DIA EDGE
TOOL NEWS
2023.6 Update
B233G

Solid Carbide Flat Bottom Drills

DFAS/MFE

Series Expansion

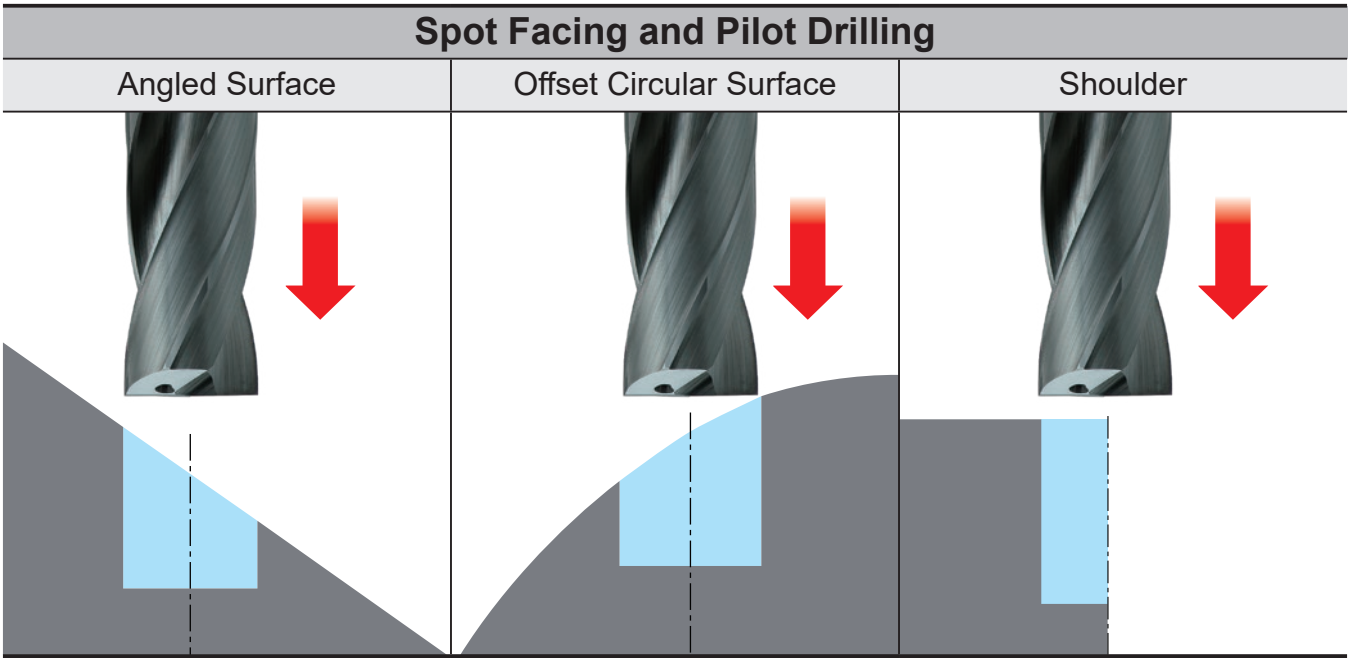
High Efficiency Drilling Over a Wide Range of Applications

MITSUBISHI MATERIALS CORPORATION

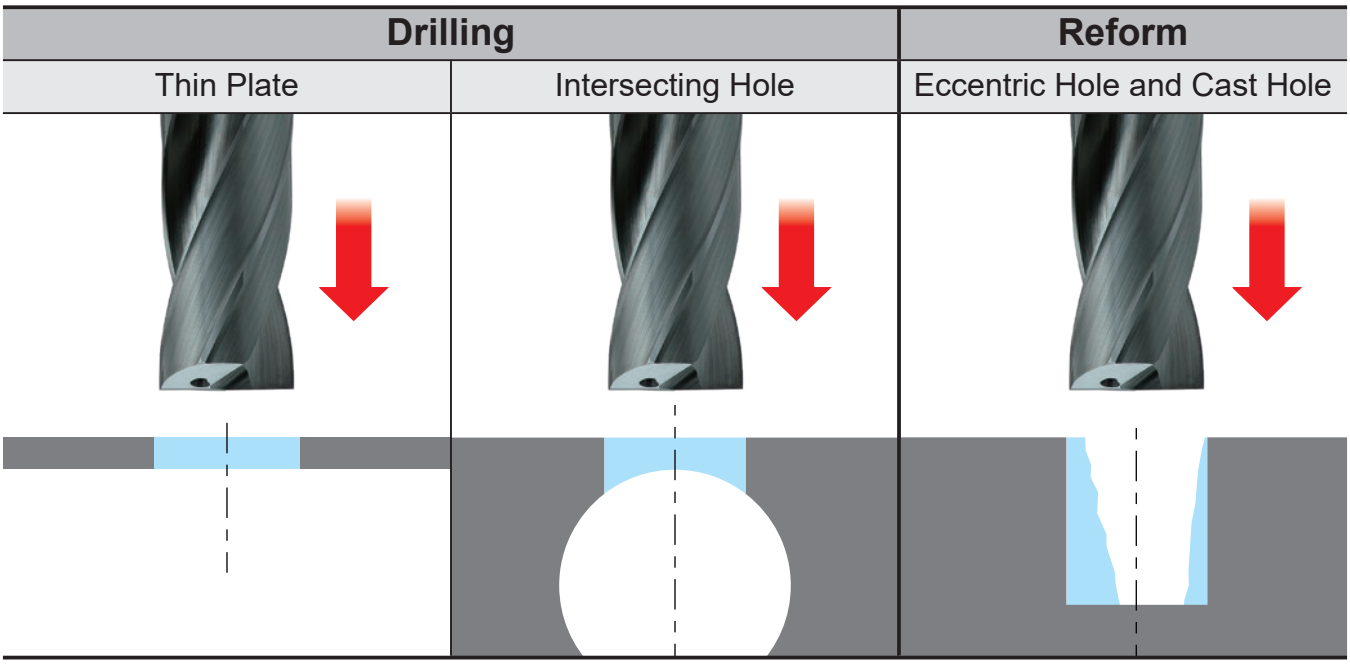
Solid Carbide Flat Bottom Drills

DFAS/MFE

High Efficiency Drilling Over a Wide Range of Applications



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

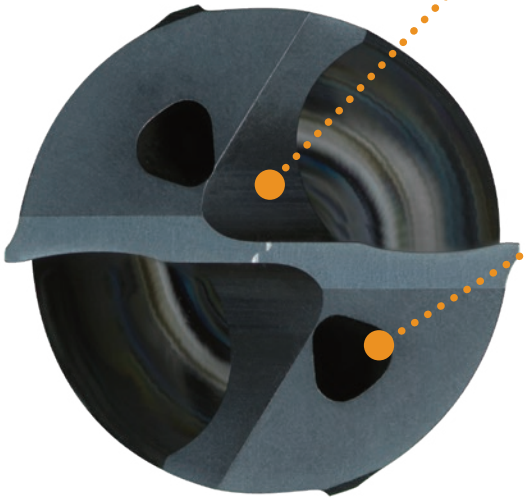


Low cutting forces reduces burrs.
Due to its unique shape, it is possible to correct eccentric holes and cast holes with high accuracy.

Internal Coolant

DFAS NEW

Features



“XR” Point Thinning

Optimised chip control and load reduction

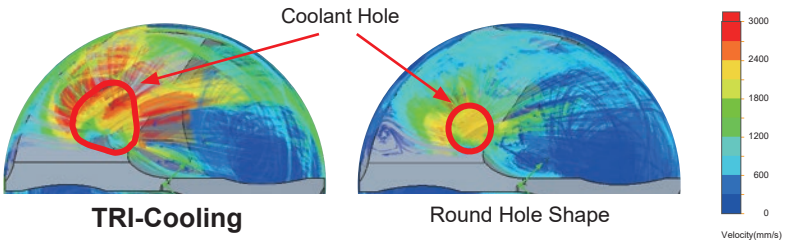
The thinned centre cutting edge generates a low resistance and thereby creates an optimum chip geometry for a smoother chip flow.

TRI-Cooling Technology for All Dia.

For machining stainless steel and titanium

Coolant flow is increased without reducing the rigidity of the drill. The extra coolant flow dramatically improves chip evacuation and dissipates cutting heat. This enables stable machining of stainless steel and titanium alloys.

Coolant Flow Speed Increase



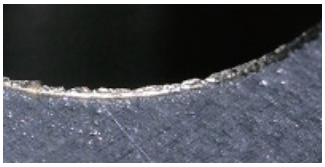
TRI-Cooling Round Hole Shape

Original Sharp Cutting Edge Shape

Suppression of Burrs

Strength is ensured by providing a flat land (gash) at the corner of the cutting edge, and by adopting a sharp cutting edge over the cutting edge, burrs are suppressed.

Comparison of burrs when machining titanium alloy



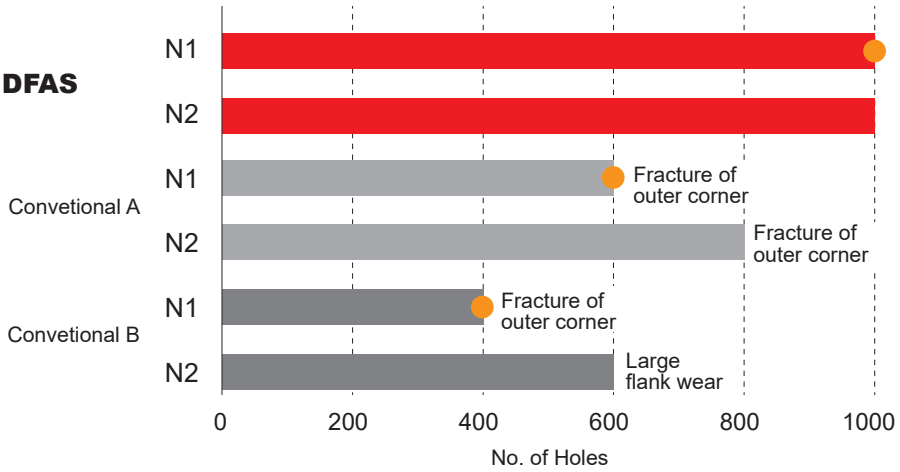
DFAS 0.08mm

Conventional 0.12mm

Cutting Performance

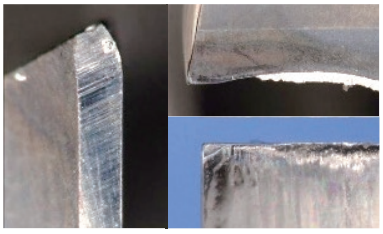
Tool Life Comparison When Machining Carbon Steel S50C

20% more holes machined than conventional tools.

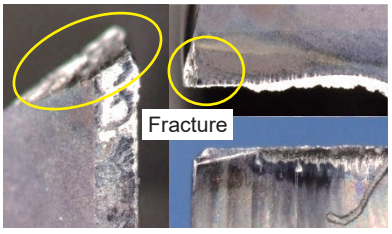


<Cutting Conditions>
Workpiece Material : JIS S50C
Tool : DFAS0600X03S060 (L/D=3)
Cutting Speed : vc=100m/min
Feed per Rev. : fr=0.12mm/rev
Hole Depth :18mm Tthrough Hole
Cutting Mode : Internal Coolant (Water-soluble) 1MPa

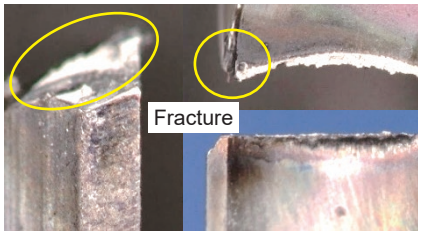
● : Photographed point



DFAS After drilling 1000 hole



Convetional A After drilling 600 hole

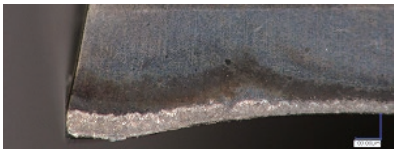


Convetional B After drilling 400 hole

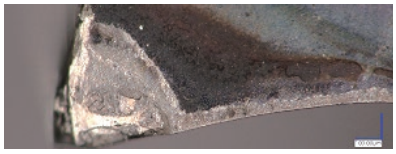
Cutting Edge Comparison When Machining Titanium Alloy Ti-6Al-4V

Provides stability even during high efficiency, continuous machining.

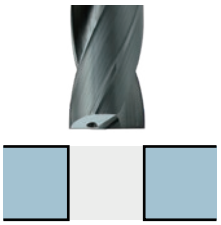
Continuous Machining
Assessment after drilling 100 holes



DFAS

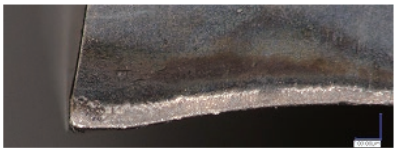


Convetional

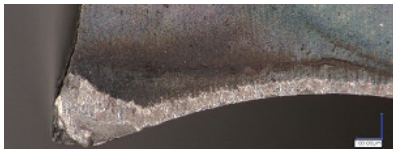


<Cutting Conditions>
Workpiece Material : Ti-6Al-4V
Tool : DFAS0600X03S060 (L/D=3)
Cutting Speed : vc=35m/min
Feed per Rev. : fr=0.06mm/rev
Hole Depth :18mm Tthrough Hole
Cutting Mode : Internal Coolant (Water-soluble) 1MPa

High Efficiency Machining
Assessment after drilling 30 holes



DFAS

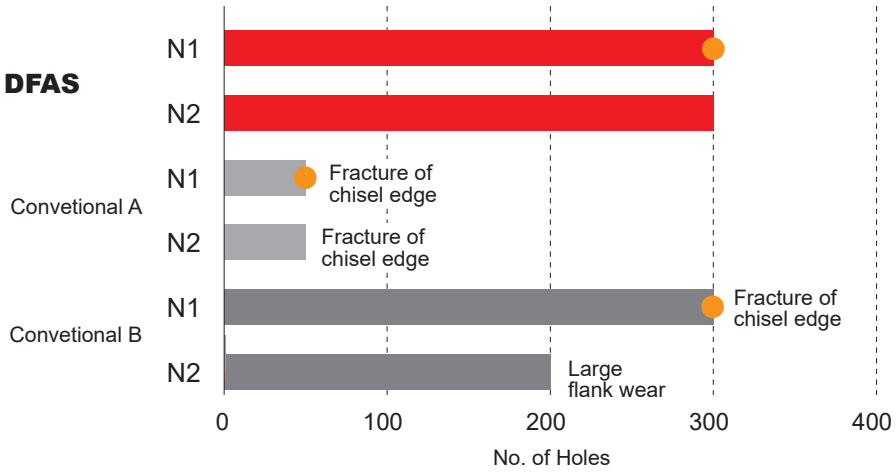


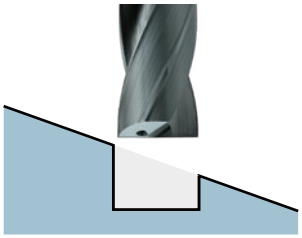
Convetional

<Cutting Conditions>
Workpiece Material : Ti-6Al-4V
Tool : DFAS0600X03S060 (L/D=3)
Cutting Speed : vc=50m/min
Feed per Rev. : fr=0.10mm/rev
Hole Depth :18mm Tthrough Hole
Cutting Mode : Internal Coolant (Water-soluble) 1MPa

Comparision of Quantity of Holes on an Inclined Surface When Machining Stainless Steel SUS304

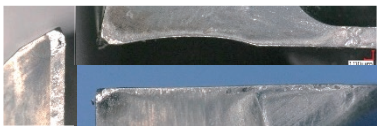
No tool wear even in the centre where the cutting speed is low. Tool life can be extended.



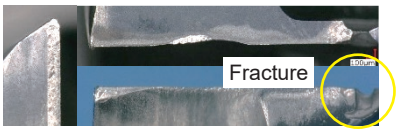


<Cutting Conditions>
Workpiece Material : JIS SUS304
Tool : DFAS0600X03S060 (L/D=3)
Cutting Speed : vc=40 m/min
Feed per Rev. : fr=0.04 mm/rev
Hole Depth :18 mm
Blind hole with 30° angled surface
Cutting Mode : Internal Coolant
(Water-soluble) 1MPa

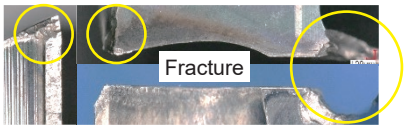
● : Photographed point



DFAS After drilling 300 holes



Convetional A After drilling 50 holes

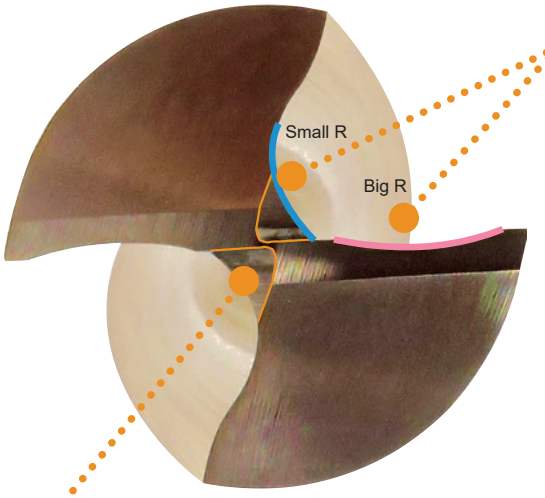


Convetional B After drilling 300 holes

External Coolant

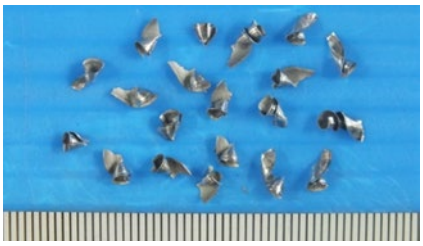
MFE

Features DC≥3mm



Excellent Chip Control

Combination of different radius sizes provides strong cutting edge and excellent chip control.

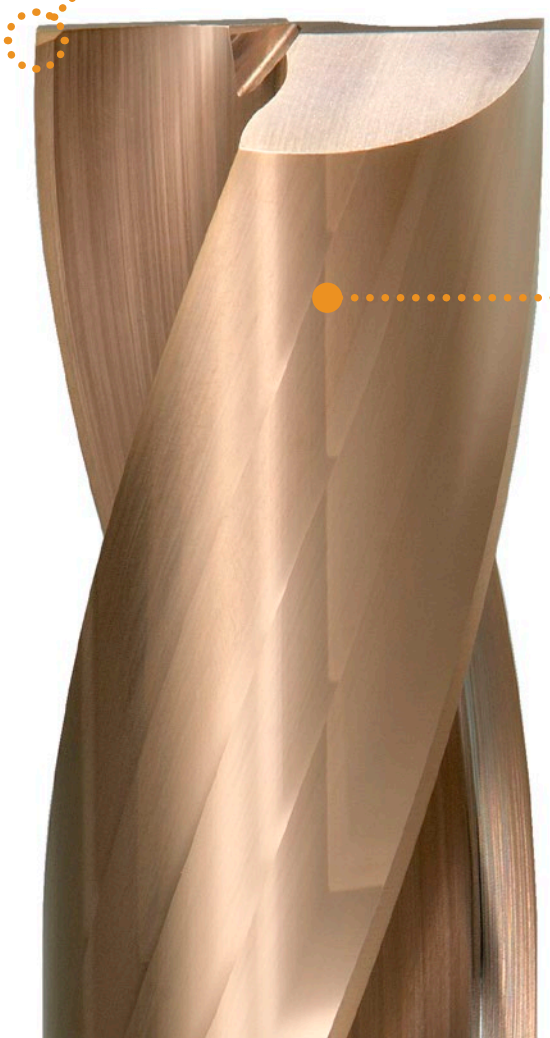


<Cutting Conditions>
Workpiece Material : JIS S50C
Cutting Speed : **vc**=50m/min
Feed per Rev. : **fr**=0.07mm/rev

New "Z" Point Thinning with Lower Thrust Force

New point thinning provides excellent chip evacuation.

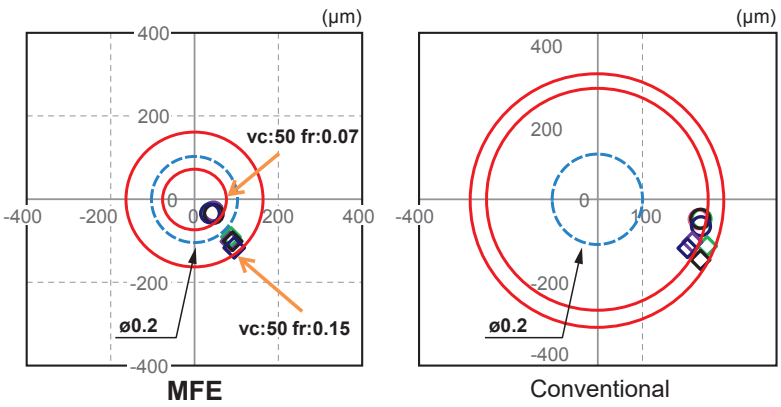
Gash Land for a Stronger Corner



Gash land (0 degree rake) provides excellent chipping resistance.

ZERO-μ Surface

Smooth surface provides reduced deflection and excellent positional accuracy.



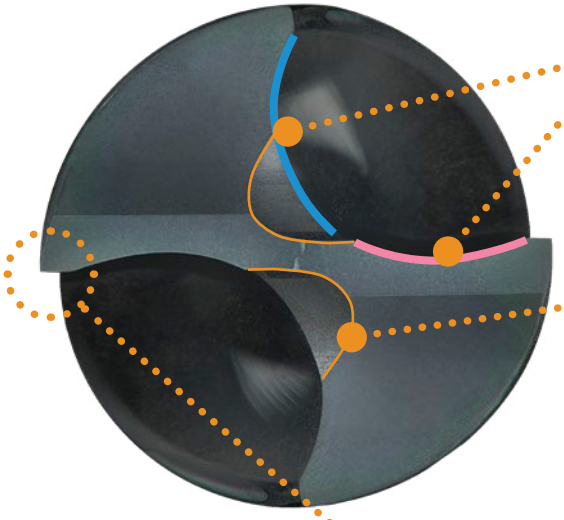
JIS S50C 45° angled surface DC×2

External Coolant

MFE

Micro Size DC<1.0mm
Mini Size 1.0mm≤DC<3.0mm

Features



Excellent Chip Control

Combination of different radius sizes provides strong cutting edge and excellent chip control.

Point Thinning with Lower Thrust Force

Ideal chips are formed by the radius geometry, thereby feeding chips away from the centre to dramatically reduce cutting resistance.

MFE

Conventional

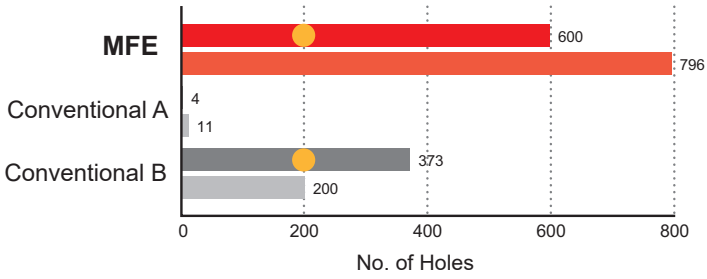
Unique Sharp Cutting Edges

The flat gash lands on the cutting edge corners provide greater strength and sharpness, which can substantially reduce the formation of burrs.

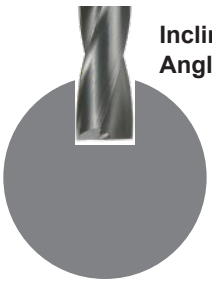
Cutting Performance

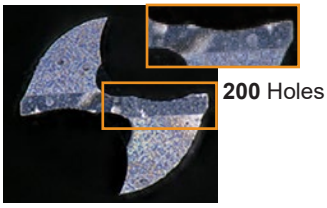
Comparison of Tool Life when Machining on JIS SUS304

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

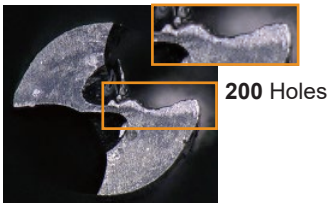


2-3 times Tool Life





MFE



Conventional B

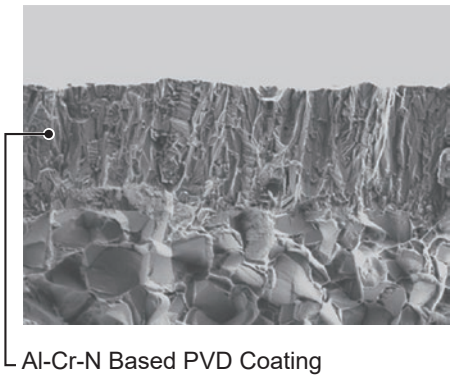
<Cutting Conditions>

Drill	: MFE0080X02S030
Workpiece Material	: JIS SUS304
Cutting Speed	: **vc**=15m/min
Feed per Rev.	: **fr**=0.01mm/rev
Cutting Mode	: Wet Cutting
	External Coolant (Water-insoluble)
Machine	: Small Automatic Lathe

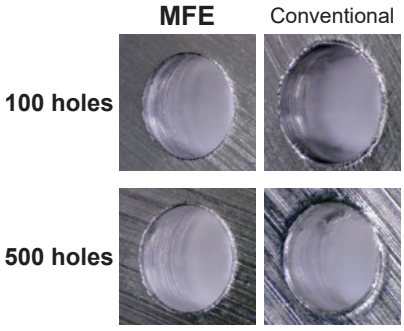
Sharp Cutting Edges with Long Tool Life

Coated Grade **DP102A**

DP102A is a special grade for drills that has excellent lubricity, heat resistance and greatly improved wear resistance, especially under low to medium speed cutting conditions. It realizes stable machining with high adhesion strength of the coating to the substrate, even when the cutting edge is sharp.



Al-Cr-N Based PVD Coating



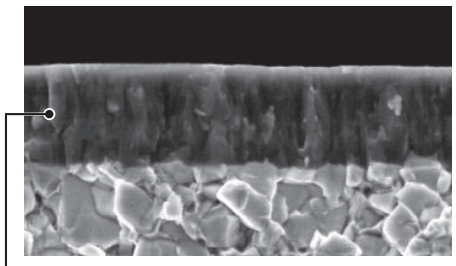
<Cutting Conditions>

Drill	: MFE0100X02S030
Workpiece Material	: JIS SUS304
Hole Depth	: 2mm
Cutting Speed	: **vc**=25m/min
Feed per Rev.	: **fr**=0.007mm/rev
Machine	: Vertical MC (BT40)

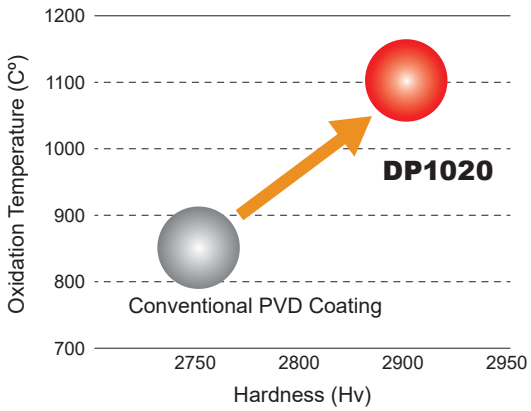
Longer Tool Life with Stable Cutting

Coated Grade **DP1020**

Newly developed coating for drills provides excellent wear resistance with low friction properties, resulting in excellent versatility and extended tool life.



Multi-layer Accumulated Al-Ti-Cr-N Based PVD Coating

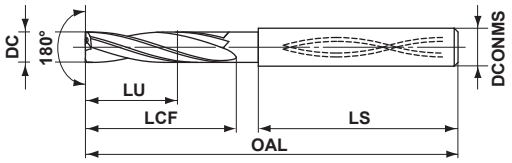


DFAS NEW

SOLID CARBIDE FLAT BOTTOM DRILLS

P Steel | M Stainless Steel | K Cast Iron | N Non-ferrous Metal | S Heat Resistant Alloy | H

Internal Coolant



Type1

DC=3	3 < DC≤6	6 < DC≤10	10 < DC≤14
0 −0.014	0 −0.018	0 −0.022	0 −0.027
4 < DCONMS≤6	6 < DCONMS≤10	10 < DCONMS≤14	
0 −0.008	0 −0.009	0 −0.011	

DC (mm)	Hole Depth (L/D)	DP102A	Order Number	Dimensions (mm) LU	LCF	LS	OAL	DCONMS	Type
3.0	3	●	**DFAS0300X03S040**	9.0	14	39.0	55	4	1
3.1	3	●	**DFAS0310X03S040**	9.3	16	37.0	55	4	1
3.2	3	●	**DFAS0320X03S040**	9.6	16	37.0	55	4	1
3.3	3	●	**DFAS0330X03S040**	9.9	16	37.0	55	4	1
3.4	3	●	**DFAS0340X03S040**	10.2	16	37.0	55	4	1
3.5	3	●	**DFAS0350X03S040**	10.5	16	37.0	55	4	1
3.6	3	●	**DFAS0360X03S040**	10.8	18	35.0	55	4	1
3.7	3	●	**DFAS0370X03S040**	11.1	18	35.0	55	4	1
3.8	3	●	**DFAS0380X03S040**	11.4	18	35.0	55	4	1
3.9	3	●	**DFAS0390X03S040**	11.7	18	35.0	55	4	1
4.0	3	●	**DFAS0400X03S040**	12.0	18	35.0	55	4	1
4.1	3	●	**DFAS0410X03S050**	12.3	20	40.0	62	5	1
4.2	3	●	**DFAS0420X03S050**	12.6	20	40.0	62	5	1
4.3	3	●	**DFAS0430X03S050**	12.9	20	40.0	62	5	1
4.4	3	●	**DFAS0440X03S050**	13.2	20	40.0	62	5	1
4.5	3	●	**DFAS0450X03S050**	13.5	20	40.0	62	5	1
4.6	3	●	**DFAS0460X03S050**	13.8	23	37.0	62	5	1
4.7	3	●	**DFAS0470X03S050**	14.1	23	37.0	62	5	1
4.8	3	●	**DFAS0480X03S050**	14.4	23	37.0	62	5	1
4.9	3	●	**DFAS0490X03S050**	14.7	23	37.0	62	5	1
5.0	3	●	**DFAS0500X03S050**	15.0	23	37.0	62	5	1
5.1	3	●	**DFAS0510X03S060**	15.3	25	39.0	66	6	1
5.2	3	●	**DFAS0520X03S060**	15.6	25	39.0	66	6	1
5.3	3	●	**DFAS0530X03S060**	15.9	25	39.0	66	6	1
5.4	3	●	**DFAS0540X03S060**	16.2	25	39.0	66	6	1
5.5	3	●	**DFAS0550X03S060**	16.5	25	39.0	66	6	1
5.6	3	●	**DFAS0560X03S060**	16.8	27	37.0	66	6	1
5.7	3	●	**DFAS0570X03S060**	17.1	27	37.0	66	6	1
5.8	3	●	**DFAS0580X03S060**	17.4	27	37.0	66	6	1
5.9	3	●	**DFAS0590X03S060**	17.7	27	37.0	66	6	1

DC = Cutting Dia. **LCF** = Length Chip Flute **OAL** = Overall Length
LU = Usable Length **LS** = Shank Length **DCONMS** = Connection Dia. Machine Side

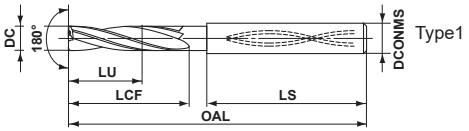
● : **Inventory maintained in Japan.**

DFAS

SOLID CARBIDE FLAT BOTTOM DRILLS

DC (mm)	Hole Depth (L/D)	DP102A	Order Number	Dimensions (mm)					Type
				LU	LCF	LS	OAL	DCONMS	
6.0	3	●	**DFAS0600X03S060**	18.0	27	37.0	66	6	1
6.1	3	●	**DFAS0610X03S070**	18.3	29	44.0	75	7	1
6.2	3	●	**DFAS0620X03S070**	18.6	29	44.0	75	7	1
6.3	3	●	**DFAS0630X03S070**	18.9	29	44.0	75	7	1
6.4	3	●	**DFAS0640X03S070**	19.2	29	44.0	75	7	1
6.5	3	●	**DFAS0650X03S070**	19.5	29	44.0	75	7	1
6.6	3	●	**DFAS0660X03S070**	19.8	32	41.0	75	7	1
6.7	3	●	**DFAS0670X03S070**	20.1	32	41.0	75	7	1
6.8	3	●	**DFAS0680X03S070**	20.4	32	41.0	75	7	1
6.9	3	●	**DFAS0690X03S070**	20.7	32	41.0	75	7	1
7.0	3	●	**DFAS0700X03S070**	21.0	32	41.0	75	7	1
7.1	3	●	**DFAS0710X03S080**	21.3	34	44.0	80	8	1
7.2	3	●	**DFAS0720X03S080**	21.6	34	44.0	80	8	1
7.3	3	●	**DFAS0730X03S080**	21.9	34	44.0	80	8	1
7.4	3	●	**DFAS0740X03S080**	22.2	34	44.0	80	8	1
7.5	3	●	**DFAS0750X03S080**	22.5	34	44.0	80	8	1
7.6	3	●	**DFAS0760X03S080**	22.8	36	42.0	80	8	1
7.7	3	●	**DFAS0770X03S080**	23.1	36	42.0	80	8	1
7.8	3	●	**DFAS0780X03S080**	23.4	36	42.0	80	8	1
7.9	3	●	**DFAS0790X03S080**	23.7	36	42.0	80	8	1
8.0	3	●	**DFAS0800X03S080**	24.0	36	42.0	80	8	1
8.1	3	●	**DFAS0810X03S090**	24.3	38	45.0	85	9	1
8.2	3	●	**DFAS0820X03S090**	24.6	38	45.0	85	9	1
8.3	3	●	**DFAS0830X03S090**	24.9	38	45.0	85	9	1
8.4	3	●	**DFAS0840X03S090**	25.2	38	45.0	85	9	1
8.5	3	●	**DFAS0850X03S090**	25.5	38	45.0	85	9	1
8.6	3	●	**DFAS0860X03S090**	25.8	41	42.0	85	9	1
8.7	3	●	**DFAS0870X03S090**	26.1	41	42.0	85	9	1
8.8	3	●	**DFAS0880X03S090**	26.4	41	42.0	85	9	1
8.9	3	●	**DFAS0890X03S090**	26.7	41	42.0	85	9	1
9.0	3	●	**DFAS0900X03S090**	27.0	41	42.0	85	9	1
9.1	3	●	**DFAS0910X03S100**	27.3	43	45.0	90	10	1
9.2	3	●	**DFAS0920X03S100**	27.6	43	45.0	90	10	1
9.3	3	●	**DFAS0930X03S100**	27.9	43	45.0	90	10	1
9.4	3	●	**DFAS0940X03S100**	28.2	43	45.0	90	10	1
9.5	3	●	**DFAS0950X03S100**	28.5	43	45.0	90	10	1
9.6	3	●	**DFAS0960X03S100**	28.8	45	43.0	90	10	1
9.7	3	●	**DFAS0970X03S100**	29.1	45	43.0	90	10	1
9.8	3	●	**DFAS0980X03S100**	29.4	45	43.0	90	10	1
9.9	3	●	**DFAS0990X03S100**	29.7	45	43.0	90	10	1

● : Inventory maintained in Japan.



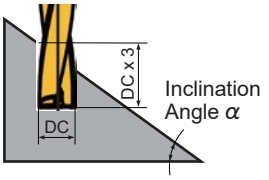
DC (mm)	Hole Depth (L/D)	DP102A	Order Number	Dimensions (mm)					Type
				LU	LCF	LS	OAL	DCONMS	
10.0	3	●	**DFAS1000X03S100**	30.0	45	43.0	90	10	1
10.1	3	●	**DFAS1010X03S110**	30.3	47	52.0	101	11	1
10.2	3	●	**DFAS1020X03S110**	30.6	47	52.0	101	11	1
10.3	3	●	**DFAS1030X03S110**	30.9	47	52.0	101	11	1
10.4	3	●	**DFAS1040X03S110**	31.2	47	52.0	101	11	1
10.5	3	●	**DFAS1050X03S110**	31.5	47	52.0	101	11	1
10.6	3	●	**DFAS1060X03S110**	31.8	50	49.0	101	11	1
10.7	3	●	**DFAS1070X03S110**	32.1	50	49.0	101	11	1
10.8	3	●	**DFAS1080X03S110**	32.4	50	49.0	101	11	1
10.9	3	●	**DFAS1090X03S110**	32.7	50	49.0	101	11	1
11.0	3	●	**DFAS1100X03S110**	33.0	50	49.0	101	11	1
11.1	3	●	**DFAS1110X03S120**	33.3	52	51.0	105	12	1
11.2	3	●	**DFAS1120X03S120**	33.6	52	51.0	105	12	1
11.3	3	●	**DFAS1130X03S120**	33.9	52	51.0	105	12	1
11.4	3	●	**DFAS1140X03S120**	34.2	52	51.0	105	12	1
11.5	3	●	**DFAS1150X03S120**	34.5	52	51.0	105	12	1
11.6	3	●	**DFAS1160X03S120**	34.8	54	49.0	105	12	1
11.7	3	●	**DFAS1170X03S120**	35.1	54	49.0	105	12	1
11.8	3	●	**DFAS1180X03S120**	35.4	54	49.0	105	12	1
11.9	3	●	**DFAS1190X03S120**	35.7	54	49.0	105	12	1
12.0	3	●	**DFAS1200X03S120**	36.0	54	49.0	105	12	1
12.5	3	●	**DFAS1250X03S130**	37.5	56	52.0	110	13	1
13.0	3	●	**DFAS1300X03S130**	39.0	59	49.0	110	13	1
13.5	3	●	**DFAS1350X03S140**	40.5	61	51.0	114	14	1
14.0	3	●	**DFAS1400X03S140**	42.0	63	49.0	114	14	1

DC = Cutting Dia. **LCF** = Length Chip Flute **OAL** = Overall Length
LU = Usable Length **LS** = Shank Length **DCONMS** = Connection Dia. Machine Side

RECOMMENDED CUTTING CONDITIONS

Workpiece Material		Mild Steel, Carbon Steel, Alloy Steel JIS SS400, S10C, SCM440, SNCM439		Stainless Steel, Precipitation-Hardening Stainless Steel JIS SUS304, SUS316, SUS630, SUS631		Gray Cast Iron, Ductile Cast Iron JIS FC300, FCD450	
Dia. **DC** (mm)	Hole Depth (L/D)	Revolution (min^{-1})	Flat Surface α=0° Feed rate (Min.—Max.) (mm/rev)	Revolution (min^{-1})	Flat Surface α=0° Feed rate (Min.—Max.) (mm/rev)	Revolution (min^{-1})	Flat Surface α=0° Feed rate (Min.—Max.) (mm/rev)
3.0	≤3	10610	0.07 (0.04—0.10)	3180	0.05 (0.04—0.06)	10610	0.04 (0.02—0.07)
4.0	≤3	7960	0.08 (0.04—0.11)	2390	0.06 (0.05—0.08)	7960	0.05 (0.03—0.09)
5.0	≤3	6370	0.10 (0.05—0.14)	1910	0.08 (0.06—0.10)	6370	0.07 (0.03—0.11)
6.0	≤3	5310	0.12 (0.06—0.17)	1590	0.10 (0.08—0.12)	5310	0.08 (0.04—0.13)
7.0	≤3	4550	0.13 (0.07—0.20)	1360	0.11 (0.09—0.14)	4550	0.09 (0.05—0.15)
8.0	≤3	3980	0.16 (0.08—0.23)	1190	0.13 (0.10—0.16)	3980	0.11 (0.05—0.17)
9.0	≤3	3540	0.17 (0.09—0.26)	1060	0.15 (0.12—0.18)	3540	0.12 (0.06—0.20)
10.0	≤3	3180	0.20 (0.10—0.29)	950	0.16 (0.13—0.20)	3180	0.13 (0.07—0.22)
11.0	≤3	2890	0.22 (0.11—0.32)	870	0.18 (0.14—0.22)	2890	0.15 (0.07—0.24)
12.0	≤3	2650	0.24 (0.12—0.35)	800	0.20 (0.16—0.24)	2650	0.16 (0.08—0.26)
13.0	≤3	2450	0.26 (0.13—0.39)	730	0.22 (0.17—0.26)	2450	0.17 (0.09—0.28)
14.0	≤3	2270	0.28 (0.14—0.42)	680	0.23 (0.19—0.28)	2270	0.19 (0.09—0.30)

Workpiece Material		Aluminium Alloys A6061, A7075		Titanium Alloys Ti-6Al-4V, Ti-5Al-5V-5Mo-3Cr	
Dia. **DC** (mm)	Hole Depth (L/D)	Revolution (min^{-1})	Flat Surface α=0° Feed rate (Min.—Max.) (mm/rev)	Revolution (min^{-1})	Flat Surface α=0° Feed rate (Min.—Max.) (mm/rev)
3.0	≤3	13790	0.04 (0.02—0.07)	3710	0.03 (0.01—0.05)
4.0	≤3	10350	0.05 (0.03—0.09)	2790	0.04 (0.01—0.07)
5.0	≤3	8280	0.07 (0.03—0.11)	2230	0.05 (0.02—0.08)
6.0	≤3	6900	0.08 (0.04—0.13)	1860	0.06 (0.02—0.10)
7.0	≤3	5910	0.09 (0.05—0.15)	1590	0.07 (0.02—0.12)
8.0	≤3	5170	0.11 (0.05—0.17)	1390	0.08 (0.03—0.13)
9.0	≤3	4600	0.12 (0.06—0.20)	1240	0.09 (0.03—0.15)
10.0	≤3	4140	0.13 (0.07—0.22)	1110	0.10 (0.03—0.17)
11.0	≤3	3760	0.15 (0.07—0.24)	1010	0.11 (0.04—0.18)
12.0	≤3	3450	0.16 (0.08—0.26)	930	0.12 (0.04—0.20)
13.0	≤3	3180	0.17 (0.09—0.28)	860	0.13 (0.04—0.22)
14.0	≤3	2960	0.19 (0.09—0.30)	800	0.14 (0.05—0.23)



Note 1) The recommended hole depth is DCx3. This should be the depth from the uppermost surface of the workpiece material when machining on an angled surface. (Refer to diagram)

Note 2) The cutting table above assumes drilling on a flat surface.
For hole drilling on an angled surface, adjust the feed rate in accordance with the inclination angle.
When the inclination angle α is 30° or less, reduce the feed rate by 30% or more as a guideline.
When the inclination angle α is greater than 30°, reduce the feed rate by 50% or more as a guideline.

Note 3) For flat surface machining of stainless steel, first drill a pilot hole with the same diameter or machine a countersink.

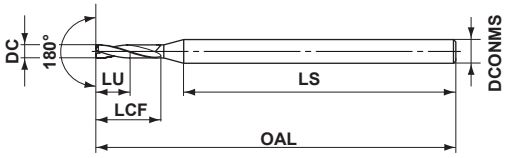
Note 4) This product is a tool intended for hole drilling. It cannot be used for cross-feed or helical machining.

MFE
Micro Size DC<1.0mm
Mini Size 1.0mm≤DC<3.0mm
SOLID CARBIDE FLAT BOTTOM DRILLS

UWC DP1A 180° XR

P	M	K	N	S	H
Steel	Stainless Steel	Cast Iron	Non-ferrous Metal		

External Coolant



Type1

0.75≤DC≤2.95	
0 −0.014	
DCONMS=3	DCONMS=4
0 −0.006	0 −0.008

DC (mm)	Hole Depth (L/D)	DP102A	Order Number	Dimensions (mm) LU	LCF	LS	OAL	DCONMS	Type
0.75	2	●	MFE0075X02S030	1.5	3.0	37.3	45	3	1
0.80	2	●	MFE0080X02S030	1.6	3.2	37.2	45	3	1
0.85	2	●	MFE0085X02S030	1.7	3.4	37.1	45	3	1
0.90	2	●	MFE0090X02S030	1.8	3.6	37.0	45	3	1
0.95	2	●	MFE0095X02S030	1.9	3.8	36.9	45	3	1
1.00	2	●	MFE0100X02S030	2.0	4.0	36.8	45	3	1
1.05	2	●	MFE0105X02S030	2.1	4.2	36.7	45	3	1
1.10	2	●	MFE0110X02S030	2.2	4.4	36.6	45	3	1
1.15	2	●	MFE0115X02S030	2.3	4.6	36.4	45	3	1
1.20	2	●	MFE0120X02S030	2.4	4.8	36.3	45	3	1
1.25	2	●	MFE0125X02S030	2.5	5.0	36.2	45	3	1
1.30	2	●	MFE0130X02S030	2.6	5.2	36.1	45	3	1
1.35	2	●	MFE0135X02S030	2.7	5.4	36.0	45	3	1
1.40	2	●	MFE0140X02S030	2.8	5.6	35.9	45	3	1
1.45	2	●	MFE0145X02S030	2.9	5.8	35.8	45	3	1
1.50	2	●	MFE0150X02S030	3.0	6.0	35.7	45	3	1
1.55	2	●	MFE0155X02S030	3.1	6.2	35.6	45	3	1
1.60	2	●	MFE0160X02S030	3.2	6.4	35.5	45	3	1
1.65	2	●	MFE0165X02S030	3.3	6.6	35.4	45	3	1
1.70	2	●	MFE0170X02S030	3.4	6.8	35.3	45	3	1
1.75	2	●	MFE0175X02S030	3.5	7.0	35.2	45	3	1
1.80	2	●	MFE0180X02S030	3.6	7.2	35.1	45	3	1
1.85	2	●	MFE0185X02S030	3.7	7.4	35.0	45	3	1
1.90	2	●	MFE0190X02S030	3.8	7.6	34.8	45	3	1
1.95	2	●	MFE0195X02S030	3.9	7.8	34.7	45	3	1
2.00	2	●	MFE0200X02S040	4.0	8.0	37.8	50	4	1
2.05	2	●	MFE0205X02S040	4.1	8.2	37.7	50	4	1
2.10	2	●	MFE0210X02S040	4.2	8.4	37.6	50	4	1
2.15	2	●	MFE0215X02S040	4.3	8.6	37.4	50	4	1
2.20	2	●	MFE0220X02S040	4.4	8.8	37.3	50	4	1
2.25	2	●	MFE0225X02S040	4.5	9.0	37.2	50	4	1
2.30	2	●	MFE0230X02S040	4.6	9.2	37.1	50	4	1
2.35	2	●	MFE0235X02S040	4.7	9.4	37.0	50	4	1
2.40	2	●	MFE0240X02S040	4.8	9.6	36.9	50	4	1
2.45	2	●	MFE0245X02S040	4.9	9.8	36.8	50	4	1
2.50	2	●	MFE0250X02S040	5.0	10.0	36.7	50	4	1
2.55	2	●	MFE0255X02S040	5.1	10.2	36.6	50	4	1
2.60	2	●	MFE0260X02S040	5.2	10.4	36.5	50	4	1
2.65	2	●	MFE0265X02S040	5.3	10.6	36.4	50	4	1
2.70	2	●	MFE0270X02S040	5.4	10.8	36.3	50	4	1
2.75	2	●	MFE0275X02S040	5.5	11.0	36.2	50	4	1
2.80	2	●	MFE0280X02S040	5.6	11.2	36.1	50	4	1
2.85	2	●	MFE0285X02S040	5.7	11.4	36.0	50	4	1
2.90	2	●	MFE0290X02S040	5.8	11.6	35.8	50	4	1
2.95	2	●	MFE0295X02S040	5.9	11.8	35.7	50	4	1

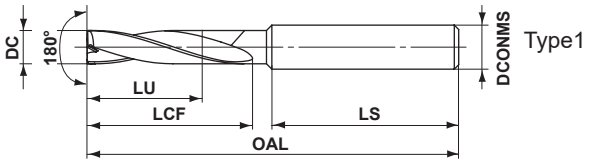
● : Inventory maintained in Japan.

MFE

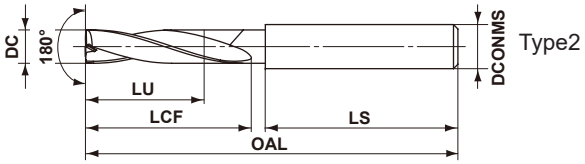
SOLID CARBIDE FLAT BOTTOM DRILLS

P	M	K	N	S	H
Steel	Stainless Steel	Cast Iron	Non-ferrous Metal		

External Coolant



Type1



Type2

3≤DC≤6	6 < DC≤10	10 < DC≤18	18 < DC≤20
0 −0.012	0 −0.015	0 −0.018	0 −0.021
DCONMS=6	6 < DCONMS≤10	10 < DCONMS≤18	DCONMS=20
0 −0.008	0 −0.009	0 −0.011	0 −0.013

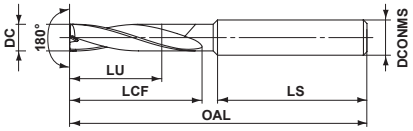
DC (mm)	Hole Depth (L/D)	DP1020	Order Number	Dimensions (mm) LU	LCF	LS	OAL	DCONMS	Type
3.0	2	●	MFE0300X02S060	6.0	12	35.4	55	6	1
3.1	2	●	MFE0310X02S060	6.2	14	33.6	55	6	1
3.2	2	●	MFE0320X02S060	6.4	14	33.8	55	6	1
3.3	2	●	MFE0330X02S060	6.6	14	34.0	55	6	1
3.4	2	●	MFE0340X02S060	6.8	14	34.1	55	6	1
3.5	2	●	MFE0350X02S060	7.0	14	34.3	55	6	1
3.6	2	●	MFE0360X02S060	7.2	16	32.5	55	6	1
3.7	2	●	MFE0370X02S060	7.4	16	32.7	55	6	1
3.8	2	●	MFE0380X02S060	7.6	16	32.9	55	6	1
3.9	2	●	MFE0390X02S060	7.8	16	33.1	55	6	1
4.0	2	●	MFE0400X02S060	8.0	16	33.3	55	6	1
4.1	2	●	MFE0410X02S060	8.2	18	38.5	62	6	1
4.2	2	●	MFE0420X02S060	8.4	18	38.6	62	6	1
4.3	2	●	MFE0430X02S060	8.6	18	38.8	62	6	1
4.4	2	●	MFE0440X02S060	8.8	18	39.0	62	6	1
4.5	2	●	MFE0450X02S060	9.0	18	39.2	62	6	1
4.6	2	●	MFE0460X02S060	9.2	20	38.3	62	6	1
4.7	2	●	MFE0470X02S060	9.4	20	38.3	62	6	1
4.8	2	●	MFE0480X02S060	9.6	20	38.4	62	6	1
4.9	2	●	MFE0490X02S060	9.8	20	38.4	62	6	1
5.0	2	●	MFE0500X02S060	10.0	20	38.5	62	6	1
5.1	2	●	MFE0510X02S060	10.2	22	36.5	62	6	1
5.2	2	●	MFE0520X02S060	10.4	22	36.6	62	6	1
5.3	2	●	MFE0530X02S060	10.6	22	36.6	62	6	1
5.4	2	●	MFE0540X02S060	10.8	22	36.7	62	6	1
5.5	2	●	MFE0550X02S060	11.0	22	36.7	62	6	1
5.6	2	●	MFE0560X02S060	11.2	24	34.8	62	6	1
5.7	2	●	MFE0570X02S060	11.4	24	34.8	62	6	1
5.8	2	●	MFE0580X02S060	11.6	24	34.9	62	6	1
5.9	2	●	MFE0590X02S060	11.8	24	34.9	62	6	1

● : Inventory maintained in Japan.

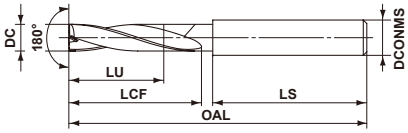
DC (mm)	Hole Depth (L/D)	DP1020	Order Number	Dimensions (mm)					Type
				LU	LCF	LS	OAL	DCONMS	
6.0	2	●	**MFE0600X02S060**	12.0	24	35.0	62	6	1
6.1	2	●	**MFE0610X02S070**	12.2	26	44.5	74	7	1
6.1	2	●	**MFE0610X02S080**	12.2	26	44.0	74	8	1
6.2	2	●	**MFE0620X02S070**	12.4	26	44.6	74	7	1
6.2	2	●	**MFE0620X02S080**	12.4	26	44.1	74	8	1
6.3	2	●	**MFE0630X02S070**	12.6	26	44.6	74	7	1
6.3	2	●	**MFE0630X02S080**	12.6	26	44.1	74	8	1
6.4	2	●	**MFE0640X02S070**	12.8	26	44.7	74	7	1
6.4	2	●	**MFE0640X02S080**	12.8	26	44.2	74	8	1
6.5	2	●	**MFE0650X02S070**	13.0	26	44.7	74	7	1
6.5	2	●	**MFE0650X02S080**	13.0	26	44.2	74	8	1
6.6	2	●	**MFE0660X02S070**	13.2	28	42.8	74	7	1
6.6	2	●	**MFE0660X02S080**	13.2	28	42.3	74	8	1
6.7	2	●	**MFE0670X02S070**	13.4	28	42.8	74	7	1
6.7	2	●	**MFE0670X02S080**	13.4	28	42.3	74	8	1
6.8	2	●	**MFE0680X02S070**	13.6	28	42.9	74	7	1
6.8	2	●	**MFE0680X02S080**	13.6	28	42.4	74	8	1
6.9	2	●	**MFE0690X02S070**	13.8	28	42.9	74	7	1
6.9	2	●	**MFE0690X02S080**	13.8	28	42.4	74	8	1
7.0	2	●	**MFE0700X02S070**	14.0	28	43.0	74	7	1
7.0	2	●	**MFE0700X02S080**	14.0	28	42.5	74	8	1
7.1	2	●	**MFE0710X02S080**	14.2	30	40.5	74	8	1
7.2	2	●	**MFE0720X02S080**	14.4	30	40.6	74	8	1
7.3	2	●	**MFE0730X02S080**	14.6	30	40.6	74	8	1
7.4	2	●	**MFE0740X02S080**	14.8	30	40.7	74	8	1
7.5	2	●	**MFE0750X02S080**	15.0	30	40.7	74	8	1
7.6	2	●	**MFE0760X02S080**	15.2	32	38.8	74	8	1
7.7	2	●	**MFE0770X02S080**	15.4	32	38.8	74	8	1
7.8	2	●	**MFE0780X02S080**	15.6	32	38.9	74	8	1
7.9	2	●	**MFE0790X02S080**	15.8	32	38.9	74	8	1
8.0	2	●	**MFE0800X02S080**	16.0	32	39.0	74	8	1
8.1	2	●	**MFE0810X02S100**	16.2	34	46.0	84	10	1
8.2	2	●	**MFE0820X02S100**	16.4	34	46.1	84	10	1
8.3	2	●	**MFE0830X02S100**	16.6	34	46.1	84	10	1
8.4	2	●	**MFE0840X02S100**	16.8	34	46.2	84	10	1
8.5	2	●	**MFE0850X02S100**	17.0	34	46.2	84	10	1
8.6	2	●	**MFE0860X02S100**	17.2	36	44.3	84	10	1
8.7	2	●	**MFE0870X02S100**	17.4	36	44.3	84	10	1
8.8	2	●	**MFE0880X02S100**	17.6	36	44.4	84	10	1
8.9	2	●	**MFE0890X02S100**	17.8	36	44.4	84	10	1
9.0	2	●	**MFE0900X02S100**	18.0	36	44.5	84	10	1
9.1	2	●	**MFE0910X02S100**	18.2	38	42.5	84	10	1
9.2	2	●	**MFE0920X02S100**	18.4	38	42.6	84	10	1
9.3	2	●	**MFE0930X02S100**	18.6	38	42.6	84	10	1
9.4	2	●	**MFE0940X02S100**	18.8	38	42.7	84	10	1
9.5	2	●	**MFE0950X02S100**	19.0	38	42.7	84	10	1
9.6	2	●	**MFE0960X02S100**	19.2	40	40.8	84	10	1
9.7	2	●	**MFE0970X02S100**	19.4	40	40.8	84	10	1

DC = Cutting Dia. **LCF** = Length Chip Flute **OAL** = Overall Length
LU = Usable Length **LS** = Shank Length **DCONMS** = Connection Dia. Machine Side

Solid Carbide Flat Bottom Drills



Type1



Type2

DC (mm)	Hole Depth (L/D)	DP1020	Order Number	Dimensions (mm) LU	LCF	LS	OAL	DCONMS	Type
9.8	2	●	**MFE0980X02S100**	19.6	40	40.9	84	10	1
9.9	2	●	**MFE0990X02S100**	19.8	40	40.9	84	10	1
10.0	2	●	**MFE1000X02S100**	20.0	40	41.0	84	10	1
10.1	2	●	**MFE1010X02S120**	20.2	42	49.0	95	12	1
10.2	2	●	**MFE1020X02S120**	20.4	42	49.1	95	12	1
10.3	2	●	**MFE1030X02S120**	20.6	42	49.1	95	12	1
10.4	2	●	**MFE1040X02S120**	20.8	42	49.2	95	12	1
10.5	2	●	**MFE1050X02S120**	21.0	42	49.2	95	12	1
10.6	2	●	**MFE1060X02S120**	21.2	44	47.3	95	12	1
10.7	2	●	**MFE1070X02S120**	21.4	44	47.3	95	12	1
10.8	2	●	**MFE1080X02S120**	21.6	44	47.4	95	12	1
10.9	2	●	**MFE1090X02S120**	21.8	44	47.4	95	12	1
11.0	2	●	**MFE1100X02S120**	22.0	44	47.5	95	12	1
11.1	2	●	**MFE1110X02S120**	22.2	46	45.5	95	12	1
11.2	2	●	**MFE1120X02S120**	22.4	46	45.6	95	12	1
11.3	2	●	**MFE1130X02S120**	22.6	46	45.6	95	12	1
11.4	2	●	**MFE1140X02S120**	22.8	46	45.7	95	12	1
11.5	2	●	**MFE1150X02S120**	23.0	46	45.7	95	12	1
11.6	2	●	**MFE1160X02S120**	23.2	48	43.8	95	12	1
11.7	2	●	**MFE1170X02S120**	23.4	48	43.8	95	12	1
11.8	2	●	**MFE1180X02S120**	23.6	48	43.9	95	12	1
11.9	2	●	**MFE1190X02S120**	23.8	48	43.9	95	12	1
12.0	2	●	**MFE1200X02S120**	24.0	48	44.0	95	12	1
12.5	2	●	**MFE1250X02S140**	25.0	50	49.0	102	14	2
13.0	2	●	**MFE1300X02S140**	26.0	52	47.0	102	14	2
13.5	2	●	**MFE1350X02S140**	27.0	54	45.0	102	14	2
14.0	2	●	**MFE1400X02S140**	28.0	56	43.0	102	14	2
14.5	2	●	**MFE1450X02S160**	29.0	58	50.0	111	16	2
15.0	2	●	**MFE1500X02S160**	30.0	60	48.0	111	16	2
15.5	2	●	**MFE1550X02S160**	31.0	62	46.0	111	16	2
16.0	2	●	**MFE1600X02S160**	32.0	64	44.0	111	16	2
16.5	2	●	**MFE1650X02S180**	33.0	66	50.0	119	18	2
17.0	2	●	**MFE1700X02S180**	34.0	68	48.0	119	18	2
17.5	2	●	**MFE1750X02S180**	35.0	70	46.0	119	18	2
18.0	2	●	**MFE1800X02S180**	36.0	72	44.0	119	18	2
18.5	2	●	**MFE1850X02S200**	37.0	74	50.0	127	20	2
19.0	2	●	**MFE1900X02S200**	38.0	76	48.0	127	20	2
19.5	2	●	**MFE1950X02S200**	39.0	78	46.0	127	20	2
20.0	2	●	**MFE2000X02S200**	40.0	80	44.0	127	20	2

DC = Cutting Dia. **LCF** = Length Chip Flute **OAL** = Overall Length
LU = Usable Length **LS** = Shank Length **DCONMS** = Connection Dia. Machine Side

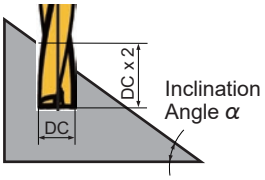
● : **Inventory maintained in Japan.**

RECOMMENDED CUTTING CONDITIONS

Workpiece Material		Mild Steel (≤180HB) JIS SS400, S10C		Carbon Steel, Alloy Steel (180−280HB) JIS S45C, SCM440		Carbon Steel, Alloy Steel (280−350HB) JIS SNCM439	
Dia. **DC** (mm)	Hole Depth (L/D)	Revolution (min^{-1})	Flat Surface α=0° Feed rate (Min.−Max.) (mm/rev)	Revolution (min^{-1})	Flat Surface α=0° Feed rate (Min.−Max.) (mm/rev)	Revolution (min^{-1})	Flat Surface α=0° Feed rate (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)
4.0	≤2	5900	0.080 (0.060−0.100)	5900	0.080 (0.060−0.100)	5100	0.080 (0.060−0.100)
5.0	≤2	4700	0.100 (0.080−0.130)	4700	0.100 (0.080−0.130)	4100	0.100 (0.080−0.130)
6.0	≤2	3900	0.130 (0.100−0.150)	3900	0.130 (0.100−0.150)	3400	0.130 (0.100−0.150)
8.0	≤2	2900	0.150 (0.130−0.170)	2900	0.150 (0.130−0.170)	2500	0.150 (0.130−0.170)
10.0	≤2	2300	0.170 (0.150−0.200)	2300	0.170 (0.150−0.200)	2000	0.170 (0.150−0.200)
12.0	≤2	1900	0.200 (0.170−0.250)	1900	0.200 (0.170−0.250)	1700	0.200 (0.170−0.250)
16.0	≤2	1400	0.250 (0.200−0.300)	1400	0.250 (0.200−0.300)	1200	0.250 (0.200−0.300)
20.0	≤2	1100	0.300 (0.250−0.350)	1100	0.300 (0.250−0.350)	1000	0.300 (0.250−0.350)

Workpiece Material		Austenitic Stainless Steel (≤200HB) JIS SUS304, SUS316		Gray Cast Iron (≤350MPa) JIS FC300		Ductile Cast Iron (≤450MPa) JIS FCD450	
Dia. **DC** (mm)	Hole Depth (L/D)	Revolution (min^{-1})	Flat Surface α=0° Feed rate (Min.−Max.) (mm/rev)	Revolution (min^{-1})	Flat Surface α=0° Feed rate (Min.−Max.) (mm/rev)	Revolution (min^{-1})	Flat Surface α=0° Feed rate (Min.−Max.) (mm/rev)
0.75	≤2	10600	0.007 (0.003−0.011)	23300	0.030 (0.010−0.050)	16900	0.010 (0.005−0.015)
1.0	≤2	7900	0.007 (0.003−0.011)	17500	0.030 (0.010−0.050)	12700	0.010 (0.005−0.015)
1.5	≤2	5300	0.010 (0.005−0.015)	12200	0.035 (0.015−0.055)	10000	0.020 (0.010−0.030)
2.0	≤2	4700	0.015 (0.010−0.020)	9500	0.040 (0.020−0.060)	8700	0.030 (0.015−0.045)
2.5	≤2	3800	0.015 (0.010−0.020)	7900	0.050 (0.030−0.070)	7300	0.045 (0.025−0.065)
3.0	≤2	3100	0.020 (0.010−0.030)	7900	0.060 (0.040−0.080)	6800	0.050 (0.040−0.060)
4.0	≤2	2300	0.030 (0.020−0.040)	5900	0.080 (0.060−0.100)	5500	0.060 (0.050−0.080)
5.0	≤2	1900	0.040 (0.030−0.050)	4700	0.100 (0.080−0.120)	4400	0.080 (0.060−0.100)
6.0	≤2	1500	0.050 (0.040−0.060)	3900	0.120 (0.100−0.140)	3700	0.100 (0.080−0.120)
8.0	≤2	1100	0.060 (0.050−0.080)	2900	0.140 (0.120−0.160)	2700	0.120 (0.100−0.150)
10.0	≤2	950	0.080 (0.060−0.100)	2300	0.160 (0.140−0.180)	2200	0.150 (0.120−0.180)
12.0	≤2	790	0.100 (0.080−0.120)	1900	0.180 (0.160−0.200)	1800	0.180 (0.150−0.200)
16.0	≤2	590	0.120 (0.100−0.150)	1400	0.200 (0.180−0.240)	1300	0.200 (0.180−0.250)
20.0	≤2	470	0.150 (0.120−0.200)	1100	0.240 (0.200−0.280)	1100	0.250 (0.200−0.300)

Workpiece Material		Aluminium Alloys (Si<5%) A6061, A7075	
Dia. **DC** (mm)	Hole Depth (L/D)	Revolution (min^{-1})	Flat Surface α=0° Feed rate (Min.−Max.) (mm/rev)
0.75	≤2	42400	0.020 (0.010−0.030)
1.0	≤2	31800	0.020 (0.010−0.030)
1.5	≤2	21200	0.020 (0.010−0.030)
2.0	≤2	17500	0.050 (0.030−0.070)
2.5	≤2	14000	0.060 (0.040−0.090)
3.0	≤2	11600	0.060 (0.040−0.090)
4.0	≤2	8700	0.080 (0.060−0.100)
5.0	≤2	7000	0.100 (0.080−0.130)
6.0	≤2	5800	0.130 (0.100−0.160)
8.0	≤2	4300	0.160 (0.130−0.200)
10.0	≤2	3500	0.200 (0.160−0.240)
12.0	≤2	2900	0.240 (0.200−0.280)
16.0	≤2	2100	0.280 (0.240−0.320)
20.0	≤2	1700	0.320 (0.280−0.360)



Note 1) The recommended hole depth is DCx2. This should be the depth from the uppermost surface of the workpiece material when machining on an angled surface. (Refer to diagram)

Note 2) The cutting table above assumes drilling on a flat surface.

For hole drilling on an angled surface, adjust the feed rate in accordance with the inclination angle.

When the inclination angle α is 30° or less, reduce the feed rate by 30% or more as a guideline.

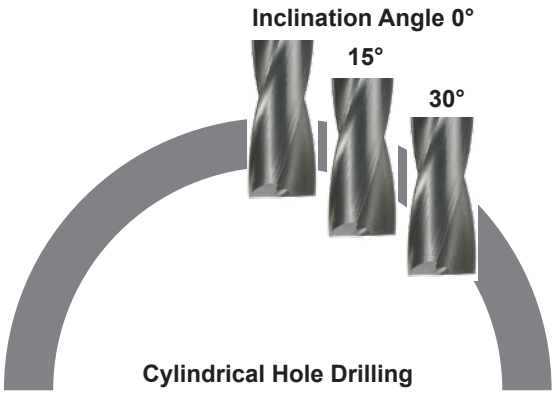
When the inclination angle α is greater than 30°, reduce the feed rate by 50% or more as a guideline.

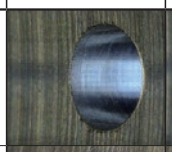
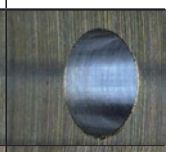
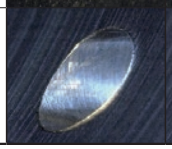
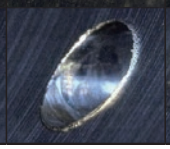
Note 3) This product is a tool intended for hole drilling. It cannot be used for cross-feed or helical machining.

Cutting Performance

Comparison of Exit Burrs Generated when machining JIS SUS304

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

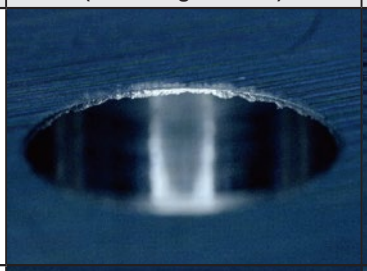
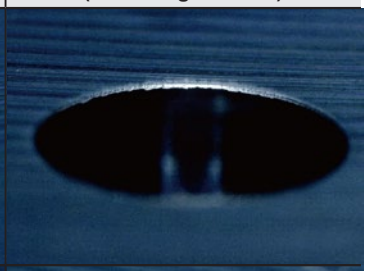
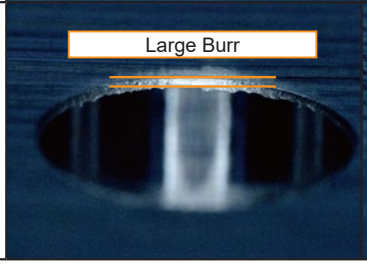


Inclination Angle	MFE	Conventional A	Conventional B
Inclination Angle 0° Hole Depth=4mm			
Inclination Angle 15° Hole Depth≒5mm			
Inclination Angle 30° Hole Depth≒7mm			

<Cutting Conditions>
Drill : MFE0200X02S040
Workpiece Material : JIS SUS304
Cutting Speed : **vc**=30m/min
Feed per Rev. : **fr**=0.01mm/rev
Cutting Mode : Wet Cutting
External Coolant (Water-soluble)
Machine : Vertical MC (BT40)

Comparison When Machining Thin Plates in JIS SCM440

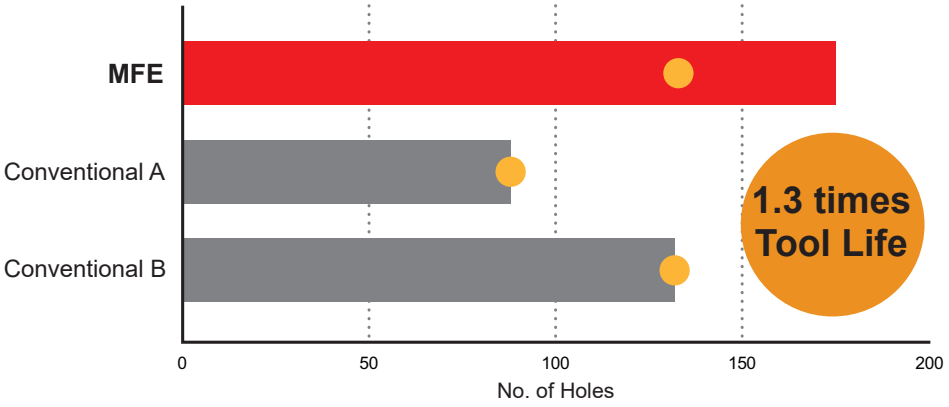
Flat tip geometry prevents burr formation in various types of applications.

	Conventional (Point Angle = 140°)	MFE (Point Angle = 180°)
vc = 50m/min fr = 0.05mm/rev		
vc = 80m/min fr = 0.15mm/rev		

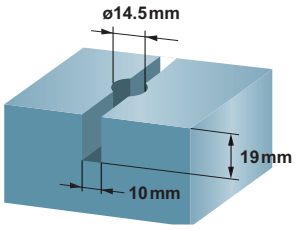
<Cutting Conditions>
Drill : MFE0600X02S060
Workpiece Material : JIS SCM440
Hole Depth : 10mm (Thin Plate)
Cutting Mode : Wet Cutting
External Coolant (Water-soluble)
Machine : Vertical MC (BT40)

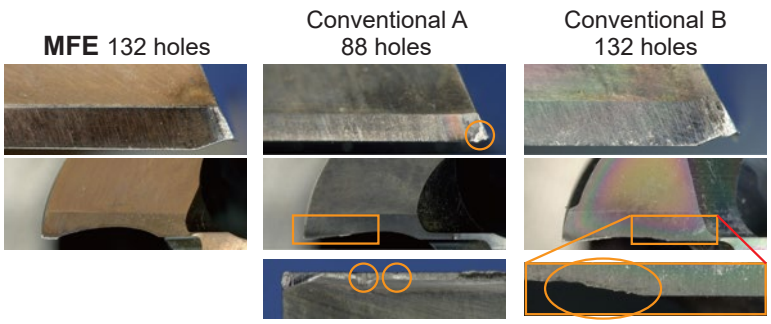
Comparison of Fracture Resistance When Machining JIS S50C

Achieved 1.3 times longer tool life compared to conventional products because of increased stability.



Cutting Mode
Drilling of ø14.5mm in groove with a width of 10mm.



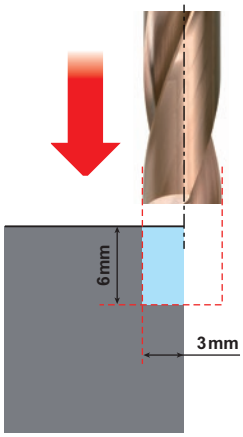


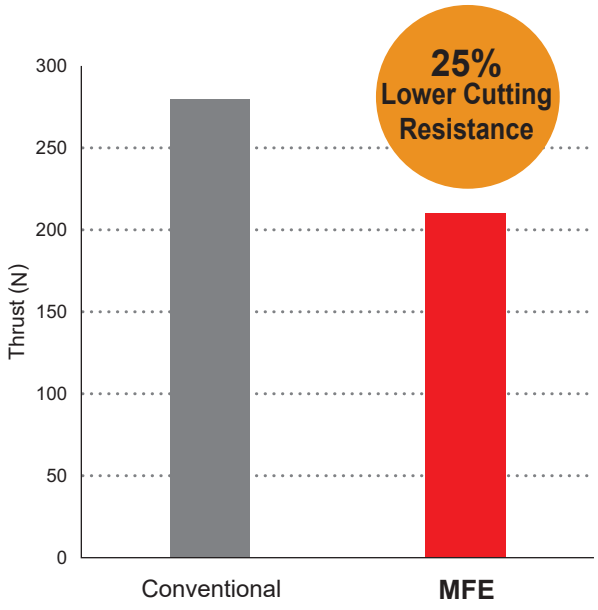
<Cutting Conditions>

Drill	: MFE1450X02S160
Workpiece Material	: JIS S50C
Hole Depth	: 24mm
Cutting Speed	: **vc**=35m/min
Feed per Rev.	: **fr**=0.025mm/rev
Cutting Mode	: Wet Cutting External Coolant (Water-soluble)
Machine	: Vertical MC (BT50)

Thrust Force Comparison When Shoulder Drilling

New “Z” point thinning with lower thrust force.





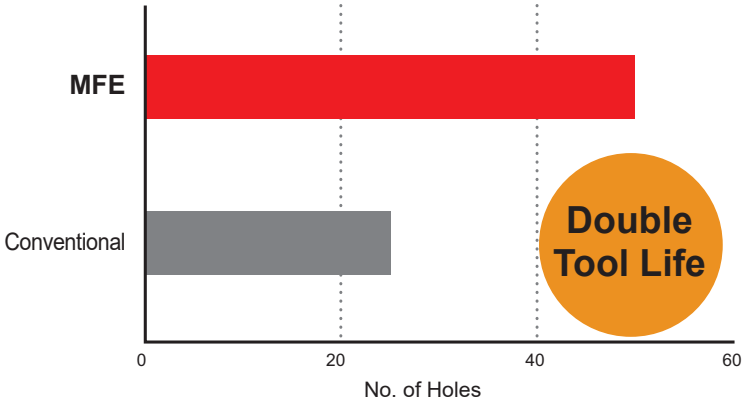
<Cutting Conditions>

Drill	: MFE0600X02S060
Workpiece Material	: JIS S50C
Hole Depth	: 6mm (l=DC×1)
Cutting Speed	: **vc**=50m/min
Feed per Rev.	: **fr**=0.07mm/rev

Cutting Performance

Comparison of Fracture Resistance When Machining JIS SUS304

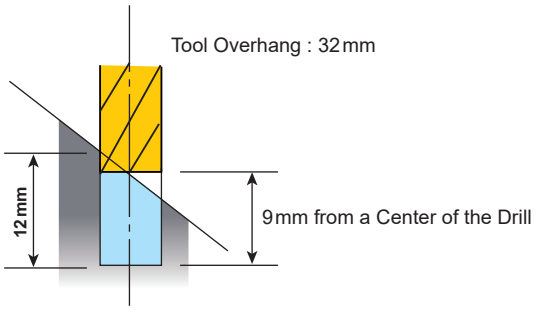
Achieved double tool life compared to conventional products because of the outstanding fracture resistance properties.



<Cutting Conditions>
Drill : MFE0600X02S060
Workpiece Material : JIS SUS304
Hole Depth : 12mm (l=DC×2)
Cutting Speed : **vc**=35m/min
Feed per Rev. : **fr**=0.025mm/rev
Cutting Mode : Wet Cutting
External Coolant (Water-soluble)
Machine : Vertical MC (BT50)

MFE After 50 holes Machining

Conventional After 25 holes Machining



Comparison When the Surface Angle is 45º and Machining JIS S45C

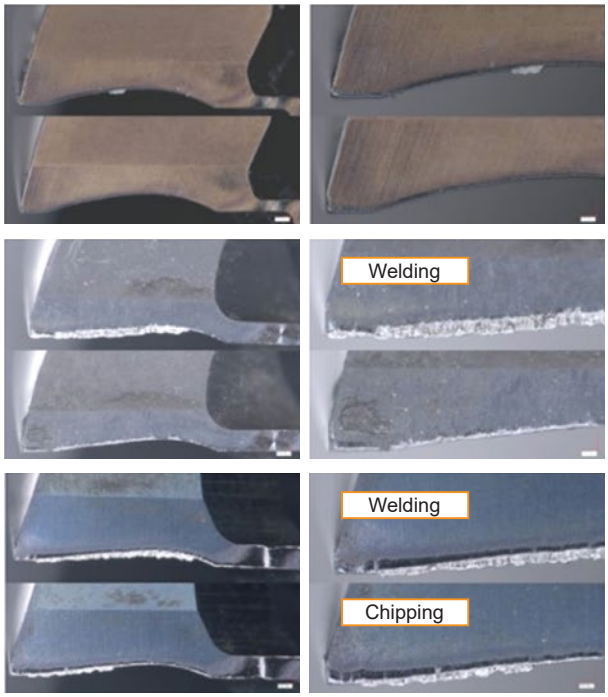
Abnormal fracturing is controlled because of the excellent welding resistance properties.

No. of Holes : Comparison of the cutting edge after machining 200 holes.

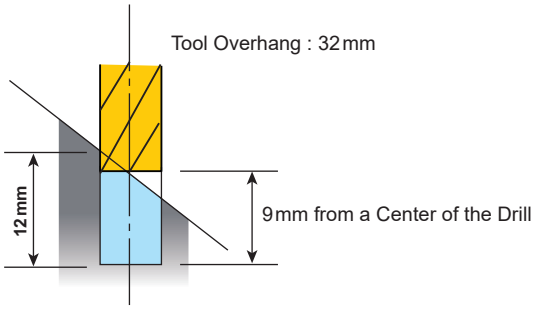
MFE

Conventional A

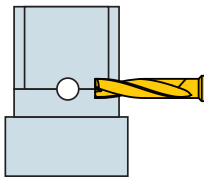
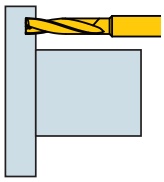
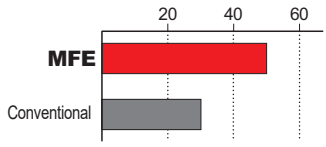
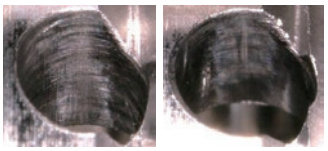
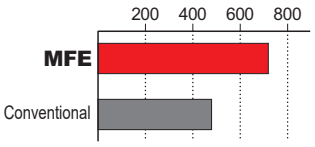
Conventional B

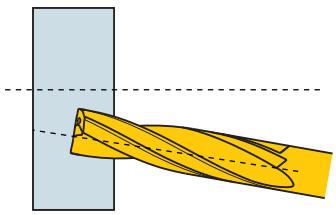
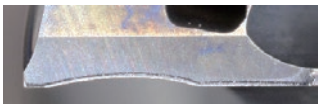


<Cutting Conditions>
Drill : MFE0600X02S060
Workpiece Material : JIS S45C
Hole Depth : 12mm (l=DC×2)
Cutting Speed : **vc**=50m/min
Feed per Rev. : **fr**=0.07mm/rev
Cutting Mode : Wet Cutting
External Coolant (Water-soluble)



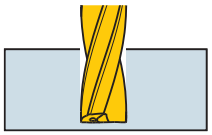
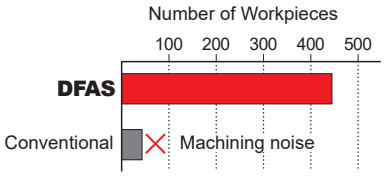
Application Example

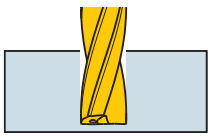
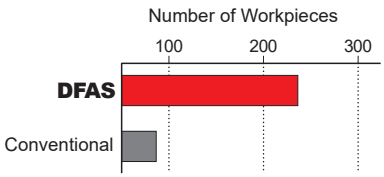
Drill	MFE1010X02S120	MFE0180X02S030	MFE0160X02S030
Workpiece	JIS SCM415 No Image	JIS SUS303 	JIS SUS440 Pilot Drilling 
Component	Ball Nut	Bolt	Nut
Cutting Conditions: Cutting Speed **vc** (m/min)	63	22	40
Cutting Conditions: Feed per Rev. **fr** (mm/rev)	0.04	0.015	0.01 – 0.012
Cutting Conditions: Hole Depth (mm)	–	–	5
Cutting Mode	Wet Cutting Extarnal Coolant (Water-soluble)	Wet Cutting Extarnal Coolant	Wet Cutting Extarnal Coolant
Machine	Vertical MC	Small Automatic Lathes	Horizontal MC
Results	Number of Workpieces  The wandering of the hole was reduced from 0.13 mm to 0.03 mm when compared to conventional products. Tool life also extended by a factor of at least 1.5.	Large Burr  **MFE** Conventional With the MFE drill on a small automatic lathe, there were no inaccuracies and it gave double the tool life during continuous machining.	Number of Workpieces  The MFE is excellent at maintaining accuracy and the tool life becomes 1.5 times longer than conventional products.

Drill	DFAS0830X03S090
Workpiece	JIS FC250 
Component	Machine Parts
Cutting Conditions: Cutting Speed **vc** (m/min)	30
Cutting Conditions: Feed per Rev. **fr** (mm/rev)	0.05
Cutting Conditions: Hole Depth (mm)	1.5
Cutting Mode	Wet Cutting Intarnal Coolant (Water-soluble) Blind hole with 10° angled surface
Machine	Horizontal MC
Results	After drilling the same number of holes (1230) as the conventional product, the wear damage was minimal thereby allowing machining to continue. After drilling 1230 holes   Flank wear amount 0.10 mm or less Wear condition

The above are customer's application examples, so can differ from the recommended conditions.

Application Example

Drill		DFAS0800X03S080
Workpiece		JIS S50C 
Component		Machine Parts
Cutting Conditions	Cutting Speed **vc** (m/min)	100
	Feed per Rev. **fr** (mm/rev)	0.12
	Hole Depth (mm)	4.5
Cutting Mode		Wet Cutting Intarnal Coolant (Water-soluble) Step
Machine		MC
Results		Cutting noise was reduced and the number of holes drilled was increased by 700% when compared to a conventional product. The quality of the machined surface finish was also improved. 

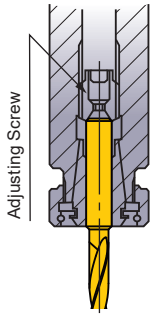
Drill		DFAS1100X03S110
Workpiece		JIS SS400 
Component		Machine Parts
Cutting Conditions	Cutting Speed **vc** (m/min)	104
	Feed per Rev. **fr** (mm/rev)	0.12
	Hole Depth (mm)	27
Cutting Mode		Wet Cutting Intarnal Coolant (Water-soluble)
Machine		MC
Results		Cutting noise was reduced and the number of holes drilled was increased by 300% when compared to a conventional product. The quality of the machined surface finish was also improved. 

The above are customer's application examples, so can differ from the recommended conditions.

Memo

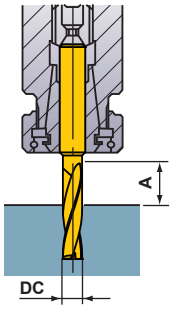
■ Operational Guidance

Drill Holding



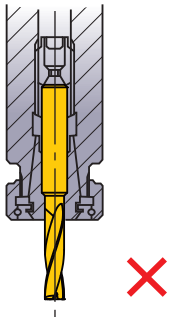
Thrust bearing type collet chuck holds the drill securely.

Drill Length



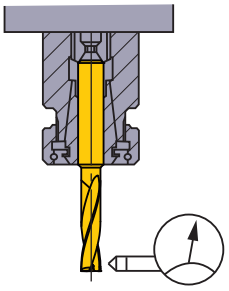
A > DC x 1.5

Drill Installation



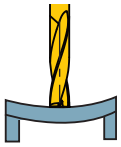
Do not clamp on the flutes.

Installation Tolerance

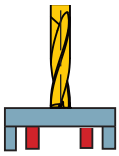


Run-out ≤ 0.03mm

Thin Workpiece



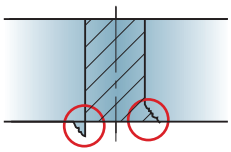
If Bending Occurs



OK

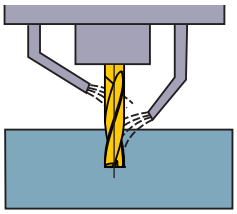
Support the Workpiece

Burring and Workpiece Chipping



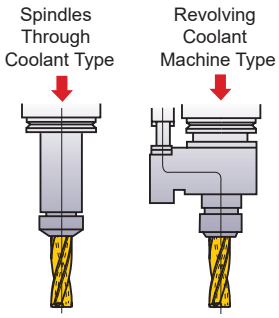
①Lower the feed rate by 50% at the end of through cutting.
②Add a chamfer.

External Coolant Method



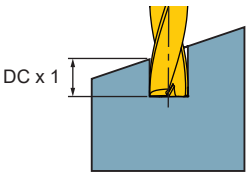
Two coolant positions, at the end and at the center are ideal.

Internal Coolant Method



More than ø3mm : 0.5MPa-7MPa
More than 3MPa is recommended.

Inclined Face Drilling



① When machining a deep hole into an inclined surface, use DFAS and MFE drill as a drill for a guide hole.

② Set the drill depth at approx. DC x 1 to obtain anaccurate guide hole.

Coolant Handling

<Internal Coolant Method>

1) Small particles of swarf will jam in the oil hole of small diameter drills. Always use a fine mesh filter as a preventative measure.

2) Dirt and dust particles adhere to the oil in old coolant and prevent an efficient flow. Regular coolant exchange is recommended.

For Your Safety
●Don't handle inserts and chips without gloves. ●Please machine within the recommended application range and exchange expired tools with new ones in advance of breakage. ●Please use safety covers and wear safety glasses. ●When using compounded cutting oils, please take fire precautions. ●When using rotating tools, please make a trial run to check run-out, vibration and abnormal sounds etc. ●Grinding or heating of cutting tools produces dust and mist. Inhaling large amount of dust or contacting with eyes and skins may harm your body.

MITSUBISHI MATERIALS CORPORATION

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(Tools specifications subject to change without notice.)

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