DIA EDGE

TOOL NEWS

2021.4 Update
B257G

Solid Carbide Drills for Swiss-type Automatic & Small CNC Lathes
WSTAR **Drill Series**

DWAE

Size Addition

Optimal Length, Low Cutting Resistance Drill Provides High Stability and Excellent Chip Control

MITSUBISHI MATERIALS CORPORATION

Solid Carbide Drills for Swiss-type Automatic & Small CNC Lathes

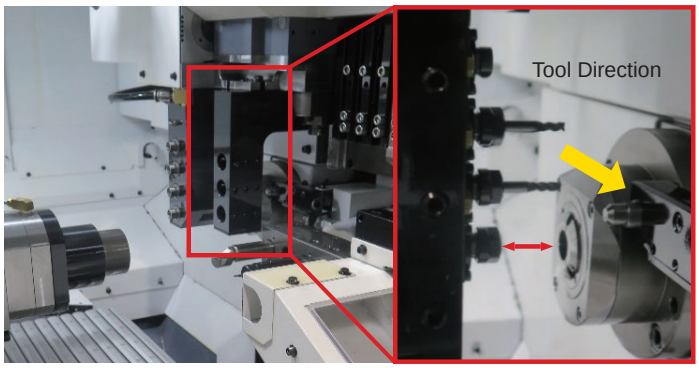
WSTAR **Drill Series**

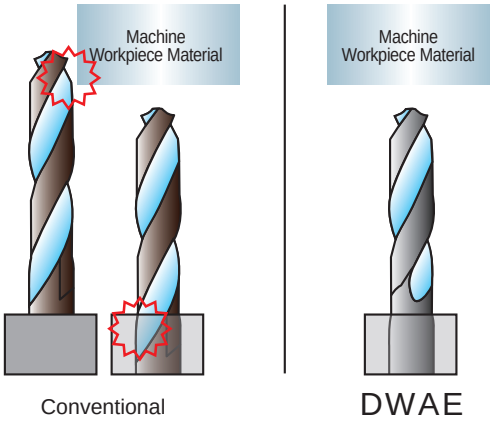
DWAE Ø3mm–Ø14mm

Features

Optimal Flute Length

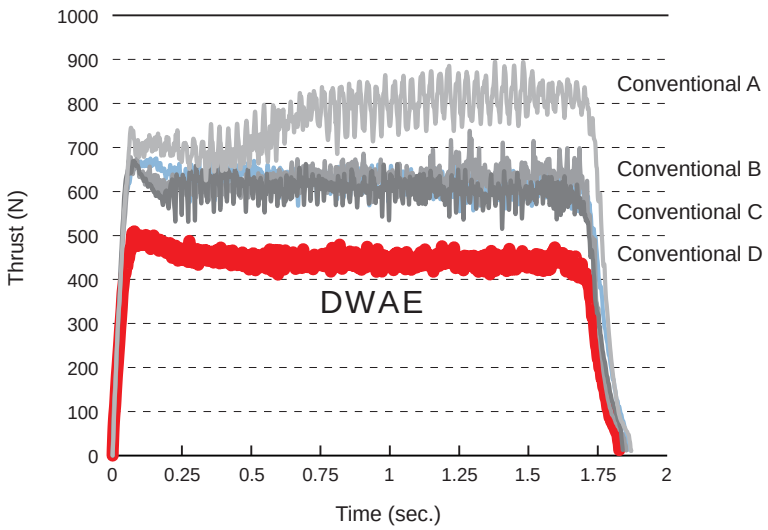
External coolant type carbide drill with ideal tool length for Swiss-type automatic and small CNC lathes.





Low Cutting Resistance Design

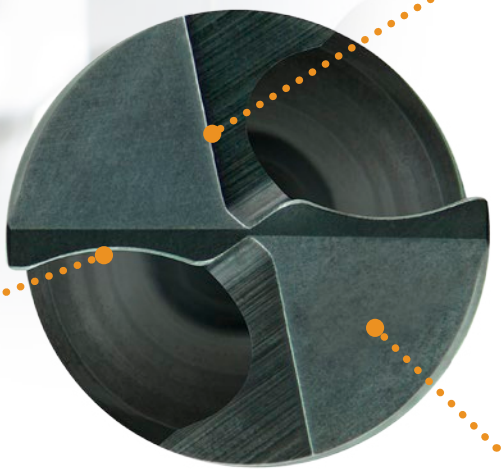
Low cutting resistance design provides for highly stable drilling even in situations where rigidity of workpiece material and or clamping is difficult to secure.



<Cutting Conditions>
Workpiece Material : JIS S10C
Tool : DWAE0600X04S060
Cutting Speed : vc= 80m/min
Feed per Rev. : fr= 0.2mm/rev.
Hole Depth : 24mm
Cutting Mode : Wet Cutting
External Coolant
(Water-soluble Coolants)

Z Thinning

The proprietary web thinning geometry ensures a wide space for chip evacuation and offers low cutting resistance.



Wave Cutting Edge

The wave type cutting edge provides both sharpness and cutting edge strength. Also provides resistance to the outer edge wear commonly found on conventional drills and efficiently breaks chips into smaller pieces.

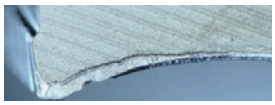
Coated Grade DP102A

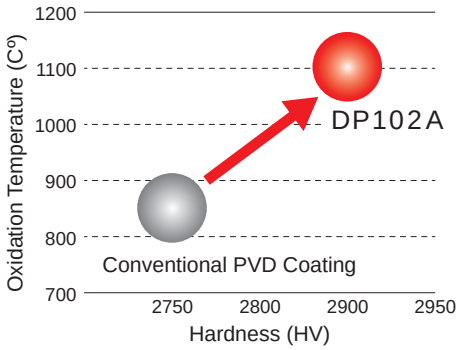
DP102A coated grade provides excellent lubricity and long-term durability, achieving excellent wear resistance at low to medium cutting speeds.

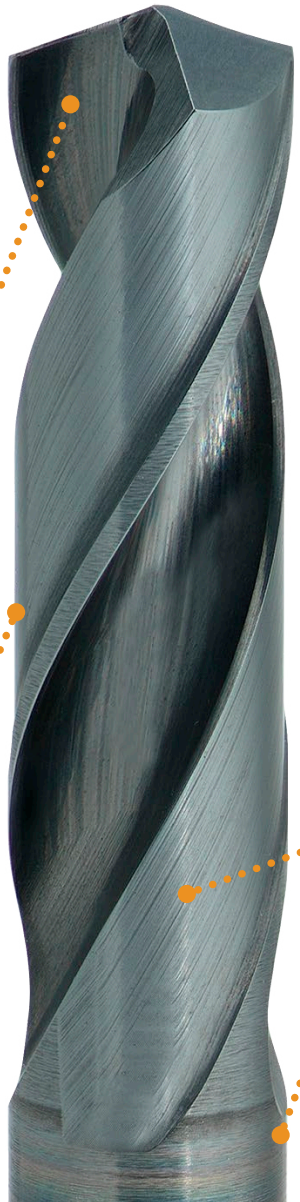
Wear comparison when drilling JIS S50C

DWAE

Conventional







Flute Shape

Specially designed flute shape breaks up chips into smaller pieces thereby preventing chip clogging.

Optimal Flute Length for Swiss-type Automatic and Small CNC Lathes

The flute length has been specifically engineered to meet the compact needs and limited machining space requirements of small CNC lathes with a range of shanks compatible with ER collet mounting available.

DCON (Connection Diameter) ø5mm＝ER8
DCON ø7mm＝ER11

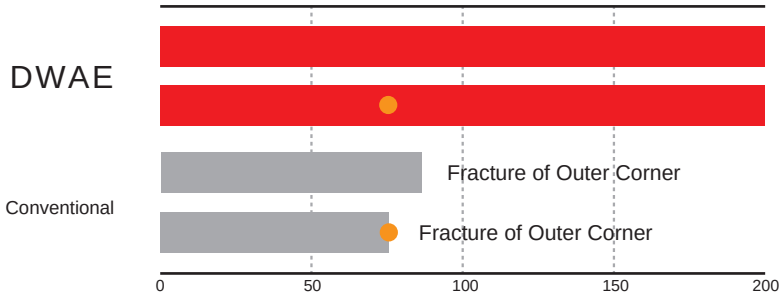
ZERO-μ Surface

A smoothing surface treatment is applied to the drill surface, further reducing cutting resistance while facilitating excellent chip evacuation.

Cutting Performance

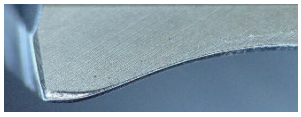
JIS S50C Fracture Resistance Comparison

DP102A offers excellent lubricity and heat resistance, providing more fracture resistance and achieving longer tool life than conventional drills under medium cutting speed conditions making stable machining possible even with external coolant.



<Cutting Conditions>
Workpiece Material : JIS S50C
Tool : DWAE0600X04S060
Cutting Speed : vc= 80m/min
Feed per Rev. : fr= 0.2mm/rev.
Hole Depth : 24mm
Cutting Mode : Wet Cutting
External Coolant
(Water-soluble Coolants)

Cutting Length
75.0m



DWAE

Conventional

JIS S10C Chip Comparison

DWAE is specially designed to break up chips into smaller pieces to prevent flutes from clogging during machining operations.

DWAE

<Cutting Conditions>
Workpiece Material : JIS S10C
Tool : DWAE0600X04S060
Cutting Speed : vc= 60m/min
Feed per Rev. : fr= 0.3mm/rev.
Hole Depth : 24mm
Cutting Mode : Wet Cutting
External Coolant
(Water-soluble Coolants)

Conventional A

Conventional B

Solid Carbide Drills for Swiss-type Automatic & Small CNC Lathes

WSTAR **Drill Series**

DWAE

NEW

Mini Size Ø1.0mm–Ø2.9mm

Featuring High Precision and Long Tool Life for Small Diameter Drilling

New Cutting Edge Treatment That Achieves Both Sharpness and Durability

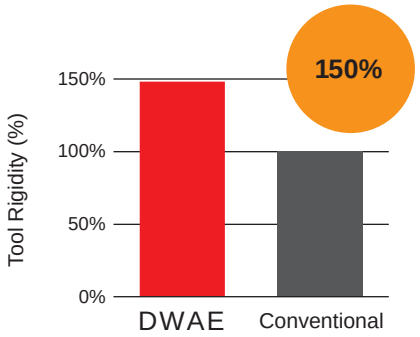
Mitsubishi's new original cutting edge treatment maintains the stability of the cutting edge while exhibiting excellent fracture and wear resistance.

Coated Grade DP102A

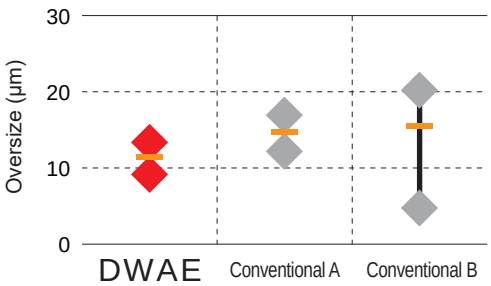
DP102A coated grade provides excellent lubricity and long-term durability, achieving excellent wear resistance at low to medium cutting speeds.

Unique Flute Form for Greater Rigidity

Mini Size is uniquely designed for rigidity and good chip evacuation by minimizing the neck length. A chip discharge area is provided through the taper neck. This increases tool rigidity by 50% compared to conventional drills and also improves hole positional accuracy.



<Analysis Conditions>
Analysis Model : DC=ø2mm, L/D=4
Overall Length : OAL= 50mm
Load : Distributed load of 130N in Z axis direction.

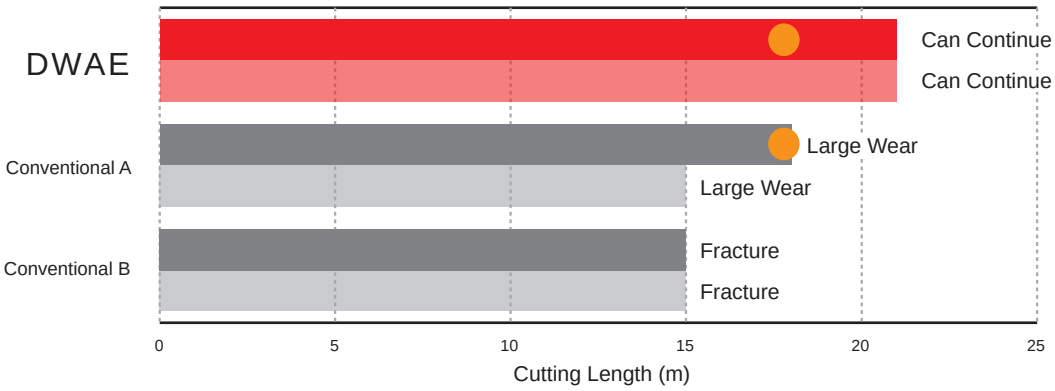


<Cutting Conditions>
Workpiece Material : JIS S10C
Tool : DC=ø2mm, L/D=4
Cutting Speed : vc= 30m/min
Feed per Rev. : fr= 0.04mm/rev.
Hole Depth : 8mm
Cutting Mode : Water-soluble Coolants

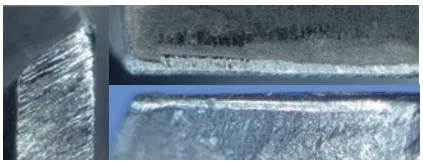
Cutting Performance

Wear Resistance Comparison when drilling JIS SUS420JS

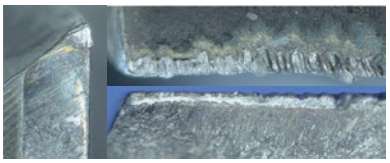
By combining DP102A and a new cutting edge treatment, durability and long tool life have been achieved when drilling with an external coolant supply.



Cutting Length 18 m



DWAE

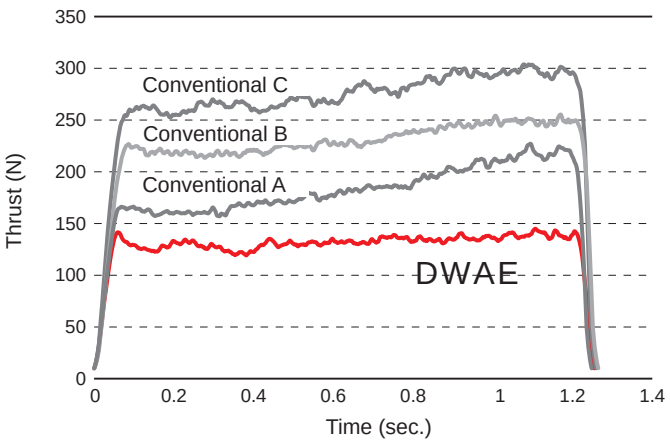


Conventional A

<Cutting Conditions>
Workpiece Material : JIS SUS420J2
Tool : DWAE0200X04S040
Cutting Speed : vc= 30m/min
Feed per Rev. : fr= 0.045mm/rev.
Hole Depth : 8mm
Cutting Mode : Wet Cutting
External Coolant
(Water-soluble Coolants)

Cutting Resistance Comparison when drilling JIS SUS420J2

DWAE attains low thrust resistance compared to conventional products.



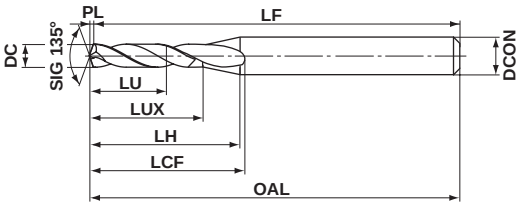
<Cutting Conditions>
Workpiece Material : JIS SUS420J2
Tool : DWAE0200X04S040
Cutting Speed : vc= 40m/min
Feed per Rev. : fr= 0.06mm/rev.
Hole Depth : 8mm
Cutting Mode : Wet Cutting
External Coolant
(Water-soluble Coolants)

DWAE Mini Size NEW

UWC DP1A 135° XR DC<2.0 X DC≥2.0

P M K N S H

External Coolant



Type1

DC≤3			
0 −0.014			
DCON=3	DCON=4		
0 −0.006	0 −0.008		

(mm)

DC	L/D	DP102A	Order Number	LU	LUX	LCF	LH	OAL	LF	PL	DCON	Type
1.0	2	●	DWAE0100X02S030	2.2	5.0	7.7	8.7	45.0	44.8	0.2	3	1
1.0	4	●	DWAE0100X04S030	4.2	7.0	9.9	10.7	45.0	44.8	0.2	3	1
1.1	2	●	DWAE0110X02S030	2.4	5.4	8.1	8.9	45.0	44.8	0.2	3	1
1.1	4	●	DWAE0110X04S030	4.6	7.6	10.5	11.1	45.0	44.8	0.2	3	1
1.2	2	●	DWAE0120X02S030	2.6	5.8	8.5	9.2	45.0	44.8	0.2	3	1
1.2	4	●	DWAE0120X04S030	5.0	8.2	11.1	11.6	45.0	44.8	0.2	3	1
1.3	2	●	DWAE0130X02S030	2.9	6.3	9.0	9.5	45.0	44.7	0.3	3	1
1.3	4	●	DWAE0130X04S030	5.5	8.9	11.9	12.1	45.0	44.7	0.3	3	1
1.4	2	●	DWAE0140X02S030	3.1	6.7	9.4	9.7	45.0	44.7	0.3	3	1
1.4	4	●	DWAE0140X04S030	5.9	9.5	12.5	12.5	45.0	44.7	0.3	3	1
1.5	2	●	DWAE0150X02S030	3.3	7.1	9.8	9.9	45.0	44.7	0.3	3	1
1.5	4	●	DWAE0150X04S030	6.3	10.1	13.1	12.9	45.0	44.7	0.3	3	1
1.6	2	●	DWAE0160X02S030	3.5	7.5	10.2	10.1	45.0	44.7	0.3	3	1
1.6	4	●	DWAE0160X04S030	6.7	10.7	13.7	13.3	45.0	44.7	0.3	3	1
1.7	2	●	DWAE0170X02S030	3.8	8.0	10.7	10.4	45.0	44.6	0.4	3	1
1.7	4	●	DWAE0170X04S030	7.2	11.4	14.4	13.8	45.0	44.6	0.4	3	1
1.8	2	●	DWAE0180X02S030	4.0	8.4	11.1	10.6	45.0	44.6	0.4	3	1
1.8	4	●	DWAE0180X04S030	7.6	12.0	15.1	14.2	45.0	44.6	0.4	3	1
1.9	2	●	DWAE0190X02S030	4.2	8.8	11.5	10.9	45.0	44.6	0.4	3	1
1.9	4	●	DWAE0190X04S030	8.0	12.6	15.7	14.7	45.0	44.6	0.4	3	1
2.0	2	●	DWAE0200X02S040	4.4	9.2	12.8	12.9	50.0	49.6	0.4	4	1
2.0	4	●	DWAE0200X04S040	8.4	13.2	17.2	16.9	50.0	49.6	0.4	4	1
2.1	2	●	DWAE0210X02S040	4.6	9.6	13.2	13.1	50.0	49.6	0.4	4	1
2.1	4	●	DWAE0210X04S040	8.8	13.8	17.8	17.3	50.0	49.6	0.4	4	1
2.2	2	●	DWAE0220X02S040	4.9	10.1	13.7	13.5	50.0	49.5	0.5	4	1
2.2	4	●	DWAE0220X04S040	9.3	14.5	18.5	17.9	50.0	49.5	0.5	4	1
2.3	2	●	DWAE0230X02S040	5.1	10.5	14.1	13.7	50.0	49.5	0.5	4	1
2.3	4	●	DWAE0230X04S040	9.7	15.1	19.2	18.3	50.0	49.5	0.5	4	1
2.4	2	●	DWAE0240X02S040	5.3	10.9	14.5	13.9	50.0	49.5	0.5	4	1
2.4	4	●	DWAE0240X04S040	10.1	15.7	19.8	18.7	50.0	49.5	0.5	4	1
2.5	2	●	DWAE0250X02S040	5.5	11.3	14.9	14.1	50.0	49.5	0.5	4	1
2.5	4	●	DWAE0250X04S040	10.5	16.3	20.4	19.1	50.0	49.5	0.5	4	1
2.6	2	●	DWAE0260X02S040	5.7	11.7	15.3	14.3	50.0	49.5	0.5	4	1
2.6	4	●	DWAE0260X04S040	10.9	16.9	21.0	19.5	50.0	49.5	0.5	4	1
2.7	2	●	DWAE0270X02S040	6.0	12.2	15.8	14.6	50.0	49.4	0.6	4	1
2.7	4	●	DWAE0270X04S040	11.4	17.6	21.7	20.0	50.0	49.4	0.6	4	1
2.8	2	●	DWAE0280X02S040	6.2	12.6	16.2	14.8	50.0	49.4	0.6	4	1
2.8	4	●	DWAE0280X04S040	11.8	18.2	22.4	20.4	50.0	49.4	0.6	4	1
2.9	2	●	DWAE0290X02S040	6.4	13.0	16.6	15.1	50.0	49.4	0.6	4	1
2.9	4	●	DWAE0290X04S040	12.2	18.8	23.0	20.9	50.0	49.4	0.6	4	1

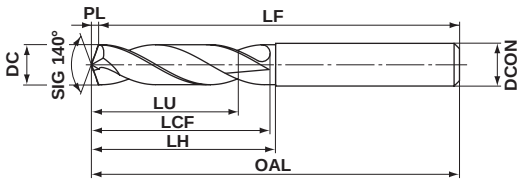
DC = Cutting Diameter
LU = Usable Length
LUX = Max. Usable Length
LCF = Length Chip Flute
LH = Neck Length
OAL = Overall Length
LF = Functional Length
PL = Point Length
DCON = Connection Diameter

● : **Inventory maintained in Japan.**

DWAE

P M K N S H

External 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
DCON=3	3<DCON≤6	6<DCON≤10	10<DCON≤14
0 −0.006	0 −0.008	0 −0.009	0 −0.011

(mm)

DC	L/D	DP102A	Order Number	LU	LCF	LH	OAL	LF	PL	DCON	Type
3.0	2	●	**DWAE0300X02S030**	6.5	12.5	14.5	45.5	45	0.5	3	1
3.0	4	●	**DWAE0300X04S030**	12.5	21.5	23.5	55.5	55	0.5	3	1
3.1	2	●	**DWAE0310X02S040**	6.8	12.6	14.6	55.6	55	0.6	4	1
3.1	4	●	**DWAE0310X04S040**	13.0	21.6	23.6	60.6	60	0.6	4	1
3.2	2	●	**DWAE0320X02S040**	7.0	13.6	15.6	55.6	55	0.6	4	1
3.2	4	●	**DWAE0320X04S040**	13.4	22.6	24.6	60.6	60	0.6	4	1
3.3	2	●	**DWAE0330X02S040**	7.2	13.6	15.6	55.6	55	0.6	4	1
3.3	4	●	**DWAE0330X04S040**	13.8	23.6	25.6	60.6	60	0.6	4	1
3.4	2	●	**DWAE0340X02S040**	7.4	13.6	15.6	55.6	55	0.6	4	1
3.4	4	●	**DWAE0340X04S040**	14.2	23.6	25.6	60.6	60	0.6	4	1
3.5	2	●	**DWAE0350X02S040**	7.6	14.6	16.6	55.6	55	0.6	4	1
3.5	4	●	**DWAE0350X04S040**	14.6	24.6	26.6	60.6	60	0.6	4	1
3.6	2	●	**DWAE0360X02S040**	7.9	14.7	16.7	55.7	55	0.7	4	1
3.6	4	●	**DWAE0360X04S040**	15.1	25.7	27.7	60.7	60	0.7	4	1
3.7	2	●	**DWAE0370X02S040**	8.1	14.7	16.7	55.7	55	0.7	4	1
3.7	4	●	**DWAE0370X04S040**	15.5	25.7	27.7	60.7	60	0.7	4	1
3.8	2	●	**DWAE0380X02S040**	8.3	15.7	17.7	55.7	55	0.7	4	1
3.8	4	●	**DWAE0380X04S040**	15.9	26.7	28.7	60.7	60	0.7	4	1
3.9	2	●	**DWAE0390X02S040**	8.5	15.7	17.7	55.7	55	0.7	4	1
3.9	4	●	**DWAE0390X04S040**	16.3	27.7	29.7	60.7	60	0.7	4	1
4.0	2	●	**DWAE0400X02S040**	8.7	15.7	17.7	55.7	55	0.7	4	1
4.0	4	●	**DWAE0400X04S040**	16.7	27.7	29.7	60.7	60	0.7	4	1
4.1	2	●	**DWAE0410X02S050**	8.9	16.7	18.7	62.7	62	0.7	5	1
4.1	4	●	**DWAE0410X04S050**	17.1	28.7	30.7	80.7	80	0.7	5	1
4.2	2	●	**DWAE0420X02S050**	9.2	16.8	18.8	62.8	62	0.8	5	1
4.2	4	●	**DWAE0420X04S050**	17.6	29.8	31.8	80.8	80	0.8	5	1
4.3	2	●	**DWAE0430X02S050**	9.4	17.8	19.8	62.8	62	0.8	5	1
4.3	4	●	**DWAE0430X04S050**	18.0	30.8	32.8	80.8	80	0.8	5	1
4.4	2	●	**DWAE0440X02S050**	9.6	17.8	19.8	62.8	62	0.8	5	1
4.4	4	●	**DWAE0440X04S050**	18.4	30.8	32.8	80.8	80	0.8	5	1

● : **Inventory maintained in Japan.**

(mm)

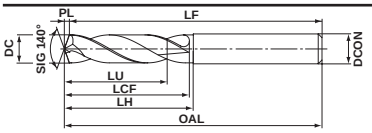
DC	L/D	DP102A	Order Number	LU	LCF	LH	OAL	LF	PL	DCON	Type
4.5	2	●	**DWAE0450X02S050**	9.8	17.8	19.8	62.8	62	0.8	5	1
4.5	4	●	**DWAE0450X04S050**	18.8	31.8	33.8	80.8	80	0.8	5	1
4.6	2	●	**DWAE0460X02S050**	10.0	18.8	20.8	62.8	62	0.8	5	1
4.6	4	●	**DWAE0460X04S050**	19.2	32.8	34.8	80.8	80	0.8	5	1
4.7	2	●	**DWAE0470X02S050**	10.3	18.9	20.9	62.9	62	0.9	5	1
4.7	4	●	**DWAE0470X04S050**	19.7	32.9	34.9	80.9	80	0.9	5	1
4.8	2	●	**DWAE0480X02S050**	10.5	18.9	20.9	62.9	62	0.9	5	1
4.8	4	●	**DWAE0480X04S050**	20.1	33.9	35.9	80.9	80	0.9	5	1
4.9	2	●	**DWAE0490X02S050**	10.7	19.9	21.9	62.9	62	0.9	5	1
4.9	4	●	**DWAE0490X04S050**	20.5	34.9	36.9	80.9	80	0.9	5	1
5.0	2	●	**DWAE0500X02S050**	10.9	19.9	21.9	62.9	62	0.9	5	1
5.0	4	●	**DWAE0500X04S050**	20.9	34.9	36.9	80.9	80	0.9	5	1
5.1	2	●	**DWAE0510X02S060**	11.1	21.9	23.9	66.9	66	0.9	6	1
5.1	4	●	**DWAE0510X04S060**	21.3	35.9	37.9	80.9	80	0.9	6	1
5.2	2	●	**DWAE0520X02S060**	11.3	21.9	23.9	66.9	66	0.9	6	1
5.2	4	●	**DWAE0520X04S060**	21.7	36.9	38.9	80.9	80	0.9	6	1
5.3	2	●	**DWAE0530X02S060**	11.6	22.0	24.0	67.0	66	1.0	6	1
5.3	4	●	**DWAE0530X04S060**	22.2	37.0	39.0	81.0	80	1.0	6	1
5.4	2	●	**DWAE0540X02S060**	11.8	22.0	24.0	67.0	66	1.0	6	1
5.4	4	●	**DWAE0540X04S060**	22.6	38.0	40.0	81.0	80	1.0	6	1
5.5	2	●	**DWAE0550X02S060**	12.0	22.0	24.0	67.0	66	1.0	6	1
5.5	4	●	**DWAE0550X04S060**	23.0	39.0	41.0	81.0	80	1.0	6	1
5.6	2	●	**DWAE0560X02S060**	12.2	24.0	26.0	67.0	66	1.0	6	1
5.6	4	●	**DWAE0560X04S060**	23.4	39.0	41.0	81.0	80	1.0	6	1
5.7	2	●	**DWAE0570X02S060**	12.4	24.0	26.0	67.0	66	1.0	6	1
5.7	4	●	**DWAE0570X04S060**	23.8	39.0	41.0	81.0	80	1.0	6	1
5.8	2	●	**DWAE0580X02S060**	12.7	24.1	26.1	67.1	66	1.1	6	1
5.8	4	●	**DWAE0580X04S060**	24.3	41.1	43.1	81.1	80	1.1	6	1
5.9	2	●	**DWAE0590X02S060**	12.9	24.1	26.1	67.1	66	1.1	6	1
5.9	4	●	**DWAE0590X04S060**	24.7	41.1	43.1	81.1	80	1.1	6	1
6.0	2	●	**DWAE0600X02S060**	13.1	24.1	26.1	67.1	66	1.1	6	1
6.0	4	●	**DWAE0600X04S060**	25.1	42.1	44.1	81.1	80	1.1	6	1
6.1	2	●	**DWAE0610X02S070**	13.3	26.1	28.1	75.1	74	1.1	7	1
6.1	4	●	**DWAE0610X04S070**	25.5	44.1	46.1	84.1	83	1.1	7	1
6.2	2	●	**DWAE0620X02S070**	13.5	26.1	28.1	75.1	74	1.1	7	1
6.2	4	●	**DWAE0620X04S070**	25.9	44.1	46.1	84.1	83	1.1	7	1
6.3	2	●	**DWAE0630X02S070**	13.7	26.1	28.1	75.1	74	1.1	7	1
6.3	4	●	**DWAE0630X04S070**	26.3	44.1	46.1	84.1	83	1.1	7	1
6.4	2	●	**DWAE0640X02S070**	14.0	26.2	28.2	75.2	74	1.2	7	1
6.4	4	●	**DWAE0640X04S070**	26.8	44.2	46.2	84.2	83	1.2	7	1
6.5	2	●	**DWAE0650X02S070**	14.2	26.2	28.2	75.2	74	1.2	7	1
6.5	4	●	**DWAE0650X04S070**	27.2	44.2	46.2	84.2	83	1.2	7	1

DC = Cutting Diameter
LU = Usable Length
LCF = Length Chip Flute
LH = Neck Length
OAL = Overall Length
LF = Functional Length
PL = Point Length
DCON = Connection Diameter

DWAE

DC	L/D	DP102A	Order Number	LU	LCF	LH	OAL	LF	PL	DCON	Type
6.6	2	●	**DWAE0660X02S070**	14.4	28.2	30.2	75.2	74	1.2	7	1
6.6	4	●	**DWAE0660X04S070**	27.6	46.2	48.2	84.2	83	1.2	7	1
6.7	2	●	**DWAE0670X02S070**	14.6	28.2	30.2	75.2	74	1.2	7	1
6.7	4	●	**DWAE0670X04S070**	28.0	46.2	48.2	84.2	83	1.2	7	1
6.8	2	●	**DWAE0680X02S070**	14.8	28.2	30.2	75.2	74	1.2	7	1
6.8	4	●	**DWAE0680X04S070**	28.4	46.2	48.2	84.2	83	1.2	7	1
6.9	2	●	**DWAE0690X02S070**	15.1	28.3	30.3	75.3	74	1.3	7	1
6.9	4	●	**DWAE0690X04S070**	28.9	46.3	48.3	84.3	83	1.3	7	1
7.0	2	●	**DWAE0700X02S070**	15.3	28.3	30.3	75.3	74	1.3	7	1
7.0	4	●	**DWAE0700X04S070**	29.3	46.3	48.3	84.3	83	1.3	7	1
7.1	2	●	**DWAE0710X02S080**	15.5	29.3	31.3	80.3	79	1.3	8	1
7.1	4	●	**DWAE0710X04S080**	29.7	51.3	53.3	91.3	90	1.3	8	1
7.2	2	●	**DWAE0720X02S080**	15.7	29.3	31.3	80.3	79	1.3	8	1
7.2	4	●	**DWAE0720X04S080**	30.1	51.3	53.3	91.3	90	1.3	8	1
7.3	2	●	**DWAE0730X02S080**	15.9	29.3	31.3	80.3	79	1.3	8	1
7.3	4	●	**DWAE0730X04S080**	30.5	51.3	53.3	91.3	90	1.3	8	1
7.4	2	●	**DWAE0740X02S080**	16.1	29.3	31.3	80.3	79	1.3	8	1
7.4	4	●	**DWAE0740X04S080**	30.9	51.3	53.3	91.3	90	1.3	8	1
7.5	2	●	**DWAE0750X02S080**	16.4	29.4	31.4	80.4	79	1.4	8	1
7.5	4	●	**DWAE0750X04S080**	31.4	51.4	53.4	91.4	90	1.4	8	1
7.6	2	●	**DWAE0760X02S080**	16.6	31.4	33.4	80.4	79	1.4	8	1
7.6	4	●	**DWAE0760X04S080**	31.8	53.4	55.4	91.4	90	1.4	8	1
7.7	2	●	**DWAE0770X02S080**	16.8	31.4	33.4	80.4	79	1.4	8	1
7.7	4	●	**DWAE0770X04S080**	32.2	53.4	55.4	91.4	90	1.4	8	1
7.8	2	●	**DWAE0780X02S080**	17.0	31.4	33.4	80.4	79	1.4	8	1
7.8	4	●	**DWAE0780X04S080**	32.6	53.4	55.4	91.4	90	1.4	8	1
7.9	2	●	**DWAE0790X02S080**	17.2	31.4	33.4	80.4	79	1.4	8	1
7.9	4	●	**DWAE0790X04S080**	33.0	53.4	55.4	91.4	90	1.4	8	1
8.0	2	●	**DWAE0800X02S080**	17.5	31.5	33.5	80.5	79	1.5	8	1
8.0	4	●	**DWAE0800X04S080**	33.5	53.5	55.5	91.5	90	1.5	8	1
8.1	2	●	**DWAE0810X02S090**	17.7	33.5	35.5	85.5	84	1.5	9	1
8.1	4	●	**DWAE0810X04S090**	33.9	57.5	59.5	99.5	98	1.5	9	1
8.2	2	●	**DWAE0820X02S090**	17.9	33.5	35.5	85.5	84	1.5	9	1
8.2	4	●	**DWAE0820X04S090**	34.3	57.5	59.5	99.5	98	1.5	9	1
8.3	2	●	**DWAE0830X02S090**	18.1	33.5	35.5	85.5	84	1.5	9	1
8.3	4	●	**DWAE0830X04S090**	34.7	57.5	59.5	99.5	98	1.5	9	1
8.4	2	●	**DWAE0840X02S090**	18.3	33.5	35.5	85.5	84	1.5	9	1
8.4	4	●	**DWAE0840X04S090**	35.1	57.5	59.5	99.5	98	1.5	9	1
8.5	2	●	**DWAE0850X02S090**	18.5	33.5	35.5	85.5	84	1.5	9	1
8.5	4	●	**DWAE0850X04S090**	35.5	57.5	59.5	99.5	98	1.5	9	1
8.6	2	●	**DWAE0860X02S090**	18.8	34.6	36.6	85.6	84	1.6	9	1
8.6	4	●	**DWAE0860X04S090**	36.0	61.6	63.6	99.6	98	1.6	9	1
8.7	2	●	**DWAE0870X02S090**	19.0	34.6	36.6	85.6	84	1.6	9	1
8.7	4	●	**DWAE0870X04S090**	36.4	61.6	63.6	99.6	98	1.6	9	1

● : Inventory maintained in Japan.



Type1

DC	L/D	DP102A	Order Number	LU	LCF	LH	OAL	LF	PL	DCON	Type
8.8	2	●	**DWAE0880X02S090**	19.2	34.6	36.6	85.6	84	1.6	9	1
8.8	4	●	**DWAE0880X04S090**	36.8	61.6	63.6	99.6	98	1.6	9	1
8.9	2	●	**DWAE0890X02S090**	19.4	34.6	36.6	85.6	84	1.6	9	1
8.9	4	●	**DWAE0890X04S090**	37.2	61.6	63.6	99.6	98	1.6	9	1
9.0	2	●	**DWAE0900X02S090**	19.6	34.6	36.6	85.6	84	1.6	9	1
9.0	4	●	**DWAE0900X04S090**	37.6	61.6	63.6	99.6	98	1.6	9	1
9.1	2	●	**DWAE0910X02S100**	19.9	36.7	38.7	90.7	89	1.7	10	1
9.1	4	●	**DWAE0910X04S100**	38.1	63.7	65.7	106.7	105	1.7	10	1
9.2	2	●	**DWAE0920X02S100**	20.1	36.7	38.7	90.7	89	1.7	10	1
9.2	4	●	**DWAE0920X04S100**	38.5	63.7	65.7	106.7	105	1.7	10	1
9.3	2	●	**DWAE0930X02S100**	20.3	36.7	38.7	90.7	89	1.7	10	1
9.3	4	●	**DWAE0930X04S100**	38.9	63.7	65.7	106.7	105	1.7	10	1
9.4	2	●	**DWAE0940X02S100**	20.5	36.7	38.7	90.7	89	1.7	10	1
9.4	4	●	**DWAE0940X04S100**	39.3	63.7	65.7	106.7	105	1.7	10	1
9.5	2	●	**DWAE0950X02S100**	20.7	36.7	38.7	90.7	89	1.7	10	1
9.5	4	●	**DWAE0950X04S100**	39.7	63.7	65.7	106.7	105	1.7	10	1
9.6	2	●	**DWAE0960X02S100**	20.9	37.7	39.7	90.7	89	1.7	10	1
9.6	4	●	**DWAE0960X04S100**	40.1	66.7	68.7	106.7	105	1.7	10	1
9.7	2	●	**DWAE0970X02S100**	21.2	37.8	39.8	90.8	89	1.8	10	1
9.7	4	●	**DWAE0970X04S100**	40.6	66.8	68.8	106.8	105	1.8	10	1
9.8	2	●	**DWAE0980X02S100**	21.4	37.8	39.8	90.8	89	1.8	10	1
9.8	4	●	**DWAE0980X04S100**	41.0	66.8	68.8	106.8	105	1.8	10	1
9.9	2	●	**DWAE0990X02S100**	21.6	37.8	39.8	90.8	89	1.8	10	1
9.9	4	●	**DWAE0990X04S100**	41.4	66.8	68.8	106.8	105	1.8	10	1
10.0	2	●	**DWAE1000X02S100**	21.8	37.8	39.8	90.8	89	1.8	10	1
10.0	4	●	**DWAE1000X04S100**	41.8	66.8	68.8	106.8	105	1.8	10	1
10.1	2	●	**DWAE1010X02S110**	22.0	40.8	42.8	101.8	100	1.8	11	1
10.1	4	●	**DWAE1010X04S110**	42.2	71.8	73.8	115.8	114	1.8	11	1
10.2	2	●	**DWAE1020X02S110**	22.3	40.9	42.9	101.9	100	1.9	11	1
10.2	4	●	**DWAE1020X04S110**	42.7	71.9	73.9	115.9	114	1.9	11	1
10.3	2	●	**DWAE1030X02S110**	22.5	40.9	42.9	101.9	100	1.9	11	1
10.3	4	●	**DWAE1030X04S110**	43.1	71.9	73.9	115.9	114	1.9	11	1
10.4	2	●	**DWAE1040X02S110**	22.7	40.9	42.9	101.9	100	1.9	11	1
10.4	4	●	**DWAE1040X04S110**	43.5	71.9	73.9	115.9	114	1.9	11	1
10.5	2	●	**DWAE1050X02S110**	22.9	40.9	42.9	101.9	100	1.9	11	1
10.5	4	●	**DWAE1050X04S110**	43.9	71.9	73.9	115.9	114	1.9	11	1
10.6	2	●	**DWAE1060X02S110**	23.1	41.9	43.9	101.9	100	1.9	11	1
10.6	4	●	**DWAE1060X04S110**	44.3	72.9	74.9	115.9	114	1.9	11	1
10.7	2	●	**DWAE1070X02S110**	23.3	41.9	43.9	101.9	100	1.9	11	1
10.7	4	●	**DWAE1070X04S110**	44.7	72.9	74.9	115.9	114	1.9	11	1
10.8	2	●	**DWAE1080X02S110**	23.6	42.0	44.0	102.0	100	2.0	11	1
10.8	4	●	**DWAE1080X04S110**	45.2	73.0	75.0	116.0	114	2.0	11	1

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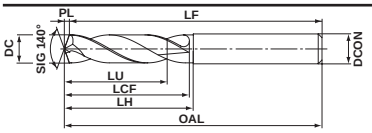
DCON = Connection Diameter

DWAE

DC	L/D	DP102A	Order Number	LU	LCF	LH	OAL	LF	PL	DCON	Type
10.9	2	●	**DWAE1090X02S110**	23.8	42.0	44.0	102.0	100	2.0	11	1
10.9	4	●	**DWAE1090X04S110**	45.6	73.0	75.0	116.0	114	2.0	11	1
11.0	2	●	**DWAE1100X02S110**	24.0	42.0	44.0	102.0	100	2.0	11	1
11.0	4	●	**DWAE1100X04S110**	46.0	73.0	75.0	116.0	114	2.0	11	1
11.1	2	●	**DWAE1110X02S120**	24.2	45.0	47.0	102.0	100	2.0	12	1
11.1	4	●	**DWAE1110X04S120**	46.4	77.0	79.0	123.0	121	2.0	12	1
11.2	2	●	**DWAE1120X02S120**	24.4	45.0	47.0	102.0	100	2.0	12	1
11.2	4	●	**DWAE1120X04S120**	46.8	77.0	79.0	123.0	121	2.0	12	1
11.3	2	●	**DWAE1130X02S120**	24.7	45.1	47.1	102.1	100	2.1	12	1
11.3	4	●	**DWAE1130X04S120**	47.3	77.1	79.1	123.1	121	2.1	12	1
11.4	2	●	**DWAE1140X02S120**	24.9	45.1	47.1	102.1	100	2.1	12	1
11.4	4	●	**DWAE1140X04S120**	47.7	77.1	79.1	123.1	121	2.1	12	1
11.5	2	●	**DWAE1150X02S120**	25.1	45.1	47.1	102.1	100	2.1	12	1
11.5	4	●	**DWAE1150X04S120**	48.1	77.1	79.1	123.1	121	2.1	12	1
11.6	2	●	**DWAE1160X02S120**	25.3	47.1	49.1	102.1	100	2.1	12	1
11.6	4	●	**DWAE1160X04S120**	48.5	79.1	81.1	123.1	121	2.1	12	1
11.7	2	●	**DWAE1170X02S120**	25.5	47.1	49.1	102.1	100	2.1	12	1
11.7	4	●	**DWAE1170X04S120**	48.9	79.1	81.1	123.1	121	2.1	12	1
11.8	2	●	**DWAE1180X02S120**	25.7	47.1	49.1	102.1	100	2.1	12	1
11.8	4	●	**DWAE1180X04S120**	49.3	79.1	81.1	123.1	121	2.1	12	1
11.9	2	●	**DWAE1190X02S120**	26.0	47.2	49.2	102.2	100	2.2	12	1
11.9	4	●	**DWAE1190X04S120**	49.8	79.2	81.2	123.2	121	2.2	12	1
12.0	2	●	**DWAE1200X02S120**	26.2	47.2	49.2	102.2	100	2.2	12	1
12.0	4	●	**DWAE1200X04S120**	50.2	79.2	81.2	123.2	121	2.2	12	1
12.1	2	●	**DWAE1210X02S130**	26.4	49.2	51.2	102.2	100	2.2	13	1
12.1	4	●	**DWAE1210X04S130**	50.6	82.2	84.2	139.2	137	2.2	13	1
12.2	2	●	**DWAE1220X02S130**	26.6	49.2	51.2	102.2	100	2.2	13	1
12.2	4	●	**DWAE1220X04S130**	51.0	82.2	84.2	139.2	137	2.2	13	1
12.3	2	●	**DWAE1230X02S130**	26.8	49.2	51.2	102.2	100	2.2	13	1
12.3	4	●	**DWAE1230X04S130**	51.4	82.2	84.2	139.2	137	2.2	13	1
12.4	2	●	**DWAE1240X02S130**	27.1	49.3	51.3	102.3	100	2.3	13	1
12.4	4	●	**DWAE1240X04S130**	51.9	82.3	84.3	139.3	137	2.3	13	1
12.5	2	●	**DWAE1250X02S130**	27.3	49.3	51.3	102.3	100	2.3	13	1
12.5	4	●	**DWAE1250X04S130**	52.3	82.3	84.3	139.3	137	2.3	13	1
12.6	2	●	**DWAE1260X02S130**	27.5	52.3	54.3	102.3	100	2.3	13	1
12.6	4	●	**DWAE1260X04S130**	52.7	84.3	86.3	139.3	137	2.3	13	1
12.7	2	●	**DWAE1270X02S130**	27.7	52.3	54.3	102.3	100	2.3	13	1
12.7	4	●	**DWAE1270X04S130**	53.1	84.3	86.3	139.3	137	2.3	13	1
12.8	2	●	**DWAE1280X02S130**	27.9	52.3	54.3	102.3	100	2.3	13	1
12.8	4	●	**DWAE1280X04S130**	53.5	84.3	86.3	139.3	137	2.3	13	1
12.9	2	●	**DWAE1290X02S130**	28.1	52.3	54.3	102.3	100	2.3	13	1
12.9	4	●	**DWAE1290X04S130**	53.9	84.3	86.3	139.3	137	2.3	13	1

● : Inventory maintained in Japan.



Type1

DC	L/D	DP102A	Order Number	LU	LCF	LH	OAL	LF	PL	DCON	Type
13.0	2	●	**DWAE1300X02S130**	28.4	52.4	54.4	102.4	100	2.4	13	1
13.0	4	●	**DWAE1300X04S130**	54.4	84.4	86.4	139.4	137	2.4	13	1
13.1	2	●	**DWAE1310X02S140**	28.6	55.4	57.4	102.4	100	2.4	14	1
13.1	4	●	**DWAE1310X04S140**	54.8	92.4	94.4	149.4	147	2.4	14	1
13.2	2	●	**DWAE1320X02S140**	28.8	55.4	57.4	102.4	100	2.4	14	1
13.2	4	●	**DWAE1320X04S140**	55.2	92.4	94.4	149.4	147	2.4	14	1
13.3	2	●	**DWAE1330X02S140**	29.0	55.4	57.4	102.4	100	2.4	14	1
13.3	4	●	**DWAE1330X04S140**	55.6	92.4	94.4	149.4	147	2.4	14	1
13.4	2	●	**DWAE1340X02S140**	29.2	55.4	57.4	102.4	100	2.4	14	1
13.4	4	●	**DWAE1340X04S140**	56.0	92.4	94.4	149.4	147	2.4	14	1
13.5	2	●	**DWAE1350X02S140**	29.5	55.5	57.5	102.5	100	2.5	14	1
13.5	4	●	**DWAE1350X04S140**	56.5	92.5	94.5	149.5	147	2.5	14	1
13.6	2	●	**DWAE1360X02S140**	29.7	57.5	59.5	102.5	100	2.5	14	1
13.6	4	●	**DWAE1360X04S140**	56.9	97.5	99.5	149.5	147	2.5	14	1
13.7	2	●	**DWAE1370X02S140**	29.9	57.5	59.5	102.5	100	2.5	14	1
13.7	4	●	**DWAE1370X04S140**	57.3	97.5	99.5	149.5	147	2.5	14	1
13.8	2	●	**DWAE1380X02S140**	30.1	57.5	59.5	102.5	100	2.5	14	1
13.8	4	●	**DWAE1380X04S140**	57.7	97.5	99.5	149.5	147	2.5	14	1
13.9	2	●	**DWAE1390X02S140**	30.3	57.5	59.5	102.5	100	2.5	14	1
13.9	4	●	**DWAE1390X04S140**	58.1	97.5	99.5	149.5	147	2.5	14	1
14.0	2	●	**DWAE1400X02S140**	30.5	57.5	59.5	102.5	100	2.5	14	1
14.0	4	●	**DWAE1400X04S140**	58.5	97.5	99.5	149.5	147	2.5	14	1

DC = Cutting Diameter
LU = Usable Length
LCF = Length Chip Flute
LH = Neck Length
OAL = Overall Length
LF = Functional Length
PL = Point Length
DCON = Connection Diameter

DWAE

Recommended Cutting Conditions

(mm)

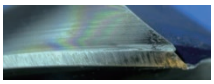
Workpiece Material	Mild Steels (≤180HB), JIS SS400, S10C,etc				Carbon Steels, Alloy Steels (180－250HB) JIS S45C, SCM440 etc			
DC	Cutting Speed **vc** (m/min)	Revolution **n** (min^{-1})	Feed **fr** (Min.－Max.) (mm/rev.)	Table Feed (mm/min)	Cutting Speed **vc** (m/min)	Revolution **n** (min^{-1})	Feed **fr** (Min.－Max.) (mm/rev.)	Table Feed (mm/min)
1.0	30	9500	0.03 (0.02—0.04)	285	30	9500	0.03 (0.02—0.04)	285
1.5	30	6300	0.05 (0.03—0.06)	315	30	6300	0.05 (0.03—0.06)	315
2.0	55	8700	0.06 (0.04—0.08)	520	55	8700	0.06 (0.04—0.08)	520
2.5	55	7000	0.08 (0.05—0.10)	560	55	7000	0.08 (0.05—0.10)	560
3.0	65	6800	0.09 (0.07—0.11)	610	60	6300	0.09 (0.07—0.11)	565
4.0	70	5500	0.12 (0.09—0.14)	660	65	5100	0.12 (0.09—0.14)	610
5.0	70	4400	0.15 (0.11—0.18)	660	65	4100	0.15 (0.11—0.18)	615
6.0	80	4200	0.18 (0.14—0.21)	755	75	3900	0.18 (0.14—0.21)	700
7.0	80	3600	0.21 (0.16—0.25)	755	75	3400	0.21 (0.16—0.25)	715
8.0	85	3300	0.23 (0.18—0.28)	760	80	3100	0.23 (0.18—0.28)	715
10.0	90	2800	0.27 (0.21—0.32)	755	85	2700	0.27 (0.21—0.32)	730
12.0	95	2500	0.28 (0.22—0.34)	700	90	2300	0.28 (0.22—0.34)	645
14.0	95	2100	0.29 (0.23—0.35)	610	90	2000	0.29 (0.23—0.35)	580

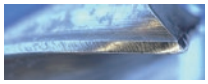
Workpiece Material	Carbon Steels, Alloy Steels (280－350HB) JIS SNCM439 etc				Austenitic Stainless Steel (≤200HB) Ferritic, Precipitation Hardening Stainless Steels (>200HB) with water-insoluble coolant JIS SUS431, SUS420J2 etc			
DC	Cutting Speed **vc** (m/min)	Revolution **n** (min^{-1})	Feed **fr** (Min.－Max.) (mm/rev.)	Table Feed (mm/min)	Cutting Speed **vc** (m/min)	Revolution **n** (min^{-1})	Feed **fr** (Min.－Max.) (mm/rev.)	Table Feed (mm/min)
1.0	25	7900	0.02 (0.01—0.03)	160	30	9500	0.02 (0.01—0.03)	190
1.5	25	5300	0.04 (0.02—0.05)	210	30	6300	0.04 (0.02—0.05)	250
2.0	50	7900	0.05 (0.03—0.07)	395	35	5500	0.04 (0.02—0.06)	220
2.5	50	6300	0.07 (0.04—0.09)	440	35	4400	0.06 (0.03—0.08)	265
3.0	55	5800	0.08 (0.06—0.09)	465	40	4200	0.07 (0.04—0.10)	295
4.0	60	4700	0.11 (0.08—0.13)	515	40	3100	0.08 (0.05—0.10)	250
5.0	60	3800	0.13 (0.10—0.16)	495	40	2500	0.10 (0.05—0.15)	250
6.0	70	3700	0.16 (0.12—0.19)	590	40	2100	0.11 (0.06—0.15)	230
7.0	70	3100	0.18 (0.14—0.22)	560	40	1800	0.12 (0.06—0.18)	215
8.0	75	2900	0.21 (0.16—0.25)	610	40	1500	0.13 (0.06—0.20)	195
10.0	80	2500	0.24 (0.20—0.28)	600	40	1200	0.14 (0.08—0.20)	170
12.0	85	2200	0.25 (0.20—0.30)	550	40	1000	0.18 (0.10—0.25)	180
14.0	85	1900	0.25 (0.20—0.30)	475	40	900	0.18 (0.10—0.25)	160

Workpiece Material	Gray Cast Iron (≤350MPa) JIS FC300 etc				Ductile Cast Iron (≤450MPa) JIS FCD450 etc			
DC	Cutting Speed **vc** (m/min)	Revolution **n** (min^{-1})	Feed **fr** (Min.－Max.) (mm/rev.)	Table Feed (mm/min)	Cutting Speed **vc** (m/min)	Revolution **n** (min^{-1})	Feed **fr** (Min.－Max.) (mm/rev.)	Table Feed (mm/min)
1.0	30	9500	0.03 (0.02—0.04)	285	25	7900	0.02 (0.01—0.03)	160
1.5	30	6300	0.05 (0.03—0.06)	315	25	5300	0.04 (0.02—0.05)	210
2.0	55	8700	0.06 (0.04—0.08)	520	50	7900	0.05 (0.03—0.07)	395
2.5	55	7000	0.08 (0.05—0.10)	560	50	6300	0.07 (0.04—0.09)	440
3.0	65	6800	0.09 (0.07—0.11)	610	55	5800	0.09 (0.05—0.12)	520
4.0	70	5500	0.12 (0.09—0.14)	660	60	4700	0.12 (0.07—0.17)	565
5.0	70	4400	0.15 (0.11—0.18)	660	60	3800	0.14 (0.08—0.20)	530
6.0	80	4200	0.18 (0.14—0.21)	755	70	3700	0.15 (0.10—0.20)	555
7.0	80	3600	0.21 (0.16—0.25)	755	70	3100	0.18 (0.12—0.23)	560
8.0	85	3300	0.23 (0.18—0.28)	760	75	2900	0.20 (0.15—0.25)	580
10.0	90	2800	0.27 (0.21—0.32)	755	80	2500	0.23 (0.18—0.28)	575
12.0	95	2500	0.28 (0.22—0.34)	700	85	2200	0.25 (0.20—0.30)	550
14.0	95	2100	0.29 (0.23—0.35)	610	85	1900	0.25 (0.20—0.30)	475

Note 1) The above cutting conditions are when water soluble coolant is used. For stainless steels, water-insoluble coolant is recommended.
Note 2) When using a water-insoluble coolant, reduce the cutting speed by 20% to ensure adequate lubrication.
Note 3) Check the condition of chips and perform step machining if necessary. * Reference of step length: 0.2 to 1.0 DC
Note 4) Adjust the cutting conditions according to machine tool and workpiece clamp rigidity and machining geometry, etc.
Note 5) Machining depths exceeding flute length (LU) are not recommended.
Note 6) Clamp the drill so that the drill runout is within 0.03mm.
Note 7) Do not clamp the flute part of the drill.

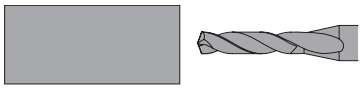
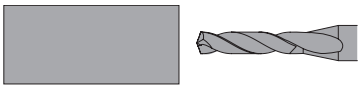
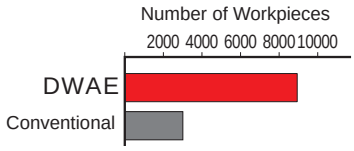
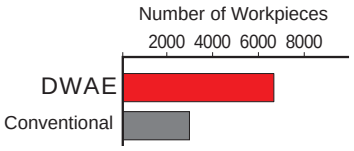
Application Example

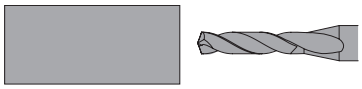
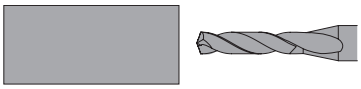
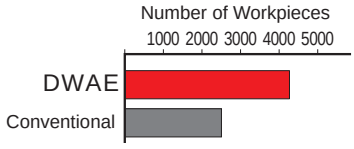
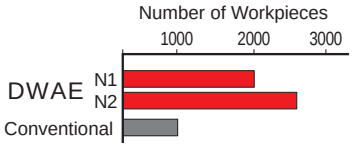
Drill		Conventional	**DWAE1080X02S110**
Workpiece		KM-62F Electromagnetic Stainless Steel	
Cutting Conditions	Cutting Speed **vc**(m/min)	71.3	
	Feed per Rev. **fr**(mm/rev)	0.25	
	Guide Hole Dia. (mm)	10.8	
	Hole Depth (mm)	14	
Cutting Mode		Wet Cutting Extarnal Coolant (Water-insoluble)	
Machine		CNC Automatic Lathe	
Number of Holes		4000 Holes	8000 Holes
Results		Rake Face / Flank   Material welded on the cutting edge / Margin  	Rake Face / Flank   Margin 
		When compared with conventional drills, the cutting resistance was lower, ensuring that the cutting edge didn't chip thereby achieving long tool life.	

Drill		Conventional	**DWAE0300X04S030**
Workpiece		JIS S10C Mild Steel	
Cutting Conditions	Cutting Speed **vc**(m/min)	47.1	51.8
	Feed per Rev. **fr**(mm/rev)	0.06	0.08
	Guide Hole Dia. (mm)	3.0	
	Hole Depth (mm)	7	
Cutting Mode		Wet Cutting Extarnal Coolant (Water-soluble)	
Machine		—	
Number of Holes		2000 Holes	4800 Holes
Results		Rake Face / Flank   Chipping / Margin 	Rake Face / Flank   Margin 
		Cutting resistance is lower than conventional drills and cutting conditions increased by a factor of 1.5. This gave greater efficiency and 2.4 times tool life.	

The examples above are customers applications and can vary from the recommended cutting conditions.

Application Example

Drill			Conventional	DWAE0250X04S040	Conventional	DWAE0190X04S030
Workpiece			SUS420J2  Pre-machining (pilot hole) Workpiece Rotation : Blind Hole Machining		Electromagnetic Stainless Steel  Pre-machining (pilot hole) Workpiece Rotation : Blind Hole Machining	
Cutting Conditions	Revolution	**n**(mm^{-1})	2546		4200	5900
	Cutting Speed	**vc**(m/min)	20		25	35
	Feed per Rev.	**fr**(mm/rev)	0.03		0.03	0.04
	Guide Hole Dia.	(mm)	2.5		6	6
	Hole Depth	(mm)	2.5		1.9	1.9
Cutting Mode			Wet Cutting (Water-insoluble)		Step feed : 1mm Wet Cutting (Water-insoluble)	Non-step feed Wet Cutting (Water-insoluble)
Machine			Automatic Lathe		Automatic Lathe	
Results			 Consistent hole dimensions and excellent chip disposal. Tool life tripled compared to conventional products.		 Efficient machining possible without step drilling and double tool life compared to conventional products.	

Drill			Conventional	DWAE0180X04S030	Conventional	DWAE0180X04S030
Workpiece			SUS420J2  Pre-machining (pilot hole) Workpiece Rotation : Blind Hole Machining		Martensitic Stainless Steel 	
Cutting Conditions	Revolution	**n**(mm^{-1})	4400	5300	2000	
	Cutting Speed	**vc**(m/min)	25	30	11	
	Feed per Rev.	**fr**(mm/rev)	0.02	0.035	0.02	
	Guide Hole Dia.	(mm)	6	6	-	
	Hole Depth	(mm)	1.8	1.8	1.8	
Cutting Mode			Step feed : 1mm Wet Cutting (Water-insoluble)	Non-step feed Wet Cutting (Water-insoluble)	Step feed : 1mm Wet Cutting (Water-insoluble)	
Machine			Automatic Lathe		CNC-lathe	
Results			 Double machining efficiency and 1.7 times tool life.		 Damage to the cutting edge greatly reduced thereby allowing more than double tool life.	

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.

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EXP-19-E011
2021.5.E(-)