

Mach Solid Flat Drill

MSFD



Mach Solid Flat Drill for Hole Making on Various Surface Types

The best tool for ramped, curved or flat workpieces

- ▣ **Surface Finish**

High quality hole making capability with 180° point angle

- ▣ **High Quality Performance**

Improved anti chipping and welding resistance by edge honing and chamfering. Minimized creation of burrs compared to general drills



MSFD

Mach Solid Flat Drill for Hole Making on Various Surface Types

MSFD

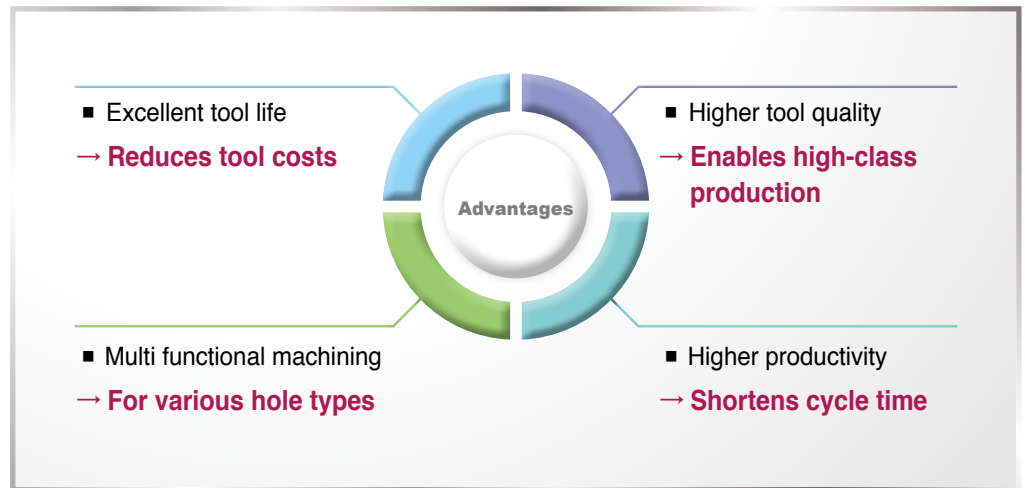
When it comes to hole making on surfaces that are ramped, curved or flat, there have been frequent issues such as poor straightness, burr creation, short tool life and many other machining troubles. It is why there continues to be requests for solutions for such problems

The **MSFD's** flat point shape enables high quality hole making on uneven workpiece surfaces. It additionally features stronger resistance to chipping and built up edge which provides longer tool life. Strengthened cutting edges through honing and chamfering were factored into its development.

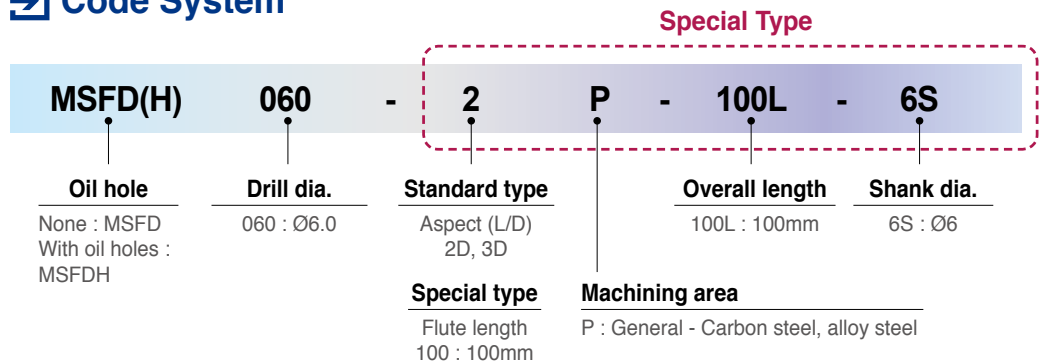
We assure our customers that the MSFD will boost productivity and save tool costs with multi functional machining availability.



MSFD For various types of holes



Code System

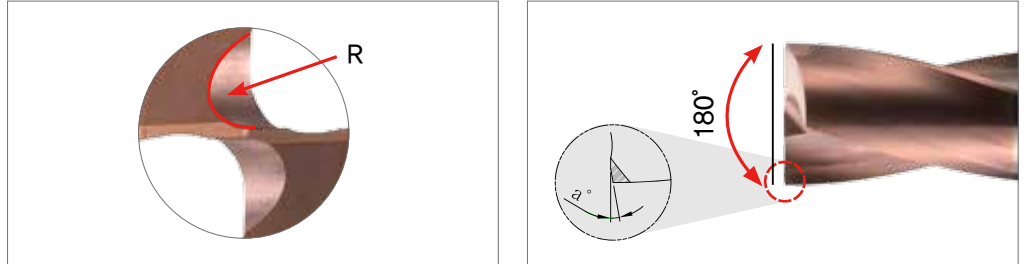


➔ Features

- Excellent chip evacuation
- Higher rigidity on corner edges
- Longer tool life through higher resistance to chipping

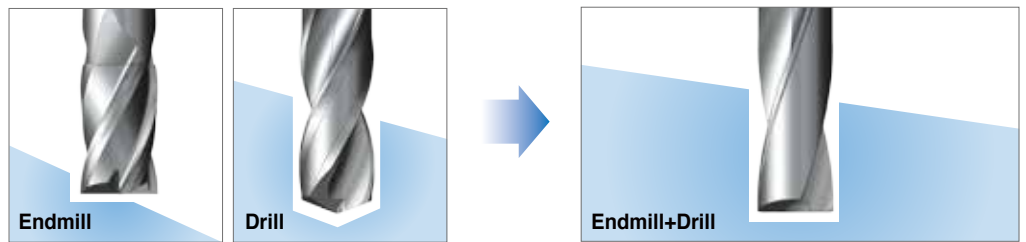
Cutting edge design

- Excellent straightness with its 180° point angle when drilling on ramped surface
- Stronger resistance to chipping through corner chamfering
- Widened chip pockets by the use of 'R' shape on the thinning part



- Multi functional capability - end milling and drilling using a single MSFD
- Higher productivity achieved through shorter process

Productivity

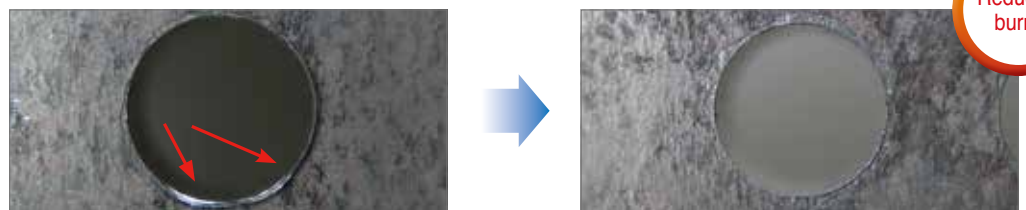


[Conventional tools used and their application]

[MSFD]

➔ Tool cost reduction, Higher productivity

Burrs



[Competitor]

[MSFD]

➔ Wide Applications

- A wide range of applications and improved cutting performance

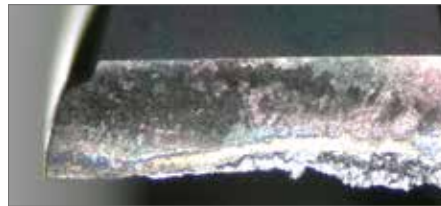
Vertical	Flat surface	Curved surface	Ramped

➔ Cutting Performance

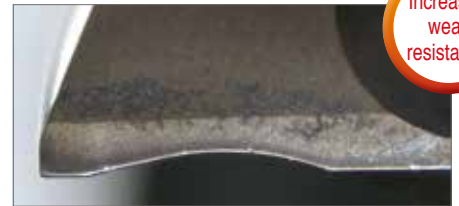
- Excellent resistance to wear and built up edge in machining carbon steels at low speed
- Prolongs tool life

Wear resistance

- Workpiece SM48C
- Cutting conditions $vc(m/min) = 80$, $fn(mm/rev) = 0.10$, $ap(mm) = 12$, wet
- Cutting length 7.2m (600 holes)
- Tools MSFD060-2P (PC325U)



[Competitor]



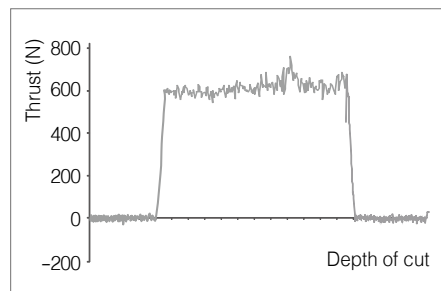
[MSFD]

Increased wear resistance

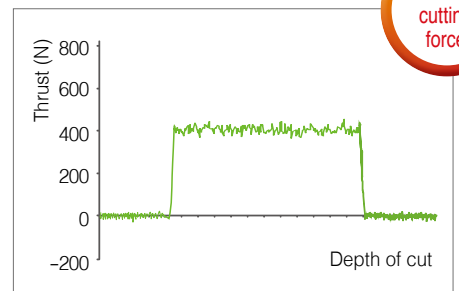
- High precision hole making availability through lower cutting load
- Stable hole size consistency and better surface finish

Cutting force

- Workpiece SM45C
- Cutting conditions $vc(m/min) = 70$, $fn(mm/rev) = 0.10$, $ap(mm) = 15$, wet
- Tools MSFD060-3P (PC325U)



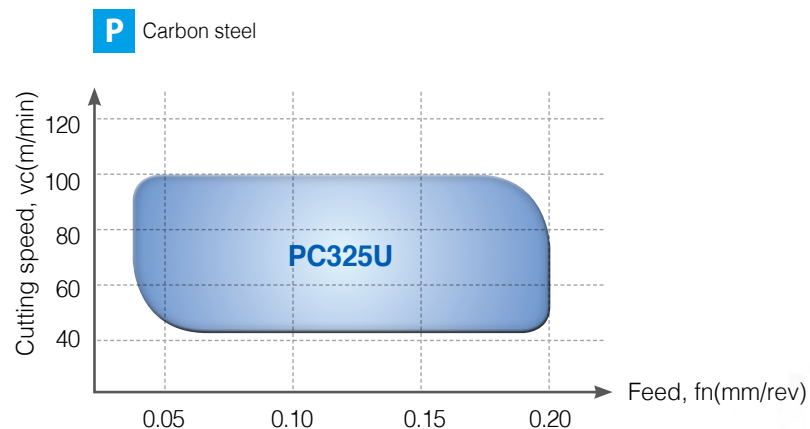
[Competitor (Average thrust of 214N)]



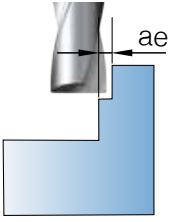
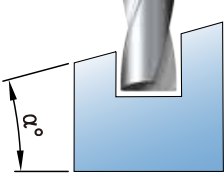
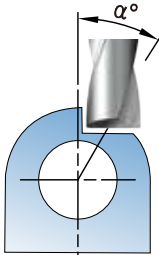
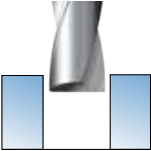
[MSFD (Average thrust of 160N)]

25% lower cutting force

➔ Application Range



⇒ Application Methods

Application type	Recommended machining conditions														
	<ul style="list-style-type: none"> Radial depth of cuts should be less than half the drill radius In case of increasing depth of cuts, divide the machining process into two passes 														
	<ul style="list-style-type: none"> Recommended slope angle range is under 30° In case of machining at slope angle over 30°, reduce the feed rate when the tool enters the workpiece <table border="1"> <thead> <tr> <th>Slope angle (α°)</th> <th>Performance</th> <th>Applied (fn)</th> </tr> </thead> <tbody> <tr> <td>≤20°</td> <td>◎</td> <td>100%</td> </tr> <tr> <td>20° < ~40°</td> <td>○</td> <td>80%</td> </tr> <tr> <td>≥40°</td> <td>△</td> <td>60%</td> </tr> </tbody> </table>	Slope angle (α°)	Performance	Applied (fn)	≤20°	◎	100%	20° < ~40°	○	80%	≥40°	△	60%		
Slope angle (α°)	Performance	Applied (fn)													
≤20°	◎	100%													
20° < ~40°	○	80%													
≥40°	△	60%													
	<ul style="list-style-type: none"> Use the tool within 30° from the center of the curve Reduce the feed rate when the tool penetrates the workpiece to the end part <table border="1"> <thead> <tr> <th>Workpiece(Ø)</th> <th>Slope angle (α°)</th> <th>Performance</th> <th>Applied (fn)</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≤Ø100</td> <td>≤20°</td> <td>◎</td> <td>100%</td> </tr> <tr> <td>20° < ~40°</td> <td>○</td> <td>80%</td> </tr> <tr> <td>≥40°</td> <td>△</td> <td>60%</td> </tr> </tbody> </table>	Workpiece(Ø)	Slope angle (α°)	Performance	Applied (fn)	≤Ø100	≤20°	◎	100%	20° < ~40°	○	80%	≥40°	△	60%
Workpiece(Ø)	Slope angle (α°)	Performance	Applied (fn)												
≤Ø100	≤20°	◎	100%												
	20° < ~40°	○	80%												
	≥40°	△	60%												
	<ul style="list-style-type: none"> Reduce the feed rate by half the recommended condition when the tool enters the workpiece Reduce the feed rate by half the recommended condition when the tool penetrates the workpiece to the end part Recommended depth of cut is under 2D 														

⇒ Recommended Cutting Conditions

Workpiece			Grade	Cutting speed, vc(m/min)	Feed(Depth of cut = 2D~3D)			
ISO	Workpiece materials	Hardness (HB)			Feed rate(mm/rev) per drill dia.(mm)			
					Ø2.5~Ø4.0	Ø4.1~Ø8.0	Ø8.1~Ø12.0	
P	Carbon steel	Low carbon steel	80~120	PC325U	75(60~90)	0.03~0.10	0.05~0.15	0.10~0.20
		High carbon steel	180~280	PC325U	75(60~80)	0.03~0.10	0.05~0.15	0.10~0.20
	Alloy steel	Low alloy steel	140~260	PC325U	65(50~80)	0.03~0.10	0.05~0.15	0.10~0.20
		High alloy steel	50~260	PC325U	65(50~80)	0.03~0.10	0.05~0.15	0.10~0.20

➔ Application Examples



Carbon steel (SM45C)

- Cutting conditions $vc(m/min) = 80$, $fn(mm/rev) = 0.1$, $ap(mm) = 12$, wet
- Tool MSFD060-2P (PC325U)

MSFD	600 holes (7.2m)
Competitor	400 holes (4.8m)



➔ 50% longer tool life compared to the competitor



Alloy steel (SCM440)

- Cutting conditions $vc(m/min) = 100$, $fn(mm/rev) = 0.1$, $ap(mm) = 14$, wet
- Tool MSFDH060-3P (PC325U)

MSFD	1400 holes (19.6m)
Competitor	1200 holes (16.8m)



➔ 16% longer tool life compared to the competitor



Carbon steel (SM45C)

- Cutting conditions $vc(m/min) = 80$, $fn(mm/rev) = 0.1$, $ap(mm) = 12$, wet
- Tool MSFD060-2P (PC325U)

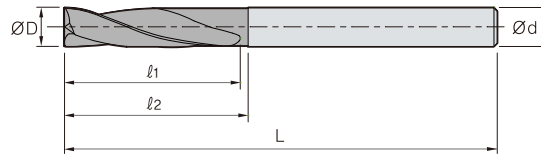
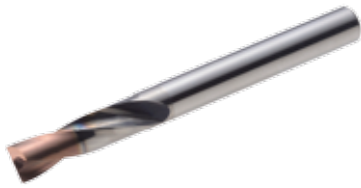
MSFD	1600 holes (19.2m)
Competitor	1400 holes (16.8m)



➔ 14% longer tool life compared to the competitor



MSFD-2D



Specification	P
Grade	PC325U
Tolerance(Drill dia.)	H7
Tolerance(Shank dia.)	h6
Point angle(θ°)	180°
Twist angle	20°
Thinning	R Type
Coolant	External

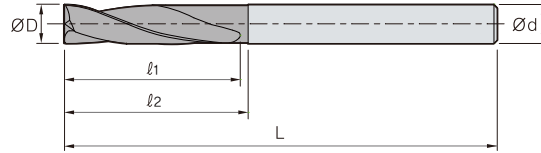
P Steel

(mm)

Designation	ØD	Ød	2P		
			l ₁	l ₂	L
MSFD 025-2P	2.5	4.0	10.5	11.5	50
026-2P	2.6	4.0	10.9	11.9	50
027-2P	2.7	4.0	11.3	12.3	50
028-2P	2.8	4.0	11.8	12.8	50
029-2P	2.9	4.0	12.2	13.2	50
030-2P	3.0	6.0	12.6	13.6	50
031-2P	3.1	6.0	13.0	14.0	50
032-2P	3.2	6.0	13.4	14.4	50
033-2P	3.3	6.0	13.9	14.9	50
034-2P	3.4	6.0	14.3	15.3	50
035-2P	3.5	6.0	14.7	15.7	50
036-2P	3.6	6.0	15.1	16.1	50
037-2P	3.7	6.0	15.5	16.5	50
038-2P	3.8	6.0	16.0	17.0	50
039-2P	3.9	6.0	16.4	17.4	50
040-2P	4.0	6.0	16.8	17.8	50
041-2P	4.1	6.0	17.2	18.2	60
042-2P	4.2	6.0	17.6	18.6	60
043-2P	4.3	6.0	18.1	19.1	60
044-2P	4.4	6.0	18.5	19.5	60
045-2P	4.5	6.0	18.9	19.9	60
046-2P	4.6	6.0	19.3	20.3	60
047-2P	4.7	6.0	19.7	20.7	60
048-2P	4.8	6.0	20.2	21.2	60
049-2P	4.9	6.0	20.6	21.6	60
050-2P	5.0	6.0	21.0	22.0	60
051-2P	5.1	6.0	21.4	22.4	60
052-2P	5.2	6.0	21.8	22.8	60
053-2P	5.3	6.0	22.3	23.3	60
054-2P	5.4	6.0	22.7	23.7	60
055-2P	5.5	6.0	23.1	24.1	60
056-2P	5.6	6.0	23.5	24.5	60
057-2P	5.7	6.0	23.9	24.9	60
058-2P	5.8	6.0	24.4	25.4	60
059-2P	5.9	6.0	24.8	25.8	60
060-2P	6.0	6.0	25.2	26.2	60
061-2P	6.1	8.0	25.6	26.6	70
062-2P	6.2	8.0	26.0	27.0	70
063-2P	6.3	8.0	26.5	27.5	70
064-2P	6.4	8.0	26.9	27.9	70
065-2P	6.5	8.0	27.3	28.3	70
066-2P	6.6	8.0	27.7	28.7	70
067-2P	6.7	8.0	28.1	29.1	70
068-2P	6.8	8.0	28.6	29.6	70
069-2P	6.9	8.0	29.0	30.0	70

MSFD

MSFD-2D



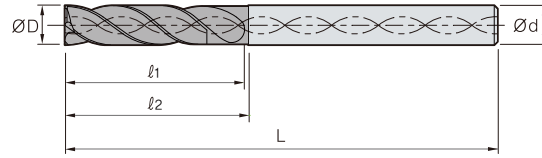
Specification	P
Grade	PC325U
Tolerance(Drill dia.)	H7
Tolerance(Shank dia.)	h6
Point angle(θ°)	180°
Twist angle	20°
Thinning	R Type
Coolant	External

P Steel

(mm)

MSFD	Designation	ØD	Ød	2P		
				l_1	l_2	L
	070-2P	7.0	8.0	29.4	30.4	70
	071-2P	7.1	8.0	29.8	30.8	70
	072-2P	7.2	8.0	30.2	31.2	70
	073-2P	7.3	8.0	30.7	31.7	70
	074-2P	7.4	8.0	31.1	32.1	70
	075-2P	7.5	8.0	31.5	32.5	70
	076-2P	7.6	8.0	31.9	32.9	70
	077-2P	7.7	8.0	32.3	33.3	70
	078-2P	7.8	8.0	32.8	33.8	70
	079-2P	7.9	8.0	33.2	34.2	70
	080-2P	8.0	8.0	33.6	34.6	70
	081-2P	8.1	10.0	34.0	35.0	80
	082-2P	8.2	10.0	34.4	35.4	80
	083-2P	8.3	10.0	34.9	35.9	80
	084-2P	8.4	10.0	35.3	36.3	80
	085-2P	8.5	10.0	35.7	36.7	80
	086-2P	8.6	10.0	36.1	37.1	80
	087-2P	8.7	10.0	36.5	37.5	80
	088-2P	8.8	10.0	37.0	38.0	80
	089-2P	8.9	10.0	37.4	38.4	80
	090-2P	9.0	10.0	37.8	38.8	80
	091-2P	9.1	10.0	38.2	39.2	80
	092-2P	9.2	10.0	38.6	39.6	80
	093-2P	9.3	10.0	39.1	40.1	80
	094-2P	9.4	10.0	39.5	40.5	80
	095-2P	9.5	10.0	39.9	40.9	80
	096-2P	9.6	10.0	40.3	41.3	80
	097-2P	9.7	10.0	40.7	41.7	80
	098-2P	9.8	10.0	41.2	42.2	80
	099-2P	9.9	10.0	41.6	42.6	80
	100-2P	10.0	10.0	42.0	43	80
	101-2P	10.1	12.0	42.4	43.4	90
	102-2P	10.2	12.0	42.8	43.8	90
	103-2P	10.3	12.0	43.3	44.3	90
	104-2P	10.4	12.0	43.7	44.7	90
	105-2P	10.5	12.0	44.1	45.1	90
	106-2P	10.6	12.0	44.5	45.5	90
	107-2P	10.7	12.0	44.9	45.9	90
	108-2P	10.8	12.0	45.4	46.4	90
	109-2P	10.9	12.0	45.8	46.8	90
	110-2P	11.0	12.0	46.2	47.2	90
	111-2P	11.1	12.0	46.6	47.6	90
	112-2P	11.2	12.0	47.0	48.0	90
	113-2P	11.3	12.0	47.5	48.5	90
	114-2P	11.4	12.0	47.9	48.9	90
	115-2P	11.5	12.0	48.3	49.3	90
	116-2P	11.6	12.0	48.7	49.7	90
	117-2P	11.7	12.0	49.1	50.1	90
	118-2P	11.8	12.0	49.6	50.6	90
	119-2P	11.9	12.0	50.0	51.0	90
	120-2P	12.0	12.0	50.4	51.4	90

MSFDH-3D



Specification	P
Grade	PC325U
Tolerance(Drill dia.)	H7
Tolerance(Shank dia.)	h6
Point angle(θ°)	180°
Twist angle	30°
Thinning	R Type
Coolant	Internal

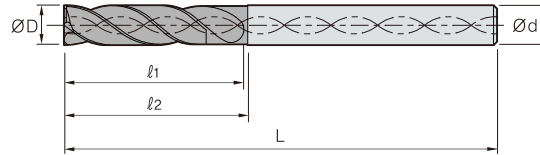
P Steel

(mm)

Designation	ØD	Ød	3P		
			l_1	l_2	L
MSFDH 025-3P	2.5	3.0	17	18	58
026-3P	2.6	3.0	17	18	58
027-3P	2.7	3.0	17	18	58
028-3P	2.8	3.0	17	18	58
029-3P	2.9	3.0	17	18	58
030-3P	3.0	6.0	20	21	62
031-3P	3.1	6.0	20	21	62
032-3P	3.2	6.0	20	21	62
033-3P	3.3	6.0	20	21	62
034-3P	3.4	6.0	20	21	62
035-3P	3.5	6.0	20	21	62
036-3P	3.6	6.0	20	21	62
037-3P	3.7	6.0	20	21	62
038-3P	3.8	6.0	24	25	66
039-3P	3.9	6.0	24	25	66
040-3P	4.0	6.0	24	25	66
041-3P	4.1	6.0	24	25	66
042-3P	4.2	6.0	24	25	66
043-3P	4.3	6.0	24	25	66
044-3P	4.4	6.0	24	25	66
045-3P	4.5	6.0	24	25	66
046-3P	4.6	6.0	24	25	66
047-3P	4.7	6.0	24	25	66
048-3P	4.8	6.0	28	29	66
049-3P	4.9	6.0	28	29	66
050-3P	5.0	6.0	28	29	66
051-3P	5.1	6.0	28	29	66
052-3P	5.2	6.0	28	29	66
053-3P	5.3	6.0	28	29	66
054-3P	5.4	6.0	28	29	66
055-3P	5.5	6.0	28	29	66
056-3P	5.6	6.0	28	29	66
057-3P	5.7	6.0	28	29	66
058-3P	5.8	6.0	28	29	66
059-3P	5.9	6.0	28	29	66
060-3P	6.0	6.0	28	29	66

MSFD

MSFDH-3D



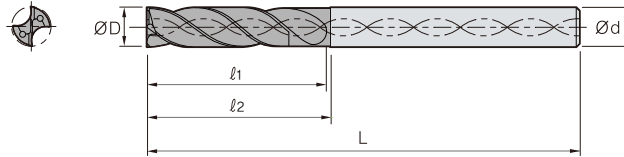
Specification	P
Grade	PC325U
Tolerance(Drill dia.)	H7
Tolerance(Shank dia.)	h6
Point angle(θ°)	180°
Twist angle	30°
Thinning	R Type
Coolant	Internal

P Steel

(mm)

Designation	ØD	Ød	3P		
			l_1	l_2	L
MSFDH 061-3P	6.1	8.0	34	35	79
062-3P	6.2	8.0	34	35	79
063-3P	6.3	8.0	34	35	79
064-3P	6.4	8.0	34	35	79
065-3P	6.5	8.0	34	35	79
066-3P	6.6	8.0	34	35	79
067-3P	6.7	8.0	34	35	79
068-3P	6.8	8.0	34	35	79
069-3P	6.9	8.0	34	35	79
070-3P	7.0	8.0	34	35	79
071-3P	7.1	8.0	41	42	79
072-3P	7.2	8.0	41	42	79
073-3P	7.3	8.0	41	42	79
074-3P	7.4	8.0	41	42	79
075-3P	7.5	8.0	41	42	79
076-3P	7.6	8.0	41	42	79
077-3P	7.7	8.0	41	42	79
078-3P	7.8	8.0	41	42	79
079-3P	7.9	8.0	41	42	79
080-3P	8.0	8.0	41	42	79
081-3P	8.1	10.0	47	48	89
082-3P	8.2	10.0	47	48	89
083-3P	8.3	10.0	47	48	89
084-3P	8.4	10.0	47	48	89
085-3P	8.5	10.0	47	48	89
086-3P	8.6	10.0	47	48	89
087-3P	8.7	10.0	47	48	89
088-3P	8.8	10.0	47	48	89
089-3P	8.9	10.0	47	48	89
090-3P	9.0	10.0	47	48	89

MSFDH-3D



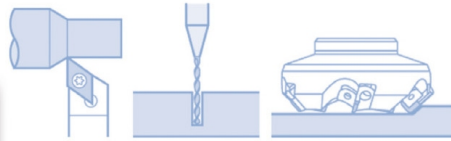
Specification	P
Grade	PC325U
Tolerance(Drill dia.)	H7
Tolerance(Shank dia.)	h6
Point angle(θ°)	180°
Twist angle	30°
Thinning	R Type
Coolant	Internal

P Steel

(mm)

Designation	ØD	Ød	3P		
			l_1	l_2	L
MSFDH 091-3P	9.1	10.0	47	48	89
092-3P	9.2	10.0	47	48	89
093-3P	9.3	10.0	47	48	89
094-3P	9.4	10.0	47	48	89
095-3P	9.5	10.0	47	48	89
096-3P	9.6	10.0	47	48	89
097-3P	9.7	10.0	47	48	89
098-3P	9.8	10.0	47	48	89
099-3P	9.9	10.0	47	48	89
100-3P	10.0	10.0	47	48	89
101-3P	10.1	12.0	55	56	102
102-3P	10.2	12.0	55	56	102
103-3P	10.3	12.0	55	56	102
104-3P	10.4	12.0	55	56	102
105-3P	10.5	12.0	55	56	102
106-3P	10.6	12.0	55	56	102
107-3P	10.7	12.0	55	56	102
108-3P	10.8	12.0	55	56	102
109-3P	10.9	12.0	55	56	102
110-3P	11.0	12.0	55	56	102
111-3P	11.1	12.0	55	56	102
112-3P	11.2	12.0	55	56	102
113-3P	11.3	12.0	55	56	102
114-3P	11.4	12.0	55	56	102
115-3P	11.5	12.0	55	56	102
116-3P	11.6	12.0	55	56	102
117-3P	11.7	12.0	55	56	102
118-3P	11.8	12.0	55	56	102
119-3P	11.9	12.0	55	56	102
120-3P	12.0	12.0	55	56	102

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Königsfelder Str. 33
58256 Ennepetal
www.thieme-werkzeuge.de

Tel. 02333-9786-0
Fax 02333-9786-49
info@thieme-werkzeuge.de



 **KORLOY**

Holystar B/D, 1350, Nambusunhwan-ro, Geumcheon-gu, Seoul, 08536, Korea
Tel : +82-2-522-3181 Fax : +82-2-522-3184, +82-2-3474-4744 Web : www.korloy.com E-mail : export@korloy.com

 **KORLOY AMERICA**

620 Maple Avenue, Torrance, CA 90503, USA
Tel : +1-310-782-3800 Toll Free : +1-888-711-0001 Fax : +1-310-782-3885
www.korloyamerica.com E-mail : sales@korloy.us

 **KORLOY INDIA**

Plot NO.415, Sector 8, IMT Manesar, Gurgaon 122051, Haryana, INDIA
Tel : +91-124-4391790 Fax : +91-124-4050032
www.korloyindia.com E-mail : sales.kip@korloy.com

 **KORLOY EUROPE**

Gablonzer Str. 25-27, 61440 Oberursel, Germany
Tel : +49-6171-277-83-0 Fax : +49-6171-277-83-59
www.korloyeurope.com E-mail : sales@korloyeurope.com

 **KORLOY BRASIL**

Av. Aruana 280, conj.12, WLC, Alphaville, Barueri,
CEP06460-010, SP, Brasil
Tel : +55-11-4193-3810 E-mail : vendas@korloy.com

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