

Ultra-small diameter solid drills for steels



DSM type

Highly Reliable Ultra-small Diameter Drill Assures Long Tool Life and Highly Accurate Drilling !



FEATURES

Excellent Performance for Small Diameter and Deep Hole Drilling of General Steels and Stainless Steels !



Point geometry

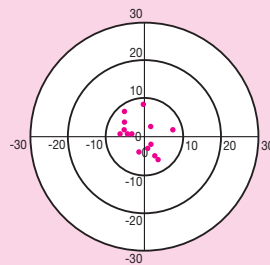
Outstanding drilling accuracy

Web-thinned point from ϕ 0.3 mm for precision drilling

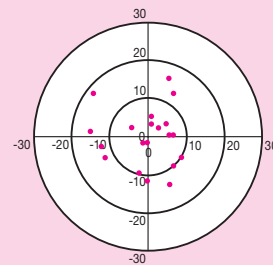
● Cutting conditions

Drill diameter: ϕ 0.3 mm
 Work material: Stainless steel (JIS SUS304)
 Machine: Vertical machining center
 Coolant: Water soluble type (Chlorine free)
 Cutting speed: $V_c=10$ m/min
 Feed: $f=0.003$ mm/rev
 Step length: 0.03 mm
 Drilling depth: 3.5 mm through-hole
 No. of holes: 20 holes
 Scale at entry side, 1 Div: 0.01 mm

Positioning accuracy of hole entry (Unit: μ m)



DSM type



Competitor's drill

DSM type, which excels in concentricity, showed higher hole-positioning accuracy than the competitor's drill.

Flute length

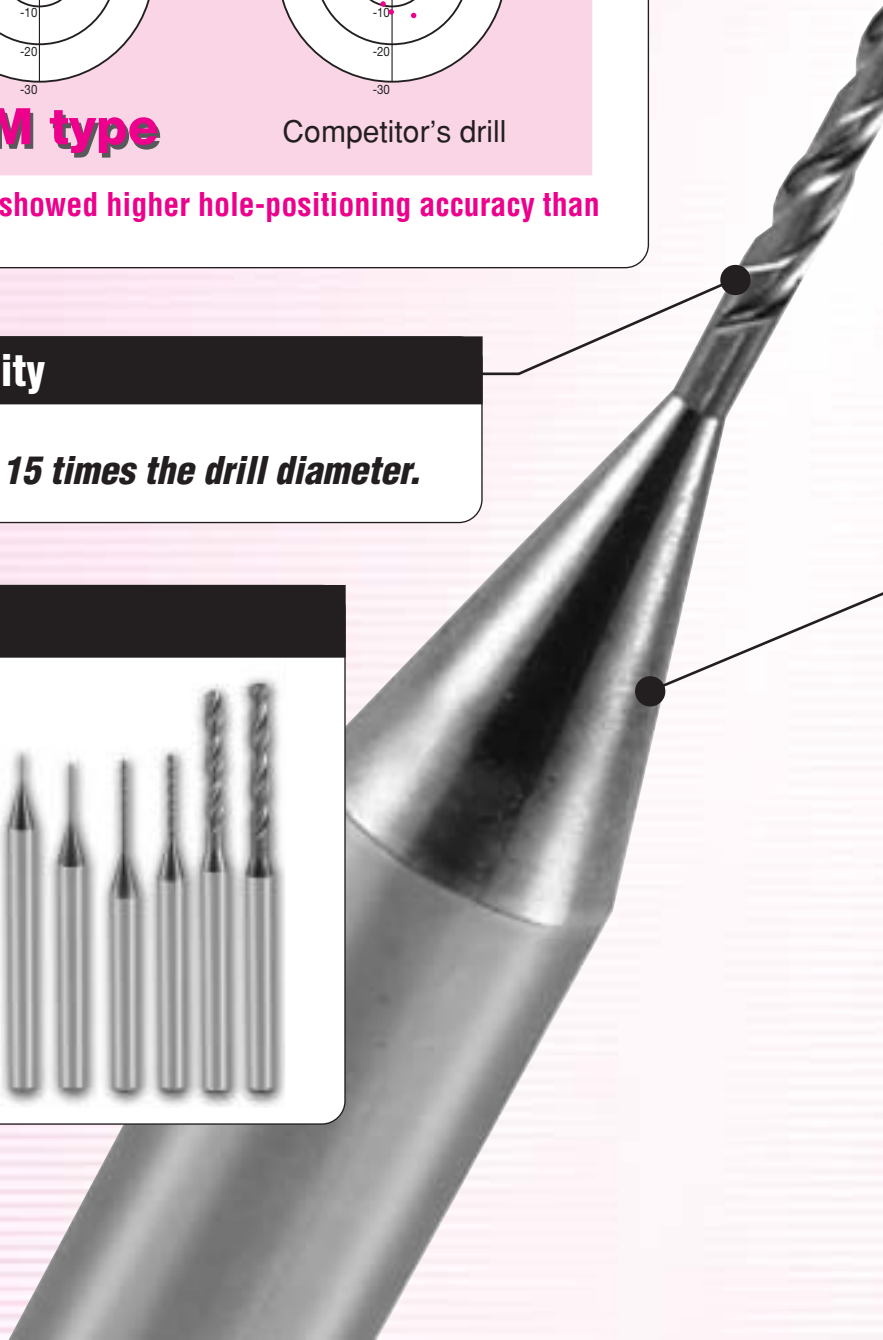
Deep hole drilling capability

Allows deep hole drilling up to 5 to 15 times the drill diameter.

Items

Variety of dimensions

Available as standard items from ϕ 0.1 to ϕ 3.0 mm in 0.01 mm increments. Shank diameters are all unified to ϕ 3 mm.

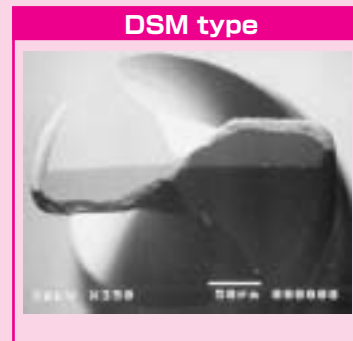
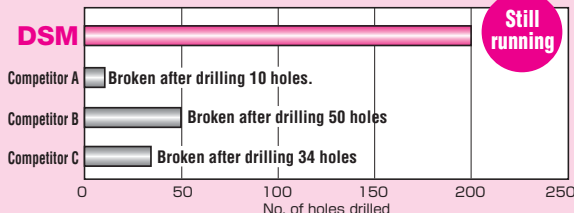


Grade High reliability. Less likely to break.

Realized stable drilling due to the highly rigid design and tough micro-grain cemented carbide

● Cutting conditions

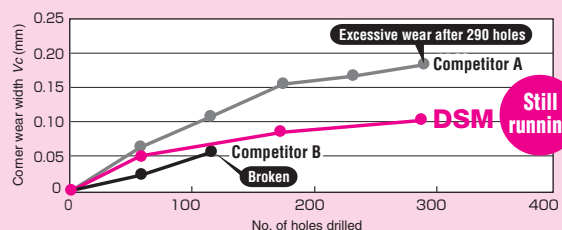
Drill diameter: ϕ 0.3 mm Cutting speed: $V_c=5$ m/min
 Work material: Stainless steel (JIS SUS304) Feed: $f=0.003$ mm/rev
 Machine: Vertical machining center Step length: 0.09 mm
 Cutting fluid: Water soluble type Drilling depth: 4.0 mm through hole



Performs well on stainless steel. After drilling 200 holes, the drill was able to use continuously.

● Cutting conditions

Drill diameter: ϕ 3.0 mm Cutting speed: $V_c=52$ m/min
 Work material: Carbon steel (JIS S45C) Feed: $f=0.06$ mm/rev
 Machine: Vertical machining center Step length: 0.75 mm
 Cutting fluid: Water soluble type Drilling depth: 15 mm blind hole



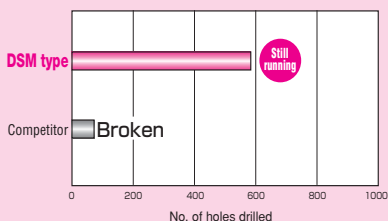
In drilling of carbon steel, DSM type showed less wear and was able to use continuously.

Coating Dramatically increased tool life

Special coated grade dedicated to small diameter drills has realized long tool life.

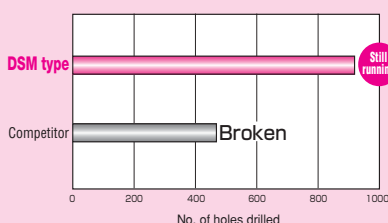
Drill diameter: ϕ 0.5 mm, Machine: Vertical machining center, Cutting fluid: Water soluble type (Chlorine free)

Stainless steel (JIS SUS304)



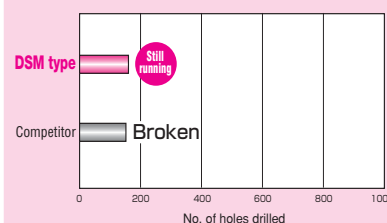
● Cutting conditions
 Cutting speed: $V_c=15$ m/min
 Feed: $f=0.005$ mm/rev
 Step length: 0.05 mm
 Drilling depth: 3 mm blind hole

Carbon steel (JIS S45C)



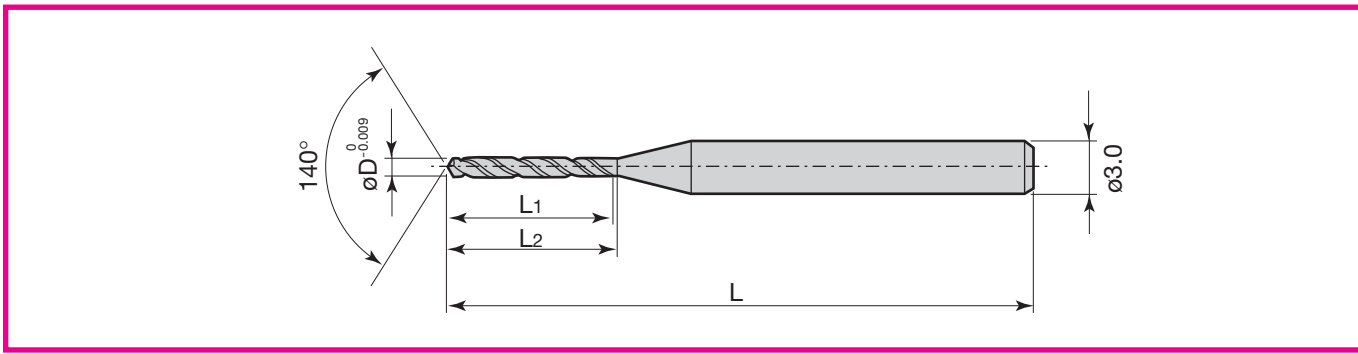
● Cutting conditions
 Cutting speed: $V_c=24$ m/min
 Feed: $f=0.007$ mm/rev
 Step length: 0.1 mm
 Drilling depth: 1.5 mm blind hole

High nickel alloy (KOVAR)



● Cutting conditions
 Cutting speed: $V_c=20$ m/min
 Feed: $f=0.007$ mm/rev
 Step length: 0.1 mm
 Drilling depth: 2 mm blind hole

STOCKED ITEMS (DSM)



Drill dia. ϕD	L/D	Cat. No.	Stock	Dimensions (mm)			Drill dia. ϕD	L/D	Cat. No.	Stock	Dimensions (mm)			Drill dia. ϕD	L/D	Cat. No.	Stock	Dimensions (mm)		
				L	L ₁	L ₂					L	L ₁	L ₂					L	L ₁	L ₂
0.10	10	DSM0010G10	●	38	1.15	1.4	0.59	10	DSM0059G10	◇	38	7.3	7.9	1.08	5	DSM0108G05	◇	38	8.0	8.6
0.11		DSM0011G10	●				0.60		DSM0060G10	●				1.09		DSM0109G05	◇			
0.12		DSM0012G10	●				0.61		DSM0061G10	◇				1.10		DSM0110G05	●			
0.13		DSM0013G10	●				0.62		DSM0062G10	◇				1.11		DSM0111G05	◇			
0.14		DSM0014G10	●				0.63		DSM0063G10	◇				1.12		DSM0112G05	◇			
0.15		DSM0015G10	●				0.64		DSM0064G10	◇				1.13		DSM0113G05	◇			
0.16		DSM0016G10	●				0.65		DSM0065G10	●				1.14		DSM0114G05	◇			
0.17		DSM0017G10	●				0.66		DSM0066G10	◇				1.15		DSM0115G05	◇			
0.18		DSM0018G10	●				0.67		DSM0067G10	◇				1.16		DSM0116G05	◇			
0.19		DSM0019G10	●				0.68		DSM0068G10	◇				1.17		DSM0117G05	◇			
0.20	DSM0020G10	●	0.69	DSM0069G10	◇	1.18	DSM0118G05	◇												
0.21	10	DSM0021G10	●	38	2.45	2.7	0.70	10	DSM0070G10	●	38	8.6	9.2	1.19	5	DSM0119G05	◇	38	8.9	9.5
0.22		DSM0022G10	●				0.71		DSM0071G10	◇				1.20		DSM0120G05	●			
0.23		DSM0023G10	●				0.72		DSM0072G10	◇				1.21		DSM0121G05	◇			
0.24		DSM0024G10	●				0.73		DSM0073G10	◇				1.22		DSM0122G05	◇			
0.25		DSM0025G10	●				0.74		DSM0074G10	◇				1.23		DSM0123G05	◇			
0.26		DSM0026G10	●				0.75		DSM0075G10	●				1.24		DSM0124G05	◇			
0.27		DSM0027G10	●				0.76		DSM0076G10	◇				1.25		DSM0125G05	◇			
0.28		DSM0028G10	●				0.77		DSM0077G10	◇				1.26		DSM0126G05	◇			
0.29		DSM0029G10	●				0.78		DSM0078G10	◇				1.27		DSM0127G05	◇			
0.30		DSM0030G10	●				0.79		DSM0079G10	◇				1.28		DSM0128G05	◇			
0.31	15	DSM0031G15	●	38	5.6	5.9	0.80	10	DSM0080G10	●	38	9.9	10.5	1.29	5	DSM0129G05	◇	38	9.7	10.3
0.32		DSM0032G15	●				0.81		DSM0081G10	◇				1.30		DSM0130G05	●			
0.33		DSM0033G15	●				0.82		DSM0082G10	◇				1.31		DSM0131G05	◇			
0.34		DSM0034G15	●				0.83		DSM0083G10	◇				1.32		DSM0132G05	◇			
0.35		DSM0035G15	●				0.84		DSM0084G10	◇				1.33		DSM0133G05	◇			
0.36		DSM0036G15	●				0.85		DSM0085G10	◇				1.34		DSM0134G05	◇			
0.37		DSM0037G15	●				0.86		DSM0086G10	◇				1.35		DSM0135G05	◇			
0.38		DSM0038G15	●				0.87		DSM0087G10	◇				1.36		DSM0136G05	◇			
0.39		DSM0039G15	●				0.88		DSM0088G10	◇				1.37		DSM0137G05	◇			
0.40		DSM0040G15	●				0.89		DSM0089G10	◇				1.38		DSM0138G05	◇			
0.41	15	DSM0041G15	●	38	7.4	7.7	0.90	10	DSM0090G10	●	38	11.0	11.6	1.39	5	DSM0139G05	◇	38	11.3	11.9
0.42		DSM0042G15	●				0.91		DSM0091G10	◇				1.40		DSM0140G05	●			
0.43		DSM0043G15	●				0.92		DSM0092G10	◇				1.41		DSM0141G05	◇			
0.44		DSM0044G15	●				0.93		DSM0093G10	◇				1.42		DSM0142G05	◇			
0.45		DSM0045G15	●				0.94		DSM0094G10	◇				1.43		DSM0143G05	◇			
0.46		DSM0046G15	●				0.95		DSM0095G10	◇				1.44		DSM0144G05	◇			
0.47		DSM0047G15	●				0.96		DSM0096G10	◇				1.45		DSM0145G05	●			
0.48		DSM0048G15	●				0.97		DSM0097G10	◇				1.46		DSM0146G05	◇			
0.49		DSM0049G15	●				0.98		DSM0098G10	◇				1.47		DSM0147G05	◇			
0.50		DSM0050G15	●				0.99		DSM0099G10	◇				1.48		DSM0148G05	◇			
0.51	10	DSM0051G10	◇	38	6.6	7.2	1.00	5	DSM0100G10	●	38	8.0	8.6	1.49	5	DSM0149G05	◇	45	12.1	12.7
0.52		DSM0052G10	◇				1.01		DSM0101G05	◇				1.50		DSM0150G05	●			
0.53		DSM0053G10	◇				1.02		DSM0102G05	◇				1.51		DSM0151G05	◇			
0.54		DSM0054G10	◇				1.03		DSM0103G05	◇				1.52		DSM0152G05	◇			
0.55		DSM0055G10	●				1.04		DSM0104G05	◇				1.53		DSM0153G05	◇			
0.56		DSM0056G10	◇				1.05		DSM0105G05	●				1.54		DSM0154G05	◇			
0.57		DSM0057G10	◇				1.06		DSM0106G05	◇				1.55		DSM0155G05	●			
0.58		DSM0058G10	◇				1.07		DSM0107G05	◇				1.56		DSM0156G05	◇			

L/D=Drilling depth/drill diameter ●: Stocked standard in Japan ◇: Stocked in dealers

Drill dia. φD	L/D	Cat. No.	Stock	Dimensions (mm)			Drill dia. φD	L/D	Cat. No.	Stock	Dimensions (mm)			Drill dia. φD	L/D	Cat. No.	Stock	Dimensions (mm)		
				L	L ₁	L ₂					L	L ₁	L ₂					L	L ₁	L ₂
1.57	5	DSM0157G05	◇	45	12.1	12.7	2.06	5	DSM0206G05	◇	45	16.1	16.7	2.55	5	DSM0255G05	◇	55	20.1	20.7
1.58		DSM0158G05	◇				2.07		DSM0207G05	◇				2.56		DSM0256G05	◇			
1.59		DSM0159G05	◇				2.08		DSM0208G05	◇				2.57		DSM0257G05	◇			
1.60		DSM0160G05	●				2.09		DSM0209G05	◇				2.58		DSM0258G05	◇			
1.61		DSM0161G05	◇				2.10		DSM0210G05	●				2.59		DSM0259G05	◇			
1.62	DSM0162G05	◇	2.11	DSM0211G05	◇	2.60	DSM0260G05	●												
1.63	5	DSM0163G05	◇	45	12.9	13.6	2.12	5	DSM0212G05	◇	45	16.9	17.5	2.61	5	DSM0261G05	◇	55	20.9	21.5
1.64		DSM0164G05	◇				2.13		DSM0213G05	◇				2.62		DSM0262G05	◇			
1.65		DSM0165G05	●				2.14		DSM0214G05	◇				2.63		DSM0263G05	◇			
1.66		DSM0166G05	◇				2.15		DSM0215G05	◇				2.64		DSM0264G05	◇			
1.67		DSM0167G05	◇				2.16		DSM0216G05	◇				2.65		DSM0265G05	◇			
1.68		DSM0168G05	◇				2.17		DSM0217G05	◇				2.66		DSM0266G05	◇			
1.69		DSM0169G05	◇				2.18		DSM0218G05	◇				2.67		DSM0267G05	◇			
1.70		DSM0170G05	●				2.19		DSM0219G05	◇				2.68		DSM0268G05	◇			
1.71		DSM0171G05	◇				2.20		DSM0220G05	●				2.69		DSM0269G05	◇			
1.72		DSM0172G05	◇				2.21		DSM0221G05	◇				2.70		DSM0270G05	●			
1.73	5	DSM0173G05	◇	45	13.7	14.3	2.22	5	DSM0222G05	◇	45	17.7	18.3	2.71	5	DSM0271G05	◇	55	21.7	22.3
1.74		DSM0174G05	◇				2.23		DSM0223G05	◇				2.72		DSM0272G05	◇			
1.75		DSM0175G05	◇				2.24		DSM0224G05	◇				2.73		DSM0273G05	◇			
1.76		DSM0176G05	◇				2.25		DSM0225G05	◇				2.74		DSM0274G05	◇			
1.77		DSM0177G05	◇				2.26		DSM0226G05	◇				2.75		DSM0275G05	◇			
1.78		DSM0178G05	◇				2.27		DSM0227G05	◇				2.76		DSM0276G05	◇			
1.79		DSM0179G05	◇				2.28		DSM0228G05	◇				2.77		DSM0277G05	◇			
1.80		DSM0180G05	●				2.29		DSM0229G05	◇				2.78		DSM0278G05	◇			
1.81		DSM0181G05	◇				2.30		DSM0230G05	●				2.79		DSM0279G05	◇			
1.82		DSM0182G05	◇				2.31		DSM0231G05	◇				2.80		DSM0280G05	●			
1.83	5	DSM0183G05	◇	45	14.5	15.1	2.32	5	DSM0232G05	◇	55	18.5	19.1	2.81	5	DSM0281G05	◇	55	22.5	23.1
1.84		DSM0184G05	◇				2.33		DSM0233G05	◇				2.82		DSM0282G05	◇			
1.85		DSM0185G05	◇				2.34		DSM0234G05	◇				2.83		DSM0283G05	◇			
1.86		DSM0186G05	◇				2.35		DSM0235G05	◇				2.84		DSM0284G05	◇			
1.87		DSM0187G05	◇				2.36		DSM0236G05	◇				2.85		DSM0285G05	◇			
1.88		DSM0188G05	◇				2.37		DSM0237G05	◇				2.86		DSM0286G05	◇			
1.89		DSM0189G05	◇				2.38		DSM0238G05	◇				2.87		DSM0287G05	◇			
1.90		DSM0190G05	●				2.39		DSM0239G05	◇				2.88		DSM0288G05	◇			
1.91		DSM0191G05	◇				2.40		DSM0240G05	●				2.89		DSM0289G05	◇			
1.92		DSM0192G05	◇				2.41		DSM0241G05	◇				2.90		DSM0290G05	●			
1.93	5	DSM0193G05	◇	45	15.3	15.9	2.42	5	DSM0242G05	◇	55	19.3	19.9	2.91	5	DSM0291G05	◇	55	23.3	23.9
1.94		DSM0194G05	◇				2.43		DSM0243G05	◇				2.92		DSM0292G05	◇			
1.95		DSM0195G05	●				2.44		DSM0244G05	◇				2.93		DSM0293G05	◇			
1.96		DSM0196G05	◇				2.45		DSM0245G05	◇				2.94		DSM0294G05	◇			
1.97		DSM0197G05	◇				2.46		DSM0246G05	◇				2.95		DSM0295G05	◇			
1.98		DSM0198G05	◇				2.47		DSM0247G05	◇				2.96		DSM0296G05	◇			
1.99		DSM0199G05	◇				2.48		DSM0248G05	◇				2.97		DSM0297G05	◇			
2.00		DSM0200G05	●				2.49		DSM0249G05	◇				2.98		DSM0298G05	◇			
2.01		DSM0201G05	◇				2.50		DSM0250G05	●				2.99		DSM0299G05	◇			
2.02		DSM0202G05	◇				2.51		DSM0251G05	◇				3.00		DSM0300G05	●			
2.03	5	DSM0203G05	◇	45	16.1	16.7	2.52	5	DSM0252G05	◇	55	20.1	20.7							
2.04		DSM0204G05	◇				2.53		DSM0253G05	◇										
2.05		DSM0205G05	◇				2.54		DSM0254G05	◇										

L/D=Drilling depth/drill diameter ●: Stocked standard in Japan ◇: Stocked in dealers

STANDARD CUTTING CONDITIONS (DSM)

Work material	Cutting speed V_C (m/min)			Feed f (mm/rev)				
	$\phi 0.1 \sim \phi 0.3$	$\phi 0.3 \sim \phi 0.5$	$\phi 0.5 \sim \phi 3.0$	$\phi 0.1 \sim \phi 0.3$	$\phi 0.3 \sim \phi 0.5$	$\phi 0.5 \sim \phi 1.0$	$\phi 1.0 \sim \phi 2.0$	$\phi 2.0 \sim \phi 3.0$
Carbon and alloy steels	5 - 15 - 20	15 - 25 - 30	25 - 40 - 60	0.001 - 0.002 - 0.004	0.002 - 0.005 - 0.01	0.005 - 0.01 - 0.05	0.03 - 0.06 - 0.09	0.05 - 0.08 - 0.1
Stainless steels	2 - 6 - 12	6 - 12 - 18	10 - 15 - 20	0.0005 - 0.002 - 0.004	0.002 - 0.005 - 0.008	0.005 - 0.01 - 0.03	0.01 - 0.02 - 0.04	0.02 - 0.03 - 0.05
Gray cast irons	5 - 10 - 15	10 - 20 - 25	20 - 35 - 50	0.0005 - 0.002 - 0.004	0.002 - 0.005 - 0.012	0.005 - 0.01 - 0.03	0.01 - 0.03 - 0.06	0.03 - 0.05 - 0.12
Ductile cast irons	5 - 10 - 15	10 - 20 - 25	20 - 35 - 50	0.001 - 0.002 - 0.003	0.002 - 0.005 - 0.01	0.005 - 0.01 - 0.02	0.01 - 0.03 - 0.05	0.03 - 0.05 - 0.1
Aluminum alloys	10 - 15 - 20	10 - 20 - 30	20 - 35 - 50	0.001 - 0.005 - 0.01	0.005 - 0.01 - 0.03	0.01 - 0.03 - 0.05	0.04 - 0.05 - 0.15	0.06 - 0.1 - 0.2
Copper alloys	10 - 15 - 20	10 - 20 - 30	20 - 35 - 50	0.001 - 0.005 - 0.01	0.005 - 0.01 - 0.03	0.01 - 0.03 - 0.05	0.04 - 0.05 - 0.15	0.06 - 0.1 - 0.2
Hardened steels	4 - 6 - 8	6 - 8 - 10	6 - 10 - 16	0.0005 - 0.001 - 0.002	0.001 - 0.003 - 0.005	0.005 - 0.01 - 0.02	0.01 - 0.02 - 0.03	0.02 - 0.04 - 0.06
Super alloys	2 - 4 - 6	5 - 8 - 10	8 - 15 - 20	0.0005 - 0.001 - 0.003	0.002 - 0.003 - 0.004	0.002 - 0.003 - 0.004	0.002 - 0.003 - 0.004	Not recommended

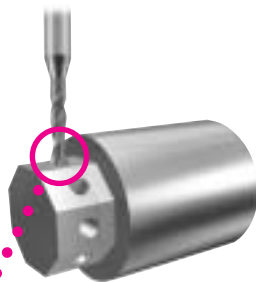
Before using DSM type drills, be sure to read the followings.

- The table above shows a guideline for determining the cutting conditions in general machining. Depending on the power and rigidity of the machine and work materials, the cutting speed and feed should be changed.
- When the hole depth exceeds $L/D=5$, pecking every 10% to 50% of the drill diameter is recommended.
- The above conditions are applied to wet cutting using a water soluble cutting fluid.
- For small hole drilling less than $\phi 0.3$ mm, predrilling with a center drill is recommended.
- When mounting the drill, the maximum radial runout should be within 0.002 mm in the taper portion. (Especially for the drills less than $\phi 0.5$ mm)

MACHINING EXAMPLES

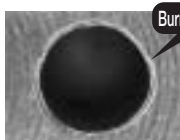
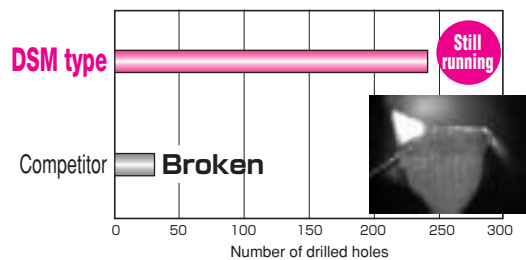
Workpiece	Machine component	Testpiece	Automobile component
Outlined shape			
Tool	DSM0030G10	DSM0050G15	DSM0150G05
Work material	Stainless steel (JIS SUS440)	Stainless steel (JIS SUS304)	Chromium steel (JIS SCr420)
Machine	Vertical machining center	Vertical machining center	NC lathe
Cutting conditions	Cutting speed	$V_C=8.5$ m/min	$V_C=12.6$ m/min
	feed	$f=0.0017$ mm/rev	$f=0.005$ mm/rev
	Drilling depth	1.6 mm	0.3 mm
Results	<p>3 times longer tool life than competitor !</p>	<p>Improved chip control and less burr !</p>	<p>Consistent tool life and stable machining !</p>

MACHINING EXAMPLE ON SMALL AUTOMATIC LATHE (MILLING SHAFT)



Cutting conditions

Drill diameter: $\phi 1.5$ mm
 Work material: Stainless steel (JIS SUS304)
 Machine: Automatic lathe (tool rotating)
 Cutting fluid: Water insoluble type
 Cutting speed: $V_C=20$ m/min
 Feed: $f=0.013$ mm/rev
 Step length: 0.5 mm
 Drilling depth: 5.4 mm blind hole



DSM (No predrilling)



DSM (With predrilling)

For unstable machining caused from the insufficient accuracy of the machine (including tool holding and the main spindle) and the machining conditions, pre-machining such as centering is needed to improve the machining accuracy.

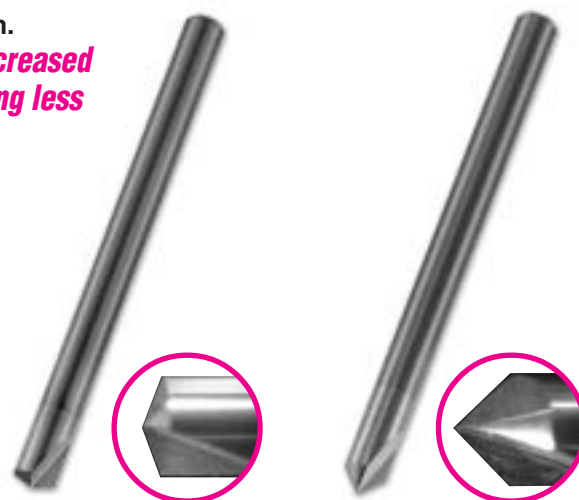
Center drills For machining guide hole

Applicable to centering for diameters from ϕ 0.1 to ϕ 3.0 mm.

Large effects on improved hole-positioning accuracy and increased tool life in unstable machining such as small diameter drilling less than ϕ 0.3 mm and deep hole drilling.

FEATURES

- A combination of the short flute design and ϕ 3.0 mm straight shank has realized a highly rigid drill.
- Available in two types of the point design optimized for the application.
- The dedicated coated grade contributes to long tool life.
- DSM-CP140 type, which has a same 140° point angle as the drill used in the following operation, can effectively prevent the cutting edge from chipping.
- DSM-CP90 type, which has a 90° point angle, can be also used for chamfering of the hole mouth.



140° point angle

Prolong tool life of the drill used in the following operation.

90° point angle

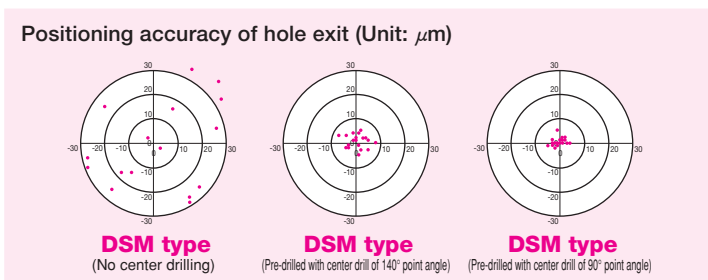
Used for both drilling and chamfering

Effect of center drill

Improved hole positioning accuracy by the use of the center drill in the pre-machining

● Cutting conditions

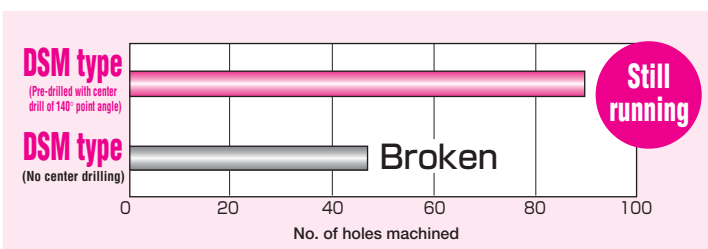
Drill diameter: ϕ 0.29mm	Cutting speed: $V_C=10$ m/min
Work material: Stainless steel (JIS SUS304)	Feed: $f=0.003$ mm/rev
Machine: Vertical machining center	Step length: 0.03 mm
Cutting fluid: Water soluble type (Chlorine free)	Drilling depth: 3.5 mm through-hole
	No. of holes: 20 holes
	Scale at exit side, 1 Div: 0.01 mm



Improved tool life by the use of the center drill of a 140° point angle in pre-machining

● Cutting conditions

Drill diameter: ϕ 0.1 mm (Special type)	Cutting speed: $V_C=4$ m/min
Work material: Stainless steel (JIS SUS304)	Feed: $f=0.001$ mm/rev
Machine: Vertical machining center	Step length: 0.01 mm
Cutting fluid: Water soluble type	Drilling depth: 1.5 mm blind hole



STOCKED ITEMS (Center drills)

Applicable hole diameter (mm)	Cat. No.	Stock	Dimensions (mm)	
			ϕ d	L1
0.1~3.0	DSM-CP90	●	3.0	38.1

Applicable hole diameter (mm)	Cat. No.	Stock	Dimensions (mm)	
			ϕ d	L1
0.1~3.0	DSM-CP140	●	3.0	38.1



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