101		51		41		1.75
2XDSS4488A	04004			11.4	.4488		12.0		101		51		41		1.77
2XDSS4527A	02270			11.5	.4527		12.0		101		51		41		1.78
2XDSS4567A	02271			11.6	.4567		12.0		101		51		41		1.80
2XDSS4606A	02272			11.7	.4606		12.0		101		51		41		1.81
2XDSS4646A	02273			11.8	.4646		12.0		101		51		41		1.83
2XDSS4685A	04005			11.9	.4685		12.0		101		51		41		1.84
2XDSS4688A	02274	15/32			.4688	15/32		4.00		2.00		1.60		0.073	
2XDSS4724A	02276			12.0	.4724		12.0		101		51		41		1.86
2XDSS4764A	02278			12.1	.4764		14.0		107		54		43		1.87
2XDSS4844A	02280	31/64			.4844	1/2		4.00		2.00		1.60		0.075	
2XDSS4921A	02282			12.5	.4921		14.0		107		54		43		1.94
2XDSS5000A	02284	1/2			.5000	1/2		4.00		2.00		1.60		0.077	
2XDSS5039A	02286			12.8	.5039		14.0		107		54		43		1.98
2XDSS5051A	02285			12.83	.5051		14.0		107		54		43		1.99
2XDSS5079A	02287			12.9	.5079		14.0		107		54		43		2.00
2XDSS5118A	02288			13.0	.5118		14.0		107		54		43		2.01
2XDSS5156A	02290	33/64			.5156	35/64		4.25		2.125		1.70		0.080	
2XDSS5312A	02291	17/32			.5312	35/64		4.25		2.125		1.70		0.082	
2XDSS5315A	02292			13.5	.5315		14.0		107		54		43		2.09
2XDSS5394A	02294			13.7	.5394		14.0		107		54		43		2.12
2XDSS5469A	02296	35/64			.5469	35/64		4.25		2.125		1.70		0.085	
2XDSS5512A	02298			14.0	.5512		14.0		107		54		43		2.17
2XDSS5625A	02300	9/16			.5625	5/8		4.625		2.375		1.90		0.087	
2XDSS5709A	02302			14.5	.5709		16.0		117		60		48		2.25

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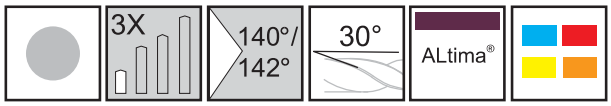
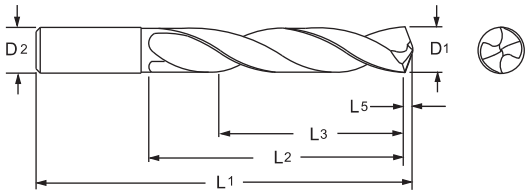
Series 2XDSS Continued





ALtima®		Diameter				Shank		OAL		Flute Length		Drill Length		Point Length	
		D1 (h7)				D2 (h6)		L1		L2 (Max.)		L3 Ref.		L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
2XDSS5787A	02304			14.7	.5787		16.0		117		60		48		2.28
2XDSS5905A	02306			15.0	.5905		16.0		117		60		48		2.32
2XDSS5938A	02308	19/32			.5938	5/8		4.625		2.375		1.90		0.092	
2XDSS6024A	02309			15.3	.6024		16.0		117		60		48		2.37
2XDSS6102A	02310			15.5	.6102		16.0		117		60		48		2.40
2XDSS6181A	02312			15.7	.6181		16.0		117		60		48		2.43
2XDSS6250A	02314	5/8			.6250	5/8		4.625		2.375		1.90		0.097	
2XDSS6299A	02316			16.0	.6299		16.0		117		60		48		2.48
2XDSS6331A	02318			16.08	.6331		18.0		122		63		51		2.49
2XDSS6417A	02319			16.3	.6417		18.0		122		63		51		2.53
2XDSS6496A	02320			16.5	.6496		18.0		122		63		51		2.56
2XDSS6562A	02322	21/32			.6562	45/64		4.81		2.500		2.00		0.102	
2XDSS6693A	02324			17.0	.6693		18.0		122		63		51		2.63
2XDSS6875A	02326	11/16			.6875	45/64		4.81		2.500		2.00		0.107	
2XDSS6890A	02328			17.5	.6890		18.0		122		63		51		2.71
2XDSS7087A	02330			18.0	.7087		18.0		122		63		51		2.79
2XDSS7283A	02332			18.5	.7283		20.0		133		70		56		2.87
2XDSS7500A	02334	3/4			.7500	3/4		5.25		2.750		2.20		0.116	
2XDSS7543A	02336			19.16	.7543		20.0		133		70		56		2.97
2XDSS7579A	02338			19.25	.7579		20.0		133		70		56		2.98
2XDSS7598A	02340			19.3	.7598		20.0		133		70		56		2.99
2XDSS7677A	02342			19.5	.7677		20.0		133		70		56		3.02
2XDSS7874A	02344			20.0	.7874		20.0		133		70		56		3.10

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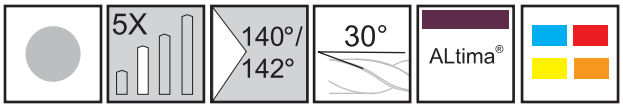
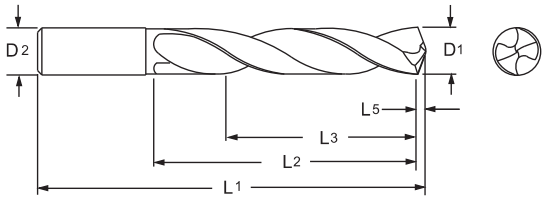
Twister XD® Series 2XDSR



Designed for high performance drilling in a broad range of materials.



ALtima®		Diameter D1 (h7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
2XDSR0156A	22201	1/64			.0156	1/64		1.50		0.187		0.14		0.002	
2XDSR0197A	28001			0.5	.0197		0.50		26		6		5		0.08
2XDSR0236A	28006			0.6	.0236		0.60		26		7		5		0.09
2XDSR0256A	28011			0.65	.0256		0.65		26		8		6		0.10
2XDSR0312A	22221	1/32			.0312	1/32		1.50		0.375		0.281		0.005	
2XDSR0374A	28016			0.95	.0374		0.95		32		11		8		0.15
2XDSR0394A	28021			1.0	.0394		1.00		34		12		9		0.16
2XDSR0413A	28026			1.05	.0413		1.05		34		12		9		0.16
2XDSR0469A	22241	3/64			.0469	3/64		1.50		0.750		0.562		0.007	
2XDSR0492A	28031			1.25	.0492		1.25		38		16		12		0.19
2XDSR0590A	28036			1.5	.0590		1.50		40		18		14		0.23
2XDSR0625A	22256	1/16			.0625	1/16		1.50		0.750		0.562		0.010	
2XDSR0630A	28041			1.6	.0630		1.60		43		20		15		0.25
2XDSR0708A	28046			1.8	.0708		1.80		46		22		17		0.28
2XDSR0748A	28051			1.9	.0748		1.90		46		22		17		0.29
2XDSR0781A	22276	5/64			.0781	5/64		1.75		0.875		0.656		0.012	
2XDSR0787A	28056			2.0	.0787		2.00		49		24		18		0.31
2XDSR0807A	28058			2.05	.0807		2.05		49		24		18		0.32
2XDSR0906A	28061			2.3	.0906		2.30		53		27		20		0.36
2XDSR0938A	22291	3/32			.0938	3/32		2.00		1.000		0.75		0.015	
2XDSR0945A	28066			2.4	.0945		2.40		57		30		23		0.37
2XDSR0984A	28071			2.5	.0984		2.50		57		30		23		0.39
2XDSR1094A	22306	7/64			.1094	7/64		2.25		1.250		0.937		0.017	
2XDSR1142A	28073			2.9	.1142		2.90		61		33		25		0.45
2XDSR1181A	02346			3.0	.1181		3.00		63		24		19		0.46
2XDSR1200A	02348		31		.1200	1/8		2.50		1.125		0.90		0.019	
2XDSR1220A	02349			3.1	.1220		4.00		69		32		26		0.48
2XDSR1250A	02350	1/8			.1250	1/8		2.50		1.125		0.90		0.019	

Inch	
D1	Tolerance (h7)
.0000 - .1181	+0/-.00039
.1182 - .2362	+0/-.00047
.2363 - .3937	+0/-.00059
.3938 - .6250	+0/-.00071

Inch	
D2	Tolerance (h6)
.0000 - .1181	+0/-.00024
.1182 - .2362	+0/-.00031
.2363 - .3937	+0/-.00035
.3938 - .6250	+0/-.00043

Metric (mm)	
D1	Tolerance (h7)
0 - 3.0	+0/-.010
3.01 - 6.0	+0/-.012
6.01 - 10.0	+0/-.015
10.01 - 16.0	+0/-.018

Metric (mm)	
D2	Tolerance (h6)
0 - 3.0	+0/-.006
3.01 - 6.0	+0/-.008
6.01 - 10.0	+0/-.009
10.01 - 16.0	+0/-.011

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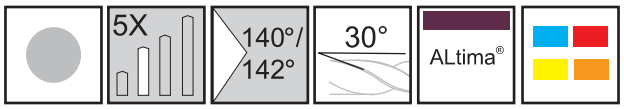
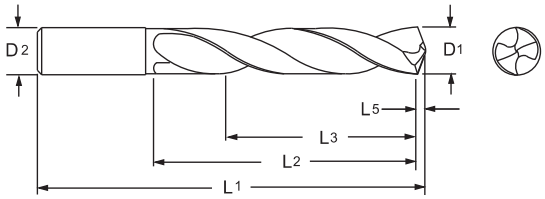
Series 2XDSR Continued





ALtima®		Diameter D1 (h7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
2XDSR1260A	02352			3.2	.1260		4.00		69		32		26		0.50
2XDSR1285A	02354		30		.1285	5/32		2.75		1.260		1.000		0.020	
2XDSR1299A	02356			3.3	.1299		4.00		69		32		26		0.51
2XDSR1339A	02358			3.4	.1339		4.00		69		32		26		0.53
2XDSR1360A	02360		29		.1360	5/32		2.75		1.260		1.000		0.021	
2XDSR1378A	02362			3.5	.1378		4.00		69		32		26		0.54
2XDSR1406A	02364	9/64			.1406	5/32		2.75		1.260		1.000		0.022	
2XDSR1417A	02365			3.6	.1417		4.00		69		32		26		0.56
2XDSR1457A	02366			3.7	.1457		4.00		69		32		26		0.57
2XDSR1496A	02368			3.8	.1496		4.00		69		32		26		0.59
2XDSR1520A	02367		24		.1520	5/32		2.75		1.260		1.000		0.024	
2XDSR1535A	02369			3.9	.1535		4.00		69		32		26		0.60
2XDSR1562A	02370	5/32			.1562	5/32		2.75		1.260		1.000		0.024	
2XDSR1575A	02372			4.0	.1575		4.00		69		32		26		0.62
2XDSR1590A	02373		21		.1590	3/16		3.15		1.500		1.200		0.025	
2XDSR1614A	04006			4.1	.1614		5.00		80		38		30		0.64
2XDSR1654A	02374			4.2	.1654		5.00		80		38		30		0.65
2XDSR1693A	02375			4.3	.1693		5.00		80		38		30		0.67
2XDSR1719A	02376	11/64			.1719	3/16		3.15		1.500		1.200		0.027	
2XDSR1732A	02377			4.4	.1732		5.00		80		38		30		0.68
2XDSR1772A	02378			4.5	.1772		5.00		80		38		30		0.70
2XDSR1811A	02380			4.6	.1811		5.00		80		38		30		0.71
2XDSR1850A	02381			4.7	.1850		5.00		80		38		30		0.73
2XDSR1875A	02382	3/16			.1875	3/16		3.15		1.500		1.200		0.029	
2XDSR1890A	02384			4.8	.1890		5.00		80		38		30		0.74
2XDSR1929A	02386			4.9	.1929		5.00		80		38		30		0.76
2XDSR1968A	02388			5.0	.1968		5.00		80		38		30		0.77
2XDSR2008A	02390			5.1	.2008		6.00		82		40		32		0.79
2XDSR2031A	02392	13/64			.2031	15/64		3.23		1.580		1.260		0.031	
2XDSR2047A	02394			5.2	.2047		6.00		82		40		32		0.81
2XDSR2087A	02396			5.3	.2087		6.00		82		40		32		0.82
2XDSR2126A	02398			5.4	.2126		6.00		82		40		32		0.84
2XDSR2165A	02400			5.5	.2165		6.00		82		40		32		0.85
2XDSR2187A	02402	7/32			.2187	15/64		3.23		1.580		1.260		0.034	
2XDSR2210A	02404		2		.2210	15/64		3.23		1.580		1.260		0.034	
2XDSR2244A	02406			5.7	.2244		6.00		82		40		32		0.88
2XDSR2283A	02408			5.8	.2283		6.00		82		40		32		0.90
2XDSR2323A	02410			5.9	.2323		6.00		82		40		32		0.91

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Series 2XDSR Continued

ALtima®		Diameter				Shank		OAL		Flute Length		Drill Length		Point Length	
		D1 (h7)				D2 (h6)		L1		L2 (Max.)		L3 Ref.		L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
2XDSR2344A	02412	15/64			.2344	15/64		3.23		1.580		1.260		0.036	
2XDSR2362A	02414			6.0	.2362		6.00		82		40		32		0.93
2XDSR2402A	02416			6.1	.2402		8.00		91		48		38		0.95
2XDSR2420A	02418		C		.2420	1/4		3.25		1.740		1.390		0.037	
2XDSR2441A	02420			6.2	.2441		8.00		91		48		38		0.96
2XDSR2460A	02422		D		.2460	1/4		3.25		1.740		1.390		0.038	
2XDSR2480A	02424			6.3	.2480		8.00		91		48		38		0.98
2XDSR2500A	02426	1/4			.2500	1/4		3.25		1.740		1.390		0.039	
2XDSR2520A	02428			6.4	.2520		8.00		91		48		38		0.99
2XDSR2559A	02430			6.5	.2559		8.00		91		48		38		1.01
2XDSR2570A	02432		F		.2570	5/16		3.58		1.890		1.510		0.040	
2XDSR2598A	02433			6.6	.2598		8.00		91		48		38		1.03
2XDSR2610A	02434		G		.2610	5/16		3.58		1.890		1.510		0.040	
2XDSR2638A	02435			6.7	.2638		8.00		91		48		38		1.04
2XDSR2656A	02436	17/64			.2656	5/16		3.58		1.890		1.510		0.041	
2XDSR2677A	02438			6.8	.2677		8.00		91		48		38		1.05
2XDSR2717A	02440			6.9	.2717		8.00		91		48		38		1.07
2XDSR2756A	02442			7.0	.2756		8.00		91		48		38		1.08
2XDSR2795A	02443			7.1	.2795		8.00		91		48		38		1.10
2XDSR2812A	02444	9/32			.2812	5/16		3.58		1.890		1.510		0.044	
2XDSR2835A	02446			7.2	.2835		8.00		91		48		38		1.12
2XDSR2874A	02447			7.3	.2874		8.00		91		48		38		1.13
2XDSR2913A	02448			7.4	.2913		8.00		91		48		38		1.15
2XDSR2953A	02450			7.5	.2953		8.00		91		48		38		1.16
2XDSR2969A	02452	19/64			.2969	5/16		3.58		1.890		1.510		0.046	
2XDSR2992A	02454			7.6	.2992		8.00		91		48		38		1.18
2XDSR3031A	02456			7.7	.3031		8.00		91		48		38		1.19
2XDSR3071A	02458			7.8	.3071		8.00		91		48		38		1.21
2XDSR3110A	02459			7.9	.3110		8.00		91		48		38		1.22
2XDSR3125A	02460	5/16			.3125	5/16		3.58		1.890		1.510		0.048	
2XDSR3150A	02480			8.0	.3150		8.00		91		48		38		1.24
2XDSR3189A	02482			8.1	.3189		10.00		103		55		44		1.26
2XDSR3228A	02484			8.2	.3228		10.00		103		55		44		1.27
2XDSR3268A	02486			8.3	.3268		10.00		103		55		44		1.29
2XDSR3281A	02488	21/64			.3281	25/64		4.06		2.170		1.740		0.051	
2XDSR3307A	02487			8.4	.3307		10.00		103		55		44		1.31
2XDSR3320A	02489		Q		.3320	25/64		4.06		2.170		1.740		0.051	
2XDSR3346A	02490			8.5	.3346		10.00		103		55		44		1.32
2XDSR3386A	02491			8.6	.3386		10.00		103		55		44		1.33
2XDSR3425A	04007			8.7	.3425		10.00		103		55		44		1.35
2XDSR3438A	02492	11/32			.3438	25/64		4.06		2.170		1.740		0.053	
2XDSR3465A	02494			8.8	.3465		10.00		103		55		44		1.36

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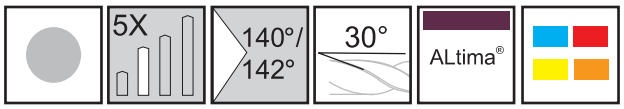
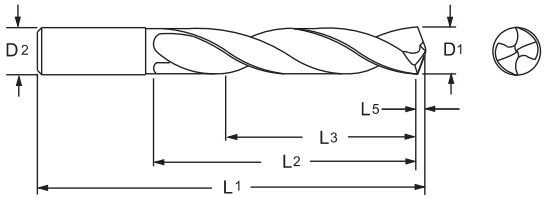
Series 2XDSR Continued





ALtima®		Diameter D1 (h7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
2XDSR3504A	02496			8.9	.3504		10.00		103		55		44		1.38
2XDSR3543A	02498			9.0	.3543		10.00		103		55		44		1.39
2XDSR3583A	02499			9.1	.3583		10.00		103		55		44		1.41
2XDSR3594A	02500	23/64			.3594	25/64		4.06		2.170		1.740		0.056	
2XDSR3622A	02502			9.2	.3622		10.00		103		55		44		1.43
2XDSR3642A	02504			9.25	.3642		10.00		103		55		44		1.43
2XDSR3661A	02506			9.3	.3661		10.00		103		55		44		1.44
2XDSR3701A	02507			9.4	.3701		10.00		103		55		44		1.46
2XDSR3740A	02508			9.5	.3740		10.00		103		55		44		1.47
2XDSR3750A	02510	3/8			.3750	25/64		4.06		2.170		1.740		0.058	
2XDSR3780A	02511			9.6	.3780		10.00		103		55		44		1.49
2XDSR3819A	02512			9.7	.3819		10.00		103		55		44		1.50
2XDSR3858A	02514			9.8	.3858		10.00		103		55		44		1.52
2XDSR3898A	02515			9.9	.3898		10.00		103		55		44		1.53
2XDSR3906A	02516	25/64			.3906	25/64		4.06		2.170		1.740		0.061	
2XDSR3937A	02518			10.0	.3937		10.00		103		55		44		1.55
2XDSR3976A	02519			10.1	.3976		12.00		120		60		48		1.56
2XDSR4016A	02520			10.2	.4016		12.00		120		60		48		1.58
2XDSR4055A	02521			10.3	.4055		12.00		120		60		48		1.60
2XDSR4062A	02522	13/32			.4062	15/32		4.72		2.360		1.890		0.063	
2XDSR4094A	02523			10.4	.4094		12.00		120		60		48		1.61
2XDSR4134A	02524			10.5	.4134		12.00		120		60		48		1.63
2XDSR4173A	02525			10.6	.4173		12.00		120		60		48		1.64
2XDSR4213A	04008			10.7	.4213		12.00		120		60		48		1.66
2XDSR4219A	02526	27/64			.4219	15/32		4.72		2.360		1.890		0.065	
2XDSR4252A	02527			10.8	.4252		12.00		120		60		48		1.67
2XDSR4291A	04009			10.9	.4291		12.00		120		60		48		1.69
2XDSR4331A	02528			11.0	.4331		12.00		120		60		48		1.70
2XDSR4370A	02529			11.1	.4370		12.00		120		66		53		1.72
2XDSR4375A	02530	7/16			.4375	15/32		4.72		2.600		2.080		0.068	
2XDSR4409A	02532			11.2	.4409		12.00		120		66		53		1.74
2XDSR4449A	02533			11.3	.4449		12.00		120		66		53		1.75
2XDSR4488A	04010			11.4	.4488		12.00		120		66		53		1.77
2XDSR4527A	02534			11.5	.4527		12.00		120		66		53		1.78
2XDSR4567A	02535			11.6	.4567		12.00		120		66		53		1.80
2XDSR4606A	02536			11.7	.4606		12.00		120		66		53		1.81

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Series 2XDSR Continued

ALtima®		Diameter				Shank		OAL		Flute Length		Drill Length		Point Length	
		D1 (h7)				D2 (h6)		L1		L2 (Max.)		L3 Ref.		L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
2XDSR4646A	02537			11.8	.4646		12.00		120		66		53		1.83
2XDSR4685A	04011			11.9	.4685		12.00		120		66		53		1.84
2XDSR4688A	02538	15/32			.4688	15/32		4.72		2.600		2.080		0.073	
2XDSR4724A	02540			12.0	.4724		12.00		120		66		53		1.86
2XDSR4764A	02542			12.1	.4764		14.00		126		72		58		1.87
2XDSR4844A	02544	31/64			.4844	1/2		4.75		2.830		2.260		0.075	
2XDSR4921A	02546			12.5	.4921		14.00		126		72		58		1.94
2XDSR5000A	02548	1/2			.5000	1/2		4.75		2.830		2.260		0.077	
2XDSR5039A	02550			12.8	.5039		14.00		126		72		58		1.98
2XDSR5051A	02549			12.83	.5051		14.00		126		72		58		1.99
2XDSR5079A	02551			12.9	.5079		14.00		126		72		58		2.00
2XDSR5118A	02552			13.0	.5118		14.00		126		72		58		2.01
2XDSR5156A	02554	33/64			.5156	35/64		5.28		3.030		2.420		0.080	
2XDSR5312A	02555	17/32			.5312	35/64		5.28		3.030		2.420		0.082	
2XDSR5315A	02556			13.5	.5315		14.00		134		77		62		2.09
2XDSR5394A	02558			13.7	.5394		14.00		134		77		62		2.12
2XDSR5469A	02560	35/64			.5469	35/64		5.28		3.030		2.420		0.085	
2XDSR5512A	02562			14.0	.5512		14.00		134		77		62		2.17
2XDSR5625A	02564	9/16			.5625	5/8		5.51		3.150		2.520		0.087	
2XDSR5709A	02566			14.5	.5709		16.00		140		80		64		2.25
2XDSR5787A	02568			14.7	.5787		16.00		140		80		64		2.28
2XDSR5905A	02570			15.0	.5905		16.00		140		80		64		2.32
2XDSR5938A	02572	19/32			.5938	5/8		5.75		3.230		2.580		0.092	
2XDSR6024A	02573			15.3	.6024		16.00		146		82		66		2.37
2XDSR6102A	02574			15.5	.6102		16.00		146		82		66		2.40
2XDSR6181A	02576			15.7	.6181		16.00		146		82		66		2.43
2XDSR6250A	02578	5/8			.6250	5/8		5.75		3.230		2.580		0.097	
2XDSR6299A	02580			16.0	.6299		16.00		146		82		66		2.48

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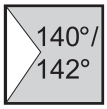
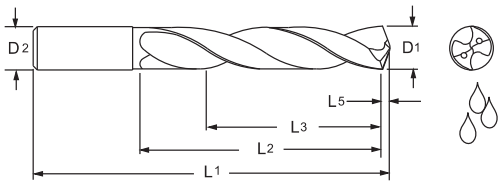
Twister XD® Series 2XDCS




Metric
>5mm
DIN
6537K

Designed for high performance drilling in a broad range of materials.



ALtima®		Diameter D1 (h7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
2XDCS1181A	04400			3.0	.1181		3.0		57		16		13		0.46
2XDCS1200A	04402		31		.1200	1/8		2.250		.750		.600		.019	
2XDCS1220A	04404			3.1	.1220		4.0		63		22		18		0.48
2XDCS1250A	04406	1/8			.1250	1/8		2.250		.750		.600		.019	
2XDCS1260A	04408			3.2	.1260		4.0		63		22		18		0.50
2XDCS1285A	04410		30		.1285	5/32		2.500		.875		.700		.020	
2XDCS1299A	04412			3.3	.1299		4.0		63		22		18		0.51
2XDCS1339A	04414			3.4	.1339		4.0		63		22		18		0.53
2XDCS1360A	04416		29		.1360	5/32		2.500		.875		.700		.021	
2XDCS1378A	04418			3.5	.1378		4.0		63		22		18		0.54
2XDCS1406A	04420	9/64			.1406	5/32		2.500		.875		.700		.022	
2XDCS1417A	04422			3.6	.1417		4.0		63		22		18		0.56
2XDCS1457A	04424			3.7	.1457		4.0		63		22		18		0.57
2XDCS1496A	04426			3.8	.1496		4.0		63		22		18		0.59
2XDCS1520A	04428		24		.1520	5/32		2.500		.875		.700		.024	
2XDCS1535A	04430			3.9	.1535		4.0		63		22		18		0.60
2XDCS1562A	04432	5/32			.1562	5/32		2.500		.875		.700		.024	
2XDCS1575A	04434			4.0	.1575		4.0		63		22		18		0.62
2XDCS1590A	04436		21		.1590	3/16		2.500		1.000		.800		.025	
2XDCS1614A	04438			4.1	.1614		5.0		63		26		21		0.64
2XDCS1654A	04440			4.2	.1654		5.0		63		26		21		0.65
2XDCS1693A	04442			4.3	.1693		5.0		63		26		21		0.67
2XDCS1719A	04444	11/64			.1719	3/16		2.500		1.000		.800		.027	
2XDCS1732A	04446			4.4	.1732		5.0		63		26		21		0.68
2XDCS1772A	04448			4.5	.1772		5.0		63		26		21		0.70
2XDCS1811A	04450			4.6	.1811		5.0		63		26		21		0.71
2XDCS1850A	04452			4.7	.1850		5.0		63		26		21		0.73
2XDCS1875A	04454	3/16			.1875	3/16		2.500		1.000		.800		.029	
2XDCS1890A	04456			4.8	.1890		5.0		63		26		21		0.74
2XDCS1929A	04458			4.9	.1929		5.0		63		26		21		0.76

Inch	
D1	Tolerance (h7)
.0000 - .1181	+0/-.00039
.1182 - .2362	+0/-.00047
.2363 - .3937	+0/-.00059
.3938 - .6250	+0/-.00071

Inch	
D2	Tolerance (h6)
.0000 - .1181	+0/-.00024
.1182 - .2362	+0/-.00031
.2363 - .3937	+0/-.00035
.3938 - .6250	+0/-.00043

Metric (mm)	
D1	Tolerance (h7)
0 - 3.0	+0/-.010
3.01 - 6.0	+0/-.012
6.01 - 10.0	+0/-.015
10.01 - 16.0	+0/-.018

Metric (mm)	
D2	Tolerance (h6)
0 - 3.0	+0/-.006
3.01 - 6.0	+0/-.008
6.01 - 10.0	+0/-.009
10.01 - 16.0	+0/-.011

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Series 2XDCS Continued

ALtima®		Diameter D1 (h7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
2XDCS1968A	04460			5.0	.1968		5.0		63		26		21		0.77
2XDCS2008A	04462			5.1	.2008		6.0		66		28		20		0.79
2XDCS2031A	04464	13/64			.2031	15/64		2.598		1.102		.787		.031	
2XDCS2047A	04466			5.2	.2047		6.0		66		28		20		0.81
2XDCS2087A	04468			5.3	.2087		6.0		66		28		20		0.82
2XDCS2126A	04470			5.4	.2126		6.0		66		28		20		0.84
2XDCS2165A	04472			5.5	.2165		6.0		66		28		20		0.85
2XDCS2187A	04474	7/32			.2187	15/64		2.598		1.102		.787		.034	
2XDCS2210A	04476		2		.2210	15/64		2.598		1.102		.787		.034	
2XDCS2244A	04478			5.7	.2244		6.0		66		28		20		0.88
2XDCS2283A	04480			5.8	.2283		6.0		66		28		20		0.90
2XDCS2323A	04482			5.9	.2323		6.0		66		28		20		0.91
2XDCS2344A	04484	15/64			.2344	15/64		2.598		1.102		.787		.036	
2XDCS2362A	04486			6.0	.2362		6.0		66		28		20		0.93
2XDCS2402A	04488			6.1	.2402		8.0		79		34		24		0.95
2XDCS2420A	04490		C		.2420	1/4		3.110		1.339		.945		.037	
2XDCS2441A	04492			6.2	.2441		8.0		79		34		24		0.96
2XDCS2460A	04494		D		.2460	1/4		3.110		1.339		.945		.038	
2XDCS2480A	04496			6.3	.2480		8.0		79		34		24		0.98
2XDCS2500A	04498	1/4			.2500	1/4		3.110		1.339		.945		.039	
2XDCS2520A	04500			6.4	.2520		8.0		79		34		24		0.99
2XDCS2559A	04502			6.5	.2559		8.0		79		34		24		1.01
2XDCS2570A	04504		F		.2570	5/16		3.110		1.339		.945		.040	
2XDCS2598A	04506			6.6	.2598		8.0		79		34		24		1.03
2XDCS2610A	04508		G		.2610	5/16		3.110		1.339		.945		.040	
2XDCS2638A	04510			6.7	.2638		8.0		79		34		24		1.04
2XDCS2656A	04512	17/64			.2656	5/16		3.110		1.339		.945		.041	
2XDCS2677A	04514			6.8	.2677		8.0		79		34		24		1.05
2XDCS2717A	04516			6.9	.2717		8.0		79		34		24		1.07
2XDCS2756A	04518			7.0	.2756		8.0		79		34		24		1.08
2XDCS2795A	04520			7.1	.2795		8.0		79		41		29		1.10
2XDCS2812A	04522	9/32			.2812	5/16		3.110		1.614		1.142		.044	
2XDCS2835A	04524			7.2	.2835		8.0		79		41		29		1.12
2XDCS2874A	04526			7.3	.2874		8.0		79		41		29		1.13
2XDCS2913A	04528			7.4	.2913		8.0		79		41		29		1.15
2XDCS2953A	04530			7.5	.2953		8.0		79		41		29		1.16
2XDCS2969A	04532	19/64			.2969	5/16		3.110		1.614		1.142		.046	
2XDCS2992A	04534			7.6	.2992		8.0		79		41		29		1.18
2XDCS3031A	04536			7.7	.3031		8.0		79		41		29		1.19
2XDCS3071A	04538			7.8	.3071		8.0		79		41		29		1.21
2XDCS3110A	04540			7.9	.3110		8.0		79		41		29		1.22
2XDCS3125A	04542	5/16			.3125	5/16		3.110		1.614		1.142		.048	

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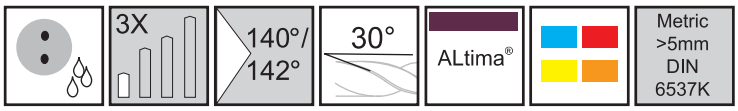
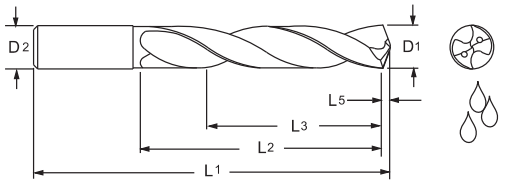
Series 2XDCS Continued





ALtima®		Diameter D1 (h7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
2XDCS3150A	04544			8.0	.3150		8.0		79		41		29		1.24
2XDCS3189A	04546			8.1	.3189		10.0		89		47		35		1.26
2XDCS3228A	04548			8.2	.3228		10.0		89		47		35		1.27
2XDCS3268A	04550			8.3	.3268		10.0		89		47		35		1.29
2XDCS3281A	04552	21/64			.3281	25/64		3.504		1.850		1.378		.051	
2XDCS3307A	04554			8.4	.3307		10.0		89		47		35		1.31
2XDCS3320A	04556		Q		.3320	25/64		3.504		1.850		1.378		.051	
2XDCS3346A	04558			8.5	.3346		10.0		89		47		35		1.32
2XDCS3386A	04560			8.6	.3386		10.0		89		47		35		1.33
2XDCS3425A	04562			8.7	.3425		10.0		89		47		35		1.35
2XDCS3438A	04564	11/32			.3438	25/64		3.504		1.850		1.378		.053	
2XDCS3465A	04566			8.8	.3465		10.0		89		47		35		1.36
2XDCS3504A	04568			8.9	.3504		10.0		89		47		35		1.38
2XDCS3543A	04570			9.0	.3543		10.0		89		47		35		1.39
2XDCS3583A	04572			9.1	.3583		10.0		89		47		35		1.41
2XDCS3594A	04574	23/64			.3594	25/64		3.504		1.850		1.378		.056	
2XDCS3622A	04576			9.2	.3622		10.0		89		47		35		1.43
2XDCS3642A	04578			9.25	.3642		10.0		89		47		35		1.43
2XDCS3661A	04580			9.3	.3661		10.0		89		47		35		1.44
2XDCS3701A	04582			9.4	.3701		10.0		89		47		35		1.46
2XDCS3740A	04584			9.5	.3740		10.0		89		47		35		1.47
2XDCS3750A	04586	3/8			.3750	25/64		3.504		1.850		1.378		.058	
2XDCS3780A	04588			9.6	.3780		10.0		89		47		35		1.49
2XDCS3819A	04590			9.7	.3819		10.0		89		47		35		1.50
2XDCS3858A	04592			9.8	.3858		10.0		89		47		35		1.52
2XDCS3898A	04594			9.9	.3898		10.0		89		47		35		1.53
2XDCS3906A	04596	25/64			.3906	25/64		3.504		1.850		1.378		.061	
2XDCS3937A	04598			10.0	.3937		10.0		89		47		35		1.55
2XDCS3976A	04600			10.1	.3976		12.0		102		55		40		1.56
2XDCS4016A	04602			10.2	.4016		12.0		102		55		40		1.58
2XDCS4055A	04604			10.3	.4055		12.0		102		55		40		1.60
2XDCS4062A	04606	13/32			.4062	15/32		4.016		2.165		1.575		.063	
2XDCS4094A	04608			10.4	.4094		12.0		102		55		40		1.61
2XDCS4134A	04610			10.5	.4134		12.0		102		55		40		1.63
2XDCS4173A	04612			10.6	.4173		12.0		102		55		40		1.64
2XDCS4213A	04614			10.7	.4213		12.0		102		55		40		1.66
2XDCS4219A	04616	27/64			.4219	15/32		4.016		2.165		1.575		.065	
2XDCS4252A	04618			10.8	.4252		12.0		102		55		40		1.67

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Series 2XDCS Continued

ALtima®		Diameter D1 (h7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
2XDCS4291A	04620			10.9	.4291		12.0		102		55		40		1.69
2XDCS4331A	04622			11.0	.4331		12.0		102		55		40		1.70
2XDCS4370A	04624			11.1	.4370		12.0		102		55		40		1.72
2XDCS4375A	04626	7/16			.4375	15/32		4.016		2.165		1.575		.068	
2XDCS4409A	04628			11.2	.4409		12.0		102		55		40		1.74
2XDCS4449A	04630			11.3	.4449		12.0		102		55		40		1.75
2XDCS4488A	04632			11.4	.4488		12.0		102		55		40		1.77
2XDCS4527A	04634			11.5	.4527		12.0		102		55		40		1.78
2XDCS4567A	04636			11.6	.4567		12.0		102		55		40		1.80
2XDCS4606A	04638			11.7	.4606		12.0		102		55		40		1.81
2XDCS4646A	04640			11.8	.4646		12.0		102		55		40		1.83
2XDCS4685A	04642			11.9	.4685		12.0		102		55		40		1.84
2XDCS4688A	04644	15/32			.4688	15/32		4.016		2.165		1.575		.073	
2XDCS4724A	04646			12.0	.4724		12.0		102		55		40		1.86
2XDCS4764A	04648			12.1	.4764		14.0		107		60		43		1.87
2XDCS4844A	04650	31/64			.4844	1/2		4.213		2.362		1.693		.075	
2XDCS4921A	04652			12.5	.4921		14.0		107		60		43		1.94
2XDCS5000A	04654	1/2			.5000	1/2		4.213		2.362		1.693		.077	
2XDCS5039A	04656			12.8	.5039		14.0		107		60		43		1.98
2XDCS5051A	04658			12.83	.5051		14.0		107		60		43		1.99
2XDCS5079A	04660			12.9	.5079		14.0		107		60		43		2.00
2XDCS5118A	04662			13.0	.5118		14.0		107		60		43		2.01
2XDCS5156A	04664	33/64			.5156	35/64		4.213		2.362		1.693		.080	
2XDCS5315A	04666			13.5	.5315		14.0		107		60		43		2.09
2XDCS5394A	04668			13.7	.5394		14.0		107		60		43		2.12
2XDCS5469A	04670	35/64			.5469	35/64		4.213		2.362		1.693		.085	
2XDCS5512A	04672			14.0	.5512		14.0		107		60		43		2.17
2XDCS5625A	04674	9/16			.5625	5/8		4.528		2.559		1.772		.087	
2XDCS5709A	04676			14.5	.5709		16.0		115		65		45		2.25
2XDCS5787A	04678			14.7	.5787		16.0		115		65		45		2.28
2XDCS5905A	04680			15.0	.5905		16.0		115		65		45		2.32
2XDCS5938A	04682	19/32			.5938	5/8		4.528		2.559		1.772		.092	
2XDCS6024A	04684			15.3	.6024		16.0		115		65		45		2.37
2XDCS6102A	04686			15.5	.6102		16.0		115		65		45		2.40
2XDCS6181A	04688			15.7	.6181		16.0		115		65		45		2.43
2XDCS6250A	04690	5/8			.6250	5/8		4.528		2.559		1.772		.097	
2XDCS6299A	04692			16.0	.6299		16.0		115		65		45		2.48

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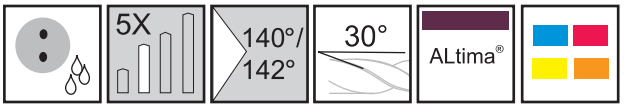
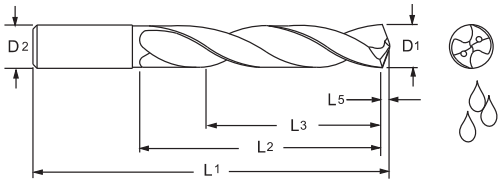
Twister XD® Series 2XDCR



Designed for high performance drilling in a broad range of materials.



ALtima®		Diameter				Shank		OAL		Flute Length		Drill Length		Point Length	
		D1 (h7)				D2 (h6)		L1		L2 (Max.)		L3 Ref.		L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
2XDCR1181A	02582			3.0	.1181		3.0		75		24		19		0.46
2XDCR1200A	02584		31		.1200	1/8		3.00		1.125		.90		0.019	
2XDCR1220A	02585			3.1	.1220		4.0		80		32		26		0.48
2XDCR1250A	02586	1/8			.1250	1/8		3.00		1.125		.90		0.019	
2XDCR1260A	02590			3.2	.1260		4.0		80		32		26		0.50
2XDCR1285A	02592		30		.1285	5/32		3.15		1.260		1.00		0.020	
2XDCR1299A	02594			3.3	.1299		4.0		80		32		26		0.51
2XDCR1339A	02596			3.4	.1339		4.0		80		32		26		0.53
2XDCR1360A	02598		29		.1360	5/32		3.15		1.2600		1.00		0.021	
2XDCR1378A	02600			3.5	.1378		4.0		80		32		26		0.54
2XDCR1406A	02602	9/64			.1406	5/32		3.15		1.260		1.00		0.022	
2XDCR1417A	02603			3.6	.1417		4.0		80		32		26		0.56
2XDCR1457A	02604			3.7	.1457		4.0		80		32		26		0.57
2XDCR1496A	02606			3.8	.1496		4.0		80		32		26		0.59
2XDCR1520A	02605		24		.1520	5/32		3.15		1.260		1.00		0.024	
2XDCR1535A	02607			3.9	.1535		4.0		80		32		26		0.60
2XDCR1562A	02608	5/32			.1562	5/32		3.15		1.260		1.00		0.024	
2XDCR1575A	02610			4.0	.1575		4.0		80		32		26		0.62
2XDCR1590A	02611		21		.1590	3/16		3.23		1.500		1.20		0.025	
2XDCR1614A	04012			4.1	.1614		5.0		82		38		30		0.64
2XDCR1654A	02612			4.2	.1654		5.0		82		38		30		0.65
2XDCR1693A	02613			4.3	.1693		5.0		82		38		30		0.67
2XDCR1719A	02614	11/64			.1719	3/16		3.23		1.500		1.20		0.027	
2XDCR1732A	02615			4.4	.1732		5.0		82		38		30		0.68
2XDCR1772A	02616			4.5	.1772		5.0		82		38		30		0.70
2XDCR1811A	02618			4.6	.1811		5.0		82		38		30		0.71

Inch	
D1	Tolerance (h7)
.0000 - .1181	+0/-.00039
.1182 - .2362	+0/-.00047
.2363 - .3937	+0/-.00059
.3938 - .7087	+0/-.00071
.7088 - .7500	+0/-.00083

Inch	
D2	Tolerance (h6)
.0000 - .1181	+0/-.00024
.1182 - .2362	+0/-.00031
.2363 - .3937	+0/-.00035
.3938 - .7087	+0/-.00043
.7088 - .7500	+0/-.00051

Metric (mm)	
D1	Tolerance (h7)
0 - 3.0	+0/-.010
3.01 - 6.0	+0/-.012
6.01 - 10.0	+0/-.015
10.01 - 18.0	+0/-.018
18.01 - 20.0	+0/-.021

Metric (mm)	
D2	Tolerance (h6)
0 - 3.0	+0/-.006
3.01 - 6.0	+0/-.008
6.01 - 10.0	+0/-.009
10.01 - 18.0	+0/-.011
18.01 - 20.0	+0/-.013

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Series 2XDCR Continued

ALtima®		Diameter D1 (h7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
2XDCR1850A	02619			4.7	.1850		5.0		82		38		30		0.73
2XDCR1875A	02620	3/16			.1875	3/16		3.23		1.500		1.20		0.029	
2XDCR1890A	02622			4.8	.1890		5.0		82		38		30		0.74
2XDCR1929A	02624			4.9	.1929		5.0		82		38		30		0.76
2XDCR1968A	02626			5.0	.1968		5.0		82		38		30		0.77
2XDCR2008A	02628			5.1	.2008		6.0		82		40		32		0.79
2XDCR2031A	02630	13/64			.2031	15/64		3.23		1.580		1.26		0.031	
2XDCR2047A	02632			5.2	.2047		6.0		82		40		32		0.81
2XDCR2087A	02634			5.3	.2087		6.0		82		40		32		0.82
2XDCR2126A	02636			5.4	.2126		6.0		82		40		32		0.84
2XDCR2165A	02638			5.5	.2165		6.0		82		40		32		0.85
2XDCR2187A	02640	7/32			.2187	15/64		3.23		1.580		1.26		0.034	
2XDCR2210A	02642		2		.2210	15/64		3.23		1.580		1.26		0.034	
2XDCR2244A	02644			5.7	.2244		6.0		82		40		32		0.88
2XDCR2283A	02646			5.8	.2283		6.0		82		40		32		0.90
2XDCR2323A	02648			5.9	.2323		6.0		82		40		32		0.91
2XDCR2344A	02650	15/64			.2344	15/64		3.23		1.580		1.26		0.036	
2XDCR2362A	02652			6.0	.2362		6.0		82		40		32		0.93
2XDCR2402A	02654			6.1	.2402		8.0		91		48		38		0.95
2XDCR2420A	02656		C		.2420	1/4		3.30		1.740		1.39		0.037	
2XDCR2441A	02658			6.2	.2441		8.0		91		48		38		0.96
2XDCR2460A	02660		D		.2460	1/4		3.30		1.740		1.39		0.038	
2XDCR2480A	02662			6.3	.2480		8.0		91		48		38		0.98
2XDCR2500A	02664	1/4			.2500	1/4		3.30		1.740		1.39		0.039	
2XDCR2520A	02666			6.4	.2520		8.0		91		48		38		0.99
2XDCR2559A	02668			6.5	.2559		8.0		91		48		38		1.01
2XDCR2570A	02670		F		.2570	5/16		3.58		1.890		1.51		0.040	
2XDCR2598A	02671			6.6	.2598		8.0		91		48		38		1.03
2XDCR2610A	02672		G		.2610	5/16		3.58		1.890		1.51		0.040	
2XDCR2638A	02673			6.7	.2638		8.0		91		48		38		1.04
2XDCR2656A	02674	17/64			.2656	5/16		3.58		1.890		1.51		0.041	
2XDCR2677A	02676			6.8	.2677		8.0		91		48		38		1.05
2XDCR2717A	02678			6.9	.2717		8.0		91		48		38		1.07
2XDCR2756A	02680			7.0	.2756		8.0		91		48		38		1.08
2XDCR2795A	02681			7.1	.2795		8.0		91		48		38		1.10
2XDCR2812A	02682	9/32			.2812	5/16		3.58		1.890		1.51		0.044	
2XDCR2835A	02684			7.2	.2835		8.0		91		48		38		1.12
2XDCR2874A	02685			7.3	.2874		8.0		91		48		38		1.13

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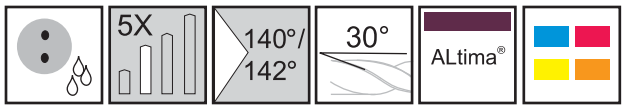
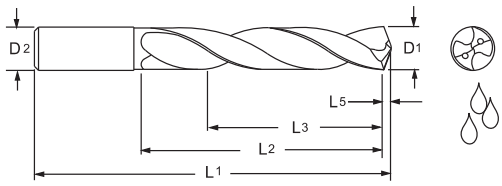
Series 2XDCR Continued





ALtima®		Diameter				Shank		OAL		Flute Length		Drill Length		Point Length	
		D1 (h7)				D2 (h6)		L1		L2 (Max.)		L3 Ref.		L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
2XDCR2913A	02686			7.4	.2913		8.0		91		48		38		1.15
2XDCR2953A	02688			7.5	.2953		8.0		91		48		38		1.16
2XDCR2969A	02690	19/64			.2969	5/16		3.58		1.890		1.51		0.046	
2XDCR2992A	02692			7.6	.2992		8.0		91		48		38		1.18
2XDCR3031A	02694			7.7	.3031		8.0		91		48		38		1.19
2XDCR3071A	02696			7.8	.3071		8.0		91		48		38		1.21
2XDCR3110A	02697			7.9	.3110		8.0		91		48		38		1.22
2XDCR3125A	02698	5/16			.3125	5/16		3.58		1.890		1.51		0.048	
2XDCR3150A	02700			8.0	.3150		8.0		91		48		38		1.24
2XDCR3189A	02702			8.1	.3189		10.0		103		55		44		1.26
2XDCR3228A	02704			8.2	.3228		10.0		103		55		44		1.27
2XDCR3268A	02706			8.3	.3268		10.0		103		55		44		1.29
2XDCR3281A	02708	21/64			.3281	25/64		4.06		2.170		1.74		0.051	
2XDCR3307A	02707			8.4	.3307		10.0		103		55		44		1.31
2XDCR3320A	02709		Q		.3320	25/64		4.06		2.170		1.74		0.051	
2XDCR3346A	02710			8.5	.3346		10.0		103		55		44		1.32
2XDCR3386A	02711			8.6	.3386		10.0		103		55		44		1.33
2XDCR3425A	04013			8.7	.3425		10.0		103		55		44		1.35
2XDCR3438A	02712	11/32			.3438	25/64		4.06		2.170		1.74		0.053	
2XDCR3465A	02714			8.8	.3465		10.0		103		55		44		1.36
2XDCR3504A	02716			8.9	.3504		10.0		103		55		44		1.38
2XDCR3543A	02718			9.0	.3543		10.0		103		55		44		1.39
2XDCR3583A	02719			9.1	.3583		10.0		103		55		44		1.41
2XDCR3594A	02720	23/64			.3594	25/64		4.06		2.170		1.74		0.056	
2XDCR3622A	02722			9.2	.3622		10.0		103		55		44		1.43
2XDCR3642A	02724			9.25	.3642		10.0		103		55		44		1.43
2XDCR3661A	02726			9.3	.3661		10.0		103		55		44		1.44
2XDCR3701A	02727			9.4	.3701		10.0		103		55		44		1.46
2XDCR3740A	02728			9.5	.3740		10.0		103		55		44		1.47
2XDCR3750A	02730	3/8			.3750	25/64		4.06		2.170		1.74		0.058	
2XDCR3780A	02731			9.6	.3780		10.0		103		55		44		1.49
2XDCR3819A	02732			9.7	.3819		10.0		103		55		44		1.50
2XDCR3858A	02734			9.8	.3858		10.0		103		55		44		1.52
2XDCR3898A	02735			9.9	.3898		10.0		103		55		44		1.53
2XDCR3906A	02736	25/64			.3906	25/64		4.06		2.170		1.74		0.061	
2XDCR3937A	02738			10.0	.3937		10.0		103		55		44		1.55

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Series 2XDCR Continued

ALtima®		Diameter D1 (h7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
2XDCR3976A	02739			10.1	.3976		12.0		120		60		48		1.56
2XDCR4016A	02740			10.2	.4016		12.0		120		60		48		1.58
2XDCR4055A	02741			10.3	.4055		12.0		120		60		48		1.60
2XDCR4062A	02742	13/32			.4062	15/32		4.72		2.360		1.89		0.063	
2XDCR4094A	02743			10.4	.4094		12.0		120		60		48		1.61
2XDCR4134A	02744			10.5	.4134		12.0		120		60		48		1.63
2XDCR4173A	02745			10.6	.4173		12.0		120		60		48		1.64
2XDCR4213A	04014			10.7	.4213		12.0		120		60		48		1.66
2XDCR4219A	02746	27/64			.4219	15/32		4.72		2.360		1.89		0.065	
2XDCR4252A	02747			10.8	.4252		12.0		120		60		48		1.67
2XDCR4291A	04015			10.9	.4291		12.0		120		60		48		1.69
2XDCR4331A	02748			11.0	.4331		12.0		120		60		48		1.70
2XDCR4370A	02749			11.1	.4370		12.0		120		66		53		1.72
2XDCR4375A	02750	7/16			.4375	15/32		4.72		2.600		2.08		0.068	
2XDCR4409A	02752			11.2	.4409		12.0		120		66		53		1.74
2XDCR4449A	02753			11.3	.4449		12.0		120		66		53		1.75
2XDCR4488A	04016			11.4	.4488		12.0		120		66		53		1.77
2XDCR4527A	02754			11.5	.4527		12.0		120		66		53		1.78
2XDCR4567A	02755			11.6	.4567		12.0		120		66		53		1.80
2XDCR4606A	02756			11.7	.4606		12.0		120		66		53		1.81
2XDCR4646A	02757			11.8	.4646		12.0		120		66		53		1.83
2XDCR4685A	04017			11.9	.4685		12.0		120		66		53		1.84
2XDCR4688A	02758	15/32			.4688	15/32		4.72		2.600		2.08		0.073	
2XDCR4724A	02760			12.0	.4724		12.0		120		66		53		1.86
2XDCR4764A	02762			12.1	.4764		14.0		126		72		58		1.87
2XDCR4844A	02764	31/64			.4844	1/2		4.75		2.830		2.26		0.075	
2XDCR4921A	02766			12.5	.4921		14.0		126		72		58		1.94
2XDCR5000A	02768	1/2			.5000	1/2		4.75		2.830		2.26		0.077	
2XDCR5039A	02770			12.8	.5039		14.0		126		72		58		1.98
2XDCR5051A	02769			12.83	.5051		14.0		126		72		58		1.99
2XDCR5079A	02771			12.9	.5079		14.0		126		72		58		2.00
2XDCR5118A	02772			13.0	.5118		14.0		126		72		58		2.01
2XDCR5156A	02774	33/64			.5156	35/64		5.28		3.030		2.42		0.080	
2XDCR5312A	02775	17/32			.5312	35/64		5.28		3.030		2.42		0.082	
2XDCR5315A	02776			13.5	.5315		14.0		134		77		62		2.09
2XDCR5394A	02778			13.7	.5394		14.0		134		77		62		2.12
2XDCR5469A	02780	35/64			.5469	35/64		5.28		3.030		2.42		0.085	
2XDCR5512A	02782			14.0	.5512		14.0		134		77		62		2.17
2XDCR5625A	02784	9/16			.5625	5/8		5.51		3.150		2.52		0.087	
2XDCR5709A	02786			14.5	.5709		16.0		140		80		64		2.25
2XDCR5787A	02788			14.7	.5787		16.0		140		80		64		2.28
2XDCR5905A	02790			15.0	.5905		16.0		140		80		64		2.32

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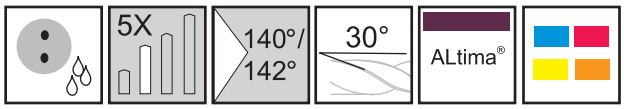
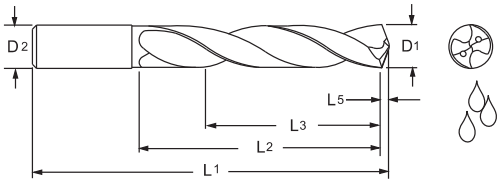
Series 2XDCR Continued





ALtima®		Diameter D1 (h7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
2XDCR5938A	02792	19/32			.5938	5/8		5.75		3.230		2.58		0.092	
2XDCR6024A	02793			15.3	.6024		16.0		146		82		66		2.37
2XDCR6102A	02794			15.5	.6102		16.0		146		82		66		2.40
2XDCR6181A	02796			15.7	.6181		16.0		146		82		66		2.43
2XDCR6250A	02798	5/8			.6250	5/8		5.75		3.230		2.58		0.097	
2XDCR6299A	02800			16.0	.6299		16.0		146		82		66		2.48
2XDCR6331A	02802			16.08	.6331		18.0		158		90		72		2.49
2XDCR6417A	02803			16.3	.6417		18.0		158		90		72		2.53
2XDCR6496A	02804			16.5	.6496		18.0		158		90		72		2.56
2XDCR6562A	02806	21/32			.6562	45/64		6.22		3.540		2.83		0.102	
2XDCR6693A	02808			17.0	.6693		18.0		158		90		72		2.63
2XDCR6875A	02810	11/16			.6875	45/64		6.22		3.740		3.00		0.107	
2XDCR6890A	02812			17.5	.6890		18.0		158		95		76		2.71
2XDCR7087A	02814			18.0	.7087		18.0		158		95		76		2.79
2XDCR7283A	02816			18.5	.7283		20.0		160		100		80		2.87
2XDCR7500A	02818	3/4			.7500	3/4		6.3		3.940		3.15		0.116	
2XDCR7543A	02820			19.16	.7543		20.0		160		100		80		2.97
2XDCR7579A	02822			19.25	.7579		20.0		160		100		80		2.98
2XDCR7598A	02824			19.3	.7598		20.0		160		100		80		2.99
2XDCR7677A	02826			19.5	.7677		20.0		160		100		80		3.02
2XDCR7874A	02828			20.0	.7874		20.0		160		100		80		3.10

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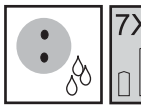
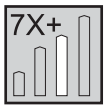
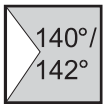
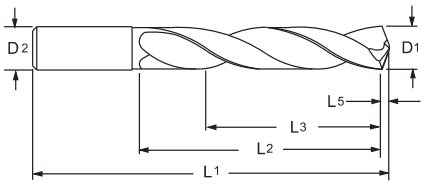
Twister XD® Series 2XDCL



Designed for high performance drilling in a broad range of materials.



ALtima®		Diameter D1 (h7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
2XDCL1181A	02830			3.0	.1181		3.0		81		33		26		0.46
2XDCL1200A	02832		31		.1200	1/8		3.500		1.500		1.200		0.019	
2XDCL1220A	02833			3.1	.1220		4.0		92		44		35		0.48
2XDCL1250A	02834	1/8			.1250	1/8		3.500		1.500		1.200		0.019	
2XDCL1260A	02836			3.2	.1260		4.0		92		44		35		0.50
2XDCL1285A	02838		30		.1285	5/32		3.625		1.750		1.400		0.020	
2XDCL1299A	02840			3.3	.1299		4.0		92		44		35		0.51
2XDCL1339A	02842			3.4	.1339		4.0		92		44		35		0.53
2XDCL1360A	02844		29		.1360	5/32		3.625		1.750		1.400		0.021	
2XDCL1378A	02846			3.5	.1378		4.0		92		44		35		0.54
2XDCL1406A	02848	9/64			.1406	5/32		3.625		1.750		1.400		0.022	
2XDCL1417A	02849			3.6	.1417		4.0		92		44		35		0.56
2XDCL1457A	02850			3.7	.1457		4.0		92		44		35		0.57
2XDCL1496A	02852			3.8	.1496		4.0		92		44		35		0.59
2XDCL1520A	02851		24		.1520	5/32		3.625		1.750		1.400		0.024	
2XDCL1535A	02853			3.9	.1535		4.0		92		44		35		0.60
2XDCL1562A	02854	5/32			.1562	5/32		3.625		1.750		1.400		0.024	
2XDCL1575A	02856			4.0	.1575		4.0		92		44		35		0.62
2XDCL1590A	02857		21		.1590	3/16		3.940		1.750		1.400		0.025	
2XDCL1614A	04018			4.1	.1614		5.0		100		45		36		0.64
2XDCL1654A	02858			4.2	.1654		5.0		100		45		36		0.65
2XDCL1693A	02859			4.3	.1693		5.0		100		45		36		0.67
2XDCL1719A	02860	11/64			.1719	3/16		3.940		1.750		1.400		0.027	
2XDCL1732A	02861			4.4	.1732		5.0		100		45		36		0.68
2XDCL1772A	02862			4.5	.1772		5.0		100		45		36		0.70
2XDCL1811A	02864			4.6	.1811		5.0		100		45		36		0.71
2XDCL1850A	02865			4.7	.1850		5.0		100		45		36		0.73
2XDCL1875A	02866	3/16			.1875	3/16		3.940		1.750		1.400		0.029	
2XDCL1890A	02868			4.8	.1890		5.0		100		45		36		0.74
2XDCL1929A	02870			4.9	.1929		5.0		100		45		36		0.76
2XDCL1968A	02872			5.0	.1968		5.0		100		45		36		0.77
2XDCL2008A	02874			5.1	.2008		6.0		100		51		41		0.79
2XDCL2031A	02876	13/64			.2031	15/64		3.940		2.000		1.600		0.031	
2XDCL2047A	02878			5.2	.2047		6.0		100		51		41		0.81
2XDCL2087A	02880			5.3	.2087		6.0		100		51		41		0.82
2XDCL2126A	02882			5.4	.2126		6.0		100		51		41		0.84
2XDCL2165A	02884			5.5	.2165		6.0		100		51		41		0.85
2XDCL2187A	02886	7/32			.2187	15/64		3.940		2.000		1.600		0.034	

Inch	
D1	Tolerance (h7)
.0000 - .1181	+0/-.00039
.1182 - .2362	+0/-.00047
.2363 - .3937	+0/-.00059
.3938 - .7087	+0/-.00071

Inch	
D2	Tolerance (h6)
.0000 - .1181	+0/-.00024
.1182 - .2362	+0/-.00031
.2363 - .3937	+0/-.00035
.3938 - .7087	+0/-.00043

Metric (mm)	
D1	Tolerance (h7)
0 - 3.0	+0/-.010
3.01 - 6.0	+0/-.012
6.01 - 10.0	+0/-.015
10.01 - 18.0	+0/-.018

Metric (mm)	
D2	Tolerance (h6)
0 - 3.0	+0/-.006
3.01 - 6.0	+0/-.008
6.01 - 10.0	+0/-.009
10.01 - 18.0	+0/-.011

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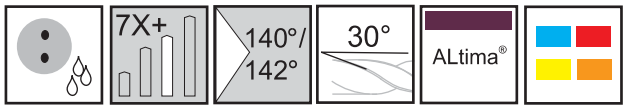
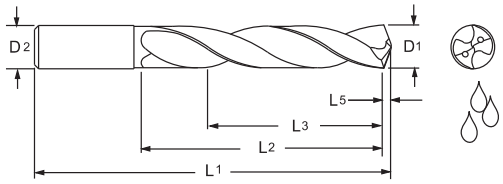
Series 2XDCL Continued





ALtima®		Diameter D1 (h7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
2XDCL2210A	02888		2		.2210	15/64		3.940		2.000		1.60		0.034	
2XDCL2244A	02890			5.7	.2244		6.0		100		51		41		0.88
2XDCL2283A	02892			5.8	.2283		6.0		100		51		41		0.90
2XDCL2323A	02894			5.9	.2323		6.0		100		51		41		0.91
2XDCL2344A	02896	15/64			.2344	15/64		3.940		2.000		1.60		0.036	
2XDCL2362A	02898			6.0	.2362		6.0		100		51		41		0.93
2XDCL2402A	02900			6.1	.2402		8.0		109		60		48		0.95
2XDCL2420A	02902		C		.2420	1/4		4.310		2.250		1.80		0.037	
2XDCL2441A	02904			6.2	.2441		8.0		109		60		48		0.96
2XDCL2460A	02906		D		.2460	1/4		4.310		2.250		1.80		0.038	
2XDCL2480A	02908			6.3	.2480		8.0		109		60		48		0.98
2XDCL2500A	02910	1/4			.2500	1/4		4.310		2.250		1.80		0.039	
2XDCL2520A	02912			6.4	.2520		8.0		109		60		48		0.99
2XDCL2559A	02914			6.5	.2559		8.0		109		60		48		1.01
2XDCL2570A	02916		F		.2570	5/16		4.310		2.375		1.90		0.040	
2XDCL2598A	02917			6.6	.2598		8.0		109		60		48		1.03
2XDCL2610A	02918		G		.2610	5/16		4.310		2.375		1.90		0.040	
2XDCL2638A	02919			6.7	.2638		8.0		109		60		48		1.04
2XDCL2656A	02920	17/64			.2656	5/16		4.310		2.375		1.90		0.041	
2XDCL2677A	02922			6.8	.2677		8.0		109		60		48		1.05
2XDCL2717A	02924			6.9	.2717		8.0		109		60		48		1.07
2XDCL2756A	02926			7.0	.2756		8.0		109		60		48		1.08
2XDCL2795A	02927			7.1	.2795		8.0		118		70		56		1.10
2XDCL2812A	02928	9/32			.2812	5/16		4.625		2.750		2.20		0.044	
2XDCL2835A	02930			7.2	.2835		8.0		118		70		56		1.12
2XDCL2874A	02931			7.3	.2874		8.0		118		70		56		1.13
2XDCL2913A	02932			7.4	.2913		8.0		118		70		56		1.15
2XDCL2953A	02934			7.5	.2953		8.0		118		70		56		1.16
2XDCL2969A	02936	19/64			.2969	5/16		4.625		2.750		2.20		0.046	
2XDCL2992A	02938			7.6	.2992		8.0		118		70		56		1.18
2XDCL3031A	02940			7.7	.3031		8.0		118		70		56		1.19
2XDCL3071A	02942			7.8	.3071		8.0		118		70		56		1.21
2XDCL3110A	02943			7.9	.3110		8.0		118		70		56		1.22
2XDCL3125A	02944	5/16			.3125	5/16		4.625		2.750		2.20		0.048	
2XDCL3150A	02946			8.0	.3150		8.0		118		70		56		1.24
2XDCL3189A	02948			8.1	.3189		10.0		127		80		64		1.26
2XDCL3228A	02950			8.2	.3228		10.0		127		80		64		1.27
2XDCL3268A	02952			8.3	.3268		10.0		127		80		64		1.29
2XDCL3281A	02954	21/64			.3281	25/64		5.000		3.150		2.52		0.051	
2XDCL3307A	02953			8.4	.3307		10.0		127		80		64		1.31
2XDCL3320A	02955		Q		.3320	25/64		5.000		3.150		2.52		0.051	
2XDCL3346A	02956			8.5	.3346		10.0		127		80		64		1.32

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Series 2XDCL Continued

ALtima®		Diameter D1 (h7)				Shank D2 (h6)		OAL L1		Flute Length L2 (Max.)		Drill Length L3 Ref.		Point Length L5	
Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
2XDCL3386A	02957			8.6	.3386		10.0		127		80		64		1.33
2XDCL3425A	04019			8.7	.3425		10.0		127		80		64		1.35
2XDCL3438A	02958	11/32			.3438	25/64		5.000		3.150		2.52		0.053	
2XDCL3465A	02960			8.8	.3465		10.0		127		80		64		1.36
2XDCL3504A	02962			8.9	.3504		10.0		127		80		64		1.38
2XDCL3543A	02964			9.0	.3543		10.0		127		80		64		1.39
2XDCL3583A	02965			9.1	.3583		10.0		136		85		68		1.41
2XDCL3594A	02966	23/64			.3594	25/64		5.312		3.340		2.67		0.056	
2XDCL3622A	02968			9.2	.3622		10.0		136		85		68		1.43
2XDCL3642A	02970			9.25	.3642		10.0		136		85		68		1.43
2XDCL3661A	02972			9.3	.3661		10.0		136		85		68		1.44
2XDCL3701A	02973			9.4	.3701		10.0		136		85		68		1.46
2XDCL3740A	02974			9.5	.3740		10.0		136		85		68		1.47
2XDCL3750A	02976	3/8			.3750	25/64		5.312		3.340		2.67		0.058	
2XDCL3780A	02977			9.6	.3780		10.0		136		85		68		1.49
2XDCL3819A	02978			9.7	.3819		10.0		136		85		68		1.50
2XDCL3858A	02980			9.8	.3858		10.0		136		85		68		1.52
2XDCL3898A	04024			9.9	.3898		10.0		136		85		68		1.53
2XDCL3906A	02981	25/64			.3906	25/64		5.312		3.340		2.67		0.061	
2XDCL3937A	02982			10.0	.3937		10.0		136		85		68		1.55
2XDCL3976A	04025			10.1	.3976		12.0		149		93		74		1.56
2XDCL4016A	02983			10.2	.4016		12.0		149		93		74		1.58
2XDCL4055A	04026			10.3	.4055		12.0		149		93		74		1.60
2XDCL4062A	02984	13/32			.4062	15/32		5.875		3.625		2.90		0.063	
2XDCL4094A	02979			10.4	.4094		12.0		149		93		74		1.61
2XDCL4134A	02986			10.5	.4134		12.0		149		93		74		1.63
2XDCL4173A	02985			10.6	.4173		12.0		149		93		74		1.64
2XDCL4213A	04020			10.7	.4213		12.0		149		93		74		1.66
2XDCL4219A	02987	27/64			.4219	15/32		5.875		3.625		2.90		0.065	
2XDCL4252A	96600			10.8	.4252		12.0		149		93		74		1.67
2XDCL4291A	04021			10.9	.4291		12.0		149		93		74		1.69
2XDCL4331A	02988			11.0	.4331		12.0		149		93		74		1.70
2XDCL4370A	04027			11.1	.4370		12.0		155		102		82		1.72
2XDCL4375A	02989	7/16			.4375	15/32		6.100		4.000		3.20		0.068	
2XDCL4409A	02990			11.2	.4409		12.0		155		102		82		1.74
2XDCL4449A	04028			11.3	.4449		12.0		155		102		82		1.75
2XDCL4488A	04022			11.4	.4488		12.0		155		102		82		1.77
2XDCL4527A	02991			11.5	.4527		12.0		155		102		82		1.78
2XDCL4567A	04029			11.6	.4567		12.0		155		102		82		1.80
2XDCL4606A	02992			11.7	.4606		12.0		155		102		82		1.81
2XDCL4646A	96602			11.8	.4646		12.0		155		102		82		1.83
2XDCL4685A	04023			11.9	.4685		12.0		155		102		82		1.84
2XDCL4688A	02993	15/32			.4688	15/32		6.100		4.000		3.20		0.073	
2XDCL4724A	02994			12.0	.4724		12.0		155		102		82		1.86
2XDCL4844A	02995	31/64			.4844	1/2		6.299		4.312		3.45		0.075	
2XDCL5000A	02996	1/2			.5000	1/2		6.299		4.312		3.45		0.077	

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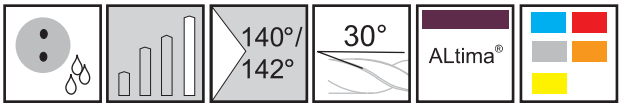
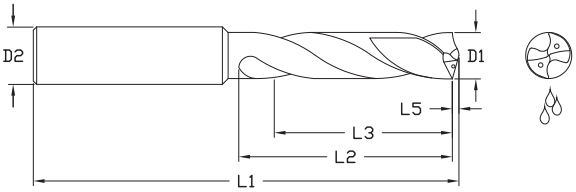
Twister XD® Series 2XDCE



Designed to drill water lines in molds, the 2XDCE drill works exceptionally well in all deep hole drilling applications. With 2XD drilling geometry, this drill provides productivity increases and reduced cycle time by eliminating the need for a peck drilling cycle. Double margin on tip.



ALtima®		Diameter			Shank		OAL		Flute Length		Drill Length		Point Length		Fl. Length/ Dia.	Dr. Length/ Dia.
		D1 (h7)			D2 (h6)		L1		L2		L3 Ref.		L5			
Tool No.	EDP	Inch	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	L2/D1	L3/D1
2XDCE1968A	04332		5.00	.1968		5.0		163		105		84		0.77	21	17
2XDCE2047A	04334		5.20	.2047		6.0		163		110		88		0.81	21	17
2XDCE2126A	04336		5.40	.2126		6.0		163		110		88		0.84	20	16
2XDCE2205A	04338		5.60	.2205		6.0		163		110		88		0.87	20	16
2XDCE2283A	04340		5.80	.2283		6.0		163		110		88		0.90	19	15
2XDCE2362A	04342		6.00	.2362		6.0		163		110		88		0.93	18	15
2XDCE2441A	04344		6.20	.2441		8.0		163		110		88		0.96	18	14
2XDCE2480A	04346		6.30	.2480		8.0		163		110		88		0.98	17	14
2XDCE2500A	04348	1/4	6.35	.2500	.3150	8.0	6.4	163	4.33	110	3.46	88	0.039	0.98	17	14
2XDCE2677A	04350		6.80	.2677		8.0		163		110		88		1.05	16	13
2XDCE2756A	04352		7.00	.2756		8.0		163		110		88		1.08	16	13
2XDCE2992A	04354		7.60	.2992		8.0		163		120		96		1.18	16	13
2XDCE3071A	04356		7.80	.3071		8.0		163		120		96		1.21	15	12
2XDCE3125A	04358	5/16	7.94	.3125	.3150	8.0	6.4	163	4.72	120	3.78	96	0.048	1.23	15	12
2XDCE3150A	04360		8.00	.3150		8.0		163		120		96		1.24	15	12
2XDCE3228A	04362		8.20	.3228		10.0		180		135		108		1.27	16	13
2XDCE3346A	04364		8.50	.3346		10.0		180		135		108		1.32	16	13
2XDCE3425A	04366		8.70	.3425		10.0		180		135		108		1.35	16	12
2XDCE3543A	04368		9.00	.3543		10.0		180		135		108		1.39	15	12
2XDCE3701A	04370		9.40	.3701		10.0		195		150		120		1.46	16	13
2XDCE3750A	04372	3/8	9.53	.3750	.3937	10.0	7.7	195	5.90	150	4.72	120	0.058	1.48	16	13
2XDCE3858A	04374		9.80	.3858		10.0		195		150		120		1.52	15	12
2XDCE3937A	04376		10.00	.3937		10.0		195		150		120		1.55	15	12
2XDCE4055A	04378		10.30	.4055		12.0		210		160		128		1.60	16	12
2XDCE4134A	04380		10.50	.4134		12.0		210		160		128		1.63	15	12
2XDCE4252A	04382		10.80	.4252		12.0		210		160		128		1.67	15	12
2XDCE4331A	04384		11.00	.4331		12.0		210		160		128		1.70	15	12
2XDCE4375A	04386	7/16	11.11	.4375	.4724	12.0	8.3	210	6.30	160	5.04	128	0.068	1.72	14	12
2XDCE4527A	04388		11.50	.4527		12.0		210		160		128		1.78	14	11
2XDCE4646A	04390		11.80	.4646		12.0		210		160		128		1.83	14	11
2XDCE4724A	04392		12.00	.4724		12.0		210		160		128		1.86	13	11
2XDCE5000A	04394	1/2	12.70	.5000	.5512	14.0	9.1	230	7.09	180	5.67	144	0.077	1.97	14	11

Inch	
D1	Tolerance (h7)
.1968 - .2362	+0/-.00047
.2363 - .3937	+0/-.00059
.3938 - .5000	+0/-.00071

Inch	
D2	Tolerance (h6)
.1968 - .2362	+0/-.00031
.2363 - .3937	+0/-.00035
.3938 - .5000	+0/-.00043

Metric (mm)	
D1	Tolerance (h7)
5.0 - 6.0	+0/-.012
6.01 - 10.0	+0/-.015
10.01 - 12.0	+0/-.018

Metric (mm)	
D2	Tolerance (h6)
5.0 - 6.0	+0/-.008
6.01 - 10.0	+0/-.009
10.01 - 12.0	+0/-.011

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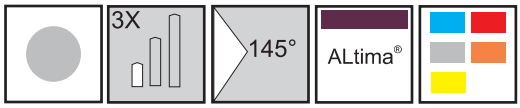
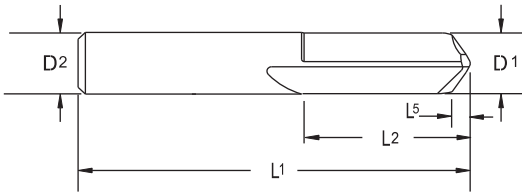
Twister® Spot Drill Series 200S



Spot Drills for High Performance Drills.



ALtima®		Diameter D1 (h7)			Shank D2 (h6)		OAL L1		Flute Length L2		Point Length L5	
Tool No.	EDP	Inch	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm
200S11810A	20221		3.0	.1181		3.0		38		16		0.41
200S12500A	20230	1/8		.1250	1/8		1-1/2		5/8		0.017	
200S23620A	20431		6.0	.2362		6.0		51		19		0.83
200S25000A	20452	1/4		.2500	1/4		2		3/4		0.034	
200S31250A	20542	5/16		.3125	5/16		2-1/2		3/4		0.043	
200S31500A	20545		8.0	.3150		8.0		64		19		1.10
200S37500A	20623	3/8		.3750	3/8		2-1/2		1		0.052	
200S39370A	20647		10.0	.3937		10.0		70		25		1.38
200S47240A	20731		12.0	.4724		12.0		76		25		1.65
200S50000A	20740	1/2		.5000	1/2		3		1		0.069	
200S62500A	20782	5/8		.6250	5/8		3-1/2		1-1/4		0.086	
200S62990A	20785		16.0	.6299		16.0		89		32		2.20

Inch	
D1	Tolerance (h7)
.1182 - .2362	+0/-.00047
.2363 - .3937	+0/-.00059
.3938 - .6250	+0/-.00071

Inch	
D2	Tolerance (h6)
.1182 - .2362	+0/-.00031
.2363 - .3937	+0/-.00035
.3938 - .6250	+0/-.00043

Metric (mm)	
D1	Tolerance (h7)
3.0	+0/-.010
3.01 - 6.0	+0/-.012
6.01 - 10.0	+0/-.015
10.01 - 16.0	+0/-.018

Metric (mm)	
D2	Tolerance (h6)
3.0	+0/-.006
3.01 - 6.0	+0/-.008
6.01 - 10.0	+0/-.009
10.01 - 16.0	+0/-.011

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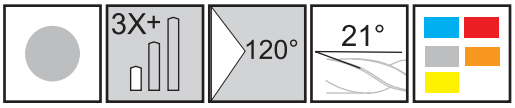
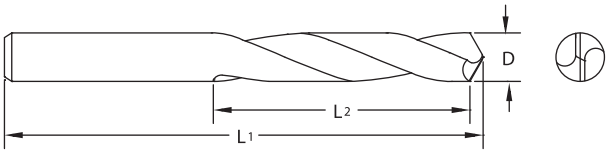
For product information, call your local distributor.

Twister® GP Series 403



Designed for accurate spotting on NC machines. Solid carbide construction, short lengths and no body clearance make this a very rigid tool.



- Can be used at higher speeds and feeds, compatible with other carbide tooling.
- Easy to repoint because there is no web taper.

Tool No.	EDP	Diameter D Inch	Diameter D mm	Diameter D Decimal	OAL L1 Inch	OAL L1 mm	Flute Length L2 Inch	Flute Length L2 mm
40318750	40301	3/16		.1875	2		1	
40319680	40305		5.0	.1968		51		26.0
40323620	40309		6.0	.2362		51		26.0
40325000	40313	1/4		.2500	2		1	
40331250	40317	5/16		.3125	2-1/2		1	
40331500	40321		8.0	.3150		64		26.0
40337500	40325	3/8		.3750	2-1/2		1	
40339370	40329		10.0	.3937		70		30.0
40347240	40333		12.0	.4724		76		39.5
40350000	40337	1/2		.5000	3		1-9/16	

Inch	
D	Tolerance
.1875 - .5000	+.0000/-.0005

Metric (mm)	
D	Tolerance
5.00 - 12.00	+.0000/-.0130

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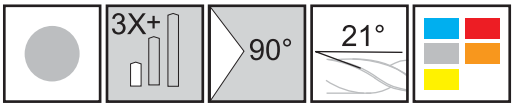
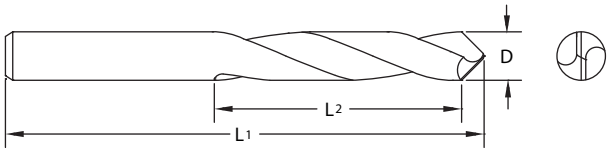
Twister® GP Series 404



Designed for accurate spotting on NC machines. Solid carbide construction, short lengths and no body clearance make this a very rigid tool.



- Can be used at higher speeds and feeds, compatible with other carbide tooling.
- Easy to repoint because there is no web taper.

Tool No.	EDP	Diameter D Inch	Diameter D mm	Diameter D Decimal	OAL L1 Inch	OAL L1 mm	Flute Length L2 Inch	Flute Length L2 mm
40418750	40401	3/16		.1875	2		1	
40419680	40405		5.0	.1968		51		26.0
40423620	40409		6.0	.2362		51		26.0
40425000	40413	1/4		.2500	2		1	
40431250	40417	5/16		.3125	2-1/2		1	
40431500	40421		8.0	.3150		64		26.0
40437500	40425	3/8		.3750	2-1/2		1	
40439370	40429		10.0	.3937		70		30.0
40447240	40433		12.0	.4724		76		39.5
40450000	40437	1/2		.5000	3		1-9/16	

Inch	
D	Tolerance
.1875 - .5000	+.0000/-.0005

Metric (mm)	
D	Tolerance
5.00 - 12.00	+.0000/-.0130

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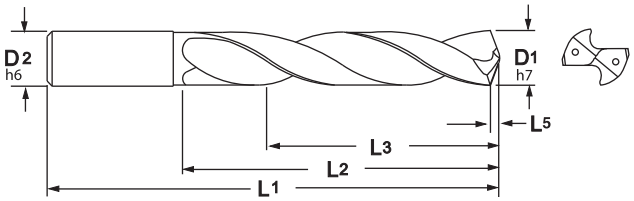
Twister® HPD Series HPDSR & HPDCR

HPDSR | HPDCR | 5X | 140° | 30° | ALtima® | DIN 6537L 4.1-16.0mm

Designed for high performance drilling in a broad range of materials.



- Self centering point that eliminates the need for spot drilling.
- 45° corner chamfer angle helps material break out on through hole applications and minimizes burs.
- h7 OD tolerance for precision holes.
- ALtima® Coating provides high toughness with low friction.
- 5X Diameter with solid and coolant through options.
- 4.1mm-16.0mm manufactured to DIN 6537L.
- h6 Shank OD Tolerance for shrink fit applications.
- Material Applications: Carbon Steels, Austenitic Stainless Steels and Titanium.
- An economical choice perfect for job shop and batch production work requiring a high performance drill option.

ALtima®				Diameter		Shank	OAL	Flute Length	Drill Length	Point Length
HPDSR		HPDCR		D1 (h7)		D2 (h6)	L1	L2	L3	L5
Tool No.	EDP	Tool No.	EDP	mm	Decimal	mm	mm	mm	mm	mm
HPDSR 0300A	21840	HPDCR 0300A	21700	3.0	.1181	3	66	28	23	0.46
HPDSR1200A	21972	HPDCR1200A	21628	3.05	.1200	4	66	28	23	0.47
HPDSR 0310A	21841	HPDCR 0310A	21701	3.1	.1220	4	66	28	23	0.48
HPDSR1250A	21973	HPDCR1250A	21629	3.18	.1250	4	66	28	23	0.49
HPDSR 0320A	21842	HPDCR 0320A	21702	3.2	.1260	4	66	28	23	0.49
HPDSR1285A	21974	HPDCR1285A	21630	3.26	.1285	4	66	28	23	0.50
HPDSR 0330A	21843	HPDCR 0330A	21703	3.3	.1299	4	66	28	23	0.51
HPDSR 0340A	21844	HPDCR 0340A	21704	3.4	.1339	4	66	28	23	0.52
HPDSR1360A	21975	HPDCR1360A	21631	3.45	.1360	4	66	28	23	0.53
HPDSR 0350A	21845	HPDCR 0350A	21705	3.5	.1378	4	66	28	23	0.54
HPDSR 0360A	21846	HPDCR 0360A	21706	3.6	.1417	4	66	28	23	0.55
HPDSR 0370A	21847	HPDCR 0370A	21707	3.7	.1457	4	66	28	23	0.57
HPDSR 0380A	21848	HPDCR 0380A	21708	3.8	.1496	4	74	36	29	0.58
HPDSR 0390A	21849	HPDCR 0390A	21709	3.9	.1535	4	74	36	29	0.60
HPDSR1562A	21976	HPDCR1562A	21632	3.97	.1562	4	74	36	29	0.61
HPDSR 0400A	21850	HPDCR 0400A	21710	4.0	.1575	4	74	36	29	0.61
HPDSR1590A	21977	HPDCR1590A	21633	4.04	.1590	6	74	36	29	0.62
HPDSR 0410A	21851	HPDCR 0410A	21711	4.1	.1614	6	74	36	29	0.64
HPDSR 0420A	21852	HPDCR 0420A	21712	4.2	.1654	6	74	36	29	0.64
HPDSR 0430A	21853	HPDCR 0430A	21713	4.3	.1693	6	74	36	29	0.66
HPDSR 0440A	21854	HPDCR 0440A	21714	4.4	.1732	6	74	36	29	0.67
HPDSR 0450A	21855	HPDCR 0450A	21715	4.5	.1772	6	74	36	29	0.69
HPDSR 0460A	21856	HPDCR 0460A	21716	4.6	.1811	6	74	36	29	0.71
HPDSR 0470A	21857	HPDCR 0470A	21717	4.7	.1850	6	74	36	29	0.72

Corner Chamfer Width		
D1	Width Inch	Width mm
3.0 - 4.0	.003 - .007	.076 - .178
4.1 - 6.0	.005 - .009	.127 - .229
6.1 - 8.0	.007 - .012	.178 - .305
8.1 - 10.0	.009 - .015	.229 - .381
10.1 - 12.0	.012 - .018	.305 - .457
12.1 - 16.0	.014 - .020	.355 - .508

Inch	
D1	Tolerance (h7)
.0000 - .1181	+0/-.00039
.1182 - .2362	+0/-.00047
.2363 - .3937	+0/-.00059
.3938 - .6250	+0/-.00071

Inch	
D2	Tolerance (h6)
.0000 - .1181	+0/-.00024
.1182 - .2362	+0/-.00031
.2363 - .3937	+0/-.00035
.3938 - .6250	+0/-.00043

Metric (mm)	
D1	Tolerance (h7)
0 - 3	+0/-.010
3.01 - 6	+0/-.012
6.01 - 10.0	+0/-.015
10.01 - 16.0	+0/-.018

Metric (mm)	
D2	Tolerance (h6)
0 - 3	+0/-.006
3.01 - 6	+0/-.008
6.01 - 10.0	+0/-.009
10.01 - 16.0	+0/-.011

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Series HPDSR & HPDCR Continued

ALtima®				Diameter		Shank	OAL	Flute Length	Drill Length	Point Length
HPDSR		HPDCR		D1 (h7)		D2 (h6)	L1	L2	L3	L5
Tool No.	EDP	Tool No.	EDP	mm	Decimal	mm	mm	mm	mm	mm
HPDSR1875A	21978	HPDCR1875A	21634	4.76	.1875	6	82	44	35	0.73
HPDSR 0480A	21858	HPDCR 0480A	21718	4.8	.1890	6	82	44	35	0.74
HPDSR 0490A	21859	HPDCR 0490A	21719	4.9	.1929	6	82	44	35	0.75
HPDSR 0500A	21860	HPDCR 0500A	21720	5.0	.1968	6	82	44	35	0.77
HPDSR 0510A	21861	HPDCR 0510A	21721	5.1	.2008	6	82	44	35	0.78
HPDSR2031A	21979	HPDCR2031A	21635	5.16	.2031	6	82	44	35	0.79
HPDSR 0520A	21862	HPDCR 0520A	21722	5.2	.2047	6	82	44	35	0.80
HPDSR 0530A	21863	HPDCR 0530A	21723	5.3	.2087	6	82	44	35	0.81
HPDSR 0540A	21864	HPDCR 0540A	21724	5.4	.2126	6	82	44	35	0.83
HPDSR 0550A	21865	HPDCR 0550A	21725	5.5	.2165	6	82	44	35	0.84
HPDSR2187A	21980	HPDCR2187A	21636	5.55	.2187	6	82	44	35	0.85
HPDSR 0560A	21866	HPDCR 0560A	21726	5.6	.2205	6	82	44	35	0.86
HPDSR 0570A	21867	HPDCR 0570A	21727	5.7	.2244	6	82	44	35	0.87
HPDSR 0580A	21868	HPDCR 0580A	21728	5.8	.2283	6	82	44	35	0.89
HPDSR 0590A	21869	HPDCR 0590A	21729	5.9	.2323	6	82	44	35	0.90
HPDSR 0600A	21870	HPDCR 0600A	21730	6.0	.2362	6	82	44	35	0.92
HPDSR 0610A	21871	HPDCR 0610A	21731	6.1	.2402	8	91	53	43	0.94
HPDSR 0620A	21872	HPDCR 0620A	21732	6.2	.2441	8	91	53	43	0.95
HPDSR 0630A	21873	HPDCR 0630A	21733	6.3	.2480	8	91	53	43	0.97
HPDSR2500A	21981	HPDCR2500A	21637	6.35	.2500	8	91	53	43	0.97
HPDSR 0640A	21874	HPDCR 0640A	21734	6.4	.2520	8	91	53	43	0.98
HPDSR 0650A	21875	HPDCR 0650A	21735	6.5	.2559	8	91	53	43	1.00
HPDSR2570A	21982	HPDCR2570A	21638	6.53	.2570	8	91	53	43	1.00
HPDSR 0660A	21876	HPDCR 0660A	21736	6.6	.2598	8	91	53	43	1.01
HPDSR 0670A	21877	HPDCR 0670A	21737	6.7	.2638	8	91	53	43	1.03
HPDSR 0680A	21878	HPDCR 0680A	21738	6.8	.2677	8	91	53	43	1.04
HPDSR 0690A	21879	HPDCR 0690A	21739	6.9	.2717	8	91	53	43	1.06
HPDSR 0700A	21880	HPDCR 0700A	21740	7.0	.2756	8	91	53	43	1.07
HPDSR 0710A	21881	HPDCR 0710A	21741	7.1	.2795	8	91	53	43	1.09
HPDSR2812A	21983	HPDCR2812A	21639	7.14	.2812	8	91	53	43	1.10
HPDSR 0720A	21882	HPDCR 0720A	21742	7.2	.2835	8	91	53	43	1.10
HPDSR 0730A	21883	HPDCR 0730A	21743	7.3	.2874	8	91	53	43	1.12
HPDSR 0740A	21884	HPDCR 0740A	21744	7.4	.2913	8	91	53	43	1.13
HPDSR 0750A	21885	HPDCR 0750A	21745	7.5	.2953	8	91	53	43	1.15
HPDSR 0760A	21886	HPDCR 0760A	21746	7.6	.2992	8	91	53	43	1.17
HPDSR 0770A	21887	HPDCR 0770A	21747	7.7	.3031	8	91	53	43	1.18
HPDSR 0780A	21888	HPDCR 0780A	21748	7.8	.3071	8	91	53	43	1.20
HPDSR 0790A	21889	HPDCR 0790A	21749	7.9	.3110	8	91	53	43	1.21
HPDSR3125A	21984	HPDCR3125A	21640	7.94	.3125	8	91	53	43	1.22
HPDSR 0800A	21890	HPDCR 0800A	21750	8.0	.3150	8	91	53	43	1.23
HPDSR 0810A	21891	HPDCR 0810A	21751	8.1	.3189	10	103	61	49	1.24
HPDSR 0820A	21892	HPDCR 0820A	21752	8.2	.3228	10	103	61	49	1.26

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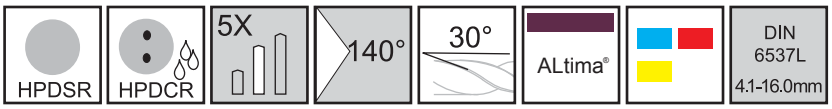
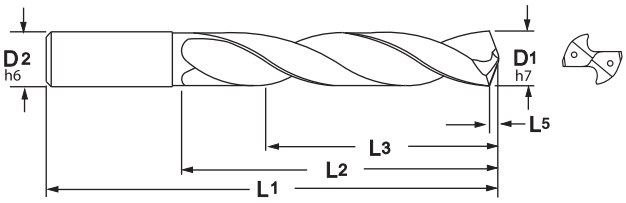
Series HPDSR & HPDCR Continued





ALtima®				Diameter		Shank	OAL	Flute Length	Drill Length	Point Length
HPDSR		HPDCR		D1 (h7)		D2 (h6)	L1	L2	L3	L5
Tool No.	EDP	Tool No.	EDP	mm	Decimal	mm	mm	mm	mm	mm
HPDSR 0830A	21893	HPDCR 0830A	21753	8.3	.3268	10	103	61	49	1.27
HPDSR 0840A	21894	HPDCR 0840A	21754	8.4	.3307	10	103	61	49	1.29
HPDSR 0850A	21895	HPDCR 0850A	21755	8.5	.3346	10	103	61	49	1.30
HPDSR 0860A	21896	HPDCR 0860A	21756	8.6	.3386	10	103	61	49	1.32
HPDSR 0870A	21897	HPDCR 0870A	21757	8.7	.3425	10	103	61	49	1.33
HPDSR 0880A	21898	HPDCR 0880A	21758	8.8	.3465	10	103	61	49	1.35
HPDSR 0890A	21899	HPDCR 0890A	21759	8.9	.3504	10	103	61	49	1.36
HPDSR 0900A	21900	HPDCR 0900A	21760	9.0	.3543	10	103	61	49	1.38
HPDSR 0910A	21901	HPDCR 0910A	21761	9.1	.3583	10	103	61	49	1.40
HPDSR 0920A	21902	HPDCR 0920A	21762	9.2	.3622	10	103	61	49	1.41
HPDSR 0930A	21903	HPDCR 0930A	21763	9.3	.3661	10	103	61	49	1.43
HPDSR 0940A	21904	HPDCR 0940A	21764	9.4	.3701	10	103	61	49	1.44
HPDSR 0950A	21905	HPDCR 0950A	21765	9.5	.3740	10	103	61	49	1.46
HPDSR3750A	21985	HPDCR3750A	21641	9.53	.3750	10	103	61	49	1.46
HPDSR 0960A	21906	HPDCR 0960A	21766	9.6	.3780	10	103	61	49	1.47
HPDSR 0970A	21907	HPDCR 0970A	21767	9.7	.3819	10	103	61	49	1.49
HPDSR 0980A	21908	HPDCR 0980A	21768	9.8	.3858	10	103	61	49	1.50
HPDSR 0990A	21909	HPDCR 0990A	21769	9.9	.3898	10	103	61	49	1.52
HPDSR 1000A	21910	HPDCR 1000A	21770	10.0	.3937	10	103	61	49	1.53
HPDSR 1010A	21911	HPDCR 1010A	21771	10.1	.3976	12	118	71	56	1.55
HPDSR 1020A	21912	HPDCR 1020A	21772	10.2	.4016	12	118	71	56	1.56
HPDSR 1030A	21913	HPDCR 1030A	21773	10.3	.4055	12	118	71	56	1.58
HPDSR 1040A	21914	HPDCR 1040A	21774	10.4	.4094	12	118	71	56	1.59
HPDSR 1050A	21915	HPDCR 1050A	21775	10.5	.4134	12	118	71	56	1.61
HPDSR 1060A	21916	HPDCR 1060A	21776	10.6	.4173	12	118	71	56	1.63
HPDSR 1070A	21917	HPDCR 1070A	21777	10.7	.4213	12	118	71	56	1.64
HPDSR 1080A	21918	HPDCR 1080A	21778	10.8	.4252	12	118	71	56	1.66
HPDSR 1090A	21919	HPDCR 1090A	21779	10.9	.4291	12	118	71	56	1.67
HPDSR 1100A	21920	HPDCR 1100A	21780	11.0	.4331	12	118	71	56	1.69
HPDSR 1110A	21921	HPDCR 1110A	21781	11.1	.4370	12	118	71	56	1.70
HPDSR4375A	21986	HPDCR4375A	21642	11.11	.4375	12	118	71	56	1.70
HPDSR 1120A	21922	HPDCR 1120A	21782	11.2	.4409	12	118	71	56	1.72
HPDSR 1130A	21923	HPDCR 1130A	21783	11.3	.4449	12	118	71	56	1.73
HPDSR 1140A	21924	HPDCR 1140A	21784	11.4	.4488	12	118	71	56	1.75
HPDSR 1150A	21925	HPDCR 1150A	21785	11.5	.4527	12	118	71	56	1.76
HPDSR 1160A	21926	HPDCR 1160A	21786	11.6	.4567	12	118	71	56	1.78
HPDSR 1170A	21927	HPDCR 1170A	21787	11.7	.4606	12	118	71	56	1.79
HPDSR 1180A	21928	HPDCR 1180A	21788	11.8	.4646	12	118	71	56	1.81

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Series HPDSR & HPDCR Continued

ALtima®				Diameter		Shank	OAL	Flute Length	Drill Length	Point Length
HPDSR		HPDCR		D1 (h7)		D2 (h6)	L1	L2	L3	L5
Tool No.	EDP	Tool No.	EDP	mm	Decimal	mm	mm	mm	mm	mm
HPDSR 1190A	21929	HPDCR 1190A	21789	11.9	.4685	12	118	71	56	1.82
HPDSR 1200A	21930	HPDCR 1200A	21790	12.0	.4724	12	118	71	56	1.84
HPDSR 1210A	21989	HPDCR 1210A	21645	12.1	.4764	14	124	77	60	1.86
HPDSR 1220A	21990	HPDCR 1220A	21646	12.2	.4803	14	124	77	60	1.87
HPDSR 1230A	21991	HPDCR 1230A	21647	12.3	.4842	14	124	77	60	1.89
HPDSR 1240A	21992	HPDCR 1240A	21648	12.4	.4882	14	124	77	60	1.90
HPDSR 1250A	21933	HPDCR 1250A	21793	12.5	.4921	14	124	77	60	1.92
HPDSR 1260A	21993	HPDCR 1260A	21649	12.6	.4961	14	124	77	60	1.93
HPDSR5000A	21987	HPDCR5000A	21643	12.7	.5000	14	124	77	60	1.95
HPDSR 1280A	21935	HPDCR 1280A	21795	12.8	.5039	14	124	77	60	1.96
HPDSR 1290A	21994	HPDCR 1290A	21650	12.9	.5079	14	124	77	60	1.98
HPDSR 1300A	21939	HPDCR 1300A	21799	13.0	.5118	14	124	77	60	1.99
HPDSR 1310A	21995	HPDCR 1310A	21651	13.1	.5157	14	124	77	60	2.01
HPDSR 1320A	21996	HPDCR 1320A	21652	13.2	.5197	14	124	77	60	2.02
HPDSR 1330A	21997	HPDCR 1330A	21653	13.3	.5236	14	124	77	60	2.04
HPDSR 1340A	21998	HPDCR 1340A	21654	13.4	.5276	14	124	77	60	2.05
HPDSR 1350A	21940	HPDCR 1350A	21800	13.5	.5315	14	124	77	60	2.07
HPDSR 1360A	21999	HPDCR 1360A	21655	13.6	.5354	14	124	77	60	2.09
HPDSR 1370A	22000	HPDCR 1370A	21656	13.7	.5394	14	124	77	60	2.10
HPDSR 1380A	21945	HPDCR 1380A	21805	13.8	.5433	14	124	77	60	2.12
HPDSR 1390A	22001	HPDCR 1390A	21657	13.9	.5472	14	124	77	60	2.13
HPDSR 1400A	21950	HPDCR 1400A	21810	14.0	.5512	14	124	77	60	2.15
HPDSR 1410A	22002	HPDCR 1410A	21658	14.1	.5551	16	133	83	63	2.16
HPDSR 1420A	22003	HPDCR 1420A	21659	14.2	.5591	16	133	83	63	2.18
HPDSR 1430A	22004	HPDCR 1430A	21660	14.3	.5630	16	133	83	63	2.19
HPDSR 1440A	22005	HPDCR 1440A	21661	14.4	.5669	16	133	83	63	2.21
HPDSR 1450A	21955	HPDCR 1450A	21815	14.5	.5709	16	133	83	63	2.22
HPDSR 1460A	22006	HPDCR 1460A	21662	14.6	.5748	16	133	83	63	2.24
HPDSR 1470A	22007	HPDCR 1470A	21663	14.7	.5787	16	133	83	63	2.25
HPDSR 1480A	21960	HPDCR 1480A	21820	14.8	.5827	16	133	83	63	2.27
HPDSR 1490A	22008	HPDCR 1490A	21664	14.9	.5866	16	133	83	63	2.28
HPDSR 1500A	21963	HPDCR 1500A	21823	15.0	.5905	16	133	83	63	2.30
HPDSR 1510A	22009	HPDCR 1510A	21665	15.1	.5945	16	133	83	63	2.32
HPDSR 1520A	22010	HPDCR 1520A	21666	15.2	.5984	16	133	83	63	2.33
HPDSR 1530A	22011	HPDCR 1530A	21667	15.3	.6024	16	133	83	63	2.35
HPDSR 1540A	22012	HPDCR 1540A	21668	15.4	.6063	16	133	83	63	2.36
HPDSR 1550A	21965	HPDCR 1550A	21825	15.5	.6102	16	133	83	63	2.38
HPDSR 1560A	22014	HPDCR 1560A	21669	15.6	.6142	16	133	83	63	2.39
HPDSR 1570A	22015	HPDCR 1570A	21670	15.7	.6181	16	133	83	63	2.41
HPDSR 1580A	21968	HPDCR 1580A	21828	15.8	.6220	16	133	83	63	2.42
HPDSR6250A	21988	HPDCR6250A	21644	15.88	.6250	16	133	83	63	2.43
HPDSR 1590A	22016	HPDCR 1590A	21671	15.9	.6260	16	133	83	63	2.44
HPDSR 1600A	21970	HPDCR 1600A	21830	16.0	.6299	16	133	83	63	2.45

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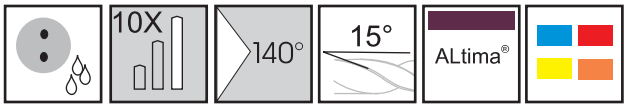
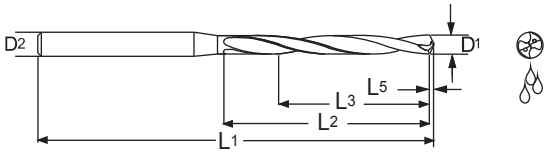
Twister® MD Series 2MDCL



Designed for high performance drilling in a broad range of materials.

• mm sizes only



ALtima®		Diameter D1 (h8)		Shank	OAL	Flute Length	Drill Length	Point Length
Tool No.	EDP	mm	Decimal	D2 (h6)	L1	L2	L3 Ref.	L5
2MDCL0787A	04198	2.00	.0787	3.0	74	24	18	0.31
2MDCL0807A	04200	2.05	.0807	3.0	74	28	21	0.32
2MDCL0827A	04202	2.10	.0827	3.0	74	28	21	0.33
2MDCL0846A	04204	2.15	.0846	3.0	74	28	21	0.33
2MDCL0866A	04206	2.20	.0866	3.0	74	28	21	0.34
2MDCL0886A	04208	2.25	.0886	3.0	74	28	21	0.35
2MDCL0906A	04210	2.30	.0906	3.0	74	28	21	0.36
2MDCL0925A	04212	2.35	.0925	3.0	74	28	21	0.36
2MDCL0945A	04214	2.40	.0945	3.0	74	28	21	0.37
2MDCL0965A	04216	2.45	.0965	3.0	74	28	21	0.38
2MDCL0984A	04218	2.50	.0984	3.0	74	28	21	0.39
2MDCL1004A	04220	2.55	.1004	3.0	81	34	25.5	0.40
2MDCL1024A	04222	2.60	.1024	3.0	81	34	25.5	0.40
2MDCL1043A	04224	2.65	.1043	3.0	81	34	25.5	0.41
2MDCL1063A	04226	2.70	.1063	3.0	81	34	25.5	0.42
2MDCL1083A	04228	2.75	.1083	3.0	81	34	25.5	0.43
2MDCL1102A	04230	2.80	.1102	3.0	81	34	25.5	0.43
2MDCL1122A	04232	2.85	.1122	3.0	81	34	25.5	0.44
2MDCL1142A	04234	2.90	.1142	3.0	81	34	25.5	0.45
2MDCL1161A	04236	2.95	.1161	3.0	81	34	25.5	0.46

Inch	
D1	Tolerance (h8)
.0787 - .1161	+0000/-.00055

Inch	
D2	Tolerance (h6)
.0787 - .1161	+0000/-.00024

Metric (mm)	
D1	Tolerance (h8)
2.00 - 2.95	+0000/-.0140

Metric (mm)	
D2	Tolerance (h6)
2.00 - 2.95	+0000/-.0060

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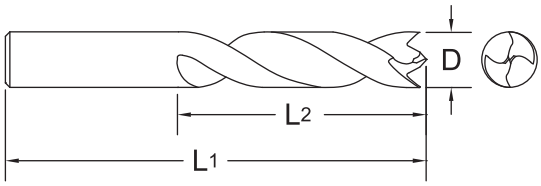
Inch sizes available as specials.

Twister® HP Series 207CE

Designed for drilling Carbon Fiber Reinforced Polymer (CFRP), graphite and aramid fiber (kevlar) reinforced composite materials.



- No delamination.
- Eliminate fuzz or “fray” at exit.
- Brad and spur point.

CERAedge®		Diameter D				OAL L1		Flute Length L2		Stock Status • Stocked
Tool No.	EDP	Inch	Wire	mm	Decimal	Inch	mm	Inch	mm	o Non-Stocked
20709380CE	27005	3/32			.0938	1-3/4		1/2		•
20709800CE	27014		40		.0980	1-13/16		1/2		•
20710150CE	27023		38		.1015	1-13/16		1/2		•
20712500CE	27068	1/8			.1250	1-7/8		5/8		•
20712600CE	27071			3.20	.1260		48		16.0	o
20712850CE	27074		30		.1285	1-15/16		11/16		•
20712990CE	27077			3.30	.1299		49		17.5	o
20713600CE	27083		29		.1360	1-15/16		11/16		o
20714050CE	27089		28		.1405	1-15/16		11/16		o
20715620CE	27122	5/32			.1562	2-1/16		3/4		o
20715900CE	27131		21		.1590	2-1/8		7/8		o
20716100CE	27134		20		.1610	2-1/8		7/8		o
20716600CE	27143		19		.1660	2-1/8		7/8		o
20718000CE	27167		15		.1800	2-3/16		15/16		o
20718750CE	27179	3/16			.1875	2-3/16		15/16		•
20719100CE	27188		11		.1910	2-1/4		1		o
20719350CE	27194		10		.1935	2-1/4		1		o
20719600CE	27197		9		.1960	2-1/4		1		o
20720100CE	27209		7		.2010	2-1/4		1		o
20720310CE	27212	13/64			.2031	2-1/4		1		o
20720900CE	27227		4		.2090	2-3/8		1-1/16		o
20721300CE	27233		3		.2130	2-3/8		1-1/16		o
20721870CE	27239	7/32			.2187	2-3/8		1-1/16		•
20722100CE	27245		2		.2210	2-7/16		1-1/8		o
20722800CE	27251		1		.2280	2-7/16		1-1/8		o
20723620CE	27266			6.00	.2362		64		32.0	o
20725000CE	27287	1/4	E		.2500	2-1/2		1-1/4		•
20725190CE	27290			6.40	.2519		64		32.0	o
20725700CE	27296		F		.2570	2-5/8		1-5/16		o
20726100CE	27299		G		.2610	2-5/8		1-5/16		o
20726560CE	27302	17/64			.2656	2-5/8		1-5/16		o
20726600CE	27305		H		.2660	2-11/16		1-3/8		o
20727560CE	27311			7.00	.2756		68		35.0	o
20728100CE	27317		K		.2810	2-11/16		1-3/8		•

Inch	
D	Tolerance
.0935 - .5000	+.0000/-.0005

Metric (mm)	
D	Tolerance
2.40 - 12.00	+.000/-.013

M.A. FORD® APG

CERAedge®

Hardness that makes it the 3rd hardest material when compared to industrial diamonds.
- Toughness that is comparable to Titanium.
- Lubricity that approaches Teflon.
- Extreme heat tolerance.
- Non-reactive to Titanium.

CERAedge® Coating Properties	
Microhardness (HV)	3400
Max. Service Temperature	1100° C / 2012° F
Friction Coefficient	0.25
Coating Thickness	2-3 microns
Color	Light Gray

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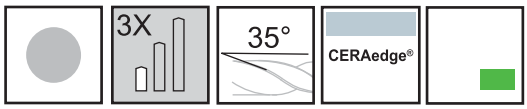
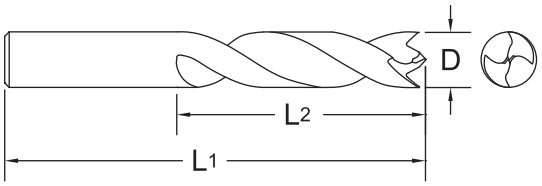
Series 207CE Continued





CERAedge®		Diameter				OAL		Flute Length		Stock Status
		D				L1		L2		• Stocked
Tool No.	EDP	Inch	Wire	mm	Decimal	Inch	mm	Inch	mm	o Non-Stocked
20728120CE	27320	9/32			.2812	2-11/16		1-3/8		o
20729000CE	27323		L		.2900	2-3/4		1-3/8		o
20729500CE	27326		M		.2950	2-3/4		1-3/8		o
20731250CE	27338	5/16			.3125	2-13/16		1-1/2		o
20731500CE	27341			8.00	.3150		71		38.0	o
20737500CE	27383	3/8			.3750	3-1/8		1-5/8		•
20739060CE	27392	25/64			.3906	3-1/4		1-3/4		o
20740400CE	27401		Y		.4040	3-5/16		1-3/4		o
20743750CE	27419	7/16			.4375	3-7/16		1-7/8		o
20750000CE	27437	1/2			.5000	3-3/4		2-1/8		o

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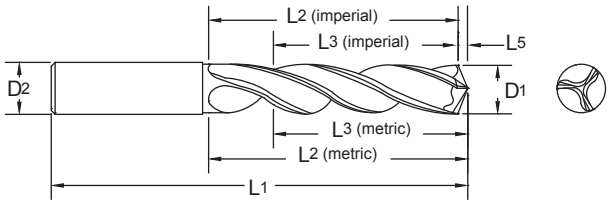
Twister® AL Series 229

Twister® AL Series 229 recommended for increased speeds and feeds when drilling aluminum and similar materials.



- Easily re-ground point design.
- Special 3 flute parabolic flute form for increased chip evacuation.
- Metric sizes 3mm and above manufactured to DIN 6537L.
- Coolant fed style available as a special.

Tool No.	EDP	Diameter D1 (m7)				Shank D2 (h6)		OAL L1		Flute Length L2		Drill Length L3 Ref.		Point Length L5	
		Inch	Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm
22904690	23050	3/64			.0469	3/64		1-1/2		3/4		9/16		0.006	
22905500	23051		54		.0550	.0550		1-1/2		3/4		9/16		0.007	
22905950	23052		53		.0595	.0595		1-1/2		3/4		9/16		0.007	
22906250	22900	1/16			.0625	1/16		1-1/2		3/4		9/16		0.008	
22906700	23054		51		.0670	.0670		1-1/2		3/4		9/16		0.008	
22907000	23055		50		.0700	.0700		1-3/4		7/8		11/16		0.008	
22907300	23056		49		.0730	.0730		1-3/4		7/8		11/16		0.009	
22907870	22950			2.00	.0787		2.0		38		16.0		12		0.24
22908200	23057		45		.0820	.0820		1-3/4		7/8		11/16		0.010	
22908900	22901		43		.0890	.0890		2		1		3/4		0.011	
22909060	23058			2.3	.0906		2.3		43		20.5		15		0.28
22909380	22902	3/32			.0938	3/32		2		1		3/4		0.011	
22909600	22903		41		.0960	.0960		2		1		3/4		0.012	
22909800	22904		40		.0980	.0980		2		1		3/4		0.012	
22909840	22951			2.50	.0984		2.5		43		20.5		15		0.30
22909950	23059		39		.0995	.0995		2-1/4		1-1/4		15/16		0.012	
22910150	22942		38		.1015	.1015		2-1/4		1-1/4		15/16		0.012	
22910400	23060		37		.1040	.1040		2-1/4		1-1/4		15/16		0.013	
22910650	22943		36		.1065	.1065		2-1/4		1-1/4		15/16		0.013	
22911000	23061		35		.1100	.1100		2-1/4		1-1/4		15/16		0.013	
22911300	22944		33		.1130	.1130		2-1/4		1-1/4		15/16		0.014	
22911420	22952			2.90	.1142		2.9		46		25.0		19		0.35
22911810	22953			3.00	.1181		6.0		66		28.0		23		0.36
22912000	22905		31		.1200	.1200		2-1/4		1-1/4		15/16		0.014	
22912200	23063			3.10	.1220		6.0		66		28.0		23		0.37
22912500	22906	1/8			.1250	1/8		2-1/4		1-1/4		15/16		0.015	

Inch	
D1	Tolerance (m7)
.0469 - .1250	+.0001/+.0004
.1251 - .2500	+.0002/+.0006
.2501 - .3750	+.0003/+.0008
.3751 - .7500	+.0003/+.0010

Metric (mm)	
D1	Tolerance (m7)
2.00 - 3.00	+002/+.012
3.01 - 6.00	+.004/+.016
6.01 - 10.00	+.006/+.021
10.01 - 16.00	+.007/+.025

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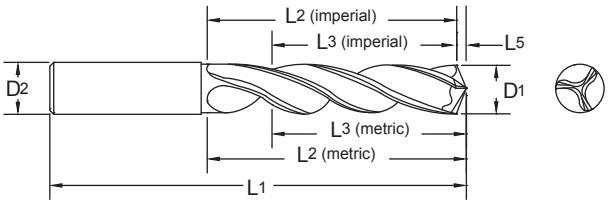
Series 229 Continued



Tool No.	EDP	Diameter D1 (m7) Inch	Wire	mm	Decimal	Shank D2 (h6) Inch	mm	OAL L1 Inch	mm	Flute Length L2 Inch	mm	Drill Length L3 Ref. Inch	mm	Point Length L5 Inch	mm
22912600	22945			3.20	.1260		6.0		66		28.0		23		0.39
22912850	22935		30		.1285	.1285		2-1/4		1-1/4		15/16		0.015	
22912990	22954			3.30	.1299		6.0		66		28.0		23		0.40
22913390	22949			3.40	.1339		6.0		66		28.0		23		0.41
22913600	22907		29		.1360	.1360		2-1/2		1-3/8		1-1/32		0.016	
22913780	22955			3.50	.1378		6.0		66		28.0		23		0.42
22914060	22908	9/64			.1406	9/64		2-1/2		1-3/8		1-1/32		0.017	
22914170	22992			3.60	.1417		6.0		66		28.0		23		0.43
22914400	22946		27		.1440	.1440		2-1/2		1-3/8		1-1/32		0.017	
22914570	22994			3.70	.1457		6.0		66		28.0		23		0.45
22914950	22973		25		.1495	.1495		2-1/2		1-3/8		1-1/32		0.018	
22914960	22996			3.80	.1496		6.0		74		36.0		29		0.46
22915200	23064		24		.1520	.1520		2-1/2		1-3/8		1-1/32		0.018	
22915350	22997			3.90	.1535		6.0		74		36.0		29		0.47
22915620	22909	5/32			.1562	5/32		2-1/2		1-3/8		1-1/32		0.019	
22915750	22956			4.00	.1575		6.0		74		36.0		29		0.48
22915900	22936		21		.1590	.1590		2-1/2		1-3/8		1-1/32		0.019	
22916100	22937		20		.1610	.1610		2-1/2		1-3/8		1-1/32		0.019	
22916140	22998			4.10	.1614		6.0		74		36.0		29		0.49
22916540	22957			4.20	.1654		6.0		74		36.0		29		0.51
22916600	22947		19		.1660	.1660		2-1/2		1-3/8		1-1/32		0.020	
22916950	22948		18		.1695	.1695		2-3/4		1-5/8		1-7/32		0.020	
22917190	22939	11/64			.1719	11/64		2-3/4		1-5/8		1-7/32		0.021	
22917300	22972		17		.1730	.1730		2-3/4		1-5/8		1-7/32		0.021	
22917320	22999			4.40	.1732		6.0		74		36.0		29		0.53
22917700	22910		16		.1770	.1770		2-3/4		1-5/8		1-7/32		0.021	
22917720	22958			4.50	.1772		6.0		74		36.0		29		0.54
22918110	23000			4.60	.1811		6.0		74		36.0		29		0.55
22918500	22911		13		.1850	.1850		2-3/4		1-5/8		1-7/32		0.022	
22918750	22912	3/16			.1875	3/16		2-3/4		1-5/8		1-7/32		0.023	
22918890	23001			4.80	.1889		6.0		82		44.0		35		0.58
22918900	22974		12		.1890	.1890		2-3/4		1-5/8		1-7/32		0.023	
22919100	22976		11		.1910	.1910		2-3/4		1-5/8		1-7/32		0.023	
22919290	23002			4.90	.1929		6.0		82		44.0		35		0.59
22919350	22938		10		.1935	.1935		2-3/4		1-5/8		1-7/32		0.023	
22919680	22959			5.00	.1968		6.0		82		44.0		35		0.60
22920100	22975		7		.2010	.2010		3		1-3/4		1-5/16		0.024	
22920470	23003			5.20	.2047		6.0		82		44.0		35		0.63

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Series 229 Continued

Tool No.	EDP	Diameter D1 (m7) Inch	Wire	mm	Decimal	Shank D2 (h6) Inch	mm	OAL L1 Inch	mm	Flute Length L2 Inch	mm	Drill Length L3 Ref. Inch	mm	Point Length L5 Inch	mm
22921300	22977		3		.2130	.2130		3		1-3/4		1-5/16		0.026	
22921650	22960			5.50	.2165		6.0		82		44.0		35		0.66
22921870	22913	7/32			.2187	7/32		3		1-3/4		1-5/16		0.026	
22922050	23004			5.60	.2205		6.0		82		44.0		35		0.68
22922800	22978		1		.2280	.2280		3		1-3/4		1-5/16		0.027	
22923400	23065		A		.2340	.2340		3-1/4		2		1-1/2		0.028	
22923620	22961			6.00	.2362		6.0		82		44.0		35		0.72
22924410	22980			6.20	.2441		8.0		91		53.0		43		0.75
22925000	22914	1/4			.2500	1/4		3-1/4		2		1-1/2		0.030	
22925590	22962			6.50	.2559		8.0		91		53.0		43		0.78
22925700	22915		F		.2570	.2570		3-1/4		2		1-1/2		0.031	
22926380	22979			6.70	.2638		8.0		91		53.0		43		0.81
22926560	22916	17/64			.2656	17/64		3-1/2		2-1/8		1-19/32		0.032	
22926770	22963			6.80	.2677		8.0		91		53.0		43		0.82
22927200	22981		I		.2720	.2720		3-1/2		2-1/8		1-19/32		0.033	
22927560	22964			7.00	.2756		8.0		91		53.0		43		0.84
22928120	22917	9/32			.2812	9/32		3-1/2		2-1/8		1-19/32		0.034	
22928350	23005			7.20	.2835		8.0		91		53.0		43		0.87
22928740	22940			7.30	.2874		8.0		91		53.0		43		0.88
22929130	22965			7.40	.2913		8.0		91		53.0		43		0.89
22929530	22966			7.50	.2953		8.0		91		53.0		43		0.90
22929690	22982	19/64			.2969	19/64		3-3/4		2-3/8		1-25/32		0.036	
22930710	23006			7.80	.3071		8.0		91		53.0		43		0.94
22931250	22918	5/16			.3125	5/16		3-3/4		2-3/8		1-25/32		0.038	
22931500	22967			8.00	.3150		8.0		91		53.0		43		0.96
22931890	23008			8.10	.3189		10.0		103		61.0		49		0.98
22932810	22919	21/64			.3281	21/64		4		2-1/2		1-7/8		0.040	
22933070	22985			8.40	.3307		10.0		103		61.0		49		1.01
22933200	22983		Q		.3320	.3320		4		2-1/2		1-7/8		0.040	
22933460	22968			8.50	.3346		10.0		103		61.0		49		1.02
22934380	22987	11/32			.3438	11/32		4		2-1/2		1-7/8		0.041	
22935430	22989			9.00	.3543		10.0		103		61.0		49		1.09
22935940	22984	23/64			.3594	23/64		4-1/4		2-3/4		2-1/16		0.043	
22936800	22991		U		.3680	.3680		4-1/4		2-3/4		2-1/16		0.044	
22937400	23009			9.50	.3740		10.0		103		61.0		49		1.15
22937500	22920	3/8			.3750	3/8		4-1/4		2-3/4		2-1/16		0.045	
22938190	23011			9.70	.3819		10.0		103		61.0		49		1.17
22939060	22921	25/64			.3906	25/64		4-1/2		2-7/8		2-5/32		0.047	
22939370	22969			10.00	.3937		10.0		103		61.0		49		1.21
22940160	22970			10.20	.4016		12.0		118		71.0		56		1.23
22940620	22922	13/32			.4062	13/32		4-1/2		2-7/8		2-5/32		0.049	
22940940	23012			10.40	.4094		12.0		118		71.0		56		1.25

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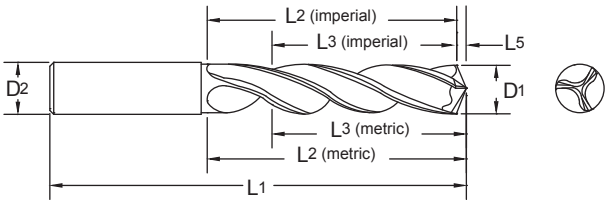
Series 229 Continued



Tool No.	EDP	Diameter D1 (m7) Inch	Wire	mm	Decimal	Shank D2 (h6) Inch	mm	OAL L1 Inch	mm	Flute Length L2 Inch	mm	Drill Length L3 Ref. Inch	mm	Point Length L5 Inch	mm
22941340	22986			10.50	.4134		12.0		118		71.0		56		1.27
22941730	23013			10.60	.4173		12.0		118		71.0		56		1.28
22942190	22923	27/64			.4219	27/64		4-1/2		2-7/8		2-5/32		0.051	
22943310	22993			11.00	.4331		12.0		118		71.0		56		1.33
22943750	22924	7/16			.4375	7/16		4-1/2		2-7/8		2-5/32		0.053	
22945280	23014			11.50	.4528		12.0		118		71.0		56		1.39
22945310	22941	29/64			.4531	29/64		4-3/4		3		2-1/4		0.055	
22946880	22995	15/32			.4688	15/32		4-3/4		3		2-1/4		0.057	
22947240	22971			12.00	.4724		12.0		118		71.0		56		1.45
22948440	22925	31/64			.4844	31/64		4-3/4		3		2-1/4		0.058	
22949210	22988			12.50	.4921		14.0		124		77.0		60		1.51
22950000	22926	1/2			.5000	1/2		4-3/4		3		2-1/4		0.060	
22951180	23015			13.00	.5118		14.0		124		77.0		60		1.57
22951560	22927	33/64			.5156	33/64		5		3-1/4		2-7/16		0.062	
22953120	22928	17/32			.5312	17/32		5		3-1/4		2-7/16		0.064	
22953150	23017			13.50	.5315		14.0		124		77.0		60		1.63
22954690	22929	35/64			.5469	35/64		5		3-1/4		2-7/16		0.066	
22955120	23018			14.00	.5512		14.0		124		77.0		60		1.69
22956250	22930	9/16			.5625	9/16		5		3-1/4		2-7/16		0.068	
22957090	23020			14.50	.5709		16.0		133		83.0		63		1.75
22959060	23021			15.00	.5906		16.0		133		83.0		63		1.81
22961020	23022			15.50	.6102		16.0		133		83.0		63		1.87
22962200	23023			15.80	.6220		16.0		133		83.0		63		1.90
22962500	22931	5/8			.6250	5/8		5-1/4		3-1/2		2-5/8		0.075	
22962990	23024			16.00	.6299		16.0		133		83.0		63		1.93
22965620	22932	21/32			.6562	21/32		5-1/2		3-5/8		2-23/32		0.079	
22968750	22933	11/16			.6875	11/16		5-1/2		3-5/8		2-23/32		0.083	
22975000	22934	3/4			.7500	3/4		5-3/4		3-7/8		2-29/32		0.090	

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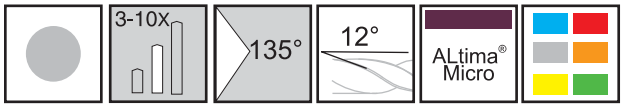
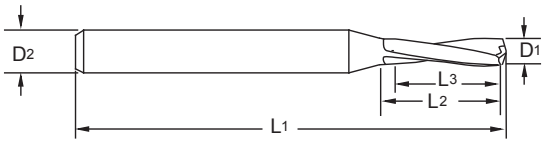
Twister® Micro-Tuff® Series 305



Designed for high performance drilling in a broad range of materials.

• Depth setting rings available on 1/8" shank tools.



Uncoated		ALtima® Micro		Diameter D1				Shank D2		OAL L1		Flute Length max.* L2		Drill Length L3 Ref.	
Tool No.	EDP	Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm
30500390	33999				102		0.0039	1/8		1-1/2		0.065		0.05	
305M0010	34000					0.1	0.0039		3.0		38		1.70		1.28
30500430	34001				101		0.0043	1/8		1-1/2		0.065		0.05	
305M0011	33900					0.11	0.0043		3.0		38		1.70		1.28
30500470	34002				100		0.0047	1/8		1-1/2		0.065		0.05	
305M0012	33901					0.12	0.0047		3.0		38		1.70		1.28
30500510	34003				99		0.0051	1/8		1-1/2		0.065		0.05	
305M0013	33902					0.13	0.0051		3.0		38		1.70		1.28
30500550	34004				98		0.0055	1/8		1-1/2		0.065		0.05	
305M0014	33903					0.14	0.0055		3.0		38		1.70		1.28
305M0015	34005					0.15	0.0059		3.0		38		2.50		1.88
30500600	34006						0.0060	1/8		1-1/2		0.100		0.08	
305M0016	33904					0.16	0.0063		3.0		38		2.50		1.88
30500630	34007				96		0.0063	1/8		1-1/2		0.100		0.08	
305M0017	33905					0.17	0.0067		3.0		38		2.50		1.88
30500670	34008				95		0.0067	1/8		1-1/2		0.100		0.08	
30500700	34009						0.0070	1/8		1-1/2		0.100		0.08	
305M0018	33906					0.18	0.0071		3.0		38		2.50		1.88
30500710	34010				94		0.0071	1/8		1-1/2		0.100		0.08	
305M0019	33907					0.19	0.0075		3.0		38		2.50		1.88
30500750	34011				93		0.0075	1/8		1-1/2		0.100		0.08	
305M0020	34012					0.20	0.0078		3.0		38		2.50		1.88
30500790	34013				92		0.0079	1/8		1-1/2		0.125		0.09	
30500800	34014						0.0080	1/8		1-1/2		0.125		0.09	
305M0021	33908					0.21	0.0083		3.0		38		2.50		1.88
30500830	34015				91		0.0083	1/8		1-1/2		0.125		0.09	
305M0022	33909					0.22	0.0087		3.0		38		2.50		1.88
30500870	34016				90		0.0087	1/8		1-1/2		0.125		0.09	
30500900	34017						0.0090	1/8		1-1/2		0.125		0.09	
305M0023	33910					0.23	0.0091		3.0		38		2.50		1.88
30500910	34018				89		0.0091	1/8		1-1/2		0.125		0.09	
305M0024	33911					0.24	0.0094		3.0		38		2.50		1.88

*Do not drill beyond specified flute length. Peck cycles may be utilized to achieve best tool performance.

Inch			
D1	Tolerance	D2	Tolerance
.0039 - .1250	+0/-0.0003	.0039 - .1250	+0/-.0002
L1	Tolerance	L2	Tolerance
.0039 - .1250	+/-.015	.0039 - .1250	+.015/-0

Metric (mm)			
D1	Tolerance	D2	Tolerance
0.1 - 3.0	+0/-0.008	0.1 - 3.0	+0/-0.005
L1	Tolerance	L2	Tolerance
0.1 - 3.0	+/-0.4	0.1 - 3.0	+0.4/-0

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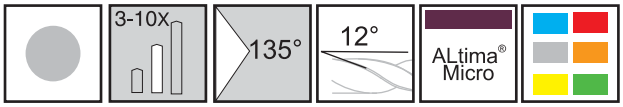

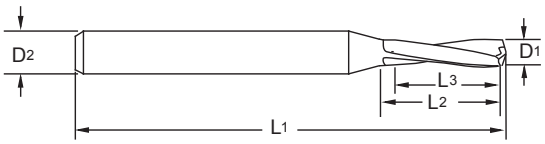

Uncoated		ALtima® Micro		Diameter D1				Shank D2		OAL L1		Flute Length max.* L2		Drill Length L3 Ref.	
Tool No.	EDP	Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm
30500950	34019				88		0.0095	1/8		1-1/2		0.125		0.09	
305M0025	34020					0.25	0.0098		3.0		38		3.20		2.40
30501000	34021				87		0.0100	1/8		1-1/2		0.150		0.11	
305M0026	33912					0.26	0.0102		3.0		38		3.20		2.40
30501050	34022				86		0.0105	1/8		1-1/2		0.150		0.11	
305M0027	33913					0.27	0.0106		3.0		38		3.20		2.40
30501100	34023				85		0.0110	1/8		1-1/2		0.150		0.11	
305M0028	33914					0.28	0.0110		3.0		38		3.20		2.40
305M0029	33915					0.29	0.0114		3.0		38		3.20		2.40
30501150	34024				84		0.0115	1/8		1-1/2		0.150		0.11	
305M0030	34025	305M0030AM	34206			0.30	0.0118		3.0		38		4.80		3.60
30501200	34026	30501200AM	34145		83		0.0120	1/8		1-1/2		0.190		0.14	
305M0031	33916					0.31	0.0122		3.0		38		4.80		3.60
30501250	34027	30501250AM	34146		82		0.0125	1/8		1-1/2		0.190		0.14	
305M0032	33917					0.32	0.0126		3.0		38		4.80		3.60
305M0033	33918					0.33	0.0130		3.0		38		4.80		3.60
30501300	34028	30501300AM	34147		81		0.0130	1/8		1-1/2		0.190		0.14	
305M0034	33919					0.34	0.0134		3.0		38		4.80		3.60
30501350	34029	30501350AM	34148		80		0.0135	1/8		1-1/2		0.190		0.14	
305M0035	34030	305M0035AM	34207			0.35	0.0138		3.0		38		4.80		3.60
305M0036	33920					0.36	0.0142		3.0		38		4.80		3.60
30501450	34031	30501450AM	34149		79		0.0145	1/8		1-1/2		0.190		0.14	
305M0037	33921					0.37	0.0146		3.0		38		4.80		3.60
305M0038	33922					0.38	0.0150		3.0		38		4.80		3.60
305M0039	33923					0.39	0.0154		3.0		38		4.80		3.60
30501560	34032	30501560AM	34150	1/64			0.0156	1/8		1-1/2		0.190		0.14	
305M0040	34033	305M0040AM	34208			0.40	0.0157		3.0		38		4.80		3.60
30501600	34034	30501600AM	34151		78		0.0160	1/8		1-1/2		0.190		0.14	
305M0041	33924					0.41	0.0161		3.0		38		6.35		4.76
305M0042	33925					0.42	0.0165		3.0		38		6.35		4.76
305M0043	33926					0.43	0.0169		3.0		38		6.35		4.76
305M0044	33927					0.44	0.0173		3.0		38		6.35		4.76
305M0045	34035	305M0045AM	34209			0.45	0.0177		3.0		38		6.35		4.76
30501800	34036	30501800AM	34152		77		0.0180	1/8		1-1/2		0.250		0.19	
305M0046	33928					0.46	0.0181		3.0		38		6.35		4.76
305M0047	33929					0.47	0.0185		3.0		38		6.35		4.76
305M0048	33930					0.48	0.0189		3.0		38		6.35		4.76
305M0049	33931					0.49	0.0193		3.0		38		6.35		4.76

*Do not drill beyond specified flute length. Peck cycles may be utilized to achieve best tool performance.

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Uncoated		ALtima® Micro		Diameter D1				Shank D2		OAL L1		Flute Length max.* L2		Drill Length L3 Ref.	
Tool No.	EDP	Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm
305M0050	34037	305M0050AM	34210			0.50	0.0197		3.0		38		6.35		4.76
30502000	34038	30502000AM	34153		76		0.0200	1/8		1-1/2		0.250		0.19	
305M0051	33932					0.51	0.0201		3.0		38		6.35		4.76
305M0052	33933					0.52	0.0205		3.0		38		6.35		4.76
305M0053	33934					0.53	0.0209		3.0		38		6.35		4.76
30502100	34039	30502100AM	34154		75		0.0210	1/8		1-1/2		0.250		0.19	
305M0054	33935					0.54	0.0213		3.0		38		6.35		4.76
305M0055	34040	305M0055AM	34211			0.55	0.0217		3.0		38		6.35		4.76
305M0056	33936					0.56	0.0220		3.0		38		6.35		4.76
305M0057	33937					0.57	0.0224		3.0		38		6.35		4.76
30502250	34041	30502250AM	34155		74		0.0225	1/8		1-1/2		0.250		0.19	
305M0058	33938					0.58	0.0228		3.0		38		6.35		4.76
305M0059	33939					0.59	0.0232		3.0		38		6.35		4.76
305M0060	34042	305M0060AM	34212			0.60	0.0236		3.0		38		6.35		4.76
30502400	34043	30502400AM	34156		73		0.0240	1/8		1-1/2		0.250		0.19	
305M0061	33940					0.61	0.0240		3.0		38		6.35		4.76
305M0062	33941					0.62	0.0244		3.0		38		6.35		4.76
305M0063	33942					0.63	0.0248		3.0		38		6.35		4.76
30502500	34044	30502500AM	34157		72		0.0250	1/8		1-1/2		0.250		0.19	
305M0064	33943					0.64	0.0252		3.0		38		6.35		4.76
305M0065	34045	305M0065AM	34213			0.65	0.0256		3.0		38		6.35		4.76
305M0066	33944					0.66	0.0260		3.0		38		8.13		6.10
30502600	34046	30502600AM	34158		71		0.0260	1/8		1-1/2		0.250		0.19	
305M0067	33945					0.67	0.0264		3.0		38		8.13		6.10
305M0068	33946					0.68	0.0268		3.0		38		8.13		6.10
305M0069	33947					0.69	0.0272		3.0		38		8.13		6.10
305M0070	34047	305M0070AM	34214			0.70	0.0276		3.0		38		8.13		6.10
305M0071	33948					0.71	0.0280		3.0		38		8.13		6.10
30502800	34048	30502800AM	34159		70		0.0280	1/8		1-1/2		0.320		0.24	
305M0072	33949					0.72	0.0283		3.0		38		8.13		6.10
305M0073	33950					0.73	0.0287		3.0		38		8.13		6.10
305M0074	33951					0.74	0.0291		3.0		38		8.13		6.10
30502920	34049	30502920AM	34160		69		0.0292	1/8		1-1/2		0.320		0.24	
305M0075	34050	305M0075AM	34215			0.75	0.0295		3.0		38		8.13		6.10
305M0076	33952					0.76	0.0299		3.0		38		10.16		7.62
305M0077	33953					0.77	0.0303		3.0		38		10.16		7.62
305M0078	33954					0.78	0.0307		3.0		38		10.16		7.62
30503100	34051	30503100AM	34161		68		0.0310	1/8		1-1/2		0.400		0.30	
305M0079	33955					0.79	0.0311		3.0		38		10.16		7.62
30503120	34052	30503120AM	34162	1/32			0.0312	1/8		1-1/2		0.400		0.30	

*Do not drill beyond specified flute length. Peck cycles may be utilized to achieve best tool performance.

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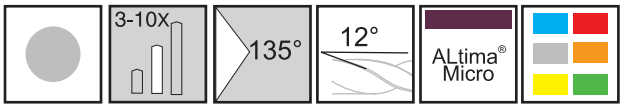

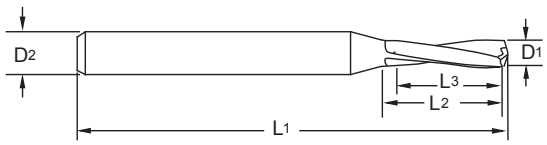

Uncoated		ALtima® Micro		Diameter D1				Shank D2		OAL L1		Flute Length max.* L2		Drill Length L3 Ref.	
Tool No.	EDP	Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm
305M0080	34053	305M0080AM	34216			0.80	0.0315		3.0		38		10.16		7.62
305M0081	33956					0.81	0.0319		3.0		38		10.16		7.62
30503200	34054	30503200AM	34163		67		0.0320	1/8		1-1/2		0.400		0.30	
305M0082	33957					0.82	0.0323		3.0		38		10.16		7.62
305M0083	33958					0.83	0.0327		3.0		38		10.16		7.62
30503300	34055	30503300AM	34164		66		0.0330	1/8		1-1/2		0.400		0.30	
305M0084	33959					0.84	0.0331		3.0		38		10.16		7.62
305M0085	34056	305M0085AM	34217			0.85	0.0335		3.0		38		10.16		7.62
305M0086	33960					0.86	0.0339		3.0		38		10.16		7.62
305M0087	33961					0.87	0.0343		3.0		38		10.16		7.62
305M0088	33962					0.88	0.0346		3.0		38		10.16		7.62
30503500	34057	30503500AM	34165		65		0.0350	1/8		1-1/2		0.400		0.30	
305M0089	33963					0.89	0.0350		3.0		38		10.16		7.62
305M0090	34058	305M0090AM	34218			0.90	0.0354		3.0		38		10.16		7.62
305M0091	33964					0.91	0.0358		3.0		38		10.16		7.62
30503600	34059	30503600AM	34166		64		0.0360	1/8		1-1/2		0.400		0.30	
305M0092	33965					0.92	0.0362		3.0		38		10.16		7.62
305M0093	33966					0.93	0.0366		3.0		38		10.16		7.62
30503700	34060	30503700AM	34167		63		0.0370	1/8		1-1/2		0.400		0.30	
305M0094	33967					0.94	0.0370		3.0		38		10.16		7.62
305M0095	34061	305M0095AM	34219			0.95	0.0374		3.0		38		10.16		7.62
305M0096	33968					0.96	0.0378		3.0		38		10.16		7.62
30503800	34062	30503800AM	34168		62		0.0380	1/8		1-1/2		0.400		0.30	
305M0097	33969					0.97	0.0382		3.0		38		10.16		7.62
305M0098	33970					0.98	0.0386		3.0		38		10.16		7.62
305M0099	33971					0.99	0.0390		3.0		38		10.16		7.62
30503900	34063	30503900AM	34169		61		0.0390	1/8		1-1/2		0.400		0.30	
305M0100	34064	305M0100AM	34220			1.00	0.0394		3.0		38		10.16		7.62
30504000	34065	30504000AM	34170		60		0.0400	1/8		1-1/2		0.400		0.30	
30504100	34066	30504100AM	34171		59		0.0410	1/8		1-1/2		0.400		0.30	
305M0105	34067	305M0105AM	34221			1.05	0.0413		3.0		38		10.16		7.62
30504200	34068	30504200AM	34172		58		0.0420	1/8		1-1/2		0.400		0.30	
30504300	34069	30504300AM	34173		57		0.0430	1/8		1-1/2		0.400		0.30	
305M0110	34070	305M0110AM	34222			1.10	0.0433		3.0		38		10.16		7.62
305M0115	34071	305M0115AM	34223			1.15	0.0452		3.0		38		10.16		7.62
30504650	34072	30504650AM	34174		56		0.0465	1/8		1-1/2		0.400		0.30	
30504690	34073	30504690AM	34175	3/64			0.0469	1/8		1-1/2		0.400		0.30	
305M0120	34074	305M0120AM	34224			1.20	0.0472		3.0		38		10.16		7.62

*Do not drill beyond specified flute length. Peck cycles may be utilized to achieve best tool performance.

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Uncoated		ALtima® Micro		Diameter D1				Shank D2		OAL L1		Flute Length max.* L2		Drill Length L3 Ref.	
Tool No.	EDP	Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm
305M0125	34075	305M0125AM	34225			1.25	0.0492		3.0		38		10.16		7.62
305M0130	34076	305M0130AM	34226			1.30	0.0511		3.0		38		10.16		7.62
30505200	34077	30505200AM	34176		55		0.0520	1/8		1-1/2		0.400		0.30	
305M0135	34078	305M0135AM	34227			1.35	0.0531		3.0		38		10.16		7.62
30505500	34079	30505500AM	34177		54		0.0550	1/8		1-1/2		0.400		0.30	
305M0140	34080	305M0140AM	34228			1.40	0.0551		3.0		38		10.16		7.62
305M0145	34081	305M0145AM	34229			1.45	0.0571		3.0		38		10.16		7.62
305M0150	34082	305M0150AM	34230			1.50	0.0590		3.0		38		10.16		7.62
30505950	34083	30505950AM	34178		53		0.0595	1/8		1-1/2		0.400		0.30	
305M0155	34084	305M0155AM	34231			1.55	0.0610		3.0		38		10.16		7.62
30506250	34085	30506250AM	34179	1/16			0.0625	1/8		1-1/2		0.480		0.36	
305M0160	34086	305M0160AM	34232			1.60	0.0630		3.0		38		12.19		9.14
30506350	34087	30506350AM	34180		52		0.0635	1/8		1-1/2		0.480		0.36	
305M0165	34088	305M0165AM	34233			1.65	0.0649		3.0		38		12.19		9.14
305M0170	34089	305M0170AM	34234			1.70	0.0669		3.0		38		12.19		9.14
30506700	34090	30506700AM	34181		51		0.0670	1/8		1-1/2		0.480		0.36	
305M0175	34091	305M0175AM	34235			1.75	0.0689		3.0		38		12.19		9.14
30507000	34092	30507000AM	34182		50		0.0700	1/8		1-1/2		0.480		0.36	
305M0180	34093	305M0180AM	34236			1.80	0.0708		3.0		38		12.19		9.14
305M0185	34094	305M0185AM	34237			1.85	0.0728		3.0		38		12.19		9.14
30507300	34095	30507300AM	34183		49		0.0730	1/8		1-1/2		0.480		0.36	
305M0190	34096	305M0190AM	34238			1.90	0.0748		3.0		38		12.19		9.14
30507600	34097	30507600AM	34184		48		0.0760	1/8		1-1/2		0.480		0.36	
305M0195	34098	305M0195AM	34239			1.95	0.0767		3.0		38		12.19		9.14
30507810	34099	30507810AM	34185	5/64			0.0781	1/8		1-1/2		0.480		0.36	
30507850	34100	30507850AM	34186		47		0.0785	1/8		1-1/2		0.480		0.36	
305M0200	34101	305M0200AM	34240			2.00	0.0787		3.0		38		12.19		9.14
305M0205	34102	305M0205AM	34241			2.05	0.0807		3.0		38		12.19		9.14
30508100	34103	30508100AM	34187		46		0.0810	1/8		1-1/2		0.480		0.36	
30508200	34104	30508200AM	34188		45		0.0820	1/8		1-1/2		0.480		0.36	
305M0210	34105	305M0210AM	34242			2.10	0.0827		3.0		38		12.19		9.14
305M0215	34106	305M0215AM	34243			2.15	0.0846		3.0		38		12.19		9.14
30508600	34107	30508600AM	34189		44		0.0860	1/8		1-1/2		0.480		0.36	
305M0220	34108	305M0220AM	34244			2.20	0.0866		3.0		38		12.19		9.14
305M0225	34109	305M0225AM	34245			2.25	0.0886		3.0		38		12.19		9.14
30508900	34110	30508900AM	34190		43		0.0890	1/8		1-1/2		0.480		0.36	
305M0230	34111	305M0230AM	34246			2.30	0.0906		3.0		38		12.19		9.14
305M0235	34112	305M0235AM	34247			2.35	0.0925		3.0		38		12.19		9.14
30509350	34113	30509350AM	34191		42		0.0935	1/8		1-1/2		0.480		0.36	
30509380	34114	30509380AM	34192	3/32			0.0938	1/8		1-1/2		0.480		0.36	

*Do not drill beyond specified flute length. Peck cycles may be utilized to achieve best tool performance.

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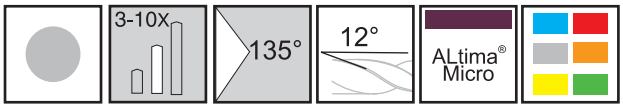
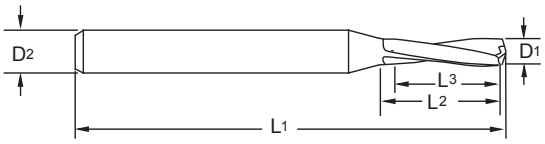
Series 305 Continued





Uncoated		ALtima® Micro		Diameter D1				Shank D2		OAL L1		Flute Length max.* L2		Drill Length L3 Ref.	
Tool No.	EDP	Tool No.	EDP	Inch	Letter/ Wire	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm
305M0240	34115	305M0240AM	34248			2.40	0.0945		3.0		38		12.19		9.14
30509600	34116	30509600AM	34193		41		0.0960	1/8		1-1/2		0.480		0.36	
305M0245	34117	305M0245AM	34249			2.45	0.0965		3.0		38		12.19		9.14
30509800	34118	30509800AM	34194		40		0.0980	1/8		1-1/2		0.480		0.36	
305M0250	34119	305M0250AM	34250			2.50	0.0984		3.0		38		12.19		9.14
30509950	34120	30509950AM	34195		39		0.0995	1/8		1-1/2		0.480		0.36	
305M0255	34121	305M0255AM	34251			2.55	0.1004		3.0		38		12.19		9.14
30510150	34122	30510150AM	34196		38		0.1015	1/8		1-1/2		0.480		0.36	
305M0260	34123	305M0260AM	34252			2.60	0.1024		3.0		38		12.19		9.14
30510400	34124	30510400AM	34197		37		0.1040	1/8		1-1/2		0.480		0.36	
305M0265	34125	305M0265AM	34253			2.65	0.1043		3.0		38		12.19		9.14
305M0270	34126	305M0270AM	34254			2.70	0.1063		3.0		38		12.19		9.14
30510650	34127	30510650AM	34198		36		0.1065	1/8		1-1/2		0.480		0.36	
305M0275	34128	305M0275AM	34255			2.75	0.1083		3.0		38		12.19		9.14
30510940	34129	30510940AM	34199	7/64			0.1094	1/8		1-1/2		0.480		0.36	
30511000	34130	30511000AM	34200		35		0.1100	1/8		1-1/2		0.480		0.36	
305M0280	34131	305M0280AM	34256			2.80	0.1102		3.0		38		12.19		9.14
30511100	34132	30511100AM	34201		34		0.1110	1/8		1-1/2		0.480		0.36	
305M0285	34133	305M0285AM	34257			2.85	0.1122		3.0		38		12.19		9.14
30511300	34134	30511300AM	34202		33		0.1130	1/8		1-1/2		0.480		0.36	
305M0290	34135	305M0290AM	34258			2.90	0.1142		3.0		38		12.19		9.14
30511600	34136	30511600AM	34203		32		0.1160	1/8		1-1/2		0.480		0.36	
305M0295	34137	305M0295AM	34259			2.95	0.1161		3.0		38		12.19		9.14
305M0300	34138	305M0300AM	34260			3.00	0.1181		3.0		38		12.19		9.14
30512000	34139	30512000AM	34204		31		0.1200	1/8		1-1/2		0.480		0.36	
30512500	34143	30512500AM	34205	1/8			0.1250	1/8		1-1/2		0.480		0.36	

*Do not drill beyond specified flute length. Peck cycles may be utilized to achieve best tool performance.

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High Performance Drill Selection Chart

Our industry leading high performance drill with the same high quality that helped set the standard.

Multipurpose high quality drill for most drilling applications adding stability, hole quality, tool life, and finish (excludes some work hardening materials).

An economical choice perfect for job shop and batch production work requiring a high performance drill option.

Series	Drill Lgth	Size Range Inch	Size Range mm	Margin	D1 Tol.	D2 Tol.	Helix	Point Angle	Coolant Fed	DIN	Coating	Application Recommendations							
												TEMA* Sizes	Steel	Hardened Steel	Stainless Steel	PH Stainless Steel	Cast Iron	Titanium	High Temp Alloys
CXDSS	3X	#31-3/4	3.0-20.0	Double	m7	h6	30°	140°	N	6537K	ALtima® Plus	X	1st	2nd	2nd	2nd	1st	2nd	2nd
CXDSR	5X	#31-5/8	3.0-16.0	Double	m7	h6	30°	140°	N	6537L	ALtima® Plus	X	1st	2nd	2nd	2nd	1st	2nd	2nd
CXDCS	3X	#31-5/8	3.0-16.0	Double	m7	h6	30°	140°	Y	6537K	ALtima® Plus	X	1st	2nd	1st	2nd	1st	1st	2nd
CXDCR	5X	#31-3/4	3.0-20.0	Double	m7	h6	30°	140°	Y	6537L	ALtima® Plus	X	1st	2nd	1st	2nd	1st	1st	2nd
CXDCL	8X	#31-5/8	3.0-16.0	Double	m7	h6	30°	140°	Y		ALtima® Plus	X	1st	2nd	1st	2nd	1st	1st	2nd
2XDSS	3X	#31-3/4	2.5-20.0	Single	h7	h6	30°	142°	N		ALtima®	X	2nd	1st	1st	1st	2nd	1st	1st
2XDSR	5X	1/64-5/8	0.5-16.0	Single	h7	h6	30°	142°	N		ALtima®	X	2nd	1st	1st	1st	2nd	1st	1st
2XDCS	3X	#31-5/8	3.0-16.0	Single	h7	h6	30°	142°	Y	6537K	ALtima®	X	2nd	1st	1st	1st	2nd	2nd	1st
2XDCR	5X	#31-3/4	3.0-20.0	Single	h7	h6	30°	142°	Y		ALtima®	X	2nd	1st	1st	1st	2nd	2nd	1st
2XDCL	7X+	#31-1/2	3.0-12.0	Single	h7	h6	30°	142°	Y		ALtima®	X	2nd	1st	1st	1st	2nd	2nd	1st
2XDCE	12X-25X**	1/4 - 1/2	5.0-12.0	Double	h7	h6	30°	142°	Y		ALtima®		2nd	1st	1st	1st	2nd	2nd	1st
HPDSR	5X	#31-5/8	3.0-16.0	Single	h7	h6	30°	140°	N	6537L	ALtima®		3rd	3rd	3rd	3rd	3rd	3rd	3rd
HPDCR	5X	#31-5/8	3.0-16.0	Single	h7	h6	30°	140°	Y	6537L	ALtima®		3rd	3rd	3rd	3rd	3rd	3rd	3rd

Note: For drilling applications involving cross holes and/or optimal hole finishes, use the CXD style drill.
*TEMA - Tubular Exchange Manufacturer's Association
**Length varies depending on size.

Inch	
D1	Tolerance (m7)
.0000 - .1181	+.00008/+.00047
.1182 - .2362	+.00016/+.00063
.2363 - .3937	+.00024/+.00083
.3938 - .7087	+.00027/+.00098
.7088 - .7500	+.00031/+.00114

Inch	
D1	Tolerance (h7)
.0000 - .1181	+0/-.00039
.1182 - .2362	+0/-.00047
.2363 - .3937	+0/-.00059
.3938 - .7087	+0/-.00071
.7088 - .7500	+0/-.00083

Inch	
D2	Tolerance (h6)
.0000 - .1181	+0/-.00024
.1182 - .2362	+0/-.00031
.2363 - .3937	+0/-.00035
.3938 - .7087	+0/-.00043
.7088 - .7500	+0/-.00051

Metric (mm)	
D1	Tolerance (m7)
0 - 3.0	+.002/+.012
3.01 - 6.0	+.004/+.016
6.01 - 10.0	+.006/+.021
10.01 - 18.0	+.007/+.025
18.01 - 20.0	+.008/+.029

Metric (mm)	
D1	Tolerance (h7)
0 - 3.0	+0/-.010
3.01 - 6.0	+0/-.012
6.01 - 10.0	+0/-.015
10.01 - 18.0	+0/-.018
18.01 - 20.0	+0/-.021

Metric (mm)	
D2	Tolerance (h6)
0 - 3.0	+0/-.006
3.01 - 6.0	+0/-.008
6.01 - 10.0	+0/-.009
10.01 - 18.0	+0/-.011
18.01 - 20.0	+0/-.013

M.A. Ford® Coating	Microhardness (HV)	Maximum Service Temp.	Friction Coefficient
ALtima®	3100	1100° C / 2012° F	0.42
ALtima® Plus	3200	1100° C / 2012° F	0.25

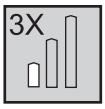
Technical data provided should be considered advisory only as variations may be necessary depending on the particular application.

For product information, call your local distributor.

Twister® Drill Icon Glossary


Solid


Coolant Fed



Drill Length

Drill Point Angle

Helix Angle

Coatings

DIN Specs

Workpiece Material Group

Steels

Stainless Steels

Cast Iron

Special Alloys

Hardened Steels (35-65Rc)

Non-Ferrous

Cutting Calculations and Definitions			Metric	U.S.
ae	=	Width of cut, radial depth of cut	(mm)	(inch)
ap	=	Depth of cut, axial depth of cut	(mm)	(inch)
Dc	=	Cutter diameter	(mm)	(inch)
f	=	Feed per revolution	(mm/rev)	(IPR)
fz	=	Feed per tooth	(mm/tooth)	(IPT)
zn	=	Number of teeth	Number	
n	=	RPM	(rev/min)	(rev/min)
Q	=	Metal removal rate	(cm^3/min)	(in^3/min)
vc	=	Cutting speed	(m/min)	(SFM)
vf	=	Feed speed	(mm/min)	(IPM)
Dw	=	Working diameter	(mm)	(inch)

Formulas

Inch
RPM (n) = SFM (vc) x 3.82/Tool Diam.
IPM (vf) = RPM (n) x IPR (f)

Conversion Inch to Metric
SFM (vc) to m/min (vc) = SFM (vc) x .3048
IPM (vf) to mm/min (vf) = IPM (vf) x 25.4

Metric
RPM (n) = m/min (vc) x 318.057/Tool Diam.
mm/min (vf) = RPM (n) x mm/Revolution (f).

Conversion Metric to Inch
m/min (vc) to SFM (vc) = (m/min)/.3048
mm/min (vf) to IPM (vf) = (mm/min)/25.4

Safety Note

Always wear the appropriate personal protective equipment such as safety glasses and protective clothing when using solid carbide or HSS cutting tools. Machines should be fully guarded.

Drill Troubleshooting

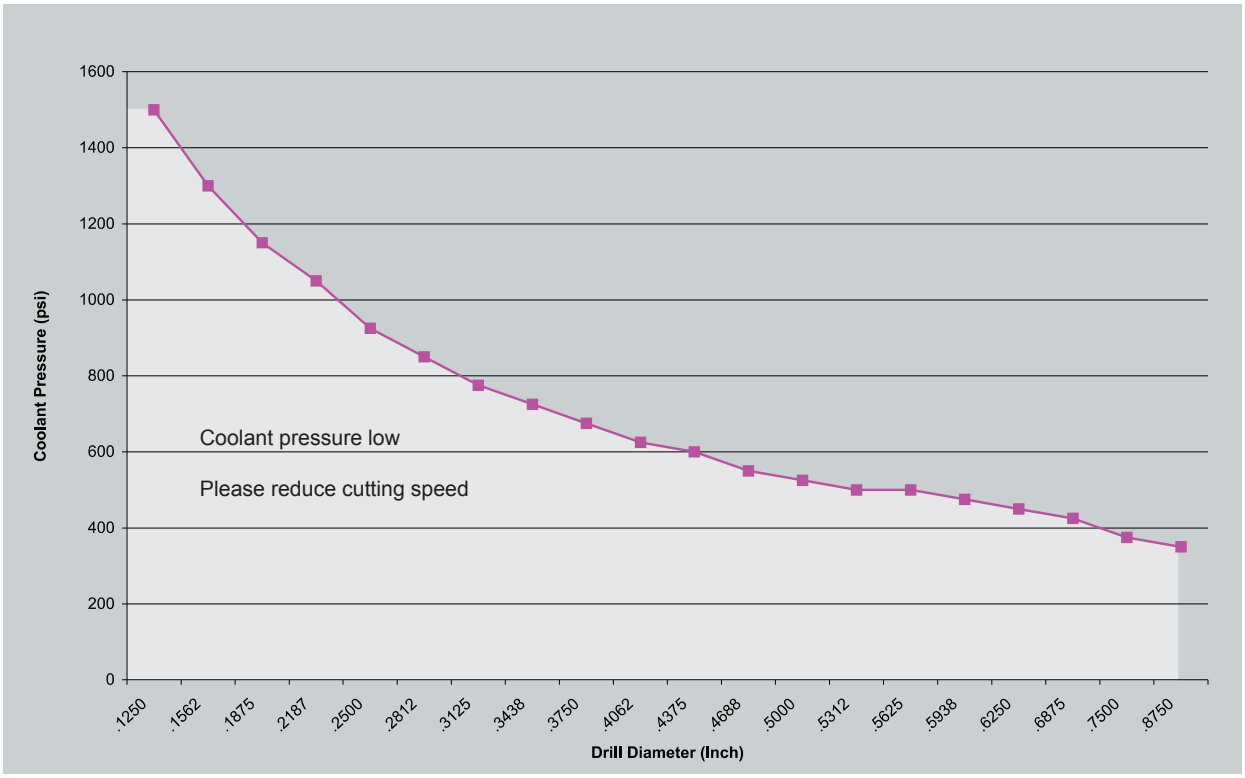
		Problem																												
		Tool Deterioration													Chip Formation			Tool Life	Workpiece								Process					
	Possible Solutions	Flank wear	Margin wear	Breakage	Flaking	Creater wear	Chisel edge wear	Corner chipping	Flute chipping	Cutting edge chipping	Cutting edge wear	Point center chipping	Rake face	Scoring on tool body	Long stringy	Varied chip form	Blue/brown chips	Tool Life	Undersized hole	Oversized hole	Poor alignment	Poor surface finish	Heavy burr breakout	Retract marks	Hole location	Hole straightness	Deflection	Point Deflection	Galling	Vibration	Abnormal noise	Chip packing	No drill penetration
Speed & Feed	Reduce feed or reduce at exit	x		x			x	x	x	x		x	x	x				x	x	x		x	x			x					x	
	Reduce feed at entrance			x															x			x			x		x					x	
	Consistent feed rate			x											x	x														x		x	
	Increase feed	x					x				x				x				x	x													
	Reduce speed	x	x			x		x			x							x	x										x		x	x	
	Increase speed																					x											
Coolant	Coolant mix		x	x	x					x				x				x	x			x	x								x	
	Coolant increase flow	x		x			x	x		x							x	x	x			x	x								x	
	Coolant filter	x		x	x					x								x	x			x	x								x	
Setup	Workpiece clamp rigid		x	x			x	x		x				x				x		x	x	x	x	x	x	x							x
	Collet accuracy			x						x										x					x	x				x			
	Tool holder fit .0008			x						x										x					x	x				x			
	Alignment			x						x										x													x
	Peck drill			x																													
	Concentricity		x	x	x			x	x					x							x	x		x	x	x		x		x			
	Do not extract tool during peck							x																									

Technical data provided should be considered advisory only as variations may be necessary depending on the particular application.

M.A. Ford® Phone: 800-553-8024 or 563-391-6220 • email: sales@maford.com • www.maford.com

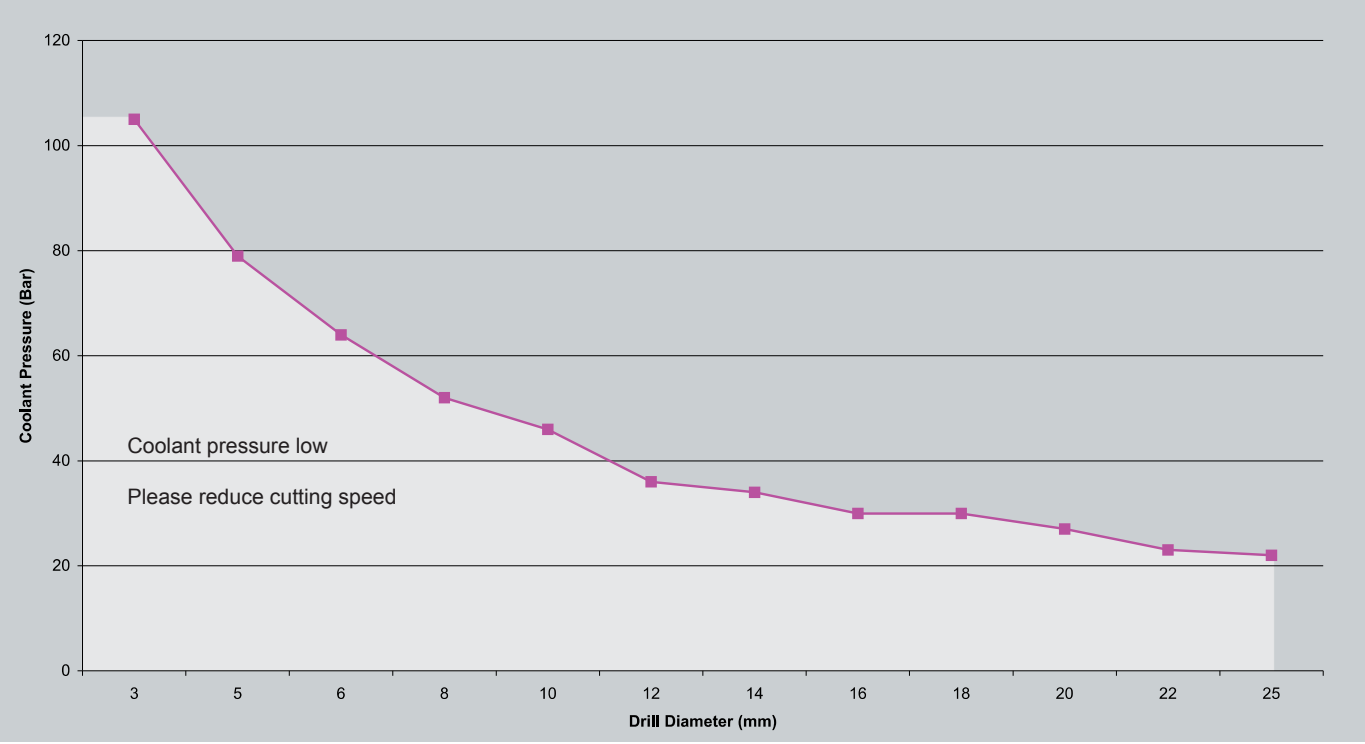
Coolant Pressure - Inch

Recommended Minimum Coolant Pressure



Coolant Pressure - Metric

Recommended Minimum Coolant Pressure



Technical data provided should be considered advisory only as variations may be necessary depending on the particular application.

For product information, call your local distributor.

cyclone

Recommended Cutting Data CXD ≤ 1/4 - Inch

For applications in aluminum, brass and copper alloys use CDA series cutting data on page 144.

Workpiece Material Group	ISO	Hardness	Tool Series	TYPE	DEPTH	Drill Diameter vc - SFM 1/8	5/32	3/16	1/4	Drill Diameter f - IPR 1/8	5/32	3/16	1/4
Free Machining & Low Carbon Steels 1006, 1008, 1015, 1018, 1020, 1022, 1025, 1117, 1140, 1141, 11L08, 11L14, 1213, 12L13, 12L14, 1215, 1330	P	up to 28 Rc	CXDSS		3	390	380	370	360	.003-.005	.004-.006	.005-.007	.0055-.0080
			CXDSR		5	390	380	370	360				
			CXDCS		3	660	650	640	630				
			CXDCR		5	660	650	640	630				
			CXDCL		8	595	580	560	540				
Medium Carbon & High Carbon Steels, Alloy Steels & Easy to Machine Tool Steels 1030, 1035, 1040, 1045, 1050, 1052, 1055, 1060, 1085, 1095, 1541, 1551, 9255, 2515, 3135, 3415, 4130, 4137, 4140, 4150, 4320, 4340, 4520, 5015, 5115, 5120, 5132, 5140, 5155, 6150, 8620, 9262, 9840, 52100, O1, O2, O6, S2, W1 to W310	P	28 to 38 Rc	CXDSS		3	330	320	310	300	.003-.005	.004-.006	.005-.007	.0055-.008
			CXDSR		5	330	320	310	300				
			CXDCS		3	575	550	540	500				
			CXDCR		5	575	550	540	500				
			CXDCL		8	430	420	410	400				
Tool Steels & Die Steels O7, M1, M2, M3, M4, M7, T1, T2, T4, T5, T8, T15, A2, A3, A6, A7, H10, H11, H12, H13, H19, H21, L3, L6, L7, P2, P20, S1, S5, S7, 52100, A128, D2, D3, D4, D5, D7	P	28 to 44 Rc	CXDSS		3	200	190	190	185	.0014-.0030	.0024-.0040	.003-.005	.0035-.006
			CXDSR		5	200	190	190	185				
			CXDCS		3	250	240	230	220				
			CXDCR		5	250	240	230	220				
			CXDCL		8	225	220	215	205				
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430	M	up to 28 Rc	CXDSS		3	350	340	330	320	.003-.005	.004-.006	.005-.007	.0055-.008
			CXDSR		5	350	340	330	320				
			CXDCS		3	550	500	475	450				
			CXDCR		5	550	500	475	450				
			CXDCL		8	450	425	400	380				
Stainless Steel - Moderately Difficult 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	up to 28 Rc	CXDSS		3	140	135	130	125	.003-.005	.004-.006	.005-.007	.0055-.008
			CXDSR		5	140	135	130	125				
			CXDCS		3	300	290	280	270				
			CXDCR		5	300	290	280	270				
			CXDCL		8	280	270	260	250				
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	M	over 28 Rc	CXDSS		3	140	130	120	110	.0020-.0033	.0024-.0035	.0030-.0043	.0031-.005
			CXDSR		5	140	130	120	110				
			CXDCS		3	265	250	240	230	.0020-.0033	.0024-.0035	.0030-.0042	.0031-.005
			CXDCR		5	265	250	240	230				
			CXDCL		8	190	180	170	160				
High Temp Alloys Nimonics, Inconel, Monel, Hastelloy	S	up to 42 Rc	CXDSS		3	85	80	75	70	.0014-.0033	.0016-.0035	.002-.004	.0023-.0043
			CXDSR		5	85	80	75	70				
			CXDCS		3	115	100	95	90				
			CXDCR		5	115	100	95	90				
			CXDCL		8	100	100	95	95				
Titanium Alloys 6Al-4V, 5Al-2.5 Sn, 6Al-2 Sn-4Zr-6Mo, 3Al-8V-6Cr4Mo-4Zr, 10V-2Fe-3Al, 13V-11Cr-3Al	S		CXDSS		3	130	125	120	115	.003-.004	.004-.006	.005-.007	.0055-.008
			CXDSR		5	130	125	120	115				
			CXDCS		3	230	220	210	200				
			CXDCR		5	230	220	210	200				
			CXDCL		8	210	190	180	170				
Cast Iron Gray CG, ASTM A48, CLASS 20, 25, 30, 35, SAE J431C, GRADES G1800, G3000, G3500, GG 10, 15, 20, 25, 30, 35, 40	K	up to 240 HB	CXDSS		3	480	470	460	430	.003-.005	.004-.006	.005-.007	.0055-.008
			CXDSR		5	480	470	460	430				
			CXDCS		3	660	640	620	600				
			CXDCR		5	660	640	620	600				
			CXDCL		8	500	490	480	470				
Cast Iron - Ductile & Malleable CGI 60-40-18, 65-45-12, D4018, D4512, D5506, 32510, 35108, M3210, M4504, M5503, 250, 300, 350,400,450	K	over 240 HB	CXDSS		3	280	270	260	250				
			CXDSR		5	280	270	260	250				
			CXDCS		3	400	480	460	440				
			CXDCR		5	400	480	460	440				
			CXDCL		8	350	340	330	320				

Technical data provided should be considered advisory only as variations may be necessary depending on the particular application.

Recommended Cutting Data CXD ≥ 5/16 - Inch

For applications in aluminum, brass and copper alloys use CDA series cutting data on page 144.

Workpiece Material Group	ISO	Hardness	Tool Series	TYPE	DEPTH	Drill Diameter vc - SFM						Drill Diameter f - IPR					
						5/16	3/8	1/2	9/16	5/8	3/4	5/16	3/8	1/2	9/16	5/8	3/4
Free Machining & Low Carbon Steels 1006, 1008, 1015, 1018, 1020, 1022, 1025, 1117, 1140, 1141, 11L08, 11L14, 1213, 12L13, 12L14, 1215, 1330	P	up to 28 Rc	CXDSS		3	350	340	320	300	275	265	.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015
			CXDSR		5	350	340	320	300	275							
			CXDCS		3	620	600	575	550	525		.006-.009	.007-.010	.009-.011	.009-.014	.010-.014	.011-.015
			CXDCR		5	620	600	575	550	525	500						
			CXDCL		8	520	500	480	460	440							
Medium Carbon & High Carbon Steels, Alloy Steels & Easy to Machine Tool Steels 1030, 1035, 1040, 1045, 1050, 1052, 1055, 1060, 1085, 1095, 1541, 1551, 9255, 2515, 3135, 3415, 4130, 4137,4140, 4150, 4320, 4340, 4520, 5015, 5115, 5120, 5132,5140, 5155, 6150, 8620, 9262, 9840, 52100, O1, O2, O6, S2, W1 to W310	P	28 to 38 Rc	CXDSS		3	290	280	270	265	260	260	.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015
			CXDSR		5	290	280	270	265	260							
			CXDCS		3	475	450	425	400	325		.006-.009	.007-.010	.009-.011	.009-.014	.010-.014	.011-.015
			CXDCR		5	475	450	425	400	325	315						
			CXDCL		8	375	350	325	305	250							
Tool Steels & Die Steels O7, M1, M2, M3, M4, M7, T1, T2, T4, T5, T8, T15, A2, A3, A6, A7, H10, H11, H12, H13, H19, H21, L3, L6, L7, P2, P20, S1, S5, S7, 52100, A128, D2, D3, D4, D5, D7	P	28 to 44 Rc	CXDSS		3	185	180	180	175	175	170	.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015
			CXDSR		5	185	180	180	175	175							
			CXDCS		3	210	210	200	200	190		.006-.009	.007-.010	.009-.011	.009-.014	.010-.014	.011-.015
			CXDCR		5	210	210	200	200	190	190						
			CXDCL		8	200	190	190	190	180							
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430	M	up to 28 Rc	CXDSS		3	310	300	275	250	225	200	.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015
			CXDSR		5	310	300	275	250	225							
			CXDCS		3	400	390	380	370	330		.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015
			CXDCR		5	400	390	380	370	330	320						
			CXDCL		8	375	370	350	340	300							
Stainless Steel - Moderately Difficult 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	up to 28 Rc	CXDSS		3	120	115	110	105	100	95	.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015
			CXDSR		5	120	115	110	105	100							
			CXDCS		3	260	250	240	240	230		.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015
			CXDCR		5	260	250	240	240	230	220						
			CXDCL		8	240	230	220	220	210							
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	M	over 28 Rc	CXDSS		3	110	105	105	100	100	95	.003-.006	.005-.009	.007-.009	.008-.010	.009-.011	.009-.013
			CXDSR		5	110	105	105	100	100							
			CXDCS		3	220	200	190	180	170		.003-.006	.005-.009	.007-.009	.008-.010	.009-.011	.009-.013
			CXDCR		5	220	200	190	180	170	155						
			CXDCL		8	150	140	130	125	120							
High Temp Alloys Nimonics, Inconel, Monel, Hastelloy	S	up to 42 Rc	CXDSS		3	65	60	55	50	45	40	.003-.005	.004-.006	.005-.007	.005-.008	.006-.008	.009-.010
			CXDSR		5	65	60	55	50	45							
			CXDCS		3	85	85	80	80	75		.003-.005	.004-.006	.005-.007	.005-.008	.006-.008	.009-.010
			CXDCR		5	85	85	80	80	75	75						
			CXDCL		8	80	80	75	75	70							
Titanium Alloys 6Al-4V, 5Al-2.5 Sn, 6Al-2 Sn-4Zr-6Mo, 3Al-8V-6Cr4Mo-4Zr, 10V-2Fe-3Al, 13V-11Cr-3Al	S	up to 42 Rc	CXDSS		3	110	105	100	100	90	90	.006-.009	.007-.010	.008-.011	.008-.010	.010-.014	.011-.015
			CXDSR		5	110	105	100	100	90							
			CXDCS		3	190	180	170	160	150		.006-.009	.007-.010	.008-.011	.008-.010	.010-.014	.011-.015
			CXDCR		5	190	180	170	160	150	150						
			CXDCL		8	160	150	140	130	125							
Cast Iron - Gray CG, ASTM A48, CLASS 20, 25, 30, 35, SAE J431C, GRADES G1800, G3000, G3500, GG 10, 15, 20, 25, 30, 35, 40	K	up to 240 HB	CXDSS		3	410	400	390	370	360	350	.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015
			CXDSR		5	410	400	390	370	360							
			CXDCS		3	580	560	550	550	525		.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015
			CXDCR		5	580	560	550	550	525	500						
			CXDCL		8	460	450	440	440	420							
Cast Iron - Ductile & Malleable CGI 60-40-18, 65-45-12, D4018, D4512, D5506, 32510, 35108, M3210, M4504, M5503, 250, 300, 350, 400, 450	K	over 240 HB	CXDSS		3	240	230	220	210	200	190	.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015
			CXDSR		5	240	230	220	210	200							
			CXDCS		3	400	375	350	300	275		.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015
			CXDCR		5	400	375	350	300	275	250						
			CXDCL		8	300	270	250	220	200							

Technical data provided should be considered advisory only as variations may be necessary depending on the particular application.

Recommended Cutting Data CXD ≤ 6mm - Metric

For applications in aluminum, brass and copper alloys, use CDA series cutting data on page 145.

Workpiece Material Group	ISO	Hardness	Tool Series	TYPE	DEPTH	Drill Diameter (mm) vc - m/min 3	4	5	6	Drill Diameter (mm) f - mm/Rev 3	4	5	6
Free Machining & Low Carbon Steels 1006, 1008, 1015, 1018, 1020, 1022, 1025, 1117, 1140, 1141, 11L08, 11L14, 1213, 12L13, 12L14, 1215, 1330	P	up to 28 Rc	CXDSS		3	119	116	113	110	.076-.127	.102-.152	.127-.178	.127-.203
			CXDSR		5	119	116	113	110				
			CXDCS		3	201	198	195	192	.076-.127	.102-.152	.127-.178	.127-.203
			CXDCR		5	201	198	195	192				
			CXDCL		8	181	177	171	165				
Medium Carbon & High Carbon Steels, Alloy Steels & Easy to Machine Tool Steels 1030, 1035, 1040, 1045, 1050, 1052, 1055, 1060, 1085, 1095, 1541, 1551, 9255, 2515, 3135, 3415, 4130, 4137, 4140, 4150, 4320, 4340, 4520, 5015, 5115, 5120, 5132, 5140, 5155, 6150, 8620, 9262, 9840, 52100, O1, O2, O6, S2, W1 to W310	P	28 to 38 Rc	CXDSS		3	101	98	94	91	.076-.127	.102-.152	.127-.178	.127-.203
			CXDSR		5	101	98	94	91				
			CXDCS		3	175	168	165	152	.076-.127	.102-.152	.127-.178	.127-.203
			CXDCR		5	175	168	165	152				
			CXDCL		8	131	128	125	122				
Tool Steels & Die Steels O7, M1, M2, M3, M4, M7, T1, T2, T4, T5, T8, T15, A2, A3, A6, A7, H10, H11, H12, H13, H19, H21, L3, L6, L7, P2, P20, S1, S5, S7, 52100, A128, D2, D3, D4, D5, D7	P	28 to 44 Rc	CXDSS		3	61	58	58	56	.036-.076	.061-.102	.076-.127	.089-.152
			CXDSR		5	61	58	58	56				
			CXDCS		3	76	73	70	67	.036-.076	.061-.102	.076-.127	.089-.152
			CXDCR		5	76	73	70	67				
			CXDCL		8	69	67	66	62				
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430	M	up to 28 Rc	CXDSS		3	107	104	101	98	.076-.127	.102-.152	.127-.178	.127-.203
			CXDSR		5	107	104	101	98				
			CXDCS		3	168	152	145	137	.076-.127	.102-.152	.127-.178	.127-.203
			CXDCR		5	168	152	145	137				
			CXDCL		8	137	130	122	116				
Stainless Steel - Moderately Difficult 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	up to 28 Rc	CXDSS		3	43	41	40	38	.076-.127	.102-.152	.127-.178	.127-.203
			CXDSR		5	43	41	40	38				
			CXDCS		3	91	88	85	82	.076-.127	.102-.152	.127-.178	.127-.203
			CXDCR		5	91	88	85	82				
			CXDCL		8	85	82	79	76				
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	M	over 28 Rc	CXDSS		3	43	40	37	34	.051-.076	.061-.089	.089-.102	.076-.127
			CXDSR		5	43	40	37	34				
			CXDCS		3	81	76	73	70	.051-.076	.061-.089	.089-.102	.076-.127
			CXDCR		5	81	76	73	70				
			CXDCL		8	58	55	52	49				
High Temp Alloys Nimonics, Inconel, Monel, Hastelloy	S	up to 42 Rc	CXDSS		3	26	24	23	21	.036-.089	.036-.089	.051-.102	.061-.127
			CXDSR		5	26	24	23	21				
			CXDCS		3	35	30	29	27	.036-.089	.036-.089	.051-.102	.061-.127
			CXDCR		5	35	30	29	27				
			CXDCL		8	30	30	29	29				
Titanium Alloys 6Al-4V, 5Al-2.5 Sn, 6Al-2 Sn-4Zr-6Mo, 3Al-8V-6Cr4Mo-4Zr, 10V-2Fe-3Al, 13V-11Cr-3Al	S	up to 42 Rc	CXDSS		3	40	38	37	35	.076-.102	.102-.152	.127-.178	.140-.229
			CXDSR		5	40	38	37	35				
			CXDCS		3	70	67	64	61	.076-.102	.102-.152	.127-.178	.140-.229
			CXDCR		5	70	67	64	61				
			CXDCL		8	64	58	55	52				
Cast Iron Gray CG, ASTM A48, CLASS 20, 25, 30, 35, SAE J431C, GRADES G1800, G3000, G3500, GG 10, 15, 20, 25, 30, 35, 40	K	up to 240 HB	CXDSS		3	146	143	140	131	.076-.127	.102-.152	.127-.178	.127-.203
			CXDSR		5	146	143	140	131				
			CXDCS		3	201	195	189	183	.076-.127	.102-.152	.127-.178	.127-.203
			CXDCR		5	201	195	189	183				
			CXDCL		8	152	149	146	143				
Cast Iron - Ductile & Malleable CGI 60-40-18, 65-45-12, D4018, D4512, D5506, 32510, 35108, M3210, M4504, M5503, 250, 300, 350, 400, 450	K	over 240 HB	CXDSS		3	85	82	79	76	.076-.127	.102-.152	.127-.178	.127-.203
			CXDSR		5	85	82	79	76				
			CXDCS		3	122	146	140	134	.076-.127	.102-.152	.127-.178	.127-.203
			CXDCR		5	122	146	140	134				
			CXDCL		8	107	104	101	98				

Technical data provided should be considered advisory only as variations may be necessary depending on the particular application.

Recommended Cutting Data CXD ≥ 8mm - Metric

For applications in aluminum, brass and copper alloys, use CDA series cutting data on page 145.

Workpiece Material Group	ISO	Hardness	Tool Series	TYPE	DEPTH	Drill Diameter (mm) vc - m/min							Drill Diameter (mm) f - mm/Rev						
						8	10	12	14	16	18	20	8	10	12	14	16	18	20
Free Machining & Low Carbon Steels 1006, 1008, 1015, 1018, 1020, 1022, 1025, 1117, 1140,1141, 11L08, 11L14, 1213, 12L13, 12L14, 1215, 1330	P	up to 28 Rc	CXDSS		3	107	104	98	91	84	81	77	.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			CXDSR		5	107	104	98	91	84	81								
			CXDCS		3	189	183	175	168	160	152		.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			CXDCR		5	189	183	175	168	160	152	145							
			CXDCL		8	158	152	146	140	134									
Medium Carbon & High Carbon Steels, Alloy Steels & Easy to Machine Tool Steels 1030, 1035, 1040, 1045, 1050, 1052, 1055, 1060, 1085, 1095, 1541, 1551, 9255, 2515, 3135, 3415, 4130, 4137,4140, 4150, 4320, 4340, 4520, 5015, 5115, 5120, 5132,5140, 5155, 6150, 8620, 9262, 9840, 52100, O1, O2, O6, S2,W1 to W310	P	28 to 38 Rc	CXDSS		3	88	85	82	81	79	79	75	.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			CXDSR		5	88	85	82	81	79	79								
			CXDCS		3	145	137	130	122	99	96		.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			CXDCR		5	145	137	130	122	99	96	92							
			CXDCL		8	114	107	99	93	76									
Tool Steels & Die Steels O7, M1, M2, M3, M4, M7, T1, T2, T4, T5, T8, T15, A2, A3, A6, A7, H10, H11, H12, H13, H19, H21, L3, L6, L7, P2, P20, S1, S5, S7, 52100, A128, D2, D3, D4, D5, D7	P	28 to 44 Rc	CXDSS		3	56	55	55	53	53	52	49	.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			CXDSR		5	56	55	55	53	53	52								
			CXDCS		3	64	64	61	61	58	58		.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			CXDCR		5	64	64	61	61	58	58	55							
			CXDCL		8	61	58	58	58	55									
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430	M	up to 28 Rc	CXDSS		3	94	91	84	76	69	61	55	.16-.24	.18-.27	.21-.31	.22-.35	.25-.36	.28-.38	.30-.37
			CXDSR		5	94	91	84	76	69	61								
			CXDCS		3	122	119	116	113	101	98		.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			CXDCR		5	122	119	116	113	101	98	94							
			CXDCL		8	114	113	107	104	91									
Stainless Steel - Moderately Difficult 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	up to 28 Rc	CXDSS		3	37	35	34	32	30	29	28	.16-.24	.18-.27	.21-.31	.22-.35	.25-.36	.28-.38	.30-.37
			CXDSR		5	37	35	34	32	30	29								
			CXDCS		3	79	76	73	73	70	67		.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			CXDCR		5	79	76	73	73	70	67	64							
			CXDCL		8	73	70	67	67	64									
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	M	over 28 Rc	CXDSS		3	34	32	32	30	30	29	27	.11-.15	.13-.23	.18-.25	.21-.27	.22-.31	.25-.33	.30-.37
			CXDSR		5	34	32	32	30	30	29								
			CXDCS		3	67	61	58	55	52	47		.11-.15	.13-.23	.18-.25	.21-.27	.22-.31	.25-.33	.30-.37
			CXDCR		5	67	61	58	55	52	47	45							
			CXDCL		8	46	43	40	38	36									
High Temp Alloys Nimonics, Inconel, Monel, Hastelloy	S	up to 42 Rc	CXDSS		3	20	18	17	15	14	12	11	.08-.13	.11-.15	.12-.17	.14-.19	.16-.21	.18-.25	.17-.24
			CXDSR		5	20	18	17	15	14	12								
			CXDCS		3	26	26	24	24	23	23		.09-.13	.11-.15	.12-.17	.14-.19	.16-.21	.18-.25	.17-.24
			CXDCR		5	26	26	24	24	23	23	22							
			CXDCL		8	24	24	23	23	21									
Titanium Alloys 6Al-4V, 5Al-2.5 Sn, 6Al-2 Sn-4Zr-6Mo, 3Al-8V-6Cr4Mo-4Zr, 10V-2Fe-3Al, 13V-11Cr-3Al	S	up to 42 Rc	CXDSS		3	34	32	30	30	27	27	25	.16-.24	.18-.27	.21-.31	.22-.35	.25-.36	.28-.38	.30-.37
			CXDSR		5	34	32	30	30	27	27								
			CXDCS		3	55	55	52	49	46	46		.16-.24	.18-.27	.21-.31	.22-.35	.25-.36	.28-.38	.30-.37
			CXDCR		5	55	55	52	49	46	46	44							
			CXDCL		8	49	46	43	40	38									
Cast Iron - Gray CG, ASTM A48, CLASS 20, 25, 30, 35, SAE J431C, GRADES G1800, G3000, G3500, GG 10, 15, 20, 25, 30, 35, 40	K	up to 240 HB	CXDSS		3	125	122	119	113	110	107	102	.16-.24	.18-.27	.21-.31	.22-.35	.25-.36	.28-.38	.30-.37
			CXDSR		5	125	122	119	113	110	107								
			CXDCS		3	177	171	168	168	160	152		.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			CXCDR		5	177	171	168	168	160	152	145							
			CXDCL		8	140	137	134	134	128									
Cast Iron - Ductile & Malleable CGI 60-40-18, 65-45-12, D4018, D4512, D5506, 32510, 35108, M3210, M4504, M5503, 250, 300, 350, 400, 450	K	over 240 HB	CXDSS		3	73	70	67	64	61	58	55	.16-.24	.18-.27	.21-.31	.22-.35	.25-.36	.28-.38	.30-.37
			CXDSR		5	73	70	67	64	61	58								
			CXDCS		3	122	114	107	91	84	76		.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			CXDCR		5	122	114	107	91	84	76	72							
			CXDCL		8	91	82	76	67	61									

Technical data provided should be considered advisory only as variations may be necessary depending on the particular application.

For product information, call your local distributor.

Recommended Cutting Data CDACR - Inch

Workpiece Material Group	ISO		Hardness	vc - SFM			Drill Diameter					
				Min	Starting Value	Max	1/8	3/16	1/4	5/16	3/8	1/2
							f - IPR					
Aluminum & Aluminum Wrought Alloys	N	10	60-100 Brinell HB	390	**750**	1480	.005–.010	.006–.011	.007–.014	.008–.017	.011–.020	.013–.022
Cast Aluminum Alloys		20	75-90 Brinell HB	390	**720**	1150	.006–.009	.006–.011	.007–.013	.009–.015	.011–.018	.013–.021
Aluminum Alloys Cast 13-22% Si		30		330	**590**	1310	.005–.007	.006–.007	.006–.010	.008–.012	.011–.015	.013–.017
Copper and Copper Alloys, Brass, Bronze, Copper		40	90-110 Brinell HB	330	**430**	980	.004–.006	.005–.007	.006–.009	.006–.011	.007–.013	.008–.014

Definition

This group contains non-ferrous, soft metals with hardness under 130 HB, except for high strength bronzes (>225HB)
Aluminum (Al) alloys comprising less than 12-13% silicon (Si) represent the largest part
MMC: Metal Matrix Composite: Al + SiC (20-30%)
Magnesium based alloys
Copper, electrolytic copper with 99.95% Cu
Bronze: Copper with Tin (Sn) (10-14%) and/or aluminum (3-10%)
Brass: Copper (60-85%) with Zinc (Zn) (40-15%)

Machinability of Aluminum

Long-chipping material
Relatively easy chip control, if alloyed
Pure Al is sticky and requires sharp cutting edges and high cutting speeds (Vc), consider Fordlube coating.
Specific cutting force: 350–700 N/mm²
Cutting forces, and thus the power required to machine them, are low.
For Cast Aluminum with Si-content above 13%, consider CERAedge® coating.
Over eutectic Al with higher Si-content > 12% is very abrasive, consider an engineered custom tool solution with GemX coating or PCD diamond tipped.

Common components

Engine block, cylinder head, transmission housings, casings, aerospace frame components.

Made in USA

Recommended Cutting Data CDACR - Metric

Workpiece Material Group	ISO		Hardness	vc - m/min			Drill Diameter (mm)					
				Min	Starting Value	Max	3.0	4.0	6.0	8.0	10.0	12.0
							f - mm/Rev					
Aluminum & Aluminum Wrought Alloys	N	10	60-100 Brinell HB	120	**230**	450	0.13–0.25	0.14–0.29	0.17–0.35	0.21–0.42	0.27–0.50	0.33–0.57
Cast Aluminum Alloys	N	20	75-90 Brinell HB	120	**220**	350	0.14–0.23	0.15–0.28	0.17–0.34	0.22–0.39	0.29–0.46	0.34–0.54
Aluminum Alloys Cast 13-22% Si	N	30		100	**180**	400	0.13–0.18	0.14–0.19	0.16–0.25	0.20–0.30	0.28–0.37	0.33–0.42
Copper and Copper Alloys, Brass, Bronze, Copper	N	40	90-110 Brinell HB	100	**130**	300	0.10–0.16	0.12–0.18	0.14–0.24	0.16–0.28	0.18–0.32	0.20–0.36

Definition

This group contains non-ferrous, soft metals with hardness under 130 HB, except for high strength bronzes (>225HB)
Aluminum (Al) alloys comprising less than 12-13% silicon (Si) represent the largest part
MMC: Metal Matrix Composite: Al + SiC (20-30%)
Magnesium based alloys
Copper, electrolytic copper with 99.95% Cu
Bronze: Copper with Tin (Sn) (10-14%) and/or aluminum (3-10%)
Brass: Copper (60-85%) with Zinc (Zn) (40-15%)

Machinability of Aluminum

Long-chipping material
Relatively easy chip control, if alloyed
Pure Al is sticky and requires sharp cutting edges and high cutting speeds (Vc), consider Fordlube coating.
Specific cutting force: 350–700 N/mm²
Cutting forces, and thus the power required to machine them, are low.
For Cast Aluminum with Si-content above 13%, consider CERAedge® coating.
Over eutectic Al with higher Si-content > 12% is very abrasive, consider an engineered custom tool solution with GemX coating or PCD diamond tipped.

Common components

Engine block, cylinder head, transmission housings, casings, aerospace frame components.

Twister® Micro XD

Recommended Cutting Data MPDCS / MXDSR / MXDCR / MXDCL Series - Inch

Workpiece Material Group	ISO	Hardness	Tool Series	TYPE	DEPTH	vc-SFM	Drill Diameter (mm) 0.5	1.0	1.5	2.0	2.5	2.95
							f - IPR					
Free Machining & Low Carbon Steels 1006, 1008, 1015, 1018, 1020, 1022, 1025, 1117, 1140, 1141, 11L08, 11L14, 1213, 12L13, 12L14, 1215, 1330	P	up to 28 Rc	MXDSR		5	150	.0005	.0010	.0015	.0020	.0025	.0030
			MPDCS		2	300	—	.0010	.0015	.0020	.0025	.0030
			MXDCR		5							
			MXDCL		12	260		.0007	.0010	.0013	.0017	.0020
Medium Carbon & High Carbon Steels, Alloy Steels & Easy to Machine Tool Steels 1030, 1035, 1040, 1045, 1050, 1052, 1055, 1060, 1085, 1095, 1541, 1551, 9255, 2515, 3135, 3415, 4130, 4137, 4140, 4150, 4320, 4340, 4520, 5015, 5115, 5120, 5132, 5140, 5155, 6150, 8620, 9262, 9840, 52100, O1, O2, O6, S2, W1 to W310	P	28 to 38 Rc	MXDSR		5	130	.0005	.0010	.0015	.0020	.0025	.0030
			MPDCS		2	300	—	.0010	.0015	.0020	.0025	.0030
			MXDCR		5							
			MXDCL		12	260		.0007	.0010	.0013	.0017	.0020
Tool Steels & Die Steels O7, M1, M2, M3, M4, M7, T1, T2, T4, T5, T8, T15, A2, A3, A6, A7, H10, H11, H12, H13, H19, H21, L3, L6, L7, P2, P20, S1, S5, S7, 52100, A128, D2, D3, D4, D5, D7	P	28 to 44 Rc	MXDSR		5	120	.0005	.0010	.0015	.0020	.0025	.0030
			MPDCS		2	250	—	.0010	.0015	.0020	.0025	.0030
			MXDCR		5							
			MXDCL		12	230		.0007	.0010	.0013	.0017	.0020
Hardened Steels A2 / 52100	H	45 to 55 Rc	MXDSR		5	50	.0002	.0004	.0007	.0009	.0011	.0014
			MPDCS		2	80	—	.0004	.0007	.0009	.0011	.0014
			MXDCR		5							
			MXDCL		12			.0002	.0004	.0006	.0008	.0010
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430	M	up to 28 Rc	MXDSR		5	140	.0005	.0010	.0015	.0020	.0025	.0030
			MPDCS		2	300	—	.0010	.0015	.0020	.0025	.0030
			MXDCR		5							
			MXDCL		12	260		.0007	.0010	.0013	.0017	.0020
Stainless Steel - Moderately Difficult 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	up to 28 Rc	MXDSR		5	125	.0005	.0010	.0015	.0020	.0025	.0030
			MPDCS		2	230	—	.0008	.0012	.0016	.0020	.0023
			MXDCR		5							
			MXDCL		12			.0007	.0010	.0013	.0017	.0020
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	M	over 28 Rc	MXDSR		5	60	.0002	.0004	.0007	.0009	.0011	.0014
			MPDCS		2	80	—	.0004	.0007	.0009	.0011	.0014
			MXDCR		5							
			MXDCL		12			.0002	.0004	.0006	.0008	.0010

Technical data provided should be considered advisory only as variations may be necessary depending on the particular application.

Twister® Micro XD

Recommended Cutting Data MPDCS / MXDSR / MXDCR / MXDCL Series - Inch (*continued*)

Workpiece Material Group	ISO	Hardness	Tool Series	TYPE	DEPTH	vc-SFM	Drill Diameter (mm)					
							0.5	1.0	1.5	2.0	2.5	2.95
							f - IPR					
Cast Iron - Gray CG, ASTM A48, CLASS 20, 25, 30, 35, SAE J431C, GRADES G1800, G3000, G3500, GG 10, 15, 20, 25, 30, 35, 40	K	up to 240 HB	MXDSR		5	150	.0005	.0010	.0015	.0020	.0025	.0030
			MPDCS		2	325	—	.0010	.0015	.0020	.0025	.0030
			MXDCR		5							
			MXDCL		12							
Cast Iron - Ductile & Malleable CGI: 60-40-18, 65-45-12, D4018, D4512, D5506, 32510, 35108, M3210, M4504, M5503, 250, 300, 350, 400, 450	K	over 240 HB	MXDSR		5	150	.0005	.0010	.0015	.0020	.0025	.0030
			MPDCS		2	250	—	.0010	.0015	.0020	.0025	.0030
			MXDCR		5							
			MXDCL		12							
Titanium 6Al-4V	S	up to 40 Rc	MXDSR		5	70	.0005	.0010	.0015	.0020	.0025	.0030
			MPDCS		2	230	—	.0004	.0006	.0008	.0010	.0012
			MXDCR		5							
			MXDCL		12							
High Temp Alloys Inconel / Hastelloy / Waspeloy / Nickel Based Alloys - Monel	S	up to 40 Rc	MXDSR		5	60	.0002	.0004	.0007	.0009	.0011	.0014
			MPDCS		2	155	—	.0004	.0006	.0008	.0010	.0012
			MXDCR		5							
			MXDCL		12							

Recommended Peck Depths for MXDSR (Solid) Drilling

Diameter	Peck Depth
0.50 mm	.2 x Diameter
1.00 mm	.3 x Diameter
1.50 mm	.6 x Diameter
2.00 mm	.8 x Diameter
2.50 mm	1.0 x Diameter
2.95 mm	3.0 x Diameter

*Peck depths can vary by material type.

Recommended Machine Requirements

High Pressure Pump System (1,000 psi / 68.9 bar)
Coolant filtration of 10 microns or better
Total runout of .0004" (.01 mm) Max. at drill tip

For best MXDCL performance, the following steps are recommended:

- When Drilling with the MXDCL, drill a pilot hole 1.5 - 2 x diameter deep using a MPDCS drill.
- Insert MXDCL into pilot hole at a low speed (300-500 RPM) stopping short of the pilot hole bottom.
- Start coolant flow and increase speed to recommended RPM.
- Feed to full depth. (Pecking may be required for standard coolant pressure. Follow the MXDSR peck depth chart. To prevent drill whip and corner damage, do not retract all the way out of hole while pecking.)
- After reaching desired depth, reduce speed (300-500 RPM) before retracting from the hole at a feed of 2-4 times the drilling feed.

Note: Under optimal conditions (high pressure coolant), one shot drilling may be accomplished with the MXDCL.

Twister® Micro XD

Recommended Cutting Data MPDCS / MXDSR / MXDCR / MXDCL Series - Metric

Workpiece Material Group	ISO	Hardness	Tool Series	TYPE	DEPTH	vc- m/min.	Drill Diameter (mm)					
							0.5	1.0	1.5	2.0	2.5	2.95
							f - mm/Rev					
Free Machining & Low Carbon Steels 1006, 1008, 1015, 1018, 1020, 1022, 1025, 1117, 1140, 1141, 11L08, 11L14, 1213, 12L13, 12L14, 1215, 1330	P	up to 28 Rc	MXDSR		5	45	.013	.025	.038	.051	.064	.076
			MPDCS		2	90	—	.025	.038	.051	.064	.076
			MXDCR		5							
			MXDCL		12	80		.017	.026	.034	.043	.050
Medium Carbon & High Carbon Steels, Alloy Steels & Easy to Machine Tool Steels 1030, 1035, 1040, 1045, 1050, 1052, 1055, 1060, 1085, 1095, 1541, 1551, 9255, 2515, 3135, 3415, 4130, 4137, 4140, 4150, 4320, 4340, 4520, 5015, 5115, 5120, 5132, 5140, 5155, 6150, 8620, 9262, 9840, 52100, O1, O2, O6, S2, W1 to W310	P	28 to 38 Rc	MXDSR		5	40	.013	.025	.038	.051	.064	.076
			MPDCS		2	90	—	.025	.038	.051	.064	.076
			MXDCR		5							
			MXDCL		12	80		.017	.026	.034	.043	.050
Tool Steels & Die Steels O7, M1, M2, M3, M4, M7, T1, T2, T4, T5, T8, T15, A2, A3, A6, A7, H10, H11, H12, H13, H19, H21, L3, L6, L7, P2, P20, S1, S5, S7, 52100, A128, D2, D3, D4, D5, D7	P	28 to 44 Rc	MXDSR		5	35	.013	.025	.038	.051	.064	.076
			MPDCS		2	75	—	.025	.038	.051	.064	.076
			MXDCR		5							
			MXDCL		12	70		.017	.026	.034	.043	.050
Hardened Steels A2 / 52100	H	45 to 55 Rc	MXDSR		5	15	.005	.010	.018	.023	.028	.036
			MPDCS		2	25	—	.010	.018	.023	.028	.036
			MXDCR		5							
			MXDCL		12			.005	.010	.015	.020	.025
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430	M	up to 28 Rc	MXDSR		5	40	.013	.025	.038	.051	.064	.076
			MPDCS		2	90	—	.025	.038	.051	.064	.076
			MXDCR		5							
			MXDCL		12	80		.017	.026	.034	.043	.050
Stainless Steel - Moderately Difficult 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	up to 28 Rc	MXDSR		5	38	.013	.025	.038	.051	.064	.076
			MPDCS		2	70	—	.020	.030	.040	.050	.059
			MXDCR		5							
			MXDCL		12			.017	.026	.034	.043	.050
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	M	over 28 Rc	MXDSR		5	18	.005	.010	.018	.023	.028	.036
			MPDCS		2	25	—	.010	.018	.023	.028	.036
			MXDCR		5							
			MXDCL		12			.005	.010	.015	.020	.025

Technical data provided should be considered advisory only as variations may be necessary depending on the particular application.

Twister® Micro XD

Recommended Cutting Data MPDCS / MXDSR / MXDCR / MXDCL Series - Metric (*continued*)

Workpiece Material Group	ISO	Hardness	Tool Series	TYPE	DEPTH	vc-SFM	Drill Diameter (mm) 0.5	1.0	1.5	2.0	2.5	2.95
							f - mm/Rev					
Cast Iron - Gray CG, ASTM A48, CLASS 20, 25, 30, 35, SAE J431C, GRADES G1800, G3000, G3500, GG 10, 15, 20, 25, 30, 35, 40	K	up to 240 HB	MXDSR		5	45	.013	.025	.038	.051	.064	.076
			MPDCS		2	100	—	.025	.038	.051	.064	.076
			MXDCR		5							
			MXDCL		12							
Cast Iron - Ductile & Malleable CGI: 60-40-18, 65-45-12, D4018, D4512, D5506, 32510, 35108, M3210, M4504, M5503, 250, 300, 350, 400, 450	K	over 240 HB	MXDSR		5	45	.013	.025	.038	.051	.064	.076
			MPDCS		2	75	—	.025	.038	.051	.064	.076
			MXDCR		5							
			MXDCL		12							
Titanium 6Al-4V	S	up to 40 Rc	MXDSR		5	20	.013	.025	.038	.051	.064	.076
			MPDCS		2	70	—	.010	.015	.020	.025	.030
			MXDCR		5							
			MXDCL		12							
High Temp Alloys Inconel / Hastelloy / Waspeloy / Nickel Based Alloys - Monel	S	up to 40 Rc	MXDSR		5	18	.005	.010	.018	.023	.028	.036
			MPDCS		2	47	—	.010	.015	.020	.025	.030
			MXDCR		5							
			MXDCL		12							

Recommended Peck Depths For MXDSR Solid Drilling by Diameter*

Diameter	Peck Depth
0.50 mm	.2 x Diameter
1.00 mm	.3 x Diameter
1.50 mm	.6 x Diameter
2.00 mm	.8 x Diameter
2.50 mm	1.0 x Diameter
2.95 mm	3.0 x Diameter

*Peck depths can vary by material type.

Recommended Machine Requirements

High Pressure Pump System (1,000 psi / 68.9 bar)
Coolant filtration of 10 microns or better
Total runout of .0004" (.01mm) Max. at drill tip

For best MXDCL performance, the following steps are recommended:

- When Drilling with the MXDCL, drill a pilot hole 1.5 - 2 x diameter deep using a MPDCS drill.
- Insert MXDCL into pilot hole at a low speed (300-500 RPM) stopping short of the pilot hole bottom.
- Start coolant flow and increase speed to recommended RPM.
- Feed to full depth. (Pecking may be required for standard coolant pressure. Follow the MXDSR peck depth chart. To prevent drill whip and corner damage, do not retract all the way out of hole while pecking.)
- After reaching desired depth, reduce speed (300-500 RPM) before retracting from the hole at a feed of 2-4 times the drilling feed.

Note: Under optimal conditions (high pressure coolant), one shot drilling may be accomplished with the MXDCL

ISO 9001:2015 Certified

Twister XD® Xtreme Drilling

Recommended Cutting Data XD ≤ 1/4 - Inch

Workpiece Material Group	ISO	Hardness	Tool Series	TYPE	DEPTH	Drill Diameter vc - SFM 1/64	1/16	1/8	5/32	3/16	1/4	Drill Diameter f - IPR 1/64	1/16	1/8	5/32	3/16	1/4
Free Machining & Low Carbon Steels 1006, 1008, 1015, 1018, 1020, 1022, 1025, 1117, 1140, 1141, 11L08, 11L14, 1213, 12L13, 12L14, 1215, 1330	P	up to 28 Rc	2XDSS		3			390	380	370	360	.001-.002	.002-.003	.003-.005	.004-.006	.005-.007	.0055-.0080
			2XDSR		5	405	400	390	380	370	360						
			2XDCS		3			660	650	640	630			.003-.005	.004-.006	.005-.007	.0055-.0080
			2XDCR		5			660	650	640	630						
			2XDCL		7+			595	580	560	540						
Medium Carbon & High Carbon Steels, Alloy Steels & Easy to Machine Tool Steels 1030, 1035, 1040, 1045, 1050, 1052, 1055, 1060, 1085, 1095, 1541, 1551, 9255, 2515, 3135, 3415, 4130, 4137, 4140, 4150, 4320, 4340, 4520, 5015, 5115, 5120, 5132, 5140, 5155, 6150, 8620, 9262, 9840, 52100, O1, O2, O6, S2, W1 to W310	P	28 to 38 Rc	2XDSS		3			330	320	310	300	.001-.002	.002-.003	.003-.005	.004-.006	.005-.007	.0055-.0080
			2XDSR		5	350	340	330	320	310	300						
			2XDCS		3			575	550	540	500			.003-.005	.004-.006	.005-.007	.0055-.0080
			2XDCR		5			575	550	540	500						
			2XDCL		7+			430	420	410	400						
Tool Steels & Die Steels O7, M1, M2, M3, M4, M7, T1, T2, T4, T5, T8, T15, A2, A3, A6, A7, H10, H11, H12, H13, H19, H21, L3, L6, L7, P2, P20, S1, S5, S7, 52100, A128, D2, D3, D4, D5, D7	P	28 to 44 Rc	2XDSS		3			200	190	190	185	.0004-.0008	.0008-.0012	.0014-.0030	.0024-.0040	.003-.005	.0035-.0060
			2XDSR		5	210	200	200	190	190	185						
			2XDCS		3			250	240	230	220			.0014-.0030	.0024-.0040	.003-.005	.0035-.0060
			2XDCR		5			250	240	230	220						
			2XDCL		7+			225	220	215	205						
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430	M	up to 28 Rc	2XDSS		3			350	340	330	320	.001-.002	.002-.003	.003-.005	.004-.006	.005-.007	.0055-.0080
			2XDSR		5	360	355	350	340	330	320						
			2XDCS		3			550	500	475	450			.003-.005	.004-.006	.005-.007	.0055-.0080
			2XDCR		5			550	500	475	450						
			2XDCL		7+			450	425	400	380						
Stainless Steel - Moderately Difficult 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	up to 28 Rc	2XDSS		3			140	135	130	125	.001-.002	.002-.003	.003-.005	.004-.006	.005-.007	.0055-.0080
			2XDSR		5	150	145	140	135	130	125						
			2XDCS		3			300	290	280	270			.003-.005	.004-.006	.005-.007	.0055-.0080
			2XDCR		5			300	290	280	270						
			2XDCL		7+			280	270	260	250						
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	M	over 28 Rc	2XDSS		3			140	130	120	110	.0004-.0012	.001-.002	.0020-.0033	.0024-.0035	.0030-.0043	.0031-.0050
			2XDSR		5	160	150	140	130	120	110						
			2XDCS		3			265	250	240	230			.0020-.0033	.0024-.0035	.0030-.0042	.0031-.0050
			2XDCR		5			265	250	240	230						
			2XDCL		7+			190	180	170	160						
High Temp Alloys Nimonics, Inconel, Monel, Hastelloy	S	up to 42 Rc	2XDSS		3			85	80	75	70	.0004-.0012	.001-.002	.0014-.0033	.0016-.0035	.002-.004	.0023-.0043
			2XDSR		5	100	90	85	80	75	70						
			2XDCS		3			115	100	95	90			.0014-.0033	.0016-.0035	.002-.004	.0023-.0043
			2XDCR		5			115	100	95	90						
			2XDCL		7+			100	100	95	95						
Titanium Alloys 6Al-4V, 5Al-2.5 Sn, 6Al-2 Sn-4Zr-6Mo, 3Al-8V-6Cr4Mo-4Zr, 10V-2Fe-3Al, 13V-11Cr-3Al	S	up to 42 Rc	2XDSS		3			130	125	120	115	.0004-.0012	.001-.002	.003-.004	.004-.006	.005-.007	.0055-.0080
			2XDSR		5	150	140	130	125	120	115						
			2XDCS		3			230	220	210	200			.003-.004	.004-.005	.005-.007	.0055-.0080
			2XDCR		5			230	220	210	200						
			2XDCL		7+			210	190	180	170						
Cast Iron - Gray CG, ASTM A48, CLASS 20, 25, 30, 35, SAE J431C, GRADES G1800, G3000, G3500, GG 10, 15, 20, 25, 30, 35, 40	K	up to 240 HB	2XDSS		3			480	470	460	430	.001-.002	.002-.003	.003-.005	.004-.006	.005-.007	.0055-.0080
			2XDSR		5	500	490	480	470	460	430						
			2XDCS		3			660	640	620	600			.003-.005	.004-.006	.005-.007	.0055-.0080
			2XDCR		5			660	640	620	600						
			2XDCL		7+			500	490	480	470						
Cast Iron Ductile & Malleable CGI 60-40-18, 65-45-12, D4018, D4512, D5506, 32510, 35108, M3210, M4504, M5503, 250, 300, 350, 400, 450	K	over 240 HB	2XDSS		3			280	270	260	250	.001-.002	.002-.003	.003-.005	.004-.006	.005-.007	.0055-.0080
			2XDSR		5	300	290	280	270	260	250						
			2XDCS		3			400	480	460	440			.003-.005	.004-.006	.005-.007	.0055-.0080
			2XDCR		5			400	480	460	440						
			2XDCL		7+			350	340	330	320						

Technical data provided should be considered advisory only as variations may be necessary depending on the particular application.

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Recommended Cutting Data XD ≥ 5/16 - Inch

Workpiece Material Group	ISO	Hardness	Tool Series	TYPE	DEPTH	Drill Diameter vc - SFM 5/16	3/8	1/2	9/16	5/8	3/4	Drill Diameter f - IPR 5/16	3/8	1/2	9/16	5/8	3/4
Free Machining & Low Carbon Steels 1006, 1008, 1015, 1018, 1020, 1022, 1025, 1117, 1140, 1141, 11L08, 11L14, 1213, 12L13, 12L14, 1215, 1330	P	up to 28 Rc	2XDSS		3	350	340	320	300	275	265	.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015
			2XDSR		5	350	340	320	300	275	265						
			2XDCS		3	620	600	575	550	525	500	.006-.009	.007-.010	.009-.011	.009-.014	.010-.014	.011-.015
			2XDCR		5	620	600	575	550	525	500						
			2XDCL		7+	520	500	480	460	440	430						
Medium Carbon & High Carbon Steels, Alloy Steels & Easy to Machine Tool Steels 1030, 1035, 1040, 1045, 1050, 1052, 1055, 1060, 1085, 1095, 1541, 1551, 9255, 2515, 3135, 3415, 4130, 4137, 4140, 4150, 4320, 4340, 4520, 5015, 5115, 5120, 5132, 5140, 5155, 6150, 8620, 9262, 9840, 52100, O1, O2, O6, S2, W1 to W310	P	28 to 38 Rc	2XDSS		3	290	280	270	265	260	260	.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015
			2XDSR		5	290	280	270	265	260	260						
			2XDCS		3	475	450	425	400	325	315	.006-.009	.007-.010	.009-.011	.009-.014	.010-.014	.011-.015
			2XDCR		5	475	450	425	400	325	315						
			2XDCL		7+	375	350	325	315	300	280						
Tool Steels & Die Steels O7, M1, M2, M3, M4, M7, T1, T2, T4, T5, T8, T15, A2, A3, A6, A7, H10, H11, H12, H13, H19, H21, L3, L6, L7, P2, P20, S1, S5, S7, 52100, A128, D2, D3, D4, D5, D7	P	28 to 44 Rc	2XDSS		3	185	180	180	175	175	170	.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015
			2XDSR		5	185	180	180	175	175	170						
			2XDCS		3	210	210	200	200	190	190	.006-.009	.007-.010	.009-.011	.009-.014	.010-.014	.011-.015
			2XDCR		5	210	210	200	200	190	190						
			2XDCL		7+	200	190	190	180	180	170						
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430	M	up to 28 Rc	2XDSS		3	310	300	275	250	225	200	.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015
			2XDSR		5	310	300	275	250	225	200						
			2XDCS		3	400	390	380	370	330	320	.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015
			2XDCR		5	400	390	380	370	330	320						
			2XDCL		7+	375	370	350	325	310	300						
Stainless Steel - Moderately Difficult 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	up to 28 Rc	2XDSS		3	120	115	110	105	100	95	.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015
			2XDSR		5	120	115	110	105	100	95						
			2XDCS		3	260	250	240	240	230	220	.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015
			2XDCR		5	260	250	240	240	230	220						
			2XDCL		7+	240	230	220	220	200	200						
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	M	over 28 Rc	2XDSS		3	110	105	105	100	100	95	.003-.006	.005-.009	.007-.009	.008-.010	.009-.011	.009-.013
			2XDSR		5	110	105	105	100	100	95						
			2XDCS		3	220	200	190	180	170	155	.003-.006	.005-.009	.007-.009	.008-.010	.009-.011	.009-.013
			2XDCR		5	220	200	190	180	170	155						
			2XDCL		7+	150	140	130	130	125	125						
High Temp Alloys Nimonics, Inconel, Monel, Hastelloy	S	up to 42 Rc	2XDSS		3	65	60	55	50	45	40	.003-.005	.004-.006	.005-.007	.005-.008	.006-.008	.009-.010
			2XDSR		5	65	60	55	50	45	40						
			2XDCS		3	85	85	80	80	75	75	.003-.005	.004-.006	.005-.007	.005-.008	.006-.008	.009-.010
			2XDCR		5	85	85	80	80	75	75						
			2XDCL		7+	90	90	85	85	75	75						
Titanium Alloys 6Al-4V, 5Al-2.5 Sn, 6Al-2 Sn-4Zr-6Mo, 3Al-8V-6Cr4Mo-4Zr, 10V-2Fe-3Al, 13V-11Cr-3Al	S	up to 42 Rc	2XDSS		3	110	105	100	100	90	90	.006-.009	.007-.010	.008-.011	.008-.010	.010-.014	.011-.015
			2XDSR		5	110	105	100	100	90	90						
			2XDCS		3	190	180	170	160	150	150	.006-.009	.007-.010	.008-.011	.008-.-.010	.010-.014	.011-.015
			2XDCR		5	190	180	170	160	150	150						
			2XDCL		7+	160	150	140	130	120	120						
Cast Iron - Gray CG, ASTM A48, CLASS 20, 25, 30, 35, SAE J431C, GRADES G1800, G3000, G3500, GG 10, 15, 20, 25, 30, 35, 40	K	up to 240 HB	2XDSS		3	410	400	390	370	360	350	.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015
			2XDSR		5	410	400	390	370	360	350						
			2XDCS		3	580	560	550	550	525	500	.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015
			2XDCR		5	580	560	550	550	525	500						
			2XDCL		7+	460	450	440	430	410	400						
Cast Iron - Ductile & Malleable CGI 60-40-18, 65-45-12, D4018, D4512, D5506, 32510, 35108, M3210, M4504, M5503, 250, 300, 350, 400, 450	K	over 240 HB	2XDSS		3	240	230	220	210	200	190	.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015
			2XDSR		5	240	230	220	210	200	190						
			2XDCS		3	400	375	350	300	275	250	.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015
			2XDCR		5	400	375	350	300	275	250						
			2XDCL		7+	300	270	250	240	220	200	.006-.009	.007-.010	.008-.011	.009-.014	.010-.014	.011-.015

Technical data provided should be considered advisory only as variations may be necessary depending on the particular application.

For product information, call your local distributor.

Twister XD® Xtreme Drilling

Recommended Cutting Data XD ≤ 6mm - Metric

Workpiece Material Group	ISO	Hardness	Tool Series	TYPE	DEPTH	Drill Diameter (mm) vc - m/min						Drill Diameter (mm) f - mm/Rev					
						0.05	1.5	3	4	5	6	0.05	1.5	3	4	5	6
Free Machining & Low Carbon Steels 1006, 1008, 1015, 1018, 1020, 1022, 1025, 1117, 1140, 1141, 11L08, 11L14, 1213, 12L13, 12L14, 1215, 1330	P	up to 28 Rc	2XDSS		3			119	116	113	110	.025-.051	.051-.076	.076-.127	.102-.152	.127-.178	.127-.203
			2XDSR		5	123	122	119	116	113	110						
			2XDCS		3			201	198	195	192			.076-.127	.102-.152	.127-.178	.127-.203
			2XDCR		5			201	198	195	192						
			2XDCL		7+			181	177	171	165						
Medium Carbon & High Carbon Steels, Alloy Steels & Easy to Machine Tool Steels 1030, 1035, 1040, 1045, 1050, 1052, 1055, 1060, 1085, 1095, 1541, 1551, 9255, 2515, 3135, 3415, 4130, 4137, 4140, 4150, 4320, 4340, 4520, 5015, 5115, 5120, 5132, 5140, 5155, 6150, 8620, 9262, 9840, 52100, O1, O2, O6, S2, W1 to W310	P	28 to 38 Rc	2XDSS		3			101	98	94	91	.025-.051	.051-.076	.076-.127	.102-.152	.127-.178	.127-.203
			2XDSR		5	107	104	101	98	94	91						
			2XDCS		3			175	168	165	152			.076-.127	.102-.152	.127-.178	.127-.203
			2XDCR		5			175	168	165	152						
			2XDCL		7+			131	128	125	122						
Tool Steels & Die Steels O7, M1, M2, M3, M4, M7, T1, T2, T4, T5, T8, T15, A2, A3, A6, A7, H10, H11, H12, H13, H19, H21, L3, L6, L7, P2, P20, S1, S5, S7, 52100, A128, D2, D3, D4, D5, D7	P	28 to 44 Rc	2XDSS		3			61	58	58	56	.010-.020	.020-.030	.036-.076	.061-.102	.076-.127	.089-.152
			2XDSR		5	64	61	61	58	58	56						
			2XDCS		3			76	73	70	67			.036-.076	.061-.102	.076-.127	.089-.152
			2XDCR		5			76	73	70	67						
			2XDCL		7+			69	67	66	62						
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430	M	up to 28 Rc	2XDSS		3			107	104	101	98	.025-.051	.051-.076	.076-.127	.102-.152	.127-.178	.127-.203
			2XDSR		5	125	120	107	104	101	98						
			2XDCS		3			168	152	145	137			.076-.127	.102-.152	.127-.178	.127-.203
			2XDCR		5			168	152	145	137						
			2XDCL		7+			137	130	122	116						
Stainless Steel - Moderately Difficult 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	up to 28 Rc	2XDSS		3			43	41	40	38	.025-.051	.051-.076	.076-.127	.102-.152	.127-.178	.127-.203
			2XDSR		5	50	48	43	41	40	38						
			2XDCS		3			91	88	85	82			.076-.127	.102-.152	.127-.178	.127-.203
			2XDCR		5			91	88	85	82						
			2XDCL		7+			85	82	79	76						
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	M	over 28 Rc	2XDSS		3			43	40	37	34	.010-.030	.025-.051	.051-.076	.061-.089	.089-.102	.076-.127
			2XDSR		5	49	46	43	40	37	34						
			2XDCS		3			81	76	73	70			.051-.076	.061-.089	.089-.102	.076-.127
			2XDCR		5			81	76	73	70						
			2XDCL		7+			58	55	52	49						
High Temp Alloys Nimonics, Inconel, Monel, Hastelloy	S	up to 42 Rc	2XDSS		3			26	24	23	21	.010-.030	.025-.051	.036-.089	.036-.089	.051-.102	.061-.127
			2XDSR		5	30	27	26	24	23	21						
			2XDCS		3			35	30	29	27			.036-.089	.036-.089	.051-.102	.061-.127
			2XDCR		5			35	30	29	27						
			2XDCL		7+			30	30	29	29						
Titanium Alloys 6Al-4V, 5Al-2.5 Sn, 6Al-2 Sn-4Zr-6Mo, 3Al-8V-6Cr4Mo-4Zr, 10V-2Fe-3Al, 13V-11Cr-3Al	S	up to 42 Rc	2XDSS		3			40	38	37	35	.010-.030	.025-.051	.076-.102	.102-.152	.127-.178	.140-.229
			2XDSR		5	46	43	40	38	37	35						
			2XDCS		3			70	67	64	61			.076-.102	.102-.152	.127-.178	.140-.229
			2XDCR		5			70	67	64	61						
			2XDCL		7+			64	58	55	52						
Cast Iron - Gray CG, ASTM A48, CLASS 20, 25, 30, 35, SAE J431C, GRADES G1800, G3000, G3500, GG 10, 15, 20, 25, 30, 35, 40	K	up to 240 HB	2XDSS		3			146	143	140	131	.025-.051	.051-.076	.076-.127	.102-.152	.127-.178	.127-.203
			2XDSR		5	152	149	146	143	140	131						
			2XDCS		3			201	195	189	183			.076-.127	.102-.152	.127-.178	.127-.203
			2XDCR		5			201	195	189	183						
			2XDCL		7+			152	149	146	143						
Cast Iron - Ductile & Malleable CGI 60-40-18, 65-45-12, D4018, D4512, D5506, 32510, 35108, M3210, M4504, M5503, 250, 300, 350, 400, 450	K	over 240 HB	2XDSS		3			85	82	79	76	.025-.051	.051-.076	.076-.127	.102-.152	.127-.178	.127-.203
			2XDSR		5	91	88	85	82	79	76						
			2XDCS		3			122	146	140	134			.076-.127	.102-.152	.127-.178	.127-.203
			2XDCR		5			122	146	140	134						
			2XDCL		7+			107	104	101	98						

Technical data provided should be considered advisory only as variations may be necessary depending on the particular application.

Recommended Cutting Data XD ≥ 8mm - Metric

Workpiece Material Group	ISO	Hardness	Tool Series	TYPE	DEPTH	Drill Diameter (mm) vc - m/min							Drill Diameter (mm) f - mm/Rev						
						8	10	12	14	16	18	20	8	10	12	14	16	18	20
Free Machining & Low Carbon Steels 1006, 1008, 1015, 1018, 1020, 1022, 1025, 1117, 1140, 1141, 11L08, 11L14, 1213, 12L13, 12L14, 1215, 1330	P	up to 28 Rc	2XDSS		3	107	104	98	91	84	81	77	.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			2XDSR		5	107	104	98	91	84	81	77							
			2XDCS		3	189	183	175	168	160	152	145	.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			2XDCR		5	189	183	175	168	160	152	145							
			2XDCL		7+	158	152	146	140	134	131	125							
Medium Carbon & High Carbon Steels, Alloy Steels & Easy to Machine Tool Steels 1030, 1035, 1040, 1045, 1050, 1052, 1055, 1060, 1085, 1095, 1541, 1551, 9255, 2515, 3135, 3415, 4130, 4137, 4140, 4150, 4320, 4340, 4520, 5015, 5115, 5120, 5132, 5140, 5155, 6150, 8620, 9262, 9840, 52100, O1, O2, O6, S2, W1 to W310	P	28 to 38 Rc	2XDSS		3	88	85	82	81	79	79	75	.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			2XDSR		5	88	85	82	81	79	79	75							
			2XDCS		3	145	137	130	122	99	96	92	.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			2XDCR		5	145	137	130	122	99	96	92							
			2XDCL		7+	114	107	99	96	91	85	81							
Tool Steels & Die Steels O7, M1, M2, M3, M4, M7, T1, T2, T4, T5, T8, T15, A2, A3, A6, A7, H10, H11, H12, H13, H19, H21, L3, L6, L7, P2, P20, S1, S5, S7, 52100, A128, D2, D3, D4, D5, D7	P	28 to 44 Rc	2XDSS		3	56	55	55	53	53	52	49	.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			2XDSR		5	56	55	55	53	53	52	49							
			2XDCS		3	64	64	61	61	58	58	55	.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			2XDCR		5	64	64	61	61	58	58	55							
			2XDCL		7+	61	58	58	55	55	52	49							
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430	M	up to 28 Rc	2XDSS		3	94	91	84	76	69	61	55	.16-.24	.18-.27	.21-.31	.22-.35	.25-.36	.28-.38	.30-.37
			2XDSR		5	94	91	84	76	69	61	55							
			2XDCS		3	122	119	116	113	101	98	94	.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			2XDCR		5	122	119	116	113	101	98	94							
			2XDCL		7+	114	113	107	99	94	91	87							
Stainless Steel - Moderately Difficult 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	up to 28 Rc	2XDSS		3	37	35	34	32	30	29	28	.16-.24	.18-.27	.21-.31	.22-.35	.25-.36	.28-.38	.30-.37
			2XDSR		5	37	35	34	32	30	29	28							
			2XDCS		3	79	76	73	73	70	67	64	.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			2XDCR		5	79	76	73	73	70	67	64							
			2XDCL		7+	73	70	67	67	61	61	58							
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	M	over 28 Rc	2XDSS		3	34	32	32	30	30	29	27	.11-.15	.13-.23	.18-.25	.21-.27	.22-.31	.25-.33	.30-.37
			2XDSR		5	34	32	32	30	30	29	27							
			2XDCS		3	67	61	58	55	52	47	45	.11-.15	.13-.23	.18-.25	.21-.27	.22-.31	.25-.33	.30-.37
			2XDCR		5	67	61	58	55	52	47	45							
			2XDCL		7+	46	43	40	40	38	38	36							
High Temp Alloys Nimonics, Inconel, Monel, Hastelloy	S	up to 42 Rc	2XDSS		3	20	18	17	15	14	12	11	.08-.13	.11-.15	.12-.17	.14-.19	.16-.21	.18-.25	.17-.24
			2XDSR		5	20	18	17	15	14	12	11							
			2XDCS		3	26	26	24	24	23	23	22	.09-.13	.11-.15	.12-.17	.14-.19	.16-.21	.18-.25	.17-.24
			2XDCR		5	26	26	24	24	23	23	22							
			2XDCL		7+	27	27	26	26	23	23	22							
Titanium Alloys 6Al-4V, 5Al-2.5 Sn, 6Al-2 Sn-4Zr-6Mo, 3Al-8V-6Cr4Mo-4Zr, 10V-2Fe-3Al, 13V-11Cr-3Al	S	up to 42 Rc	2XDSS		3	34	32	30	30	27	27	25	.16-.24	.18-.27	.21-.31	.22-.35	.25-.36	.28-.38	.30-.37
			2XDSR		5	34	32	30	30	27	27	25							
			2XDCS		3	55	55	52	49	46	46	44	.16-.24	.18-.27	.21-.31	.22-.35	.25-.36	.28-.38	.30-.37
			2XDCR		5	55	55	52	49	46	46	44							
			2XDCL		7+	49	46	43	40	37	37	35							
Cast Iron - Gray CG, ASTM A48, CLASS 20, 25, 30, 35, SAE J431C, GRADES G1800, G3000, G3500, GG 10, 15, 20, 25, 30, 35, 40	K	up to 240 HB	2XDSS		3	125	122	119	113	110	107	102	.16-.24	.18-.27	.21-.31	.22-.35	.25-.36	.28-.38	.30-.37
			2XDSR		5	125	122	119	113	110	107	102							
			2XDCS		3	177	171	168	168	160	152	145	.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			2XDCR		5	177	171	168	168	160	152	145							
			2XDCL		7+	140	137	134	131	125	122	117							
Cast Iron - Ductile & Malleable CGI 60-40-18, 65-45-12, D4018, D4512, D5506, 32510, 35108, M3210, M4504, M5503, 250, 300, 350, 400, 450	K	over 240 HB	2XDSS		3	73	70	67	64	61	58	55	.16-.24	.18-.27	.21-.31	.22-.35	.25-.36	.28-.38	.30-.37
			2XDSR		5	73	70	67	64	61	58	55							
			2XDCS		3	122	114	107	91	84	76	72	.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			2XDCR		5	122	114	107	91	84	76	72							
			2XDCL		7+	91	82	76	73	67	61	58							

Technical data provided should be considered advisory only as variations may be necessary depending on the particular application.

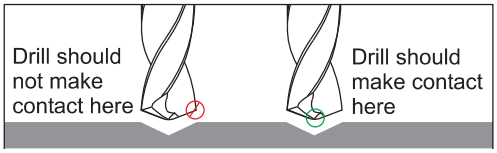
For product information, call your local distributor.

Twister XD® Xtreme Drilling

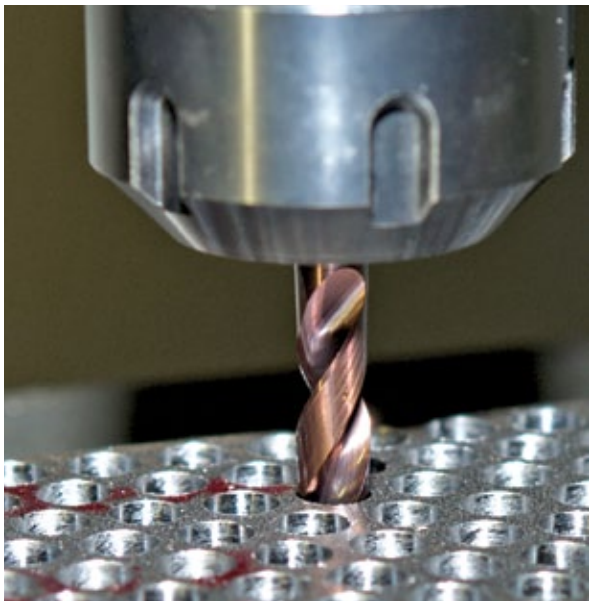
Series 2XDCE Technical Information

Process For Successful Deep Hole Drilling:

1. Start by producing a 1.5 x diameter to 3 x diameter pilot hole using a coolant or non-coolant pilot drill. Typically this tool will have a point angle the same as or greater than the deep hole drill. Run this drill at 100% of the final drill speed and 1/2 the normal IPM (mm/min).



2. Retract and tool change to the final deep hole (2XDCE M.A. Ford® Series) drill.
3. Rapid to clearance plane and enter the pilot hole at 25% (don't exceed 400 to 500 RPM (n)) of the final speed and 1 to 2 IPM (25.4 to 50.8 mm/min). This will help with true position by eliminating drill whip. Once into the hole, turn on the coolant and advance to the material start. At this point, you can add a dwell to clear any chips that have been left from the previous drill and let the spindle get to full speed. Increase the speed and feed to final drilling parameters.
4. Drill one shot to the final hole depth or through.
5. Should you experience any squeaking you may need to retract the drill and increase your feed. Chip packing is occurring and will need to be addressed.
6. Once through the material, it may be necessary to reduce the RPM (n) to eliminate breakage of the drill due to drill whip. Then retract to the clearance plane.



Machine Requirements

High Pressure Pump System (1,000 psi/68.9 bar)
Machine runout of .0003" (.008mm) Max.

Due to the conditions of equipment, tool holders, and conditions beyond M.A. Ford®'s control, your results may vary.

Should your application require more in depth discussion or a special tool, please contact M.A. Ford®'s Application Engineering Department at 563-391-6220 / 800-553-8024.

Recommended Cutting Data XD 2XDCE - Inch

Workpiece Material Group	ISO	Hardness	TYPE	DEPTH	vc - SFM	Drill Diameter				
						3/16	1/4	5/16	3/8	1/2
						f - IPR				
Free Machining & Low Carbon Steels 1006, 1008, 1015, 1018, 1020, 1022, 1025, 1117, 1140, 1141, 11L08, 11L14, 1213, 12L13, 12L14, 1215, 1330	P	up to 28 Rc		12-25X	345	.0030	.0040	.0080	.0090	.0100
Medium Carbon & High Carbon Steels, Alloy Steels & Easy to Machine Tool Steels 1030, 1035, 1040, 1045, 1050, 1052, 1055, 1060, 1085, 1095, 1541, 1551, 9255, 2515, 3135, 3415, 4130, 4137, 4140, 4150, 4320, 4340, 4520, 5015, 5115, 5120, 5132, 5140, 5155, 6150, 8620, 9262, 9840, 52100, O1, O2, O6, S2, W1 to W310	P	28 to 35 Rc		12-25X	265	.0030	.0040	.0080	.0090	.0100
Tool Steels & Die Steels O7, M1, M2, M3, M4, M7, T1, T2, T4, T5, T8, T15, A2, A3, A6, A7, H10, H11, H12, H13, H19, H21, L3, L6, L7, P2, P20, S1, S5, S7, 52100, A128, D2, D3, D4, D5, D7	P	28 to 35 Rc		12-25X	265	.0030	.0040	.0080	.0090	.0100
Hardened Steels	H	35-45 Rc		12-25X	115	.0006	.0009	.0020	.0024	.0030
Hardened Steels		45-55 Rc			80					
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430	M	up to 28 Rc		12-25X	300	.0030	.0040	.0080	.0090	.0100
Stainless Steel - Moderately Difficult 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	up to 28 Rc		12-25X	180	.0030	.0040	.0080	.0090	.0100
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	M	over 28 Rc		12-25X	130	.0020	.0030	.0060	.0080	.0100
High Temp Alloys Nimonics, Inconel, Monel, Hastelloy	S	up to 42 Rc		12-25X	65-80	.0009	.0014	.0025	.0030	.0033
Titanium Alloys 6Al-4V, 5Al-2.5 Sn, 6Al-2 Sn-4Zr-6Mo, 3Al-8V-6Cr4Mo-4Zr, 10V-2Fe-3Al, 13V-11Cr-3Al	S	up to 42 Rc		12-25X	150	.0016	.0024	.0050	.0060	.0060
Cast Iron - Gray CG, ASTM A48, CLASS 20, 25, 30, 35, SAE J431C, GRADES G1800, G3000, G3500, GG 10, 15, 20, 25, 30, 35, 40	K	up to 240 HB		12-25X	400	.0030	.0050	.0080	.0090	.0100
Cast Iron - Ductile & Malleable CGI 60-40-18, 65-45-12, D4018, D4512, D5506, 32510, 35108, M3210, M4504, M5503, 250, 300, 350, 400, 450	K	over 240 HB		12-25X	265	.0030	.0050	.0080	.0090	.0100
Non-Ferrous - Al < 14% Si	N			12-25X	500	.0043	.0070	.0110	.0138	.0149
Non-Ferrous - Al > 14% Si	N			12-25X	350	.0043	.0070	.0110	.0138	.0149
Non-Ferrous - Brass	N			12-25X	400	.0030	.0040	.0110	.0130	.0140
Non-Ferrous - Cu/Cu Alloys/Magnesium	N			12-25X	300	.0030	.0040	.0110	.0130	.0140

Made in USA

ISO 9001:2015 Certified

Technical data provided should be considered advisory only as variations may be necessary depending on the particular application.

For product information, call your local distributor.

Twister XD® Xtreme Drilling

Recommended Cutting Data XD 2XDCE - Metric

Workpiece Material Group	ISO	Hardness	TYPE	DEPTH	vc - m/min	Drill Diameter (mm)						
						5	6	7	8	9	10	12
						f - mm/Rev						
Free Machining & Low Carbon Steels 1006, 1008, 1015, 1018, 1020, 1022, 1025, 1117, 1140,1141, 11L08, 11L14, 1213, 12L13, 12L14, 1215, 1330	P	up to 28 Rc		12-25X	105	.088	.106	.127	.193	.215	.238	.254
Medium Carbon & High Carbon Steels, Alloy Steels & Easy to Machine Tool Steels 1030, 1035, 1040, 1045, 1050, 1052, 1055, 1060, 1085, 1095, 1541, 1551, 9255, 2515, 3135, 3415, 4130, 4137, 4140, 4150, 4320, 4340, 4520, 5015, 5115, 5120, 5132, 5140, 5155, 6150, 8620, 9262, 9840, 52100, O1, O2, O6, S2, W1 to W310	P	28 to 35 Rc		12-25X	80	.088	.106	.127	.193	.215	.238	.254
Tool Steels & Die Steels O7, M1, M2, M3, M4, M7, T1, T2, T4, T5, T8, T15, A2, A3, A6, A7, H10, H11, H12, H13, H19, H21, L3, L6, L7, P2, P20, S1, S5, S7, 52100, A128, D2, D3, D4, D5, D7	P	28 to 35 Rc		12-25X	80	.088	.106	.127	.193	.215	.238	.254
Hardened Steels	H	35-45 Rc		12-25X	35	.020	.022	.027	.046	.053	.060	.066
Hardened Steels	H	45-55 Rc		12-25X	25	.020	.022	.027	.046	.053	.060	.066
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430	M	up to 28 Rc		12-25X	90	.090	.105	.127	.193	.215	.238	.254
Stainless Steel - Moderately Difficult 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	up to 28 Rc		12-25X	55	.090	.105	.127	.193	.215	.238	.254
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	M	over 28 Rc		12-25X	40	.090	.105	.127	.193	.215	.238	.254
High Temp Alloys Nimonics, Inconel, Monel, Hastelloy	S	up to 42 Rc		12-25X	20-25	.030	.035	.048	.051	.071	.078	.085
Titanium Alloys 6Al-4V, 5Al-2.5 Sn, 6Al-2 Sn-4Zr-6Mo, 3Al-8V-6Cr4Mo-4Zr, 10V-2Fe-3Al, 13V-11Cr-3Al	S	up to 42 Rc		12-25X	45	.050	.060	.071	.098	.127	.140	.152
Cast Iron - Gray CG, ASTM A48, CLASS 20, 25, 30, 35, SAE J431C, GRADES G1800, G3000, G3500, GG 10, 15, 20, 25, 30, 35, 40	K	up to 240 HB		12-25X	120	.100	.120	.140	.200	.215	.240	.254
Cast Iron - Ductile & Malleable CGI 60-40-18, 65-45-12, D4018, D4512, D5506, 32510, 35108, M3210, M4504, M5503, 250, 300, 350, 400, 450	K	over 240 HB		12-25X	80	.100	.120	.140	.200	.215	.240	.254
Non-Ferrous - Al < 14% Si	N			12-25X	150	.140	.170	.195	.280	.314	.350	.378
Non-Ferrous - Al > 14% Si	N			12-25X	105	.140	.170	.195	.280	.314	.350	.378
Non-Ferrous - Brass	N			12-25X	120	.088	.106	.127	.279	.314	.350	.378
Non- Ferrous - Cu/Cu Alloys/Magnesium	N			12-25X	90	.088	.106	.127	.279	.314	.350	.378

Safety Note

Always wear the appropriate personal protective equipment such as safety glasses and protective clothing when using solid carbide or HSS cutting tools. Machines should be fully guarded. Technical data provided should be considered advisory only as variations may be necesary depending on the particular application.

Technical data provided should be considered advisory only as variations may be necessary depending on the particular application.

Twister® Spot Drill

Recommended Cutting Data 200S - Inch

Workpiece Material Group	ISO	Hardness	DEPTH	vc - SFM	Drill Diameter 1/8 f - IPR	1/4	3/8	1/2	5/8
Free Machining & Low Carbon Steels 1006, 1008, 1015, 1018, 1020, 1022, 1025, 1117, 1140,1141, 11L08, 11L14, 1213, 12L13, 12L14, 1215, 1330	P	up to 28 Rc	3	330	.0015	.0030	.0040	.0050	.0060
Medium Carbon & High Carbon Steels, Alloy Steels & Easy to Machine Tool Steels 1030, 1035, 1040, 1045, 1050, 1052, 1055, 1060, 1085, 1095, 1541, 1551, 9255, 2515, 3135, 3415, 4130, 4137, 4140, 4150, 4320, 4340, 4520, 5015, 5115, 5120, 5132, 5140, 5155, 6150, 8620, 9262, 9840, 52100, O1, O2, O6, S2,W1 to W310	P	28 to 38 Rc	3	265	.0015	.0030	.0040	.0050	.0060
Tool Steels & Die Steels O7, M1, M2, M3, M4, M7, T1, T2, T4, T5, T8, T15, A2, A3, A6, A7, H10, H11, H12, H13, H19, H21, L3, L6, L7, P2, P20, S1, S5, S7, 52100, A128, D2, D3, D4, D5, D7	P	28 to 44 Rc	3	230	.0015	.0030	.0040	.0050	.0060
Hardened Steel	H	45 to 65 Rc	3	50	.0005	.0005	.0010	.0010	.0010
Stainless Steel - Moderately Difficult 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	up to 28 Rc	3	150	.0015	.0030	.0040	.0050	.0060
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L,321, PH13-8Mo, Nitronics	M	up to 28 Rc	3	100	.0010	.0020	.0025	.0030	.0040
High Temp Alloys Nimonics, Inconel, Monel, Hastelloy	S	up to 42 Rc	3	70	.0010	.0020	.0025	.0030	.0040
Titanium Alloys 6Al-4V, 5Al-2.5 Sn, 6Al-2 Sn-4Zr-6Mo, 3Al-8V-6Cr4Mo-4Zr,10V-2Fe-3Al, 13V-11Cr-3Al	S		3	180	.0010	.0020	.0025	.0030	.0040
Cast Iron - Gray CG, ASTM A48, CLASS 20, 25, 30, 35, SAE J431C, GRADES G1800, G3000, G3500, GG 10, 15, 20, 25, 30, 35, 40	K	up to 240 HB	3	365	.0015	.0030	.0040	.0050	.0060
Cast Iron - Ductile & Malleable CGI 60-40-18, 65-45-12, D4018, D4512, D5506, 32510, 35108,M3210, M4504, M5503, 250, 300, 350,400,450	K	over 240 HB	3	265	.0015	.0030	.0040	.0050	.0060
Plastics Kevlar/Graphite	N		3	300	.0015	.0030	.0040	.0050	.0060

Recommended Cutting Data 200S - Metric

Workpiece Material Group	ISO	Hardness	DEPTH	vc - m/min	Drill Diameter (mm) 3 f - mm/Rev	6	8	10	12	16
Free Machining & Low Carbon Steels 1006, 1008, 1015, 1018, 1020, 1022, 1025, 1117, 1140, 1141, 11L08, 11L14, 1213, 12L13, 12L14, 1215, 1330	P	up to 28 Rc	3	100	.0380	.0760	.1020	.1270	.1520	.1520
Medium Carbon & High Carbon Steels, Alloy Steels & Easy to Machine Tool Steels 1030, 1035, 1040, 1045, 1050, 1052, 1055, 1060, 1085, 1095, 1541, 1551, 9255, 2515, 3135, 3415, 4130, 4137, 4140, 4150, 4320, 4340, 4520, 5015, 5115, 5120, 5132, 5140, 5155, 6150, 8620, 9262, 9840, 52100, O1, O2, O6, S2,W1 to W310	P	28 to 38 Rc	3	80	.0380	.0760	.1020	.1270	.1520	.1520
Tool Steels & Die Steels O7, M1, M2, M3, M4, M7, T1, T2, T4, T5, T8, T15, A2, A3, A6, A7, H10, H11, H12, H13, H19, H21, L3, L6, L7, P2, P20, S1, S5, S7, 52100, A128, D2, D3, D4, D5, D7	P	28 to 44 Rc	3	45	.0380	.0760	.1020	.1270	.1520	.1520
Hardened Steel	H	45 to 65 Rc	3	15	.0127	.0127	.0254	.0254	.0254	.0381
Stainless Steel - Moderately Difficult 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	up to 28 Rc	3	45	.0380	.0760	.1020	.1270	.1520	.1520
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	M	up to 28 Rc	3	30	.0250	.0510	.0640	.0760	.1020	.1270
High Temp Alloys Nimonics, Inconel, Monel, Hastelloy	S	up to 42 Rc	3	20	.0250	.0510	.0640	.0760	.1020	.1270
Titanium Alloys 6Al-4V, 5Al-2.5 Sn, 6Al-2 Sn-4Zr-6Mo, 3Al-8V-6Cr4Mo-4Zr,10V-2Fe-3Al, 13V-11Cr-3Al	S		3	55	.0250	.0510	.0640	.0760	.1020	.1270
Cast Iron - Gray CG, ASTM A48, CLASS 20, 25, 30, 35, SAE J431C, GRADES G1800, G3000, G3500, GG 10, 15, 20, 25, 30, 35, 40	K	up to 240 HB	3	110	.0380	.0760	.1020	.1270	.1520	.1520
Cast Iron - Ductile & Malleable CGI 60-40-18, 65-45-12, D4018, D4512, D5506, 32510, 35108, M3210, M4504, M5503, 250, 300, 350, 400, 450	K	over 240 HB	3	80	.0380	.0760	.1020	.1270	.1520	.1520
Plastics Kevlar/Graphite	N		3	90	.0380	.0760	.1020	.1270	.1520	.1520

Technical data provided should be considered advisory only as variations may be necessary depending on the particular application.

For product information, call your local distributor.

Twister® HPD Series 5xD

Series HPDSR - HPDCR Recommended Cutting Data - Inch

Recommended Speeds By Material Group			Vc (SFM)	
Material Groups		Material Type	HPDSR	HPDCR
			5 X D Solid	5 X D Through Coolant
Steels	P	Low Carbon	490 - **525** - 560	590 - **625** - 655
		Alloy Steel (≤ 35 Rc)	360 - **395** - 425	425 - **460** - 490
		Alloy Steel (36-45 Rc)	330 - **360** - 395	360 - **395** - 425
		Mold/Tool Steel	200 - **230** - 260	230 - **260** - 295
Stainless Steels	M	Austenitic	130 - **165** - 200	165 - **200** - 230
		Martensitic	100 - **130** - 165	130 - **165** - 200
Cast Irons	K	Gray Cast Iron	590 - **625** - 655	625 - **655** - 690
		Ductile Cast Iron	460 - **490** - 525	490 - **525** - 560

RPM Formula For Inch Drills Only - RPM = SFM x 3.82 ÷ Drill Ø D¹

Recommended Feedrates By Material Group			Drill Diameter (inch)							
Material Groups		Material Type	1/8	5/32	3/16	1/4	5/16	3/8	1/2	5/8
			Feed (in/rev)							
Steels	P	Low Carbon	0.0057	0.0071	0.0071	0.0089	0.0112	0.0143	0.0143	0.0178
		Alloy Steel (≤ 35 Rc)								
		Alloy Steel (36-45 Rc)								
		Mold/Tool Steel	0.0033	0.0040	0.0040	0.0051	0.0066	0.0083	0.0083	0.0102
Stainless Steels	M	Austenitic	0.0028	0.0035	0.0035	0.0043	0.0055	0.0071	0.0071	0.0089
		Martensitic								
Cast Irons	K	Gray Cast Iron	0.0061	0.0076	0.0085	0.0120	0.0120	0.0152	0.0171	0.0209
		Ductile Cast Iron								

Feedrate Formula For Inch Drills - Feed = RPM x in/rev

Series HPDSR - HPDCR Recommended Cutting Data - Metric

Recommended Speeds By Material Group			Vc (m/min)	
Material Groups		Material Type	HPDSR	HPDCR
			5 X D Solid	5 X D Through Coolant
Steels	P	Low Carbon	150 - **160** - 170	180 - **190** - 200
		Alloy Steel (≤ 35 Rc)	110 - **120** - 130	130 - **140** - 150
		Alloy Steel (36-45 Rc)	100 - **110** - 120	110 - **120** - 130
		Mold/Tool Steel	60 - **70** - 80	70 - **80** - 90
Stainless Steels	M	Austenitic	40 - **50** - 60	50 - **60** - 70
		Martensitic	30 - **40** - 50	40 - **50** - 60
Cast Irons	K	Gray Cast Iron	180 - **190** - 200	190 - **200** - 210
		Ductile Cast Iron	140 - **150** - 160	150 - **160** - 170

RPM Formula For Metric Drills Only - RPM = (Vc x 318.0) ÷ Drill Ø D¹

Recommended Feedrates By Material Group			Drill Diameter (mm)							
Material Groups		Material Type	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
			Feed (mm/rev)							
Steels	P	Low Carbon	0.145	0.181	0.181	0.226	0.285	0.362	0.362	0.453
		Alloy Steel (≤ 35 Rc)								
		Alloy Steel (36-45 Rc)								
		Mold/Tool Steel	0.084	0.102	0.102	0.130	0.167	0.210	0.210	0.260
Stainless Steels	M	Austenitic	0.070	0.090	0.090	0.110	0.140	0.180	0.180	0.225
		Martensitic								
Cast Irons	K	Gray Cast Iron	0.155	0.193	0.217	0.305	0.305	0.386	0.435	0.532
		Ductile Cast Iron								

Feedrate Formula For Metric Drills - Feed = RPM x mm/rev

Technical data provided should be considered advisory only as variations may be necessary depending on the particular application.

Twister® MD

Recommended Cutting Data 2MDCL - Inch

Workpiece Material Group	ISO	Hardness	TYPE	DEPTH	Drill Diameter			Drill Diameter		
					0.0787	0.0984	0.1142	0.0787	0.0984	0.1142
					vc - SFM			f - IPR		
Free Machining & Low Carbon Steels 1006, 1008, 1015, 1018, 1020, 1022, 1025, 1117, 1140, 1141, 11L08, 11L14, 1213, 12L13, 12L14, 1215, 1330	P	up to 28 Rc		10X	300	300	250	.0018	.0020	.0022
Medium Carbon & High Carbon Steels, Alloy Steels & Easy to Machine Tool Steels 1030, 1035, 1040, 1045, 1050, 1052, 1055, 1060, 1085, 1095, 1541, 1551, 9255, 2515, 3135, 3415, 4130, 4137, 4140, 4150, 4320, 4340, 4520, 5015, 5115, 5120, 5132, 5140, 5155, 6150, 8620, 9262, 9840, 52100, O1, O2, O6, S2, W1 to W310	P	28 to 38 Rc		10X	300	300	250	.0018	.0020	.0022
Tool Steels & Die Steels O7, M1, M2, M3, M4, M7, T1, T2, T4, T5, T8, T15, A2, A3, A6, A7, H10, H11, H12, H13, H19, H21, L3, L6, L7, P2, P20, S1, S5, S7, 52100, A128, D2, D3, D4, D5, D7	P	28 to 44 Rc		10X	250	250	200	.0018	.0020	.0022
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430	M	up to 28 Rc		10X	300	300	250	.0018	.0020	.0022
Stainless Steel - Moderately Difficult 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	up to 28 Rc		10X	230	230	200	.0018	.0020	.0022
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	M	over 28 Rc		10X	60	60	50	.0009	.0011	.0015
High Temp Alloys Nimonics, Inconel, Monel, Hastelloy	S	up to 42 Rc		10X	50	50	40	.0009	.0011	.0014
Titanium Alloys 6Al-4V, 5Al-2.5 Sn, 6Al-2 Sn-4Zr-6Mo, 3Al-8V-6Cr4Mo-4Zr, 10V-2Fe-3Al, 13V-11Cr-3Al	S	up to 42 Rc		10X	175	175	150	.0009	.0011	.0014
Cast Iron - Gray CG, ASTM A48, CLASS 20, 25, 30, 35, SAE J431C, GRADES G1800, G3000, G3500, GG 10, 15, 20, 25, 30, 35, 40	K	up to 240 HB		10X	325	325	300	.0018	.0020	.0022
Cast Iron - Ductile & Malleable CGI 60-40-18, 65-45-12, D4018, D4512, D5506, 32510, 35108, M3210, M4504, M5503, 250, 300, 350, 400, 450	K	over 240 HB		10X	250	250	200	.0018	.0020	.0022

M.A. Ford® recommends full retraction of the body of the drill from the hole during the peck cycle. It is recommended to leave the drill point within the hole.

For hole depths deeper than 4x the diameter, M.A. Ford® recommends using a “soft start” program that drills to .5x diameter deep at 2/3 of the speed and feed.

Machine Requirements

High Pressure Pump System (1,000 psi/68.9 bar)
Coolant filtration of 10 microns or better
Machine runout of .0004" (.01mm) Max.

Estimated Peck Depths

For hole depths up to 6X diameter No Pecks
For hole depths up to 10X diameter 0-2 Pecks
For hole depths up to 15X diameter 2-4 Pecks

Twister® MD

Recommended Cutting Data 2MDCL - Metric

Workpiece Material Group	ISO	Hardness	TYPE	DEPTH	Drill Diameter (mm)			Drill Diameter (mm)		
					2.0	2.5	2.9	2.0	2.5	2.9
					vc - m/min			f - mm/Rev		
Free Machining & Low Carbon Steels 1006, 1008, 1015, 1018, 1020, 1022, 1025, 1117, 1140, 1141, 11L08, 11L14, 1213, 12L13, 12L14, 1215, 1330	P	up to 28 Rc		10X	90	90	75	.046	.051	.056
Medium Carbon & High Carbon Steels, Alloy Steels & Easy to Machine Tool Steels 1030, 1035, 1040, 1045, 1050, 1052, 1055, 1060, 1085, 1095, 1541, 1551, 9255, 2515, 3135, 3415, 4130, 4137, 4140, 4150, 4320, 4340, 4520, 5015, 5115, 5120, 5132, 5140, 5155, 6150, 8620, 9262, 9840, 52100, O1, O2, O6, S2, W1 to W310	P	28 to 38 Rc		10X	90	90	75	.046	.051	.056
Tool Steels & Die Steels O7, M1, M2, M3, M4, M7, T1, T2, T4, T5, T8, T15, A2, A3, A6, A7, H10, H11, H12, H13, H19, H21, L3, L6, L7, P2, P20, S1, S5, S7, 52100, A128, D2, D3, D4, D5, D7	P	28 to 44 Rc		10X	60	60	53	.046	.051	.056
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430	M	up to 28 Rc		10X	90	90	75	.046	.051	.056
Stainless Steel - Moderately Difficult 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	up to 28 Rc		10X	75	75	60	.033	.038	.043
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	M	over 28 Rc		10X	18	18	15	.025	.027	.038
High Temp Alloys Nimonics, Inconel, Monel, Hastelloy	S	up to 42 Rc		10X	15	15	12	.025	.027	.036
Titanium Alloys 6Al-4V, 5Al-2.5 Sn, 6Al-2 Sn-4Zr-6Mo, 3Al-8V-6Cr4Mo-4Zr, 10V-2Fe-3Al, 13V-11Cr-3Al	S	up to 42 Rc		10X	55	55	45	.025	.027	.036
Cast Iron - Gray CG, ASTM A48, CLASS 20, 25, 30, 35, SAE J431C, GRADES G1800, G3000, G3500, GG 10, 15, 20, 25, 30, 35, 40	K	up to 240 HB		10X	100	100	90	.046	.051	.065
Cast Iron - Ductile & Malleable CGI 60-40-18, 65-45-12, D4018, D4512, D5506, 32510, 35108, M3210, M4504, M5503, 250, 300, 350, 400, 450	K	over 240 HB		10X	75	75	60	.046	.051	.056

M.A. Ford® recommends full retraction of the body of the drill from the hole during the peck cycle. It is recommended to leave the drill point within the hole.

For hole depths deeper than 4x the diameter, M.A. Ford® recommends using a “soft start” program that drills to .5x diameter deep at 2/3 of the speed and feed.

Machine Requirements

High Pressure Pump System (1,000 psi/68.9 bar)
Coolant filtration of 10 microns or better
Machine runout of .0004" (.01mm) Max.

Estimated Peck Depths

For hole depths up to 6X diameter No Pecks
For hole depths up to 10X diameter 0-2 Pecks
For hole depths up to 15X diameter 2-4 Pecks

Twister® HP

Recommended Cutting Data 207CE - Inch

Workpiece Material Group	ISO	Tool Series	TYPE	DEPTH	Speed - (SFM) Surface Feed Per minute	Drill Diameter			
						1/8	1/4	3/8	1/2
						Feed - (IPR) Inch per Rev			
Plastics	N	207CE	●	3	330	.002	.004	.005	.006
Kevlar/Graphite	N			3	420	.002	.004	.005	.006

Recommended Cutting Data 207CE - Metric

Workpiece Material Group	ISO	Tool Series	TYPE	DEPTH	Speed Vc- (m/min) Meters Per minute	Drill Diameter			
						3.0	6.0	10.0	12.0
						Feed - (mm/rev) milimeters per Rev			
Plastics	N	207CE	●	3	100	.05	.10	.13	.15
Kevlar/Graphite	N			3	125	.05	.10	.13	.15

Twister® AL

Recommended Cutting Data 229 - Inch

Workpiece Material Group	ISO	TYPE	DEPTH	vc - SFM	Drill Diameter				
					3/64	3/16	1/4	1/2	3/4
					f - IPR				
Non-Ferrous - Al < 14% Si	N	●	5	700	.003	.007	.012	.017	.024
Non-Ferrous - Al > 14% Si	N		5	500	.002	.003	.006	.009	.012
Non-Ferrous - Brass	N		5	400	.002	.003	.006	.009	.012
Non-Ferrous - Cu/Cu Alloys/Magnesium	N		5	300	.002	.003	.006	.009	.012

Recommended Cutting Data 229 - Metric

Workpiece Material Group	ISO	TYPE	DEPTH	vc - m/min	Drill Diameter (mm)				
					1.5	3	6	12	20
					f - mm/Rev				
Non-Ferrous - Al < 14% Si	N	●	5	215	.080	.200	.310	.450	.610
Non-Ferrous - Al > 14% Si	N		5	155	.050	.080	.150	.250	.310
Non-Ferrous - Brass	N		5	120	.050	.080	.150	.250	.310
Non-Ferrous - Cu/Cu Alloys/Magnesium	N		5	90	.050	.080	.150	.250	.310

Twister® HP

Recommended Cutting Data 305 Micro-Tuff® - Inch

Workpiece Material Group	ISO	Hardness	Tool Series	TYPE	vc - SFM	Drill Diameter				
						1/64	1/32	1/16	3/32	1/8
						f - IPR				
Free Machining & Low Carbon Steels: 1006, 1008, 1015, 1018, 1020, 1022, 1025, 1117, 1140, 1141, 11L08, 11L14, 1213, 12L13, 12L14, 1215, 1330	P	up to 28 Rc	305		300	.0004	.0008	.0015	.0023	.0030
			305AM		360					
Medium Carbon & High Carbon Steels, Alloy Steels & Easy to Machine Tool Steels: 1030, 1035, 1040, 1045, 1050, 1052, 1055, 1060, 1085, 1095, 1541, 1551, 9255, 2515, 3135, 3415, 4130, 4137, 4140, 4150, 4320, 4340, 4520, 5015, 5115, 5120, 5132, 5140, 5155, 6150, 8620, 9262, 9840, 52100, O1, O2, O6, S2, W1 to W310	P	28 to 38 Rc	305		225	.0004	.0008	.0015	.0023	.0030
			305AM		270					
Tool Steels & Die Steels: O7, M1, M2, M3, M4, M7, T1, T2, T4, T5, T8, T15, A2, A3, A6, A7, H10, H11, H12, H13, H19, H21, L3, L6, L7, P2, P20, S1, S5, S7, 52100, A128, D2, D3, D4, D5, D7	P	28 to 44 Rc	305		200	.0004	.0008	.0015	.0023	.0030
			305AM		240					
Hardened Steels A2 / 52100	H	35-55 Rc	305		50	.0002	.0004	.0007	.0011	.0014
			305AM		60					
Free Machining Stainless	M	up to 28 Rc	305		175	.0004	.0008	.0015	.0023	.0030
			305AM		210					
Stainless Steel - Austenitic 304 / 316	M	up to 28 Rc	305		200	.0004	.0008	.0015	.0023	.0030
			305AM		240					
Stainless Steel - Ferritic / Martensitic	M	up to 28 Rc	305		100	.0004	.0008	.0015	.0023	.0030
			305AM		120					
Stainless Steel - Moderately Difficult: 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	over 28 Rc	305		75	.0004	.0008	.0015	.0023	.0030
			305AM		90					
Aluminum (<10% Si)	N		305		450	.0005	.0010	.0020	.0030	.0040
			305AM		-	-	-	-	-	-
Aluminum (>10% Si)	N		305		325	.0005	.0010	.0020	.0030	.0040
			305AM		-	-	-	-	-	-
Plastics	N		305		550	.0005	.0010	.0020	.0030	.0040
			305AM		-	-	-	-	-	-
Composities / Fiber Reinforced Materials / Circuit Boards	N		305		650	.0005	.0010	.0020	.0030	.0040
			305AM		-	-	-	-	-	-
Cast Iron - Gray CG: ASTM A48, CLASS 20, 25, 30, 35, SAE J431C, GRADES G1800, G3000, G3500, GG 10, 15, 20, 25, 30, 35, 40	K	up to 240 HB	305		400	.0004	.0008	.0015	.0023	.0030
			305AM		480					
Cast Iron - Ductile & Malleable CGI: 60-40-18, 65-45-12, D4018, D4512, D5506, 32510, 35108, M3210, M4504, M5503, 250, 300, 350, 400, 450	K	over 240 HB	305		350	.0004	.0008	.0015	.0023	.0030
			305AM		420					
Titanium 6Al-4V	S	up to 40 Rc	305		60	.0004	.0008	.0015	.0023	.0030
			305AM		70					
High Temp Alloys Inconel / Hastelloy / Waspeloy / Nickel Based Alloys-Monel	S	up to 40 Rc	305		50	.0002	.0004	.0007	.0011	.0014
			305AM		60					

Recommended Peck Depths by Diameter*

Diameter	Peck Depth
1/64	.2 x Diameter
1/32	.3 x Diameter
1/16	.6 x Diameter
5/64	.8 x Diameter
3/32	1.0 x Diameter
1/8	1.2 x Diameter

*Peck depths can vary by material type.

Technical data provided should be considered advisory only as variations may be necessary depending on the particular application.

Twister® HP

Recommended Cutting Data 305 Micro-Tuff® - Metric

Workpiece Material Group	ISO	Hardness	Tool Series	TYPE	vc - m/min	Drill Diameter (mm)				
						0.5	1	2	2.5	3
						f - mm/Rev				
Free Machining & Low Carbon Steels: 1006, 1008, 1015, 1018, 1020, 1022, 1025, 1117, 1140, 1141, 11L08, 11L14, 1213, 12L13, 12L14, 1215, 1330	P	up to 28 Rc	305		90	.010	.020	.040	.060	.075
			305AM		110					
Medium Carbon & High Carbon Steels, Alloy Steels & Easy to Machine Tool Steels: 1030, 1035, 1040, 1045, 1050, 1052, 1055, 1060, 1085, 1095, 1541, 1551, 9255, 2515, 3135, 3415, 4130, 4137, 4140, 4150, 4320, 4340, 4520, 5015, 5115, 5120, 5132, 5140, 5155, 6150, 8620, 9262, 9840, 52100, O1, O2, O6, S2, W1 to W310	P	28 to 38 Rc	305		70	.010	.020	.040	.060	.075
			305AM		84					
Tool Steels & Die Steels: O7, M1, M2, M3, M4, M7, T1, T2, T4, T5, T8, T15, A2, A3, A6, A7, H10, H11, H12, H13, H19, H21, L3, L6, L7, P2, P20, S1, S5, S7, 52100, A128, D2, D3, D4, D5, D7	P	28 to 44 Rc	305		60	.010	.020	.040	.060	.075
			305AM		72					
Hardened Steels A2 / 52100	H	35-55 Rc	305		15	.005	.010	.020	.025	.035
			305AM		18					
Free Machining Stainless	M	up to 28 Rc	305		55	.010	.020	.040	.060	.075
			305AM		66					
Stainless Steel - Austenitic 304 / 316	M	up to 28 Rc	305		60	.010	.020	.040	.060	.075
			305AM		72					
Stainless Steel - Ferritic / Martensitic	M	up to 28 Rc	305		30	.010	.020	.040	.060	.075
			305AM		36					
Stainless Steel - Moderately Difficult: 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	over 28 Rc	305		25	.010	.020	.040	.060	.075
			305AM		30					
Aluminum (<10% Si)	N		305		140	.015	.025	.050	.075	.100
			305AM		-	-	-	-	-	-
Aluminum (>10% Si)	N		305		100	.015	.025	.050	.075	.100
			305AM		-	-	-	-	-	-
Plastics	N		305		170	.015	.025	.050	.075	.100
			305AM		-	-	-	-	-	-
Composities / Fiber Reinforced Materials / Circuit Boards	N		305		200	.015	.025	.050	.075	.100
			305AM		-	-	-	-	-	-
Cast Iron - Gray CG: ASTM A48, CLASS 20, 25, 30, 35, SAE J431C, GRADES G1800, G3000, G3500, GG 10, 15, 20, 25, 30, 35, 40	K	up to 240 HB	305		120	.010	.020	.040	.060	.075
			305AM		144					
Cast Iron - Ductile & Malleable CGI: 60-40-18, 65-45-12, D4018, D4512, D5506, 32510, 35108, M3210, M4504, M5503, 250, 300, 350, 400, 450	K	over 240 HB	305		110	.010	.020	.040	.060	.075
			305AM		132					
Titanium 6Al-4V	S	up to 40 Rc	305		20	.010	.020	.040	.060	.075
			305AM		24					
High Temp Alloys Inconel / Hastelloy / Waspeloy / Nickel Based Alloys-Monel	S	up to 40 Rc	305		15	.005	.010	.020	.030	.035
			305AM		18					

Recommended Peck Depths by Diameter*

Diameter	Peck Depth
0.5 mm	.2 x Diameter
1.0 mm	.4 x Diameter
1.5 mm	.6 x Diameter
2.0 mm	.8 x Diameter
2.5 mm	1.0 x Diameter
3.0 mm	1.2 x Diameter

*Peck depths can vary by material type.

Technical data provided should be considered advisory only as variations may be necessary depending on the particular application.

For product information, call your local distributor.

Twister® GP

Recommended Cutting Data 402 / 403 / 404 / 405 - Inch

Workpiece Material Group	ISO	Hardness	Tool Series	TYPE	vc - SFM	Drill Diameter					
						1/32	1/16	1/8	1/4	3/8	1/2
						f - IPR					
Free Machining & Low Carbon Steels 1006, 1008, 1015, 1018, 1020, 1022, 1025, 1117, 1140, 1141, 11L08, 11L14, 1213, 12L13, 12L14, 1215, 1330	P	up to 28 Rc	402		175	.0005	.0010	.0015	.0030	.0040	.0050
			403								
			404								
			405								
Medium Carbon & High Carbon Steels, Alloy Steels & Easy to Machine Tool Steels 1030, 1035, 1040, 1045, 1050, 1052, 1055, 1060, 1085, 1095, 1541, 1551, 9255, 2515, 3135, 3415, 4130, 4137, 4140, 4150, 4320, 4340, 4520, 5015, 5115, 5120, 5132, 5140, 5155, 6150, 8620, 9262, 9840, 52100, O1, O2, O6, S2, W1 to W310	P	28 to 38 Rc	402	●	165	.0005	.0010	.0015	.0030	.0040	.0050
			403								
			404								
			405								
Tool Steels & Die Steels O7, M1, M2, M3, M4, M7, T1, T2, T4, T5, T8, T15, A2, A3, A6, A7, H10, H11, H12, H13, H19, H21, L3, L6, L7, P2, P20, S1, S5, S7, 52100, A 128, D2, D3, D4, D5, D7	P	28 to 44 Rc	402		150	.0005	.0010	.0015	.0030	.0040	.0050
			403								
			404								
			405								
Hardened Steels A2 / 52100	H	35 to 45 Rc	402	●	50	.0005	.0010	.0015	.0030	.0040	.0050
			403								
			404/405								
Stainless Steel - Austenitic 304 / 316	M	up to 28 Rc	402		125	.0005	.0010	.0015	.0030	.0040	.0050
			403								
			404								
			405								
Stainless Steel - Moderately Difficult 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	over 28 Rc	402	●	60	.0005	.0010	.0015	.0030	.0040	.0050
			403								
			404								
			405								
Cast Iron - Gray CG, ASTM A48, CLASS 20, 25, 30, 35, SAE J431C, GRADES G1800, G3000, G3500, GG 10, 15, 20, 25, 30, 35, 40	K	up to 240 HB	402		275	.0005	.0010	.0015	.0030	.0040	.0050
			403								
			404								
			405								
Cast Iron - Ductile & Malleable CGI 60-40-18, 65-45-12, D4018, D4512, D5506, 32510, 35108, M3210, M4504, M5503, 250, 300, 350, 400, 450	K	over 240 HB	402	●	175	.0005	.0010	.0015	.0030	.0040	.0050
			403								
			404								
			405								
Titanium 6Al-4V	S	up to 42 Rc	402		80	.0005	.0010	.0015	.0030	.0040	.0050
			403								
			404								
			405								
High Temp Alloys Inconel / Hastelloy / Waspeloy / Nickel Based Alloys-Monel	S	up to 42 Rc	402	●	40	.0005	.0010	.0015	.0030	.0040	.0050
			403								
			404								
			405								

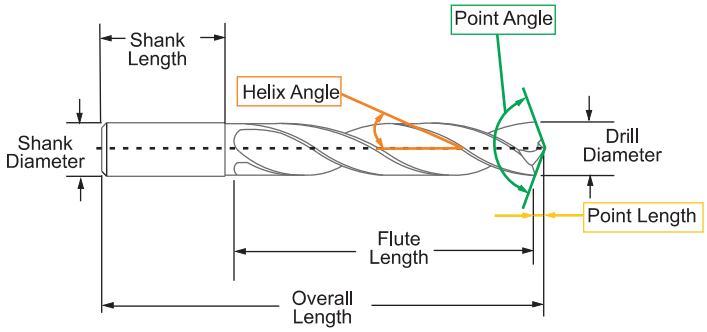
Technical data provided should be considered advisory only as variations may be necessary depending on the particular application.

Twister® GP

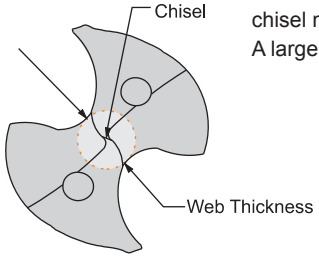
Recommended Cutting Data 402 / 403 / 404 / 405 - Metric

Workpiece Material Group	ISO	Hardness	Tool Series	TYPE	vc - m/min	Drill Diameter (mm)					
						1	2	3	6	10	12
						f - mm/Rev					
Free Machining & Low Carbon Steels 1006, 1008, 1015, 1018, 1020, 1022, 1025, 1117, 1140, 1141, 1L08, 1L14, 1213, 12L13, 12L14, 1215, 1330	P	up to 28 Rc	402	●	55	.013	.025	.038	.076	.102	.127
			403								
			404								
			405								
Medium Carbon & High Carbon Steels, Alloy Steels & Easy to Machine Tool Steels 1030, 1035, 1040, 1045, 1050, 1052, 1055, 1060, 1085, 1095, 1541, 1551, 9255, 2515, 3135, 3415, 4130, 4137, 4140, 4150, 4320, 4340, 4520, 5015, 5115, 5120, 5132, 5140, 5155, 6150, 8620, 9262, 9840, 52100, O1, O2, O6, S2, W1 to W310	P	28 to 38 Rc	402		50	.013	.025	.038	.076	.102	.127
			403								
			404								
			405								
Tool Steels & Die Steels O7, M1, M2, M3, M4, M7, T1, T2, T4, T5, T8, T15, A2, A3, A6, A7, H10, H11, H12, H13, H19, H21, L3, L6, L7, P2, P20, S1, S5, S7, 52100, A 128, D2, D3, D4, D5, D7	P	28 to 44 Rc	402		45	.013	.025	.038	.076	.102	.127
			403								
			404								
			405								
Hardened Steels A2 / 52100	H	35 to 45 Rc	402	●	15	.013	.025	.038	.076	.102	.127
			403								
			404								
			405								
Stainless Steel - Austenitic 304 / 316	M	up tp 28 Rc	402	●	40	.013	.025	.038	.076	.102	.127
			403								
			404								
			405								
Stainless Steel - Moderately Difficult 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	over 28 Rc	402		20	.013	.025	.038	.076	.102	.127
			403								
			404								
			405								
Cast Iron - Gray CG, ASTM A48, CLASS 20, 25, 30, 35, SAE J431C, GRADES G1800, G3000, G3500, GG 10, 15, 20, 25, 30, 35, 40	K	up to 240 HB	402	●	85	.013	.025	.038	.076	.102	.127
			403								
			404								
			405								
Cast Iron - Ductile & Malleable CGI 60-40-18, 65-45-12, D4018, D4512, D5506, 32510, 35108, M3210, M4504, M5503, 250, 300, 350, 400, 450	K	over 240 HB	402		55	.013	.025	.038	.076	.102	.127
			403								
			404								
			405								
Titanium 6Al-4V	S	up to 42 Rc	402	●	25	.013	.025	.038	.076	.102	.127
			403								
			404								
			405								
High Temp Alloys Inconel / Hastelloy / Waspeloy / Nickel Based Alloys-Monel	S	up to 42 Rc	402		10	.013	.025	.038	.076	.102	.127
			403								
			404								
			405								

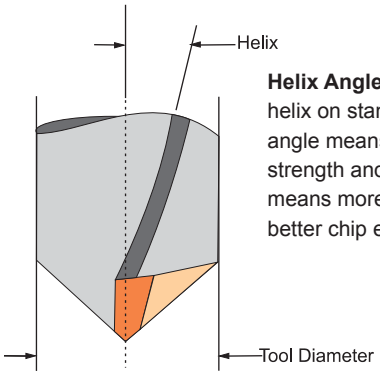
Drill Terminology



Chisel Edge – The non-cutting tip of the drill. Pushes, rather than cuts material. Having a smaller chisel means that a tool will cut more aggressively. A larger chisel means that a tool will be stronger.

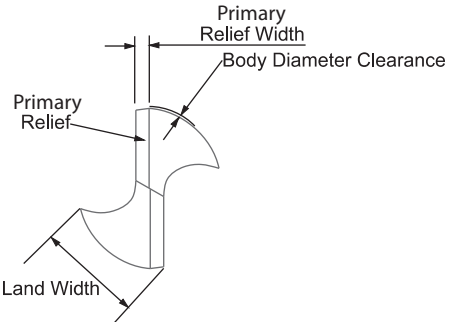


Web – The core of the drill that is left from the fluting operation. A thicker web means added rigidity, while a smaller web means more chip evacuation. On two flute drills, typically varies from 16% - 30% of the tool diameter.

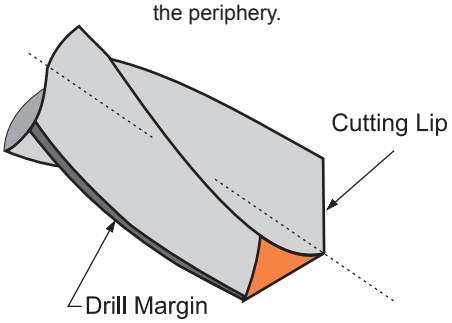


Helix Angle - Varies from 0° to 35° helix on standard tools. Lower helix angle means more rigidity and strength and a higher helix angle means more aggressive drilling and better chip evacuation.

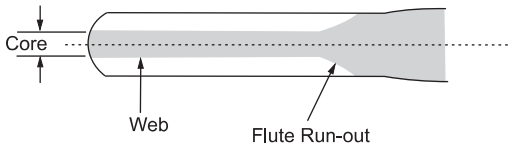
Margin Width – Provides a surface to support the drill inside the hole during the drilling operation. M.A. Ford® offers both single margin and double margin geometries. Margin widths are a balancing act between friction build-up vs. tool support in the drilling operation.



Cutting Lip - The cutting edges of a two flute drill extending from the chisel edge to the periphery.



Land Width – The amount of material left on the drill per side, from the fluting operation. Larger land widths mean more rigidity, while smaller land widths allow for better chip evacuation.



Having a problem with drill geometries? Circle the area where the problem exists.
Include a detailed explanation of the issue and fax to Attn: Technical Application Support 800-892-9522 / 563-386-7660
or email: maftech@maford.com

Coatings

ALtima®
Aluminum Titanium Nitride (AlTiN). ALtima® is the original high performance coating. This coating allows tools to be run at higher speeds and feeds in a wide array of materials. Also, it allows the option of running tools dry due to the high oxidation temperature of the coating.

ALtima® Plus
This Aluminum Titanium Nitride (AlTiN) multi-layer coating has optimized coating structure, with pre and post treatment of the coating for optimized high performance drilling in any ferrous material.

ALtima® 52
Aluminum Titanium Nitride (AlTiN). ALtima® 52 is specially designed for milling hardened steels 52 Rc and above. It has very high hardness and the oxidation temperature of the coating makes this the absolute best choice for hardened steel milling. ALtima® 52 is designed to allow for dry machining.

ALtima® Blaze
Aluminum Chromium Nitride (AlCrN). ALtima® Blaze is designed to allow higher material removal rates. This coating has a higher oxidation temperature than a typical TiAlN coating. It has shown very good results in nickel alloys, titanium, and other difficult to machine materials. Tools coated with ALtima® Blaze can be used in dry machining.

ALtima® Micro
An ultra thin, nano structured, TiAlN coating developed specifically for micro tool applications.

ALtima® Xtreme
Designed for high speed and dry machining.

Fordlube
Titanium DiBoride (TiB_2) is a unique coating with low Aluminum affinity, smooth surface finish and high hardness. It is ideal for Aluminum and Magnesium alloys as it prevents build-up on cutting edge, provides superior chip flow along with extended wear resistance.

Gem+
Recommended for aluminium and aluminium alloys up to 12% Si, non-ferrous metals and composites. Gem+ provides excellent wear resistance and maintains sharp cutting edges.

GemX
A CVD diamond coating for composites and aluminum that offers the maximum hardness and wear resistance of any of our coatings.

TiN
Titanium Nitride (TiN). TiN coating has shown good results in low carbon steels and many iron-based applications. It is a very popular coating used in the industry today.

TiCN
Titanium Carbonitride (TiCN). TiCN is a multi-layer coating. Because of the multi-layer composition, TiCN is tougher than TiN, even though TiCN is harder. The added toughness of the TiCN coating makes it a good choice for mechanically stressed edges like in end mill applications. The higher hardness makes TiCN a good choice for abrasive applications where higher wear resistance is required.

CERAedge®
CERAedge® is a unique coating that provides excellent performance in titanium, aluminium, and composites.

Special Coatings
Upon request, M.A. Ford® can provide any commercially available coating. **Any standard uncoated M.A. Ford® cutting tool can be provided with coating if requested.**

Coating Properties

M.A. Ford® Coating	M.A. Ford® Tool Number Designation	Microhardness (HV)	Maximum Service Temp.	Friction Coefficient
ALtima®	A	3100	1100° C / 2012° F	0.42
ALtima® Plus	AP	3200	1100° C / 2012° F	0.25
ALtima® 52	A or AH	3600	1200° C / 2192° F	0.40
ALtima® Blaze	B	3200	1100° C / 2012° F	0.35
ALtima® Micro	AM	3300	900° C / 1652° F	0.30-0.35
ALtima® Xtreme	AX	3800	1100° C / 2012° F	0.30-0.50
Fordlube	F	4000	700° C / 1292° F	0.30
Gem+	GP	4710	500° C / 932° F	0.30
GemX	GX	10000	600° C / 1100° F	0.10
TiN	T	2300	600° C / 1112° F	0.40
TiCN	C	3000	400° C / 752° F	0.40
CERAedge®	CE	3400	1100° C / 2012° F	0.25

Material Conversion Chart

	USA	France	Brazil	German W-nr	German DIN	UK	Spain	Japan JIS
FREE MACHINING STEEL	12L13	S250Pb		1.0718	9SMnPB28		F.2112 -	
	1108	10F1		1.0721	10S20	210M15	F.2121 -	
	11L08	10PbF2		1.0722	10SPb20		F.2122 -	
				1.0723	15S20	210A15	F.210F.	
	1215	S300	1215	1.0736	9SMn36	240M07 EN 1B	F.2113-	
	12L14	S300Pb		1.0737	9MnPb36		F.2114 -	
LOW CARBON STEEL	1010	AF34C10/XC10	1010	1.0301	C10	045M10		
	1015	AF37C12/XC18	1015	1.0401	C15	080M15;040A15	F.111	
	1020	AF42C20/XC25	1020	1.0402	C22	055M15 EN2C	F.112	
	1025	AF50C30		1.0406	C25	070M26	F.221	
	1212			1.0711	9S20	220M07		
	1213	S250	1213	1.0715	9SMn28	230M07	F.2111 -	
	1010	XC10	1010	1.1121	Ck10	040A10	F.1510 -	
	1022/1518	20M5		1.1133	20Mn5	120M19	F.1515 -	
	1015	XC15 / C15E	1015	1.1141	Ck15	080M15 EN 32C	F.1511 -	
	10201023	XC25 / C22E	1020	1.1151	Ck22	050A20	F.1120 -	
	1025	XC25 / C25E		1.1158	Ck25	070M26	F.1120 -	
	A350-LF5	15N6 / 15Ni6		1.5622	14Ni6		F.2641 -	
	3310/9314	12NC15		1.5752	14NiCr14	655M13/A12 EN 36A		
MEDIUM CARBON STEEL	1035	AF55C35 /XC38	1035	1.0501	C35	060A35	F.113	
	1045	AF65C45 /C45	1045	1.0503	C45	080M46	F.114	
	1040	AF60C40 C40	1040	1.0511	C40		F.114.A	
	1055	C55	1055	1.0535	C55	070M55		
	1060	AF70C55 / C60	1060	1.0601	C60	080A62 EN 43D	F.115	
	1140	35MF6	1140	1.0726	35S20	212M36 EN 8M	F.210G.	
	1146	45MF4		1.0727	45S20	212M44		
	9255	51S7		1.0903	51Si7	250A53 EN 45	F.1450 -	
	9255	55S7	9254	1.0904	55Si7		F.1440-	
	9260	60S7		1.0909	60Si7	250A58	F.1441 -	
	9262	60SC7		1.0961	60SiCr7	250A61	F.1442 -	
	1330/1536	35M5 / 30Mn5		1.1165/66	30Mn5/34Mn5	120M36/150M28	F.1203	
	1335	40M5 / 36Mn5	1541	1.1167	36Mn5	150M36 EN 15	F.1203 -	
	1330	20M5 / 28Mn6	1330	1.117	28Mn6	150M28 EN 14A		
	1035	XC32 / C35R	1035	1.118	Cm35	080M36	F.1135 -	
	1040	XC42H1 / C40E	1040	1.1186	Ck40	060A40/080A40		S 40 C
	1045	XC42H1 / C45/XC45	1045	1.1191	Ck45	080M46/060A47	F.1140 -	S 45 C
	1045	XC42H1 /C45R	1045	1.1201	Cm45	080M46	F.1145 -	
	1055	XC55H1 / C55E	1055	1.1203	Ck55	060A57/070M55	F.1150 -	S55C
	1050	XC48H1 / C50E	1050	1.1206	Ck50	080M50		
	1050	XC48H1TS	1050	1.1213	Cf53	060A52		
	1060	XC60 / C60E/2C60	1060	1.1221	Ck60	060A62	F.511/F.512	S58C
	1070	XC68	1070	1.1231	Ck67	060A67		
ALLOY STEEL	1080/1078/1086	XC75 / C75E/XC90	1074	1.1248/1269	Ck75	060A78	F.513/514/515	
	1095	XC100	1095	1.1274	Ck101	060A96		
	4135/4142	34CD4 /42CD4		1.233	35CrMo4/47CrMo4	708A37/M40		SCM435TK
	3135/3140	35NC6		1.571/.5711	36NiCr6/40NiCr6	640A35/M40 EN111A		
	8620/8720	20NCD2	8620	1.6523/43	21NiCrMo2	805M20/A20 EN 362	F.1522 -	SNCM220(H)
	8740	40NCD2	8640	1.6546	40NiCrMo22	311-Type7	F.1204 -	SNCM240
		18NCD6		1.6587	17CrNiMo8	820A16	F.1560 -	
	5132	32C4 / 34Cr4		1.7033	34Cr4	530A32 EN18B	F.8221 /F.224	SCR430(H)
	5135	38C4 / 37Cr4	5135	1.7034	37Cr4	530A36	F.1201 -	
	5140	42C4 / 41Cr4	5140	1.7035	41Cr4	530M40/A40 EN 18	F.1202 -	SCR440(H)
	5140	42C4TS	5140	1.7045	42Cr4	530A40	F.1202 -	SCR440
	5115	16MC5	5115	1.7131	16MnCr5	527M17	F.1515 -	
	5155	55C3		1.7176	55Cr3	527A60 EN 48	F.1431 -	SUP9(A)
	4130	25CD4 / 25CrMo4	4130	1.7218	25CrMo4	1717CDS110	F.8330 -	SCM420/430
	4135/4137	35CD4 / 34CrMo4		1.722	34CrMo4	708A37 EN 19B	F.8231 -	
	4140/4142	42CD4 / 42CrMo4	4140	1.7225	42CrMo4	708M40 EN 19A	F.8232 -	
	4150	50CrMo4	4150	1.7228	50CrMo4	708A47		
	6150	50CV4 / 51CrV4	6151	1.8159	50CrV4	735A50 EN 47	F.1430 -	

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Material Conversion Chart

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HIGH STRENGTH ALLOY STEEL	A355Cl.D	30CAD6.12		1.8507	34CrAlMo5	905M31	F.1741 -	
	A355Cl.A	40CAD6.12		1.8509	41CrAlMo7	905M39 EN 41B	F.1740 -	
		18NC13		1.5755	31NiCr14	653M31	F.123	
	9840	40NCD3		1.6511	36CrNiMo4	816M40 EN 110	F.1280	
	4340		4340	1.6562	40NiCrMo73	817M40		SNCM 447
		30CND8		1.658	30CrNiMo8	823M30		
	4340	35NCD6	4340	1.6582	34CrNiMo8	817M40 EN 24	F.1272	SNCM 447
		35NCD14		1.6746	32NiCrMo145	830M31	F.1262	
		35NCD16		1.6747	30NiCrMo166	835M30	F.1260	
		30CD12		1.8515	31CrMoV139	722M24 EN 40B	F.1712	
				1.8523	39CrMoV139	897M39 EN 40C		
STRUCTURAL STEEL	A570 (36)	E24-2NE / S235JRG2	A36	1.0038	RSt37-2	4360-40C		STKM 12A
	A570 (40)	E28-2 / S275JR		1.0044	St44-2	4360-43A/B	A 430B	SM 400 A;B;C
	A570 (50)	A50-2 / E295		1.005	St50-2	4360-50B		SS490
		A60-2 / E335-A70-2/E360		1.006/.007	St60-2/St70-2	4360-55E		
	A284/A573/A611	E24-3;-4 / S235J2G3		1.0116	St37-3	4360-40C/D-1449-37C	A360 C;D	
	A366/1012/A619	DC01		1.033/.0333	St12/13	1449 -2/3/4CR	AP 00/02	
	A620	DC04		1.0338	St14	1449 1CR; 2CR	AP 04	
	A516Gr.65;-55;	A37CP;AP / P235GH		1.0345	H I	1501Gr.161-360/400	A 37 RC I;RA II	
		A42CP;AP / P265GH		1.0425	H II	161-400;	A42 RC I	
	A537	A52CP;AP / P335GH		1.0473	19Mn6		A 47 RB II	
	A516 (70)	A48CP;AP / P295GH		1.0481	17Mn4		A 47 RC I; RA II	
		E36-3/4 / S355J2G3		1.057	St52-3	4360-50B;50C;50D	A 510 C;D	
	A204 (A)	15D3 / 15Mo3		1.5415	15Mo3	1501-240	F.2601 -	
	4520			1.5423	16Mo5	1503-245-420	F.2602 -	
	A350-LF3	12N14 / 12Ni14		1.5637	10Ni14	1501-503-690	F.152	
	3115	10NC6		1.5713	13NiCr6			
	3415	14NC11		1.5732	14NiCr10		F.1540	
	A182-F11;F12	15CD3.05		1.7335	13CrMo44	620Gr.27;31	F.2631	
	A387 (12)	15CD4.5		1.7337	16CrMo44	620Gr.27		
	A182F22	10CrMo9-10		1.738	10CrMo910	622Gr.31;45	TU.H	
	A633Gr.E	E420RIFP / S420N		1.8902	StE420	4360-55E	AE 420 KG	
	A633Gr.E	E460RIFP / S460N		1.8905	StE460		AE 460 KG	
HIGH TEMPERATURE ALLOYS	330	Z12NCS37.18		1.4864	X12NiCrSi3616	NA17	F.3313	
				1.4865	G-X40NiCrSi3818	330C40		
	B163	Z8NC3221		1.4876	X10NiCrAlTi3320	NA15(H)	F.3545	
	4544/SB127/164	NU30		2.436	NiCu30Fe	3072-76/NA13		
	4676			2.4375	NiCu30Al	3072-76/NA18/3146		
	5388 C	NC 17 DWY		2.4602	NiCr17Mo17FeW			
		NC 20 T		2.463	Ni-Cr20Ti	HR5/203-4/703-B		
		NC 20 TA		2.4631	NiCr20TiAl	HR 401HR601/736B		
		NCKD 20 ATV		2.4634	NiCo20Cr15MoAlTi	HR 3/5007		
	687	NCKD 20 AT		2.4636	NiCo15Cr15MoAlTi			
		NCK 20 D		2.465	NiCr20Co19MoTi	HR 10		
	5660C	Z8 NCDT 42		2.4662	NiCr15MoTi			
	5536E	Nc 22 FeD		2.4665	NiCr22Fe18Mo	HR 6/204		
		NC 19 FeNb		2.4668	NiCr19Fe19NbMo	HR 8		
	5542G	NC 15 Fe TNb		2.4669	NiCr16FeTi	HR 505		
	5391A	NC 13 AD		2.467	G-NiCr13Al6MoNb	HC 203		
		NK 15 CAT		2.4674	NiCo15Cr10MoAlTi	HC 204		
	5540	NC 15 Fe		2.4816	NiCr15Fe	3072-76		
	5581	NC 22 FeDNB		2.4856	NiCr22Mo9Nb			
		NC 21 FeDU		2.4858	NiCr21Mo	3072-76		
		NC 19 KDT		2.4973	NiCr19Co11MoTi			
	684	NCK 19 DAT		2.4983	NiCr18Co18MoAlTi			
TITANIUM TITANIUM ALLOYS		T-35		3.7024/25	Ti 99,8	TA.1	Ti-PO1	
		T-U2		3.7124	TiCu2	TA.21-24/52-55/58	Ti-P11	
		T-A6ZD		3.7154	TiAl6Zr5Mo0,5Si0,2	TA.43/44	Ti-P67	
		T-A4DE		3.7184	TiAl4Mo4Sn2Si0,5	TA.45-51/57	Ti-P68	
	4941/42/51/4902	T-40		3.7034/35	Ti 99,7	TA.2/3/4/5	Ti-PO2	
	4901/21	T-60		3.7064/65	Ti99,5	TA.6/7/8/9	Ti-PO4	
	491128/35/54/65/67	T-A6V		3.7164/65	TiAl6V4	TA.10-13/28/56	Ti-P63	
	4900	T-50				DTD 5023/5283		

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	USA	France	Brazil	German W-nr	German DIN	UK	Spain	Japan JIS
STAINLESS STEELS	410S	Z3014		1.4001	X7Cr14	403S17	F.8401	
	405	Z6CA13 / Z6CrAl13		1.4002	X6CrAl13	405S17	F.3111	
	416	Z12CF13 / Z12CrS13		1.4005	X12CrS13	416S21	F.3411	SUS 416
	410/CA-15	Z12C13 / Z12Cr13	410	1.4006	X10Cr13	410S21 ENEN 56A	F.3401	SUS 410
	430	Z8C17 / Z6Cr17		1.4016	X6Cr17	430S15 EN 60	F.3113	SUS 430
	420	Z20C13 / Z20Cr13	420	1.4021	X20Cr13	420S37	F.3402	SUS 420
		Z40C14 / Z40Cr14		1.4034	X46Cr13	420S45 EN 56D	F.3405	
	431	Z15CN16.02		1.4057	X20CrNi172	431S29 EN 57	F.3427	
	430F	Z10CF17		1.4104	X12CrMoS17		F.3117	
	434	Z8CD17.01		1.4113	X6CrMo17	434S17		
	440C	Z100CD17		1.4125	X105CrMo17			
	304/304H	Z6CN18.09	304	1.4301	X5CrNi1810	304S15 EN 58E	F.3451	SUS304
	308; 305	Z8CN18.12		1.4303	X5CrNi1812	305S19	F.3513	
	303	Z10CNF18.09	303	1.4305	X10CrNiS189	303S21 EN 58M	F.3508	SUS303
	304L	Z2CN18.10/Z3CN19.10M		1.4306	G-X2CrNi189/1911	304S12/S11/C12	F.3503	SCS19
	CF-8	Z6CN18.10M		1.4308	G-X6CrNi189	304C15		
	301	Z12CN17.07	302	1.431	X12CrNi177	301S21	F.3517	
	304LN	Z2CN18.10Az		1.4311	X2CrNiN1810	304S62		
		Z10CN18.9M		1.4312	G-X10CrNi188	302C25		
	CA6-NM	Z4CND13.4M		1.4313	G-X5CrNi134	425C11		
	316/316L	Z6CND17.11	316	1.4401	X5CrNiMo17122	316S16/S31 EN 58J	F.3543	SUS316
	316L	Z2CND 18.13	316L	1.4404	X2CrNiMo17132	316S11/S12	F.3533	SUS316 L
	316LN	Z2CND 17.12Az		1.4406	2CrNiMoN17122	316S61		SUS316LN
	CF-8M			1.4408	G-X6CrNiMo1810	316C16	F.8414	
	316LN	Z2CND17.13Az		1.4429	X2CrNiMo17133	316S62		SUS316LN
	316L	Z2CND17.13		1.4435	X2CrNiMo18143	316S11/S12	F.3533	SUS316LN
	316	Z6CND17.12		1.4436	X5CrNiMo17133	316S16	F.3534	SUS316
	317L	Z2CND19.15		1.4438	X2CrNiMo18164	317S12		SUS317L
	329		329 (DUPLEX)	1.446	X8CrNiMo275		F.3309	SUS329
	XM8/430Ti	Z8CT17		1.451	X6CrTi17		F.3114	
	409	Z6CT12		1.4512	X5CrTi12	409S19		
	321	Z6CNT18.10	321	1.4541	X6CrNiTi1810	321S12/S31 EN 58B	F.3523	SUS321
	630	Z6CNU17.04		1.4542	X5CrNiCuNb1714			SUS630
	347	Z6CNNb18.10		1.455	X6CrNiNb1810	347S17/S31 EN 58F	F.3552	SUS347
	316Ti	Z6CNDT17.12		1.4571	X6CrNiMoTi17122	320S31/S17 EN 58J	F.3552	
	316Ti			1.4573	X10CrNiMoTi1812	320S33		
	316Cb	Z6CNDNb17.12/19.13		1.458	X6CrNiMoNb17122	318S17		
	HNV3	Z45CS9		1.4718	X45CrSi93	401S45 EN52	F.3220	
		Z10C13		1.4724	X10CrAl13	403S17	F.13152	
		Z40CSD10		1.4731	X40CrSiMo102		F.3221	
	430	Z10CAS18		1.4742	X10CrAl18	430S15	F.3153	SUS430
	HNV6	Z80CSN20.02		1.4747	X80CrNiSi20	443S65 EN 59	F.3222	
	446	Z10CAS24		1.4762	X10CrAl24		F.3154	SUH446
	309	Z15CNS20.12		1.4828	X15CrNiSi2012	309S24		
	309S	Z15CN24.13		1.4833	X7CrNi2314	309S24		
	314/310	Z15CNS25.20	314	1.4841	X15CrNiSi2520		F.3310	
	310S	Z12CN25.20	310	1.4845	X12CrNi2521	310S24	F.331	
	HK			1.4848	G-X40CrNiSi2520	310C40	F.8452	
	EV8	Z52CMN21.09		1.4871	X53CrMnNiN219	349S54	F.3217	
		Z35CNWS14.14		1.4873	X45CrNiW189	331S40	F.3211	
	321	T6CNT18.12(B)		1.4878	X12CrNiTi189	321S20	F.3523	SUS321
	A353	Z8N9		1.5662	X8Ni9	1501-509;510	F.2645	
	2515	Z18N5		1.568	12Ni19			

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	USA	France	Brazil	German W-nr	German DIN	UK	Spain	Japan JIS
TOOL STEELS	A532IBNiCr-LC			0.962	G-X260NiCr42	Grade2A		
	A532IANiCr-HC			0.9625	G-X330NiCr42	Grade2B		
	A532IDNi-HiCr			0.963	G-X300CrNiSi952	Grade2C;D;E		
	A532IID20%CrMo-LC			0.9645	G-X260CrMoNi2021	Grade3C		
	A532IIIA25%Cr			0.965	G-X260Cr27	Grade3D		
	A532IIIA25%Cr			0.9655	G-X300CrMo271	Grade3E		
	W108	Y190;Y180		1.1525	C80W1			
	W110	Y1105		1.1545	C105W1			SK3
	W112	Y2120		1.1663	C125W		F.5123	
	W1			1.175/.1625	C75W/C80W1	BW1A/BW1B	F.1507	
	L3	Y100C6	52100	1.2067	100Cr6	BL3	F.5230	
	D3	Z200C12	420 (1.2083)	1.208	X210Cr12	BD3	F.5212	
	L2			1.221	115CrV3			
	H11	Z38CDV5	H11	1.2343	X38CrMoV51	BH11	F.5317	
	H13	Z40CDV5	H13	1.2344	X40CrMoV51	BH13	F.5318	SKD61
	A2	Z100CDV5	A2	1.2363	X100CrMoV51	BA2	F.5227	SKD12
	H10	32DCV28	H10	1.2365	X32CrMoV33	BH10	F.5313	
	D2	Z160CDV12	D2	1.2379	X155CrVMo121	BD2		
		105WC13		1.2419	105WCr6		F.5233	
			D6 (VC131)	1.2436	X210CrW12		F.5213	
	O1		O1 (VND)	1.251	100MnCrW4	BO1	F.5220	SKS 31
	S1		S1 (VW3)	1.2542	45WCrV7	BS1	F.5241	
		55WC20		1.255	60WCrV7			
	H21	Z30WCV9	H20/H21	1.2581	X30WCrV93	BH21	F.5323	SKD5
				1.2601	X165CrMoV12		F.5211	
	H12	Z35CWDV5	H12	1.2606	X37CrMoW51	BH12		
	L6	55NCDV7	(VMO)	1.2713	55NiCrMoV6		F.528	
	W210	Y1105V		1.2833	100V1	BW2		
	2	90MV8		1.2842	90MnCrV8	BO2		
	T15			1.3202	S12-1-4-5	BT15	F.5563	
		Z130WKCDV10-10-04-03		1.3207	S10-4-3-10		F.553	
		Z85WDKCV06-05-05-04-02	M35	1.3243	S6-5-2-5		F.5613	
	M41	Z110WKCDV07-05-04-04-02		1.3246	S7-4-2-5		F.5613	
	M42	Z110DKCWV09-08-04-02-01	M42	1.3247	S2-10-1-8	BT42	F.5615	
	M33/M34			1.3249	S2-9-2-8	BM34	F.5611	
	T4	Z80WKCV18-05-04-01		1.3255	S18-1-2-5	BT4	F.5530	
	T5			1.3265	S18-1-2-10	BT5	F.5540	
	M3	Z90WDCV06-05-04-03		1.3342	SC6-5-2			
	M2	Z85WDCV06-05-04-02	M2	1.3343	S6-5-2	BM2	F.5603	
	M3Class2	Z130WDCV06-05-04-04	M3:2	1.3344	S6-5-3		F.5605	
	H41/M1	Z85DCWV08-04-02-01		1.3346	S2-9-1	BM1		
	M7	Z100DCWV09-04-02-02	M7	1.3348	S2-9-2		F.5607	
	T1	Z80WCV18-04-01		1.3355	S18-0-1	BT1	F.5520	
	A128(A)	Z120M12 / Z120Mn12		1.3401	X120Mn12		F.82551	
	52100	100C6	52100	1.3505	100Cr6	534A99	F.1310	
HARDENED STEEL								
CAST ALUMINIUM	319,2	A-S5U		3.2151	G-AlSi6Cu4	LM4/LM22	L-2660	
	380,1	A-S9U3		3.2161	G-AlSi8Cu3	LM24	L-2630	
		A-S4G		3.2341	G-AlSi5Mg	DTD716B		
	A356.2	A-S7G0,3		3.2371	G-AlSi7Mg	2L99/LM25		
		A7-S10G		3.2373	G-AlSi9Mg			
	A360	A-S10G		3.2381	G-AlSi10Mg	LM9	L-2560	
	413,1	A-S12U		3.2583	G-AlSi12Cu	LM20	L-2530	
	514.1	A-G6		3.3561	G-AlMg5	LM5		
	A413	A-S13		3.3581	G-AlSi12	LM6	L-2520	
	520	A-G10-Y4		3.3591	G-AlMg10	LM10	L-2310	
	390				AlSi17Cu4			
	393				AlSi18-25CuNiMg	LM28/LM29		

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Material Conversion Chart

	USA	France	Brazil	German W-nr	German DIN	UK	Spain	Japan JIS
WROUGHT ALUMINIUM	1200	A4		3.0205	Al99	1C	L-3001	
	1050A	A5		3.0255	Al99,5	1B	L-3051	
	1350A	A5/L		3.0257	E-Al	1E	L-3052	
	1080A	A8		3.0285	Al99,8	1A	L-3081	
	1199	A99		3.0385	Al99,98R	1		
	3004	A-M1G		3.0526	AlMnMg1	N4	L-3820	
	2014	A-U4SG		3.1255	AlCuSiMn	H15	L-3130	
	2117	A-U2G		3.1305	AlCu2,5Mg0,5	3L86/HR13	L-3180	
	2017A	A-U4G		3.1325	AlCuMg1	H14	L-3120	
	2024	A-U4G1		3.1355	AlCuMg2	2L98	L3140	
	2003	A-U4Pb		3.1645	AlCuMgPb		L-3121	
	2011	A-U5PbBi		3.1655	AlCuBiPb	FC1	L-3182	
	6101B			3.2305	E-AlMgSi	91E	L-3431	
	6463	A85-GS		3.2307	Al99,85MGsI	BTR6		
	6181	A-SGMO,7		3.2315	Al-Si1 Mg	H30	L-3451	
	6060			3.3206	AlMGSi0,5	H9	L-3441	
	6101C	A-GS/L		3.3207	E-AlMgSi0,5	BTRE6		
	5005A	A-G0,6		3.3315	AlMg1	N41	L-3350	
	5050B	A-G1,5		3.3316	AlMg1,5	3L44	L-3380	
	5052	A-G2,5C		3.3523	AlMg2,5	N5Mg3,5	L-3360	
	5251	A-G2M		3.3525	AlMg2Mn0,3	N4		
	5754	A-G3M		3.3535	AlMg3		L-3390	
	5454	A-G2,5MC		3.3537	AlMg2,7Mn	N51		
	5083	5083		3.3547	AlMg4,5Mn	N8	L-3321	
	5056A			3.3555	AlMg5	N6	L-3320	
	7020	A-Z5G		3.4335	AlZn4,5Mg1	H17	L-3741	
	7075	A-Z5GU		3.4365	AlZnMgCu1,5	2L95	L-3710	
SG / NODULAR CAST IRON	60-40-18	FGS-400-12		0.704	GGG-40	420/12		
		FGS370-17		0.7043	GGG-40.3	370/17		
	65-45-12	FGS500-7		0.705	GGG-50	500/7		FDC500
	80-55-06	FGS 600-3		0.706	GGG-60	600/3		
	100-70-03	FGS 700-2		0.707	GGG-70	700/2		FDC700
	120-90-02	FGS 800-2		0.708	GGG-80	800/2		
		MB 35-7		0.8035	GTW-35-04	W 340/3		
		MB 40-10		0.804	GTW-40-05	W 410/4		
				0.8045	GTW-45-07			
	32 510	MN 35-10		0.8135	GTS-35-10	B 340/12		
		MP 50-5		0.8145	GTS-45-06	P 440/7		
		MP 60-3		0.8155	GTS-55-04	P 540/5		
				0.8165	GTS 65-02			
	70 003	MP 70-2		0.817	GTS 70-02	P 690/2		
GREY / WHITE CAST IRON	A48-40B	Ft25D / FGL250		0.6025	GG25	Grade 260	FG 25	
	A48-20B	Ft10D / FGL100		0.601	GG10		FG 10	
	A48-25B	Ft15D / FGL150		0.6015	GG15	Grade 150	FG 15	
	A48-30B	Ft20D / FGL200		0.602	GG20	Grade 220	FG20	
	A48-45B	Ft30D / FGL300		0.603	GG30	Grade 300	FG 30	
	A48-50B	Ft35D / FGL350		0.6035	GG35	Grade 350	FG35	
	A48-60B	Ft40D / FGL400		0.604	GG40	Grade 400		
BRONZE ALUMINIUM- BRONZE TIN BRONZE	C 60 800	CuAl6		2.0918	CuAl5As			
	C 61 000	CuAl8		2.092	CuAl8			
	C 61 400	CuAl7Fe2		2.0932	CuAl8Fe3	CA 106		
	C 62 300	CuAl9Fe3Mn2		2.0936	CuAl10Fe3Mn2	CA 105		
	C 95 200	CuAl9Fe3		2.094	CuAl10Fe	AB 1		
	B 505	CuAl9Fe3		2.094	G-FeAlBzF50	AB 1		
		CuAl9Mn2		2.096	CuAl9Mn2			
	C 63 200	CuAl9Ni5Fe3Mn		2.0966	CuAl10Ni5Fe4	CA 104		
	C 95 800	CuAl9Ni5Fe		2.097	G-NiAlBzF50	AB 2		
		CuAl11Ni5Fe5		2.0978	CuA11Ni6Fe5			
	C 94100	CuPb20Sn5		2.1188	G-CuPb20Sn	LB5		

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Material Conversion Chart

	USA	France	Brazil	German W-nr	German DIN	UK	Spain	Japan JIS
BRASS	C 21000/34500	CuZn5		2.022/2.032	CuZn5	CZ 125/101		
	C 85700	CuZn40-Y30		2.034	G-CuZn37Pb	PCB 3		
	C 28000/38500	CuZn40/44Pb2		2.036/2.041	CuZn40/44Pb2	CZ 109/CZ130		
	C 68700	CuZn22Al2		2.046	CuZn20Al2	CZ 110		
	C 44300			2.047	CuZn28Sn1	CZ 111		
	C 46400			2.053	CuZn38Sn1	CZ 112		
	C 67400			2.055	CuZn40Al2	CZ 114		
	C 86400			2.0591	G-CuZn38Al	PCB1, DCB 3		
	C 86400	CuZn40-Y30		2.0592	G-CuZn35Al1	HTB 1		
	C 86300			2.0598	G-CuZn25Al5	HTB 3		
	C 90500			2.105	G-CuSn10Zn	G1		
	C 90800	CuSn12		2.1052	G-CuSn12	Pb2		
	C 91700			2.106	G-CuSn12Ni	CT2		
	C 90250			2.1086	G-CuSn10	CT1		
	C 93200	CuSn7Pb6Zn4		2.109	G-CuSn7ZnPb			
	C 92410			2.1093	G-CuSn6ZnNi	LG4		
	C 83600	CuPb5Sn5Zn5		2.1096	G-CuSn5ZnPb/RG5	LG2		
	C 93700	CuPb10Sn10		2.1176	G-CuPb10Sn	LB2		
	C 93800			2.1182	G-CuPb15Sn	LB1		
COPPER COPPER/NICKEL ALLOYS	C 96200			2.0815	G-CuNi10			
	C 71300	CiNi25		2.083	CuNi25	CN 105		
	C 96400			2.0835	G-CuNi30	CN 2		
	C 72150	CuNi44		2.0842	CuNi44Mn1			
	C 70600	CuNi10Fe1Mn		2.0872	CuNi10Fe1Mn	CN 102		
	C 71500	CuNi30Mn1Fe		2.0882	CuNi30Mn1Fe	CN 107		
	C 17000	CuBe1,7		2.1245	CuBe1,7	CB 101		
	C 17200	CuBe1,9		2.1247	CuBe2			
	C 17500			2.1285	CuCo2Be	C 112		
	C 71640	CuNi30Fe2Mn2			CuNi30Fe2Mn2	CN 108		
	OF	Cu-c1/C2		2.004	OF-Cu	Cu-OF C 103/110		
	C 11000	Cu-a1/A2		2.006	E-Cu57	Cu-ETP-2 C 101		
	C 11000	Cu-a1		2.0065	E-Cu58	Cu-ETP-2 C 101		
	C 1200	Cu-b2		2.0076	SW-Cu			
	C 12200	Cu-b1		2.009	SF-Cu	Cu-DHP C 106		

Notes

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