

# Die & Mold

**NEW**

## Twister<sup>®</sup> XD

**2XDCE**

Coolant Extra Long Drills  
Works Exceptionally Well in All  
Deep Hole Drilling Applications!

See Page 3

**NEW**

## TuffCut<sup>®</sup> DM

**Series 158**

Designed for Die & Mold Steels  
& Hard to Machine  
Materials up to 65 Rc.

See Page 7





# Twister XD<sup>®</sup>

Coolant Extra Long Drills  
**2XDCE**

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



Increases Productivity

Reduces Cycle Time

12X - 25X Diameter Deep

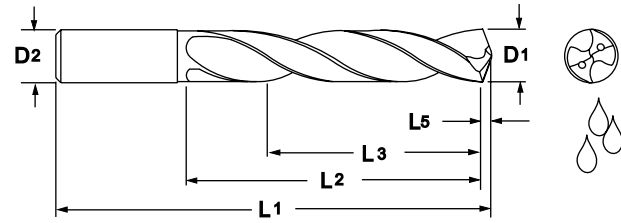


High Performance Deep Hole Drills

# Twister XD<sup>®</sup> High Performance Drills

## Twister XD<sup>®</sup> 2XDCE

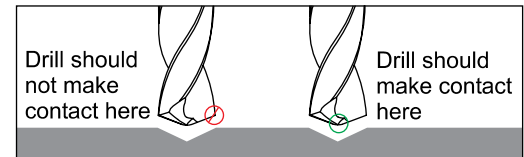
- 30° Helix
- 142° Point
- ALtima<sup>®</sup> Coating



Tool No.	EDP	Diameter			Shank		OAL		Flute Length		Drill Length		Point Length		Fl. Lgth./Diam.
		D1 (h7)			D2 (h6)		L1		L2		L3 Ref.		L5		
		Inch	mm	Decimal	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	L2/D1
2XDCE1181A	04300		3.00	.1181		3.0		125		75		60		0.46	25
2XDCE1250A	04302	1/8	3.18	.1250	.1575	4.0	6.4	163	3.94	100	3.15	80	0.019	0.49	31
2XDCE1260A	04304		3.20	.1260		4.0		163		100		80		0.50	31
2XDCE1299A	04306		3.30	.1299		4.0		163		100		80		0.51	30
2XDCE1339A	04308		3.40	.1339		4.0		163		100		80		0.53	29
2XDCE1417A	04310		3.60	.1417		4.0		163		100		80		0.56	28
2XDCE1496A	04312		3.80	.1496		4.0		163		100		80		0.59	26
2XDCE1535A	04314		3.90	.1535		4.0		163		100		80		0.60	26
2XDCE1575A	04316		4.00	.1575		4.0		163		100		80		0.62	25
2XDCE1654A	04318		4.20	.1654		5.0		163		105		84		0.65	25
2XDCE1693A	04320		4.30	.1693		5.0		163		105		84		0.67	24
2XDCE1732A	04322		4.40	.1732		5.0		163		105		84		0.68	24
2XDCE1811A	04324		4.60	.1811		5.0		163		105		84		0.71	23
2XDCE1875A	04326	3/16	4.76	.1875	.1968	5.0	6.4	163	4.13	105	3.31	84	0.029	0.74	22
2XDCE1890A	04328		4.80	.1890		5.0		163		105		84		0.74	22
2XDCE1929A	04330		4.90	.1929		5.0		163		105		84		0.76	21
2XDCE1968A	04332		5.00	.1968		5.0		163		105		84		0.77	21
2XDCE2047A	04334		5.20	.2047		6.0		163		110		88		0.81	21
2XDCE2126A	04336		5.40	.2126		6.0		163		110		88		0.84	20
2XDCE2205A	04338		5.60	.2205		6.0		163		110		88		0.87	20
2XDCE2283A	04340		5.80	.2283		6.0		163		110		88		0.90	19
2XDCE2362A	04342		6.00	.2362		6.0		163		110		88		0.93	18
2XDCE2441A	04344		6.20	.2441		8.0		163		110		88		0.96	18
2XDCE2480A	04346		6.30	.2480		8.0		163		110		88		0.98	17
2XDCE2500A	04348	1/4	6.35	.2500	.3150	8.0	6.4	163	4.33	110	3.46	88	0.039	0.98	17
2XDCE2677A	04350		6.80	.2677		8.0		163		110		88		1.05	16
2XDCE2756A	04352		7.00	.2756		8.0		163		110		88		1.08	16
2XDCE2992A	04354		7.60	.2992		8.0		163		120		96		1.18	16
2XDCE3071A	04356		7.80	.3071		8.0		163		120		96		1.21	15
2XDCE3125A	04358	5/16	7.94	.3125	.3150	8.0	6.4	163	4.72	120	3.78	96	0.048	1.23	15
2XDCE3150A	04360		8.00	.3150		8.0		163		120		96		1.24	15
2XDCE3228A	04362		8.20	.3228		10.0		180		135		108		1.27	16
2XDCE3346A	04364		8.50	.3346		10.0		180		135		108		1.32	16
2XDCE3425A	04366		8.70	.3425		10.0		180		135		108		1.35	16
2XDCE3543A	04368		9.00	.3543		10.0		180		135		108		1.39	15
2XDCE3701A	04370		9.40	.3701		10.0		195		150		120		1.46	16
2XDCE3750A	04372	3/8	9.53	.3750	.3937	10.0	7.7	195	5.90	150	4.72	120	0.058	1.48	16
2XDCE3858A	04374		9.80	.3858		10.0		195		150		120		1.52	15
2XDCE3937A	04376		10.00	.3937		10.0		195		150		120		1.55	15
2XDCE4055A	04378		10.30	.4055		12.0		210		160		128		1.60	16
2XDCE4134A	04380		10.50	.4134		12.0		210		160		128		1.63	15
2XDCE4252A	04382		10.80	.4252		12.0		210		160		128		1.67	15
2XDCE4331A	04384		11.00	.4331		12.0		210		160		128		1.70	15
2XDCE4375A	04386	7/16	11.11	.4375	.4724	12.0	8.3	210	6.30	160	5.04	128	0.068	1.72	14
2XDCE4527A	04388		11.50	.4527		12.0		210		160		128		1.78	14
2XDCE4646A	04390		11.80	.4646		12.0		210		160		128		1.83	14
2XDCE4724A	04392		12.00	.4724		12.0		210		160		128		1.86	13
2XDCE5000A	04394	1/2	12.70	.5000	.5512	14.0	9.1	230	7.09	180	5.67	144	0.077	1.97	14

## 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.



2. Retract and tool change to the final deep hole (2XDCE MA Ford® Series) drill.
3. Rapid to clearance plane and enter the pilot hole at 25% (don't exceed 400 to 500 RPM) of the final speed and 1 to 2 IPM. 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 to eliminate breakage of the drill due to drill whip. Then retract to the clearance plane.

Due to the conditions of equipment, tool holders, and conditions beyond MA 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.

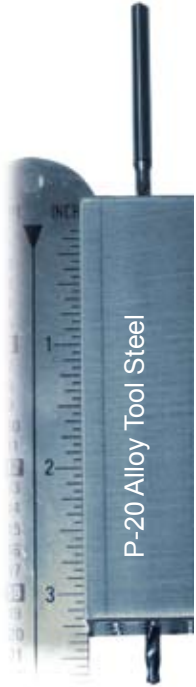
### Safety Note

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.

Inch		Inch		Metric (mm)		Metric (mm)	
D1	Tolerance (h7)	D2	Tolerance (h6)	D1	Tolerance (h7)	D2	Tolerance (h6)
.0000 - .1181	+0/- .00039	.0000 - .1181	+0/- .00024	0 - 3.0	+0/- .010	0 - 3.0	+0/- .006
.1182 - .2362	+0/- .00047	.1182 - .2362	+0/- .00031	3.01 - 6.0	+0/- .012	3.01 - 6.0	+0/- .008
.2363 - .3937	+0/- .00059	.2363 - .3937	+0/- .00035	6.01 - 10.0	+0/- .015	6.01 - 10.0	+0/- .009
.3938 - .7087	+0/- .00071	.3938 - .7087	+0/- .00043	10.01 - 18.0	+0/- .018	10.01 - 18.0	+0/- .011

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

## 2XDCE Inch Speeds and Feeds



28.38 IPM  
6307 RPM  
One pass/hole  
3-1/4" deep  
1/8" dia.

Workpiece Material Group	Examples	SFM	Tool Diameter									
			.1181	.1575	.1968	.2362	.2756	.3150	.3543	.3937	.4724	
			IPR									
Steels	P	Low Carbon Steels 1018/12L14	350	.0020	.0028	.0035	.0042	.0050	.0076	.0085	.0094	.0100
		Medium Carbon Steels 4140	260									
		Tool & Die Steels A2/D2/P20/H13										
		Alloy Steels 4140/8620										
		Structural Steels										
		Steel Forgings	175	.0024	.0031	.0039	.0047	.0055	.0076	.0085	.0094	.0100
Cast Irons	K	Gray Cast Iron Class 20	400									
		Ductile Cast Iron 60-40-18	260									
		Malleable Iron Ferritic	260									
Austenitic	M	304/316	180	.0020	.0028	.0035	.0042	.0050	.0076	.0085	.0094	.0100
Precipitation Hardened Stainless Steels	M	17-4 PH 13-8 PH	125									
		Martensitic	M									
Stainless	M	Ferritic	250									
Special Alloys	S	Titanium 6AL-4V	160									
		Cobalt-Based Alloys Stellite, Haynes 25/188	80									
		Nickel-Based Alloys Inconel 625/718	80									
		Iron-Based Alloys Incoloy 800-802/Multimet	60									
		High Nickel Alloys Monel	80									
Hardened Materials	H	Alloy Steels (36-45 Rc) A2/D2/P20/H13	260	.0005	.0006	.0008	.0009	.0011	.0019	.0021	.0024	.0026
		Alloy Steels (46-50 Rc) A2/D2/P20/H13	120									
Non-Ferrous	N	Aluminum < 14% Si 6061-T6	500	.0021	.0028	.0035	.0042	.0050	.0110	.0125	.0135	.0150
		Aluminum > 14% Si	350									
		Brass	400									
		Copper/Copper Alloys Magnesium	300									

**Inch Formulas**  
 $RPM = SFM \times 3.82 / \text{Tool Diameter}$   
 $IPM = RPM \times IPR$

**Conversion Inch to Metric**  
 $SFM \text{ to SMM} = SFM \times .3048$   
 $IPM \text{ to mm/min.} = IPM \times 25.4$

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

# Series 2XDCE Technical Information Continued

## 2XDCE Metric Speeds and Feeds

Workpiece Material Group	Examples	SMM	Tool Diameter (mm)									
			3	4	5	6	7	8	9	10	12	
			mm/rev.									
Steels	P	Low Carbon Steels 1018/12L14	105	.050	.071	.088	.106	.127	.193	.215	.238	.254
		Medium Carbon Steels 4140										
		Tool & Die Steels A2/D2/P20/H13										
		Alloy Steels 4140/8620										
		Structural Steels										
		Steel Forgings										
Cast Irons	K	Gray Cast Iron Class 20	120	.060	.078	.099	.119	.139	.193	.215	.238	.254
		Ductile Cast Iron 60-40-18										
		Malleable Iron Ferritic										
Austenitic	M	304/316	55	.050	.071	.088	.106	.127	.193	.215	.238	.254
Precipitation Hardened Stainless Steels	M	17-4 PH	40									
		13-8 PH										
Martensitic	M	410/440	40									
Stainless	M	Ferritic	75									
Special Alloys	S	Titanium 6AL-4V	45									
		Cobalt-Based Alloys Stellite, Haynes 25/188	25									
		Nickel-Based Alloys Inconel 625/718	25									
		Iron-Based Alloys Incoloy 800-802/Multimet	20									
		High Nickel Alloys Monel	25									
Hardened Materials	H	Alloy Steels (36-45 Rc) A2/D2/P20/H13	35	.012	.015	.020	.022	.027	.048	.053	.060	.066
		Alloy Steels (46-50 Rc) A2/D2/P20/H13	25									
Non-Ferrous	N	Aluminum < 14% Si 6061-T6	150	.083	.110	.139	.167	.195	.279	.314	.350	.378
		Aluminum > 14% Si	105									
		Brass	120									
		Copper/Copper Alloys Magnesium	90									

### Metric Formulas

$RPM = SMM \times 318.057 / \text{Tool Diameter}$   
 $mm/min. = RPM \times mm/rev.$

### Conversion Metric to Inch

$SMM \text{ to SFM} = SMM / .3048$   
 $mm/min. \text{ to IPM} = (mm/min.) / 25.4$

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

**NEW**

## TuffCut® DM

### Series 158

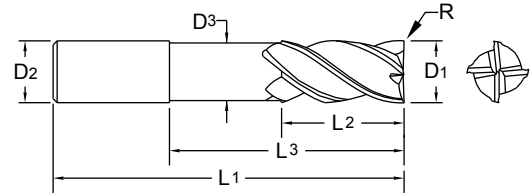
Similar TuffCut® XR Geometry

Designed for Die and Mold Steels and Hard to Machine Materials Up to 65 Rc.

3.0mm - 20mm Size Range.

Necked with Square End and Corner Radius Styles.

ALtima® 52 coated for materials Rc 52 and above.



Tool No.	EDP	Diameter		Shank h6 D2	Neck Diameter D3	OAL L1	Flute Length L2	Neck Length L3	Radius R
		mm	Decimal						
15811800N3A	15522	3	.1181	6	2.9	50	5	9	
15811800N5A	15524	3	.1181	6	2.9	50	5	15	
15811800R012N3A	15526	3	.1181	6	2.9	50	5	9	0.3
15811800R012N5A	15528	3	.1181	6	2.9	50	5	15	0.3
15811800R031N5A	15530	3	.1181	6	2.9	50	5	15	0.8
15823600N3A	15532	6	.2362	6	5.8	100	9	18	
15823600N5A	15534	6	.2362	6	5.8	100	9	30	
15823600R012N3A	15536	6	.2362	6	5.8	100	9	18	0.3
15823600R012N5A	15538	6	.2362	6	5.8	100	9	30	0.3
15823600R059N5A	15540	6	.2362	6	5.8	100	9	30	1.5
15831500N3A	15542	8	.3150	8	7.6	100	12	24	
15831500N5A	15544	8	.3150	8	7.6	100	12	40	
15831500R012N3A	15546	8	.3150	8	7.6	100	12	24	0.3
15831500R012N5A	15548	8	.3150	8	7.6	100	12	40	0.3
15831500R079N5A	15550	8	.3150	8	7.6	100	12	40	2.0
15839300N3A	15552	10	.3937	10	9.6	100	15	30	
15839300N5A	15554	10	.3937	10	9.6	100	15	50	
15839300R012N3A	15556	10	.3937	10	9.6	100	15	30	0.3
15839300R012N5A	15558	10	.3937	10	9.6	100	15	50	0.3
15839300R079N5A	15560	10	.3937	10	9.6	100	15	50	2.0
15847200N3A	15562	12	.4724	12	11.4	100	18	36	
15847200N5A	15564	12	.4724	12	11.4	130	18	60	
15847200R012N3A	15566	12	.4724	12	11.4	100	18	36	0.3
15847200R012N5A	15568	12	.4724	12	11.4	130	18	60	0.3
15847200R079N5A	15570	12	.4724	12	11.4	130	18	60	2.0
15862900N3A	15572	16	.6299	16	15.2	130	24	48	
15862900N5A	15574	16	.6299	16	15.2	150	24	80	
15862900R012N3A	15576	16	.6299	16	15.2	130	24	48	0.3
15862900R012N5A	15578	16	.6299	16	15.2	150	24	80	0.3
15862900R118N5A	15580	16	.6299	16	15.2	150	24	80	3.0
15878700N5A	15582	20	.7874	20	19.2	150	30	100	
15878700R012N5A	15584	20	.7874	20	19.2	150	30	100	0.3
15878700R118N5A	15586	20	.7874	20	19.2	150	30	100	3.0

Inch	
D1	Tolerance
.0000 - .7874	+0/- .0008

Metric (mm)	
D1	Tolerance
0 - 20.0	+0/- .02

## Series 158 Inch Speeds and Feeds

### Cutting Conditions - Lower RPM/High Feed

Workpiece Material Group	Examples	Tool Overhang	Tool Diameter															
			.1181 X R .0315 (3.0 x R 0.8mm)				.2362 X R .059 (6.0 x R 1.5mm)				.315 X R .0787 (8.0 x R 2.0mm)				.3937 X R .0787 (10.0 x R 2.0mm)			
			Axial Depth	Radial Depth	RPM	IPM	Axial Depth	Radial Depth	RPM	IPM	Axial Depth	Radial Depth	RPM	IPM	Axial Depth	Radial Depth	RPM	IPM
Steels P	Cast Iron/ Carbon Steels/ Alloy Steels 150-250 HB	5 x D	.0094	.0275	8,000	239	.0170	.0590	4,000	264	.0236	.0787	3,000	264	.0236	.1180	2,400	264
		6 X D	.0085	.0275			.0159	.0590			.0210	.0787			.0212	.1180		
		7 X D	.0078	.0275			.0147	.0590			.0196	.0787			.0196	.1180		
		8 X D	.0072	.0275			.0135	.0590			.0181	.0787			.0181	.1180		
		9 X D	.0059	.0275			.0112	.0590			.0149	.0787			.0149	.1180		
10 X D	.0047	.0275	.0088	.0590	.0118	.0787	.0118	.1180										
Steels P	Tool Steels 25-35 Rc	5 x D	.0094	.0275	7,400	200	.0170	.0590	3,700	224	.0236	.0787	2,800	225	.0236	.1180	2,200	222
		6 X D	.0085	.0275			.0159	.0590			.0210	.0787			.0212	.1180		
		7 X D	.0078	.0275			.0147	.0590			.0196	.0787			.0196	.1180		
		8 X D	.0072	.0275			.0135	.0590			.0181	.0787			.0181	.1180		
		9 X D	.0059	.0275			.0112	.0590			.0149	.0787			.0149	.1180		
10 X D	.0047	.0275	.0088	.0590	.0118	.0787	.0118	.1180										
Hardened Steels H	Hardened Steels 35-45 Rc H13/D2/ P20 4140/8620	5 x D	.0094	.0275	6,900	146	.0170	.0590	3,400	160	.0236	.0787	2,600	164	.0236	.1180	2,100	165
		6 X D	.0085	.0275			.0159	.0590			.0210	.0787			.0212	.1180		
		7 X D	.0078	.0275			.0147	.0590			.0196	.0787			.0196	.1180		
		8 X D	.0072	.0275			.0135	.0590			.0181	.0787			.0181	.1180		
		9 X D	.0059	.0275			.0112	.0590			.0149	.0787			.0149	.1180		
10 X D	.0047	.0275	.0088	.0590	.0118	.0787	.0118	.1180										
Hardened Steels H	Hardened Steels 45 - 55 Rc H13/D2/ P20 4140/8620	5 x D	.0066	.0275	5,300	112	.0124	.0590	2,700	127	.0165	.0787	2,000	125	.0165	.1180	1,600	125
		6 X D	.0059	.0275			.0111	.0590			.0148	.0787			.0148	.1180		
		7 X D	.0055	.0275			.0103	.0590			.0137	.0787			.0137	.1180		
		8 X D	.0050	.0275			.0095	.0590			.0126	.0787			.0126	.1180		
		9 X D	.0041	.0275			.0078	.0590			.0104	.0787			.0104	.1180		
10 X D	.0033	.0275	.0062	.0590	.0082	.0787	.0082	.1180										
Hardened Steels H	Hardened Steels 55-60 Rc H13/D2/P20 4140/8620	5 x D	.0047	.0275	5,300	45	.0088	.0590	2,700	50	.0118	.0787	2,000	50	.0118	.1180	1,600	50
		6 X D	.0042	.0275			.0079	.0590			.0106	.0787			.0106	.1180		
		7 X D	.0039	.0275			.0073	.0590			.0098	.0787			.0098	.1180		
		8 X D	.0036	.0275			.0067	.0590			.0090	.0787			.0090	.1180		
		9 X D	.0029	.0275			.0056	.0590			.0074	.0787			.0074	.1180		
10 X D	.0023	.0275	.0044	.0590	.0059	.0787	.0059	.1180										

MA Ford® Coating	MA Ford® Tool Number Designation	Microhardness (HV)	Maximum Service Temp.	Friction Coefficient
ALtima® 52	A	3600	1200° C 2192° F	0.40

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

## Series 158 Inch Speeds and Feeds

### Cutting Conditions - Lower RPM/High Feed

Workpiece Material Group	Examples	Tool Over- hang	Tool Diameter											
			.4724 x R .0787 (12.0 x R 2.0mm)				.6299 X R .1181 (16.0 x R 3.0mm)				.7874 X R .1181 (20.0 x R 3.0mm)			
			Axial Depth	Radial Depth	RPM	IPM	Axial Depth	Radial Depth	RPM	IPM	Axial Depth	Radial Depth	RPM	IPM
Steels	P Cast Iron/ Carbon Steels/ Alloy Steels 150-250 HB	5 x D	.0236	.1574	2,000	250	.0354	.1968	1,500	210	.0354	.2755	1,200	172
		6 X D	.0212	.1574			.0318	.1968			.0318	.2755		
		7 X D	.0196	.1574			.0295	.1968			.0295	.2755		
		8 X D	.0181	.1574			.0271	.1968			.0271	.2755		
		9 X D	.0149	.1574			.0224	.1968			.0226	.2755		
		10 X D	.0118	.1574			.0177	.1968			.0177	.2755		
Steels	P Tool Steels 25-35 Rc	5 x D	.0236	.1574	1,900	218	.0354	.1968	1,400	180	.0354	.2755	1,100	144
		6 X D	.0212	.1574			.0318	.1968			.0318	.2755		
		7 X D	.0196	.1574			.0295	.1968			.0295	.2755		
		8 X D	.0181	.1574			.0271	.1968			.0271	.2755		
		9 X D	.0149	.1574			.0224	.1968			.0226	.2755		
		10 X D	.0118	.1574			.0177	.1968			.0177	.2755		
Hardened Steels	H Hardened Steels 35-45 Rc H13/D2/ P20 4140/8620	5 x D	.0236	.1574	1,700	153	.0354	.1968	1,300	131	.0354	.2755	1,000	102
		6 X D	.0212	.1574			.0318	.1968			.0318	.2755		
		7 X D	.0196	.1574			.0295	.1968			.0295	.2755		
		8 X D	.0181	.1574			.0271	.1968			.0271	.2755		
		9 X D	.0149	.1574			.0224	.1968			.0226	.2755		
		10 X D	.0118	.1574			.0177	.1968			.0177	.2755		
Hardened Steels	H Hardened Steels 45 - 55 Rc H13/D2/ P20 4140/8620	5 x D	.0165	.1574	1,300	116	.0248	.1968	1,000	100	.0248	.2755	800	82
		6 X D	.0148	.1574			.0223	.1968			.0223	.2755		
		7 X D	.0137	.1574			.0206	.1968			.0206	.2755		
		8 X D	.0126	.1574			.0190	.1968			.0190	.2755		
		9 X D	.0104	.1574			.0157	.1968			.0157	.2755		
		10 X D	.0082	.1574			.0124	.1968			.0124	.2755		
Hardened Steels	H Hardened Steels 55-60 Rc H13/D2/P20 4140/8620	5 x D	.0118	.1574	1,300	47	.0177	.1968	1,000	40	.0177	.2755	800	32
		6 X D	.0106	.1574			.0159	.1968			.0159	.2755		
		7 X D	.0098	.1574			.0147	.1968			.0147	.2755		
		8 X D	.0090	.1574			.0135	.1968			.0135	.2755		
		9 X D	.0074	.1574			.0112	.1968			.0112	.2755		
		10 X D	.0059	.1574			.0088	.1968			.0088	.2755		

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

# Series 158 Technical Information Continued

## Series 158 Metric Speeds and Feeds

### Cutting Conditions - Lower RPM/High Feed

Workpiece Material Group	Examples	Tool Overhang	Tool Diameter (mm)																
			3.0 x R 0.8				6.0 x R 1.5				8.0 x R 2.0				10.0 x R 2.0				
			Axial Depth	Radial Depth	RPM	mm/min.	Axial Depth	Radial Depth	RPM	mm/min.	Axial Depth	Radial Depth	RPM	mm/min.	Axial Depth	Radial Depth	RPM	mm/min.	
Steels	P	Cast Iron/ Carbon Steels/ Alloy Steels 150-250 HB	5 x D	0.24	0.7	8,000	6,080	0.45	1.5	4,000	6700	0.60	2.0	3,000	6,700	0.60	3.0	2,400	6,700
			6 X D	0.22	0.7			0.41	1.5			0.54	2.0			0.54	3.0		
			7 X D	0.20	0.7			0.38	1.5			0.50	2.0			0.50	3.0		
			8 X D	0.18	0.7			0.35	1.5			0.46	2.0			0.46	3.0		
			9 X D	0.15	0.7			0.29	1.5			0.38	2.0			0.38	3.0		
			10 X D	0.12	0.7			0.23	1.5			0.30	2.0			0.30	3.0		
Steels	P	Tool Steels 25-35 Rc	5 x D	0.24	0.7	7,400	5,100	0.45	1.5	3,700	5670	0.60	2.0	2,800	5,725	0.60	3.0	2,200	5,620
			6 X D	0.22	0.7			0.41	1.5			0.54	2.0			0.54	3.0		
			7 X D	0.20	0.7			0.38	1.5			0.50	2.0			0.50	3.0		
			8 X D	0.18	0.7			0.35	1.5			0.46	2.0			0.46	3.0		
			9 X D	0.15	0.7			0.29	1.5			0.38	2.0			0.38	3.0		
			10 X D	0.12	0.7			0.23	1.5			0.30	2.0			0.30	3.0		
Hardened Steels	H	Hardened Steels 35-45 Rc H13/ D2/ P20 4140/8620	5 x D	0.24	0.7	6,900	3,720	0.45	1.5	3,400	4050	0.60	2.0	2,600	4,150	0.60	3.0	2,100	4,200
			6 X D	0.22	0.7			0.41	1.5			0.54	2.0			0.54	3.0		
			7 X D	0.20	0.7			0.38	1.5			0.50	2.0			0.50	3.0		
			8 X D	0.18	0.7			0.35	1.5			0.46	2.0			0.46	3.0		
			9 X D	0.15	0.7			0.29	1.5			0.38	2.0			0.38	3.0		
			10 X D	0.12	0.7			0.23	1.5			0.30	2.0			0.30	3.0		
Hardened Steels	H	Hardened Steels 45 - 55 Rc H13/ D2/ P20 4140/8620	5 x D	0.17	0.7	5,300	2,850	0.32	1.5	2,700	3230	0.42	2.0	2,000	3,190	0.42	3.0	1,600	3,190
			6 X D	0.15	0.7			0.28	1.5			0.38	2.0			0.38	3.0		
			7 X D	0.14	0.7			0.26	1.5			0.35	2.0			0.35	3.0		
			8 X D	0.13	0.7			0.24	1.5			0.32	2.0			0.32	3.0		
			9 X D	0.11	0.7			0.20	1.5			0.27	2.0			0.27	3.0		
			10 X D	0.08	0.7			0.16	1.5			0.21	2.0			0.21	3.0		
Hardened Steels	H	Hardened Steels 55-60 Rc H13/D2/P20 4140/8620	5 x D	0.12	0.7	5,300	1,130	0.23	1.5	2,700	1295	0.30	2.0	2,000	1,275	0.30	3.0	1,600	1,275
			6 X D	0.11	0.7			0.20	1.5			0.27	2.0			0.27	3.0		
			7 X D	0.10	0.7			0.19	1.5			0.25	2.0			0.25	3.0		
			8 X D	0.09	0.7			0.17	1.5			0.23	2.0			0.23	3.0		
			9 X D	0.08	0.7			0.14	1.5			0.19	2.0			0.19	3.0		
			10 X D	0.06	0.7			0.11	1.5			0.15	2.0			0.15	3.0		

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

## Series 158 Metric Speeds and Feeds

### Cutting Conditions - Lower RPM/High Feed

Workpiece Material Group	Examples	Tool Over- hang	Tool Diameter (mm)											
			12.0 x R 2.0				16.0 x R 3.0				20.0 x R 3.0			
			Axial Depth	Radial Depth	RPM	mm/ min.	Axial Depth	Radial Depth	RPM	mm/ min.	Axial Depth	Radial Depth	RPM	mm/ min.
Steels	P Cast Iron/ Carbon Steels/ Alloy Steels 150-250 HB	5 x D	0.60	4.0	2,000	6,350	0.90	5.0	1,500	5,350	0.90	7.0	1,200	4,360
		6 X D	0.54	4.0			0.81	5.0			0.81	7.0		
		7 X D	0.50	4.0			0.75	5.0			0.75	7.0		
		8 X D	0.46	4.0			0.69	5.0			0.69	7.0		
		9 X D	0.38	4.0			0.57	5.0			0.57	7.0		
		10 X D	0.30	4.0			0.45	5.0			0.45	7.0		
Steels	P Tool Steels 25-35 Rc	5 x D	0.60	4.0	1,900	5,530	0.90	5.0	1,400	4,580	0.90	7.0	1,100	3,650
		6 X D	0.54	4.0			0.81	5.0			0.81	7.0		
		7 X D	0.50	4.0			0.75	5.0			0.75	7.0		
		8 X D	0.46	4.0			0.69	5.0			0.69	7.0		
		9 X D	0.38	4.0			0.57	5.0			0.57	7.0		
		10 X D	0.30	4.0			0.45	5.0			0.45	7.0		
Hardened Steels	H Hardened Steels 35-45 Rc H13/D2/ P20 4140/8620	5 x D	0.60	4.0	1,700	3,875	0.90	5.0	1,300	3,325	0.90	7.0	1,000	2,595
		6 X D	0.54	4.0			0.81	5.0			0.81	7.0		
		7 X D	0.50	4.0			0.75	5.0			0.75	7.0		
		8 X D	0.46	4.0			0.69	5.0			0.69	7.0		
		9 X D	0.38	4.0			0.57	5.0			0.57	7.0		
		10 X D	0.30	4.0			0.45	5.0			0.45	7.0		
Hardened Steels	H Hardened Steels 45 - 55 Rc H13/D2/ P20 4140/8620	5 x D	0.42	4.0	1,300	2,950	0.63	5.0	1,000	2,550	0.63	7.0	800	2,070
		6 X D	0.38	4.0			0.57	5.0			0.57	7.0		
		7 X D	0.35	4.0			0.53	5.0			0.53	7.0		
		8 X D	0.32	4.0			0.48	5.0			0.48	7.0		
		9 X D	0.27	4.0			0.40	5.0			0.40	7.0		
		10 X D	0.21	4.0			0.32	5.0			0.32	7.0		
Hardened Steels	H Hardened Steels 55-60 Rc H13/D2/P20 4140/8620	5 x D	0.30	4.0	1,300	1,185	0.45	5.0	1,000	1,000	0.45	7.0	800	825
		6 X D	0.27	4.0			0.41	5.0			0.41	7.0		
		7 X D	0.25	4.0			0.38	5.0			0.38	7.0		
		8 X D	0.23	4.0			0.35	5.0			0.35	7.0		
		9 X D	0.19	4.0			0.29	5.0			0.29	7.0		
		10 X D	0.15	4.0			0.23	5.0			0.23	7.0		

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