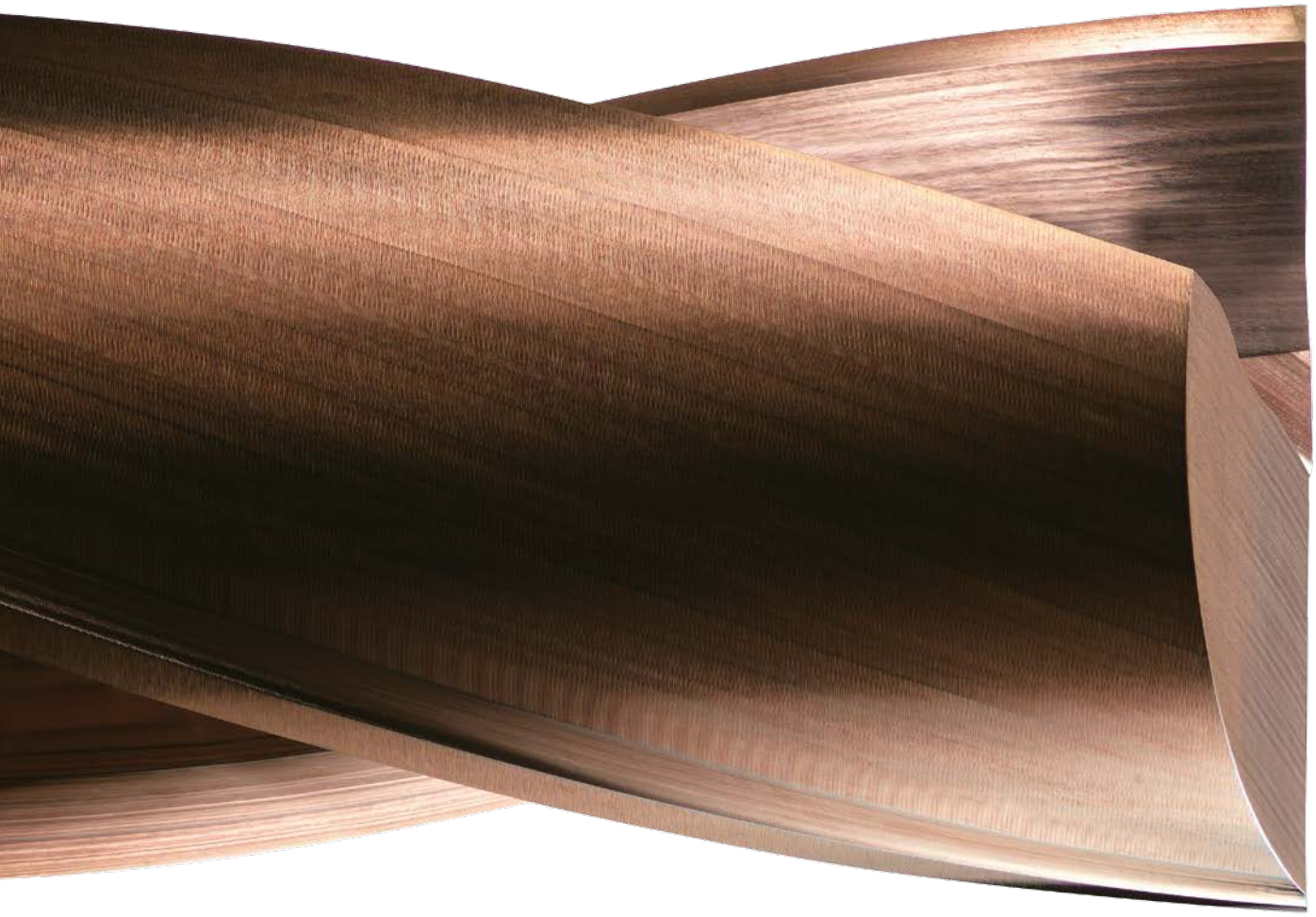
MINI-MFE

SOLID CARBIDE FLAT BOTTOM DRILLS FOR HIGH EFFICIENCY DRILLING OF VARIOUS APPLICATIONS



DIAEDGE

MITSUBISHI MATERIALS

MINI-MFE

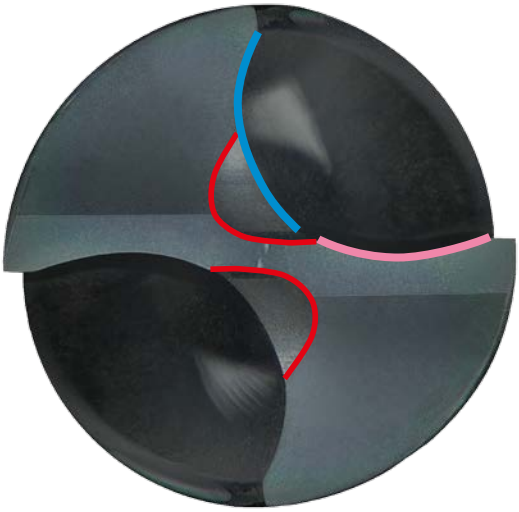
SMALL DIAMETER SOLID CARBIDE FLAT BOTTOM DRILLS DC 0.75MM - DC 2.95MM

UNIQUE SHARP CUTTING EDGES

The flat lands on the corners provide greater strength and sharpness for substantial reduction of burrs.

EXCELLENT CHIP CONTROL

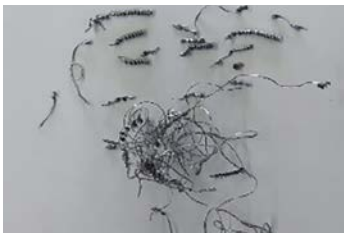
End geometry that combines different radii forms a strong cutting edge and provides excellent chip control.



POINT THINNING FOR LOWER THRUST FORCE

The mutli radius point geometry in combination with the thinned point forms the ideal chip shape, thereby dramatically reducing cutting resistance.

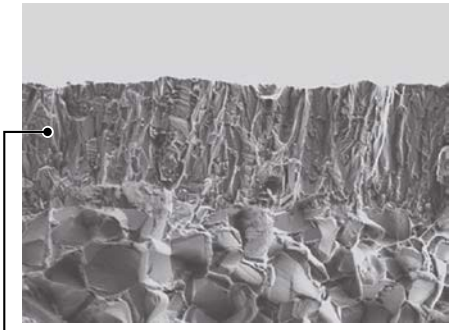
MFE



Conventional

COATED GRADE DP102A

DP102A is a PVD coated cemented carbide grade specialized for drills. The coating has high adhesion and stability even on a sharp cutting edge. This greatly improves wear resistance and is ideal for drilling small diameter holes at low speed and feed conditions.



Al-Cr-N Based PVD Coating

SHARP CUTTING EDGES WITH LONG TOOL LIFE

Material	DIN X5CrNi189
Tool / Drill	MFE0100X02S030
Hole Depth (mm)	2
Cutting Speed Vc (m/min)	25
Feed per Rev. fr (mm/rev.)	0.007
Machine	Vertical MC (BT40)

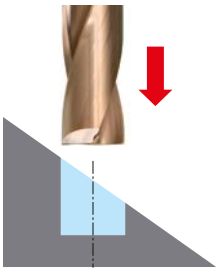
100 holes | **500 holes**

MFE | Conventional | **MFE** | Conventional

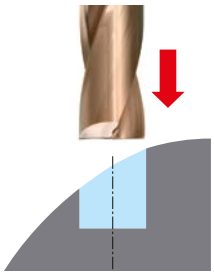
HIGH EFFICIENCY OVER A WIDE APPLICATION RANGE

SPOT FACING

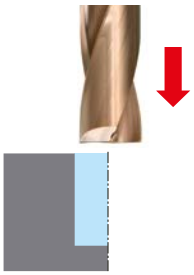
Angled Surface



Offset Circular Surface



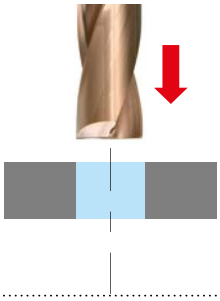
Shoulder



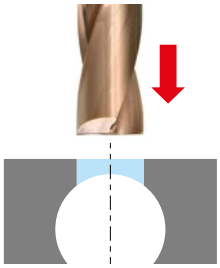
High efficiency counter boring in various types of machining with excellent chipping resistance.

DRILLING

Thin Plate

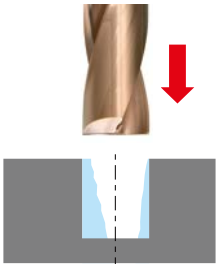


Intersecting Hole



REFORM

Eccentric and Cast Holes

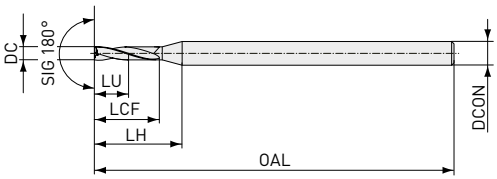


Low cutting force provides less burrs.
Excellent performance on eccentric and cast holes.

MINI-MFE

FOR SMALL DIAMETER HOLES

P M K N

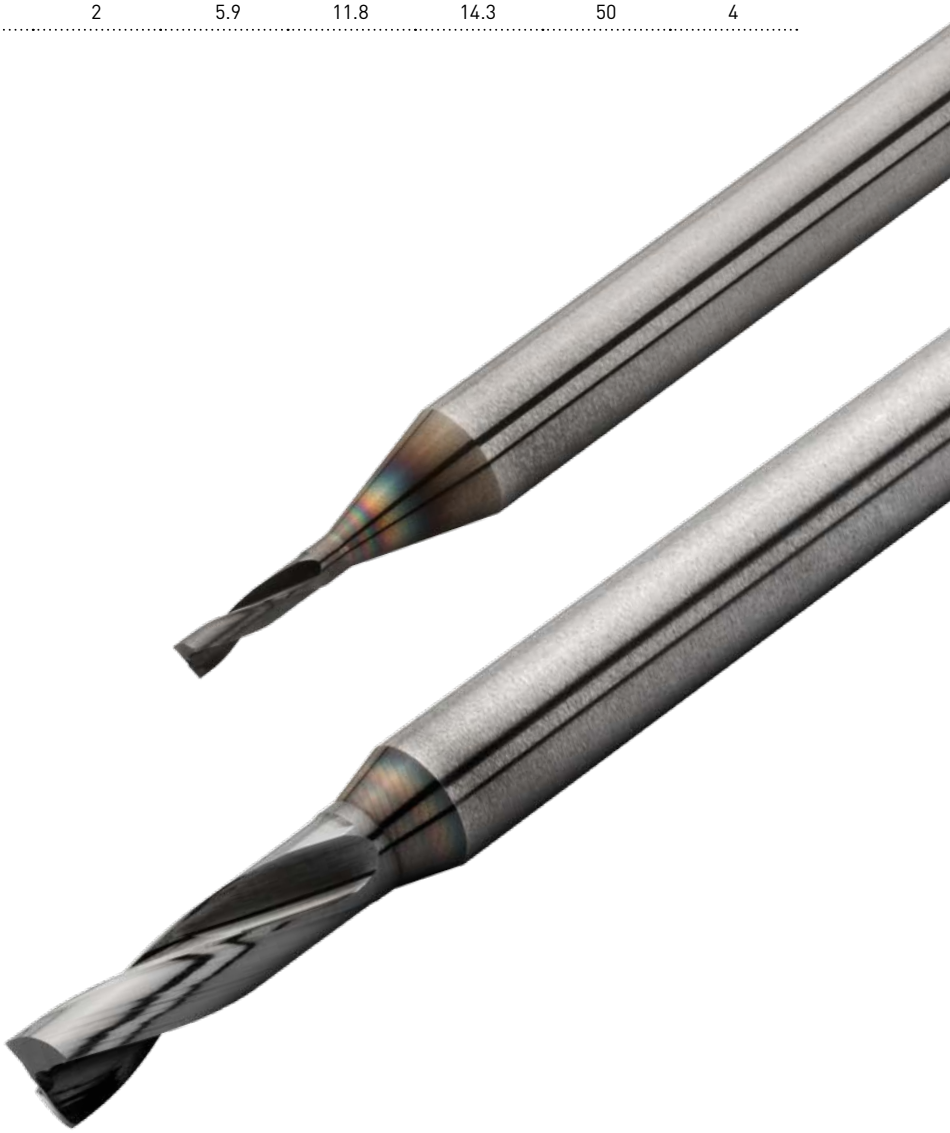


0.75<DC<2.95	
0	
— 0.014	
DCON=3	DCON=4
0	0
— 0.006	— 0.008

Order Number	DP102A	DC	L/D	LU	LCF	LH	OAL	DCON
MFE0075X02S030	★	0.75	2	1.5	3	7.7	45	3
MFE0080X02S030	★	0.8	2	1.6	3.2	7.8	45	3
MFE0085X02S030	★	0.85	2	1.7	3.4	7.9	45	3
MFE0090X02S030	★	0.9	2	1.8	3.6	8	45	3
MFE0095X02S030	★	0.95	2	1.9	3.8	8.1	45	3
MFE0100X02S030	★	1	2	2	4	8.2	45	3
MFE0105X02S030	★	1.05	2	2.1	4.2	8.3	45	3
MFE0110X02S030	★	1.1	2	2.2	4.4	8.4	45	3
MFE0115X02S030	★	1.15	2	2.3	4.6	8.6	45	3
MFE0120X02S030	★	1.2	2	2.4	4.8	8.7	45	3
MFE0125X02S030	★	1.25	2	2.5	5	8.8	45	3
MFE0130X02S030	★	1.3	2	2.6	5.2	8.9	45	3
MFE0135X02S030	★	1.35	2	2.7	5.4	9	45	3
MFE0140X02S030	★	1.4	2	2.8	5.6	9.1	45	3
MFE0145X02S030	★	1.45	2	2.9	5.8	9.2	45	3
MFE0150X02S030	★	1.5	2	3	6	9.3	45	3
MFE0155X02S030	★	1.55	2	3.1	6.2	9.4	45	3
MFE0160X02S030	★	1.6	2	3.2	6.4	9.5	45	3
MFE0165X02S030	★	1.65	2	3.3	6.6	9.6	45	3
MFE0170X02S030	★	1.7	2	3.4	6.8	9.7	45	3
MFE0175X02S030	★	1.75	2	3.5	7	9.8	45	3
MFE0180X02S030	★	1.8	2	3.6	7.2	9.9	45	3
MFE0185X02S030	★	1.85	2	3.7	7.4	10	45	3
MFE0190X02S030	★	1.9	2	3.8	7.6	10.2	45	3
MFE0195X02S030	★	1.95	2	3.9	7.8	10.3	45	3
MFE0200X02S040	★	2	2	4	8	12.2	50	4
MFE0205X02S040	★	2.05	2	4.1	8.2	12.3	50	4
MFE0210X02S040	★	2.1	2	4.2	8.4	12.4	50	4
MFE0215X02S040	★	2.15	2	4.3	8.6	12.6	50	4

● : Inventory maintained. ★ : Inventory maintained in Japan.

Order Number	DP102A	DC	L/D	LU	LCF	LH	OAL	DCON
MFE0220X02S040	★	2.2	2	4.4	8.8	12.7	50	4
MFE0225X02S040	★	2.25	2	4.5	9	12.8	50	4
MFE0230X02S040	★	2.3	2	4.6	9.2	12.9	50	4
MFE0235X02S040	★	2.35	2	4.7	9.4	13	50	4
MFE0240X02S040	★	2.4	2	4.8	9.6	13.1	50	4
MFE0245X02S040	★	2.45	2	4.9	9.8	13.2	50	4
MFE0250X02S040	★	2.5	2	5	10	13.3	50	4
MFE0255X02S040	★	2.55	2	5.1	10.2	13.4	50	4
MFE0260X02S040	★	2.6	2	5.2	10.4	13.5	50	4
MFE0265X02S040	★	2.65	2	5.3	10.6	13.6	50	4
MFE0270X02S040	★	2.7	2	5.4	10.8	13.7	50	4
MFE0275X02S040	★	2.75	2	5.5	11	13.8	50	4
MFE0280X02S040	★	2.8	2	5.6	11.2	13.9	50	4
MFE0285X02S040	★	2.85	2	5.7	11.4	14	50	4
MFE0290X02S040	★	2.9	2	5.8	11.6	14.2	50	4
MFE0295X02S040	★	2.95	2	5.9	11.8	14.3	50	4



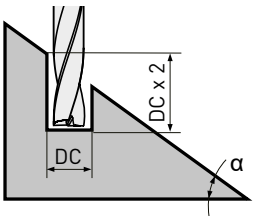
RECOMMENDED CUTTING CONDITIONS

Material		P					
		Mild Steels (<180HB) C10E etc.		Carbon Steels, Alloy Steels (180 —280HB) DIN Ck45, 41CrMo4 etc.		Carbon Steels, Alloy Steels (280 —350HB) DIN 40CrNiMoA etc.	
DC	L/D	n (min^{-1})	α=0° fr (Min. — Max.) (mm/rev)	n (min^{-1})	α=0° fr (Min. — Max.) (mm/rev)	n (min^{-1})	α=0° fr (Min. — Max.) (mm/rev)
0.75	≤2	23300	0.030 (0.010 — 0.050)	19000	0.030 (0.010 — 0.050)	16900	0.030 (0.010 — 0.050)
1.0	≤2	17500	0.030 (0.010 — 0.050)	14300	0.030 (0.010 — 0.050)	12700	0.030 (0.010 — 0.050)
1.5	≤2	12200	0.035 (0.015 — 0.055)	10000	0.035 (0.015 — 0.055)	8400	0.035 (0.015 — 0.050)
2.0	≤2	9500	0.040 (0.020 — 0.060)	7900	0.040 (0.020 — 0.060)	6700	0.040 (0.020 — 0.060)
2.5	≤2	7900	0.050 (0.030 — 0.070)	6600	0.050 (0.030 — 0.070)	5700	0.050 (0.030 — 0.070)
3.0	≤2	7900	0.060 (0.040 — 0.080)	7900	0.060 (0.040 — 0.080)	6800	0.060 (0.040 — 0.080)

Material		M		K	
		Austenitic Stainless Steels (<200HB) DIN X5CrNi189, X5CrNiMo1810 etc.		Gray Cast Irons (<350MPa) DIN GG30 etc.	
DC	L/D	n (min^{-1})	α=0° fr (Min. — Max.) (mm/rev)	n (min^{-1})	α=0° fr (Min. — Max.) (mm/rev)
0.75	≤2	10600	0.007 (0.003 — 0.011)	23300	0.030 (0.010 — 0.050)
1.0	≤2	7900	0.007 (0.003 — 0.011)	17500	0.030 (0.010 — 0.050)
1.5	≤2	5300	0.010 (0.005 — 0.015)	12200	0.035 (0.015 — 0.055)
2.0	≤2	4700	0.015 (0.010 — 0.020)	9500	0.040 (0.020 — 0.060)
2.5	≤2	3800	0.015 (0.010 — 0.020)	7900	0.050 (0.030 — 0.070)
3.0	≤2	3100	0.020 (0.010 — 0.030)	7900	0.060 (0.040 — 0.080)

Material		K		N	
		Ductile Cast Irons (<450MPa) DIN GGG40.3 etc.		Aluminium Alloys (Si<5%) JIS A6061, A7075 etc.	
DC	L/D	n (min^{-1})	α=0° fr (Min. — Max.) (mm/rev)	n (min^{-1})	α=0° fr (Min. — Max.) (mm/rev)
0.75	≤2	16900	0.010 (0.005 — 0.015)	42400	0.020 (0.010 — 0.030)
1.0	≤2	12700	0.010 (0.005 — 0.015)	31800	0.020 (0.010 — 0.030)
1.5	≤2	10000	0.020 (0.010 — 0.030)	21200	0.020 (0.010 — 0.030)
2.0	≤2	8700	0.030 (0.015 — 0.045)	17500	0.050 (0.030 — 0.070)
2.5	≤2	7300	0.045 (0.025 — 0.065)	14000	0.060 (0.040 — 0.090)
3.0	≤2	6800	0.050 (0.040 — 0.060)	11600	0.060 (0.040 — 0.090)

1. The recommended hole depth is DCx2. This should be the depth from the uppermost surface of the work material when machining on angled surfaces. (Refer to diagram)
2. The table above assumes drilling on a flat surface. For drilling on angled surfaces, adjust the feed rate accordingly. When the inclination angle α is 30° or less, as a guide adjust the feed rate to 70% or lower and when the inclination angle α is greater than 30° adjust the feed rate to 50% or lower.
3. This tool is for hole drilling only. It cannot be used for cross-feed or helical machining.

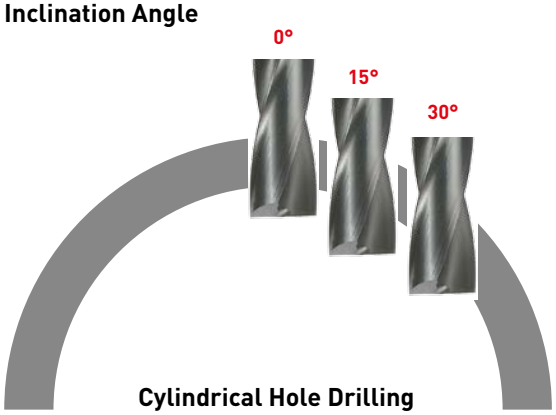


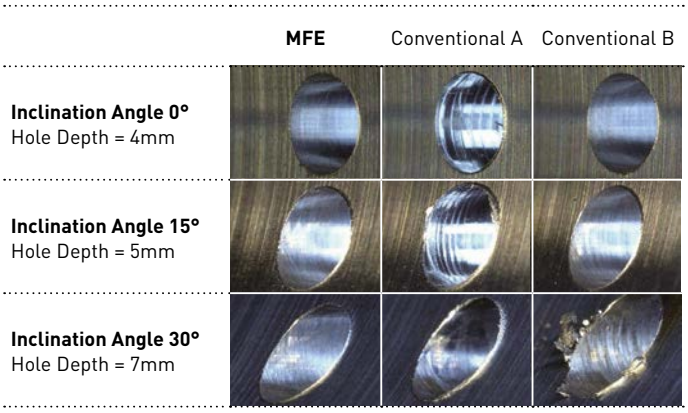
CUTTING PERFORMANCE

COMPARISON OF EXIT BURRS GENERATED WHEN DRILLING STAINLESS STEEL

The unique cutting edge shape suppresses the formation of exit burrs.

Inclination Angle

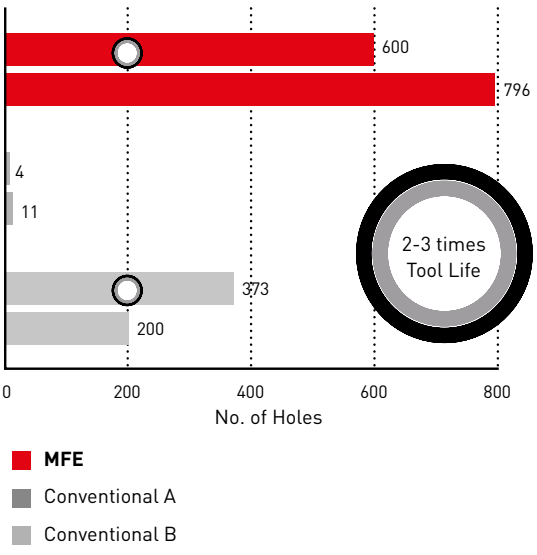


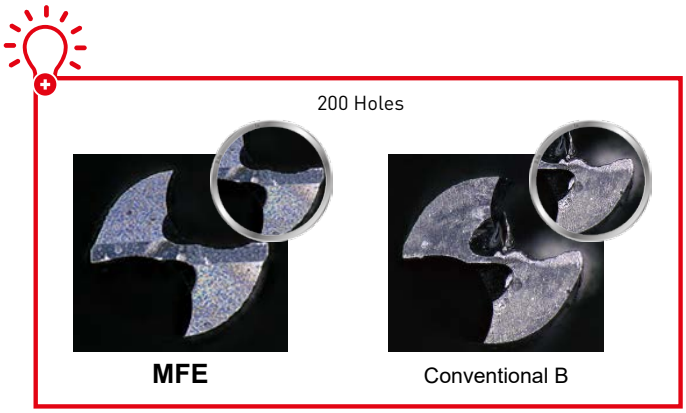


Material	DIN X5CrNi189
Tool / Drill	MFE0200X02S040
Cutting Speed Vc (m/min)	30
Feed per Rev. fr (mm/rev.)	0.01
Cutting Mode	Wet Cutting
Coolant	External Coolant (Water-soluble)
Machine	Vertical MC (BT40)

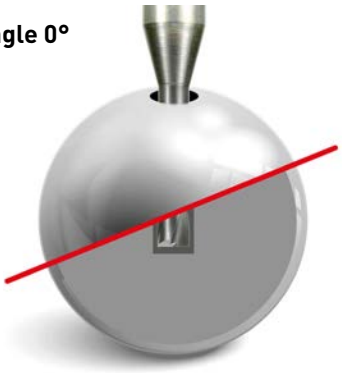
COMPARISON OF TOOL LIFE WHEN WHEN DRILLING STAINLESS STEEL

Excellent fracture resistance is achieved even when drilling cylindrical surfaces on a small automatic lathe.





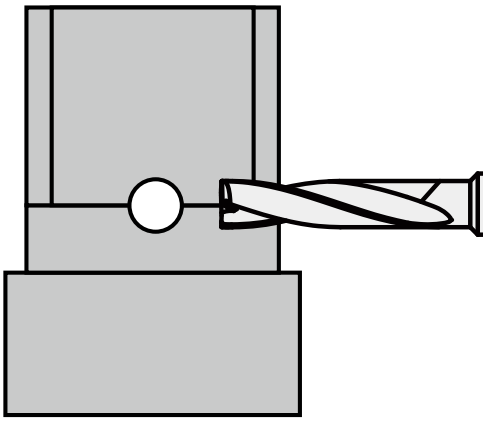
Inclination Angle 0°



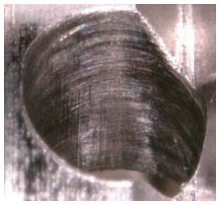
Material	DIN X5CrNi189
Tool / Drill	MFE0080X02S030
Cutting Speed Vc (m/min)	15
Feed per Rev. fr (mm/rev.)	0.01
Cutting Mode	Wet Cutting
Coolant	External Coolant (Water-insoluble)
Machine	Small Automatic Lathe

APPLICATION EXAMPLE

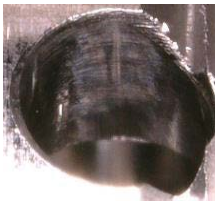
Material	DIN X12CrNiS188
Tool / Drill	MFE0180X02S030
Component	Bolt
Cutting Speed Vc (m/min)	22
Feed per Rev. fr (mm/rev.)	0.015
Cutting Mode	Wet Cutting
Coolant	External Coolant
Machine	Small Automatic Lathe
Results	MFE - No accuracy errors even when used for continuous hole drilling on a small automatic lathe and gave at least double tool life.



Large Burr

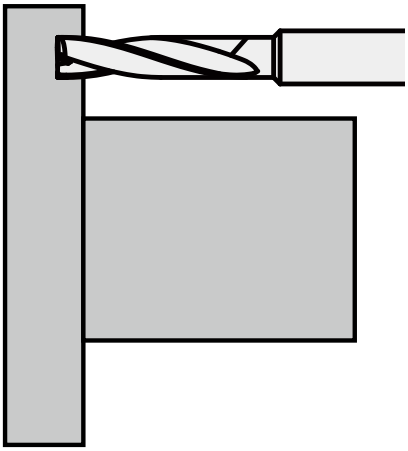


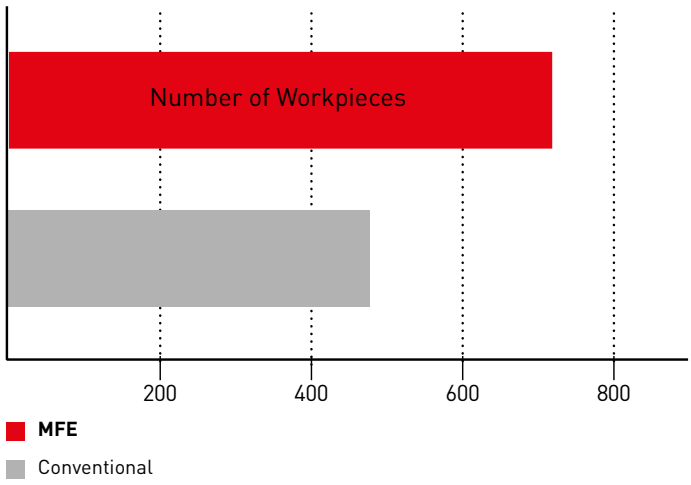
MFE



Conventional

Material	JIS SUS 440 Pilot Drilling
Tool / Drill	MFE0160X02S030
Component	Nut
Cutting Speed Vc (m/min)	40
Feed per Rev. fr (mm/rev.)	0.01 — 0.012
Hole Depth ap (mm)	5
Cutting Mode	Wet Cutting
Coolant	External Coolant
Machine	Horizontal MC
Results	MFE is excellent at maintaining accuracy and the tool life extended by 1.5 times when compared to conventional products.

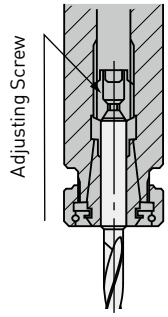




The above examples are actual applications, therefore can differ from the recommended conditions.

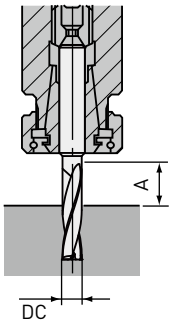
OPERATIONAL GUIDANCE

Drill Holding



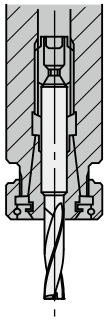
Thrust bearing type collet chuck holds the drill securely.

Drill Length



A > DC x 1.5

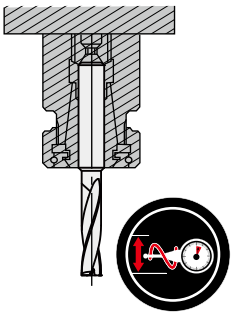
Drill Installation



NG

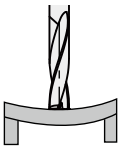
Do not clamp on the flutes.

Installation Tolerance



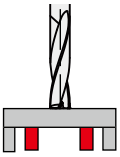
Run-out < 0.03mm

Thin Workpiece



NG

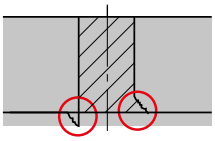
If Bending Occurs



OK

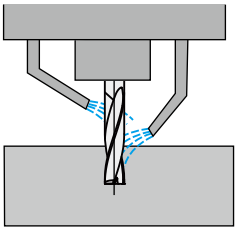
Support the Workpiece

Burring and Workpiece Chipping



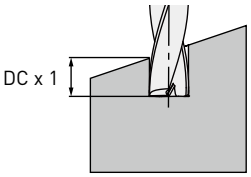
Lower the feed rate by 50% at the end of through cutting.
Add a chamfer.

Coolant Method (MFE)



Two coolant positions, at the end and at the centre are ideal.

Inclined Face Drilling



When machining a deep hole into an inclined surface, use MFE drill (L/D=2) as a drill for a guide hole.
Set the drill depth at approx. DC x 1 to obtain an accurate guide hole.

MEMO

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