

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



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

## WSTAR Drill Series

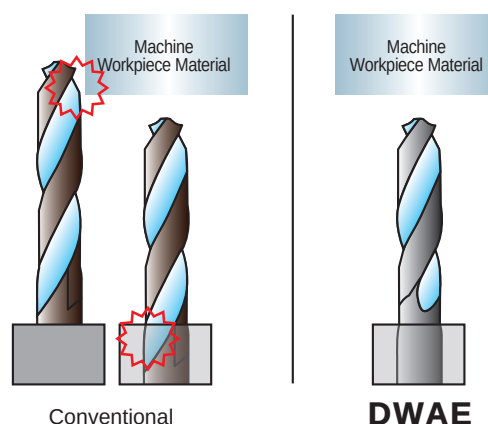
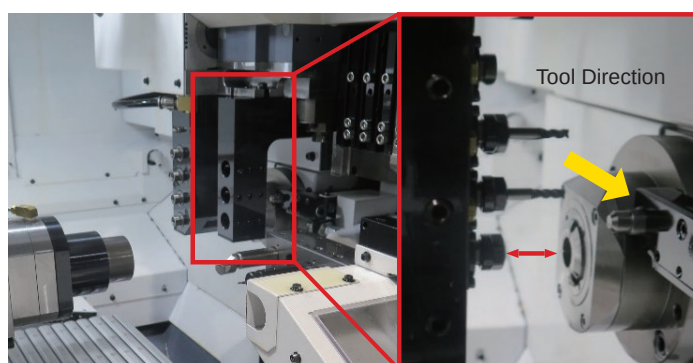
# DWAE

Ø3mm–Ø14mm

## Features

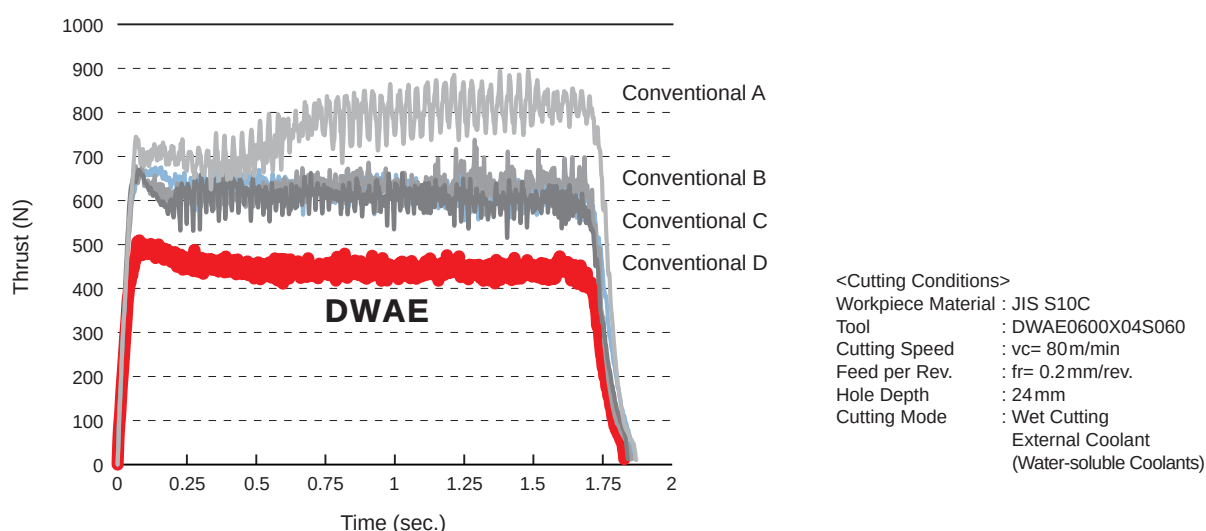
### Optimal Flute Length

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.



## 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

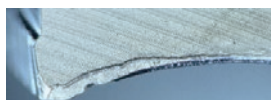
DP102A coated grade provides excellent lubricity and long-term durability, achieving excellent wear resistance at low to medium cutting speeds.

Wear comparison when drilling JIS S50C

### DWAE



Conventional

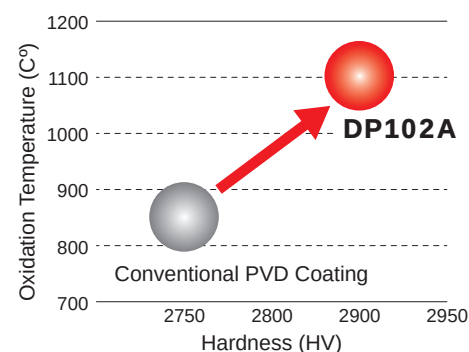


## Flute Shape

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

## ZERO- $\mu$ Surface

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



## 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.

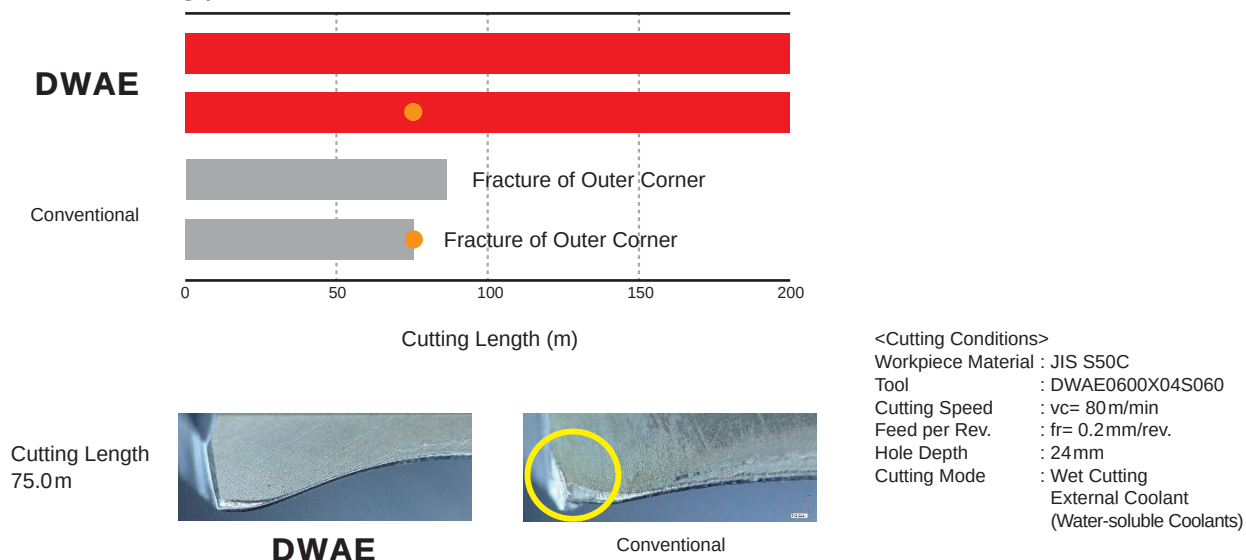
DCON (Connection Diameter)  $\varnothing$ 5mm=ER8  
DCON  $\varnothing$ 7mm=ER11



## 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.



### JIS S10C Chip Comparison

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



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



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

## DWAE NEW Mini Size $\varnothing 1.0\text{ mm} - \varnothing 2.9\text{ mm}$

Featuring High Precision and Long Tool Life for Small Diameter Drilling

### New Cutting Edge Treatment That Achieves Both Sharpness and Durability

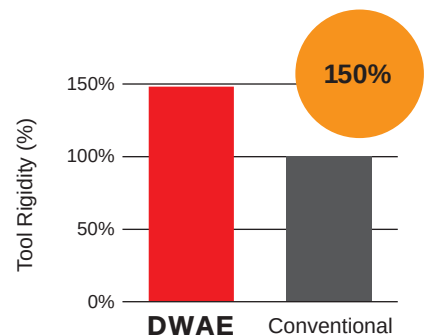
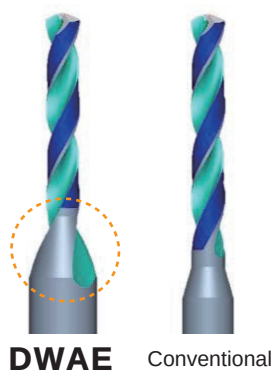
Mitsubishi's new original cutting edge treatment maintains the stability of the cutting edge while exhibiting excellent fracture and wear resistance.

### Coated Grade DP102A

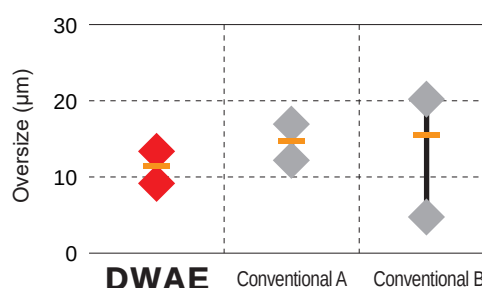
DP102A coated grade provides excellent lubricity and long-term durability, achieving excellent wear resistance at low to medium cutting speeds.

### 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= $\varnothing 2\text{ mm}$ , L/D=4  
Overall Length : OAL= 50 mm  
Load : Distributed load of 130N in Z axis direction.

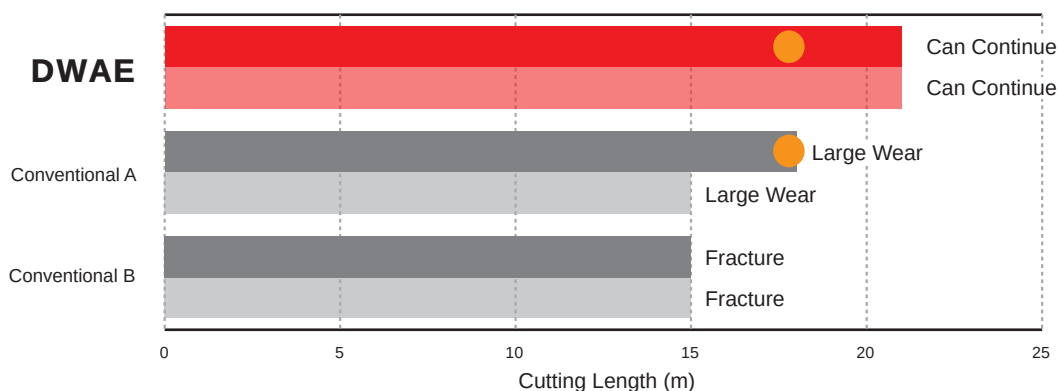


<Cutting Conditions>  
Workpiece Material : JIS S10C  
Tool : DC= $\varnothing 2\text{ mm}$ , L/D=4  
Cutting Speed :  $vc = 30\text{ m/min}$   
Feed per Rev. :  $fr = 0.04\text{ mm/rev.}$   
Hole Depth : 8 mm  
Cutting Mode : Water-soluble Coolants

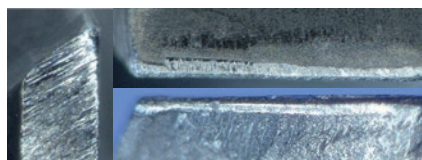
## Cutting Performance

### Wear Resistance Comparison when drilling JIS SUS420JS

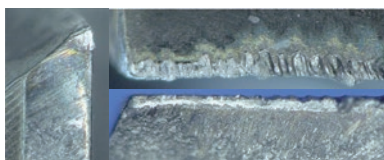
By combining DP102A and a new cutting edge treatment, durability and long tool life have been achieved when drilling with an external coolant supply.



Cutting Length 18 m



DWAE



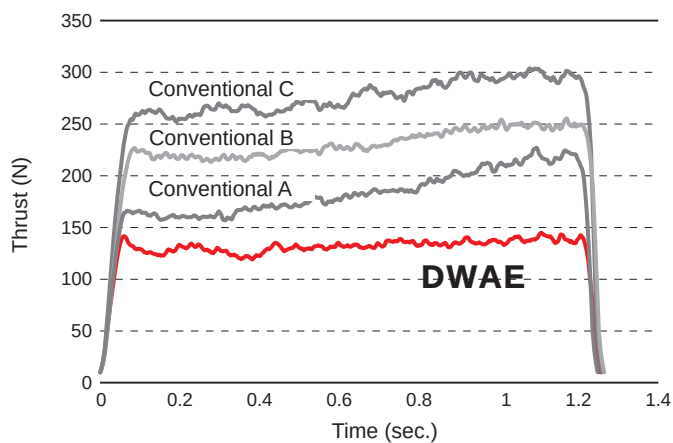
Conventional A

<Cutting Conditions>

Workpiece Material : JIS SUS420J2  
 Tool : DWAE0200X04S040  
 Cutting Speed :  $vc = 30\text{m/min}$   
 Feed per Rev. :  $fr = 0.045\text{mm/rev.}$   
 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 :  $vc = 40\text{m/min}$   
 Feed per Rev. :  $fr = 0.06\text{mm/rev.}$   
 Hole Depth : 8mm  
 Cutting Mode : Wet Cutting  
 External Coolant  
 (Water-soluble Coolants)

P

M

K

N

S

H

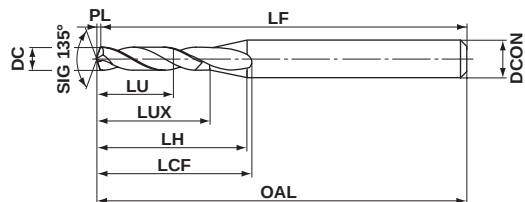
## External Coolant



DC<2.0



DC≥2.0



Type1



|                                                     |                                                     |  |  |
|-----------------------------------------------------|-----------------------------------------------------|--|--|
| DC≤3                                                |                                                     |  |  |
| $\begin{smallmatrix} 0 \\ -0.014 \end{smallmatrix}$ |                                                     |  |  |
| DCON=3                                              | DCON=4                                              |  |  |
| $\begin{smallmatrix} 0 \\ -0.006 \end{smallmatrix}$ | $\begin{smallmatrix} 0 \\ -0.008 \end{smallmatrix}$ |  |  |



(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

**DWAE**

P

M

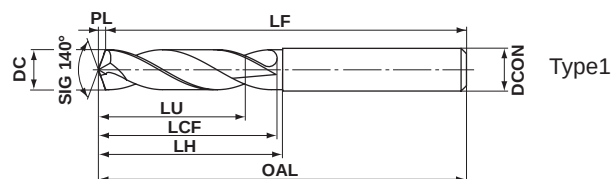
K

N

S

H

External Coolant



| DC=3                                                | 3<DC≤6                                              | 6<DC≤10                                             | 10<DC≤14                                            |
|-----------------------------------------------------|-----------------------------------------------------|-----------------------------------------------------|-----------------------------------------------------|
| $\begin{smallmatrix} 0 \\ -0.014 \end{smallmatrix}$ | $\begin{smallmatrix} 0 \\ -0.018 \end{smallmatrix}$ | $\begin{smallmatrix} 0 \\ -0.022 \end{smallmatrix}$ | $\begin{smallmatrix} 0 \\ -0.027 \end{smallmatrix}$ |
| DCON=3                                              | 3<DCON≤6                                            | 6<DCON≤10                                           | 10<DCON≤14                                          |
| $\begin{smallmatrix} 0 \\ -0.006 \end{smallmatrix}$ | $\begin{smallmatrix} 0 \\ -0.008 \end{smallmatrix}$ | $\begin{smallmatrix} 0 \\ -0.009 \end{smallmatrix}$ | $\begin{smallmatrix} 0 \\ -0.011 \end{smallmatrix}$ |



| 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    |

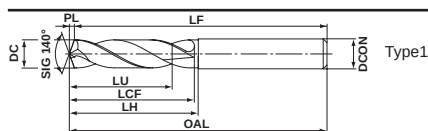
DC = Cutting Diameter  
LU = Usable Length  
LCF = Length Chip Flute

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    |



| 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    |

DC = Cutting Diameter  
LU = Usable Length  
LCF = Length Chip Flute

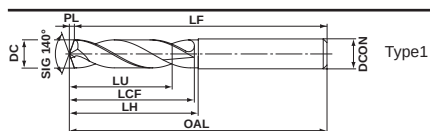
LH = Neck Length  
OAL = Overall Length  
LF = Functional Length

PL = Point Length  
DCON = Connection Diameter

# DWAE

| DC   | L/D | DP102A | Order Number    | LU   | LCF  | LH   | OAL   | LF  | PL  | DCON | Type |
|------|-----|--------|-----------------|------|------|------|-------|-----|-----|------|------|
| 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    |





| 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<br>Material | Mild Steels (≤180HB),<br><br>JIS SS400, S10C,etc |                                |                                         |                                     | Carbon Steels, Alloy Steels (180—250HB)<br><br>JIS S45C, SCM440 etc |                                |                                         |                                     |                        |
|-----------------------|--------------------------------------------------|--------------------------------|-----------------------------------------|-------------------------------------|---------------------------------------------------------------------|--------------------------------|-----------------------------------------|-------------------------------------|------------------------|
|                       | DC                                               | Cutting Speed<br>vc<br>(m/min) | Revolution<br>n<br>(min <sup>-1</sup> ) | Feed fr<br>(Min.—Max.)<br>(mm/rev.) | Table Feed<br>(mm/min)                                              | Cutting Speed<br>vc<br>(m/min) | Revolution<br>n<br>(min <sup>-1</sup> ) | Feed fr<br>(Min.—Max.)<br>(mm/rev.) | Table Feed<br>(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<br>Material | Carbon Steels, Alloy Steels (280—350HB)<br><br>JIS SNCM439 etc |                                         |                                     |                        | Austenitic Stainless Steel (≤200HB)<br>Ferritic, Precipitation Hardening Stainless Steels (>200HB)<br>with water-insoluble coolant<br>JIS SUS431, SUS420J2 etc |                                         |                                     |                        |
|-----------------------|----------------------------------------------------------------|-----------------------------------------|-------------------------------------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-------------------------------------|------------------------|
|                       | Cutting Speed<br>vc<br>(m/min)                                 | Revolution<br>n<br>(min <sup>-1</sup> ) | Feed fr<br>(Min.—Max.)<br>(mm/rev.) | Table Feed<br>(mm/min) | Cutting Speed<br>vc<br>(m/min)                                                                                                                                 | Revolution<br>n<br>(min <sup>-1</sup> ) | Feed fr<br>(Min.—Max.)<br>(mm/rev.) | Table Feed<br>(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<br>Material | Gray Cast Iron (≤350MPa)       |                                         |                                     |                        | Ductile Cast Iron (≤450MPa)    |                                         |                                     |                        |
|-----------------------|--------------------------------|-----------------------------------------|-------------------------------------|------------------------|--------------------------------|-----------------------------------------|-------------------------------------|------------------------|
|                       | JIS FC300 etc                  |                                         |                                     |                        | JIS FCD450 etc                 |                                         |                                     |                        |
| DC                    | Cutting Speed<br>vc<br>(m/min) | Revolution<br>n<br>(min <sup>-1</sup> ) | Feed fr<br>(Min.—Max.)<br>(mm/rev.) | Table Feed<br>(mm/min) | Cutting Speed<br>vc<br>(m/min) | Revolution<br>n<br>(min <sup>-1</sup> ) | Feed fr<br>(Min.—Max.)<br>(mm/rev.) | Table Feed<br>(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

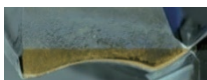
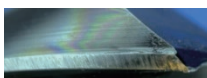
Note 4) Adjust the cutting conditions according to machine tool and workpiece clamp rigidity and machining geometry, etc.

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.

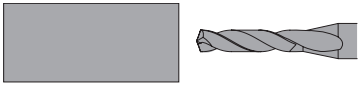
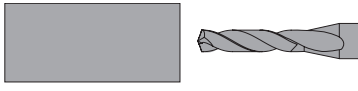
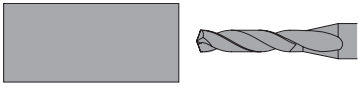
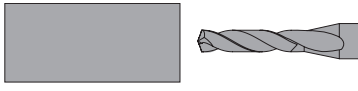
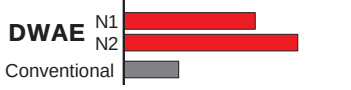
## Application Example

| Drill                                                                                                                                                  |                                     | Conventional                                                                      | DWAE1080X02S110 |                                                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-----------------------------------------------------------------------------------|-----------------|-------------------------------------------------------------------------------------|
| Workpiece                                                                                                                                              |                                     | KM-62F Electromagnetic Stainless Steel                                            |                 |                                                                                     |
| Cutting Conditions                                                                                                                                     | Cutting Speed <b>vc</b> (m/min)     | 71.3                                                                              |                 |                                                                                     |
|                                                                                                                                                        | Feed per Rev. <b>fr</b> (mm/rev)    | 0.25                                                                              |                 |                                                                                     |
|                                                                                                                                                        | Guide Hole Dia. (mm)                | 10.8                                                                              |                 |                                                                                     |
|                                                                                                                                                        | Hole Depth (mm)                     | 14                                                                                |                 |                                                                                     |
| Cutting Mode                                                                                                                                           |                                     | Wet Cutting External 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                              |  |                 |                                                                                     |
| 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 <b>vc</b> (m/min)  | 47.1                                                                                | 51.8            |                                                                                       |
|                                                                                                                                                                 | Feed per Rev. <b>fr</b> (mm/rev) | 0.06                                                                                | 0.08            |                                                                                       |
|                                                                                                                                                                 | Guide Hole Dia. (mm)             | 3.0                                                                                 |                 |                                                                                       |
|                                                                                                                                                                 | Hole Depth (mm)                  | 7                                                                                   |                 |                                                                                       |
| Cutting Mode                                                                                                                                                    |                                  | Wet Cutting External Coolant (Water-soluble)                                        |                 |                                                                                       |
| Machine                                                                                                                                                         |                                  | —                                                                                   |                 |                                                                                       |
| Number of Holes                                                                                                                                                 |                                  | 2000 Holes                                                                          |                 | 4800 Holes                                                                            |
| Results                                                                                                                                                         | Rake Face                        |  |                 |   |
|                                                                                                                                                                 | Flank                            |  |                 |  |
|                                                                                                                                                                 | Chipping                         |  |                 |  |
|                                                                                                                                                                 | 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                                                                                                                                                                                                                                                  |                                                | Electromagnetic Stainless Steel                                                                                                                                                                                                                     |                                                |
|                    |                 | <br>Pre-machining (pilot hole)<br>Workpiece Rotation : Blind Hole Machining                                                                                              |                                                | <br>Pre-machining (pilot hole)<br>Workpiece Rotation : Blind Hole Machining                                                                                      |                                                |
| Cutting Conditions | Revolution      | $n(\text{mm}^{-1})$                                                                                                                                                                                                                                       | 2546                                           | 4200                                                                                                                                                                                                                                                | 5900                                           |
|                    | Cutting Speed   | $vc(\text{m/min})$                                                                                                                                                                                                                                        | 20                                             | 25                                                                                                                                                                                                                                                  | 35                                             |
|                    | Feed per Rev.   | $fr(\text{mm/rev})$                                                                                                                                                                                                                                       | 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<br>Wet Cutting (Water-insoluble)                                                                                                                                                                                                    | Non-step feed<br>Wet Cutting (Water-insoluble) |
| Machine            |                 | Automatic Lathe                                                                                                                                                                                                                                           |                                                | Automatic Lathe                                                                                                                                                                                                                                     |                                                |
| Results            |                 | Number of Workpieces<br>2000 4000 6000 8000 10000<br><br>Consistent hole dimensions and excellent chip disposal.<br>Tool life tripled compared to conventional products. |                                                | Number of Workpieces<br>2000 4000 6000 8000<br><br>Efficient machining possible without step drilling and<br>double tool life compared to conventional products. |                                                |
|                    |                 |                                                                                                                                                                                                                                                           |                                                |                                                                                                                                                                                                                                                     |                                                |
| Drill              |                 | Conventional                                                                                                                                                                                                                                              | DWAE0180X04S030                                | Conventional                                                                                                                                                                                                                                        | DWAE0180X04S030                                |
| Workpiece          |                 | SUS420J2                                                                                                                                                                                                                                                  |                                                | Martensitic Stainless Steel                                                                                                                                                                                                                         |                                                |
|                    |                 | <br>Pre-machining (pilot hole)<br>Workpiece Rotation : Blind Hole Machining                                                                                             |                                                | <br>Pre-machining (pilot hole)                                                                                                                                  |                                                |
| Cutting Conditions | Revolution      | $n(\text{mm}^{-1})$                                                                                                                                                                                                                                       | 4400                                           | 5300                                                                                                                                                                                                                                                | 2000                                           |
|                    | Cutting Speed   | $vc(\text{m/min})$                                                                                                                                                                                                                                        | 25                                             | 30                                                                                                                                                                                                                                                  | 11                                             |
|                    | Feed per Rev.   | $fr(\text{mm/rev})$                                                                                                                                                                                                                                       | 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<br>Wet Cutting (Water-insoluble)                                                                                                                                                                                                          | Non-step feed<br>Wet Cutting (Water-insoluble) | Step feed : 1mm<br>Wet Cutting (Water-insoluble)                                                                                                                                                                                                    |                                                |
| Machine            |                 | Automatic Lathe                                                                                                                                                                                                                                           |                                                | CNC-lathe                                                                                                                                                                                                                                           |                                                |
| Results            |                 | Number of Workpieces<br>1000 2000 3000 4000 5000<br><br>Double machining efficiency and 1.7 times tool life.                                                           |                                                | Number of Workpieces<br>1000 2000 3000<br><br>Damage to the cutting edge greatly reduced thereby<br>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.



#### 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 attaching inserts or spare parts, please use only the correct wrench or driver. ●When using rotating tools, please make a trial run to check run-out, vibration and abnormal sounds etc.

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(Tools specifications subject to change without notice.)