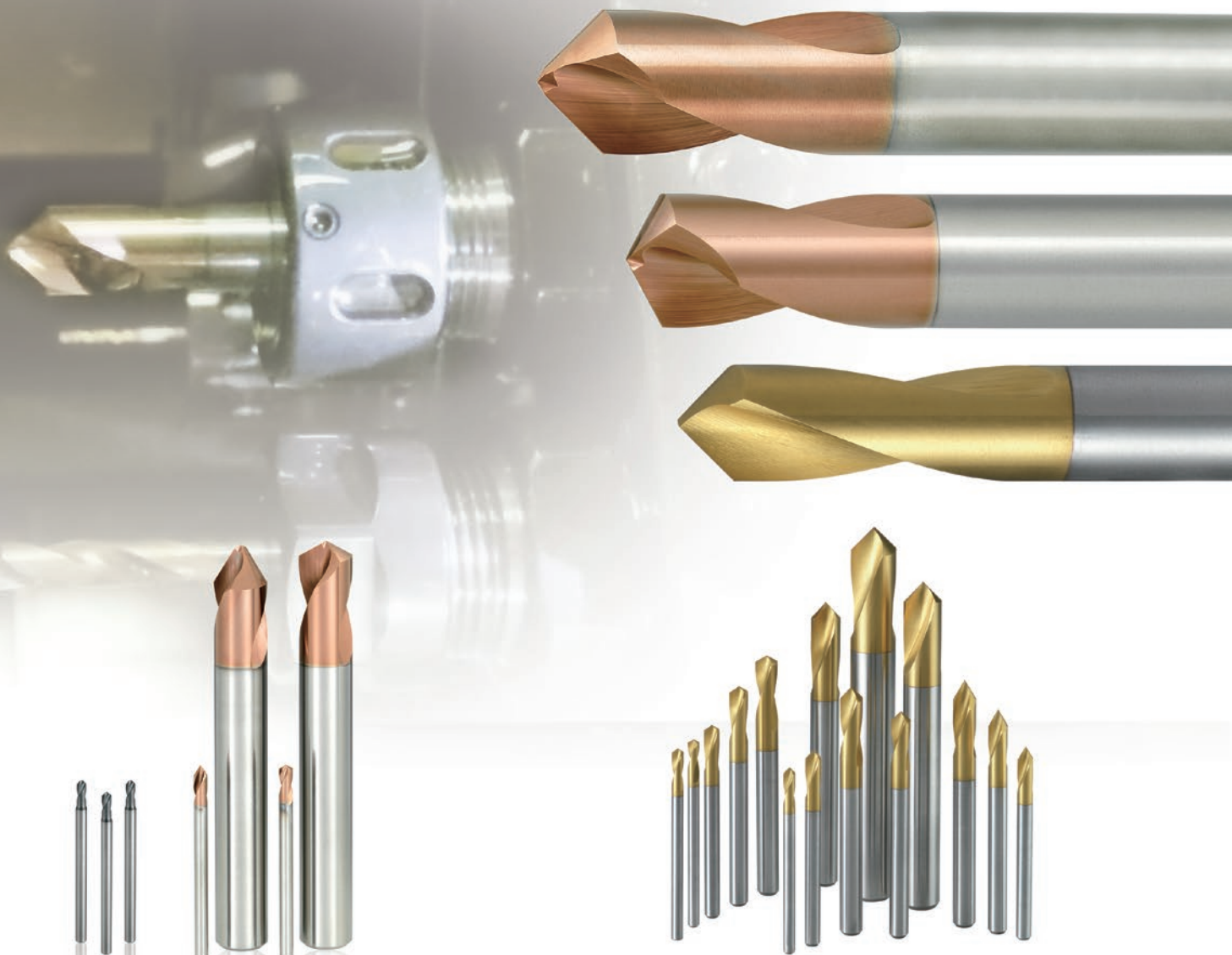


Solid Drills for Centering and Chamfering

Leading Drill Series

Item
Expansion

**Excellent Fracture Resistance and
Sharp Cutting Edge.
Ideal for Machining Stainless Steels.**



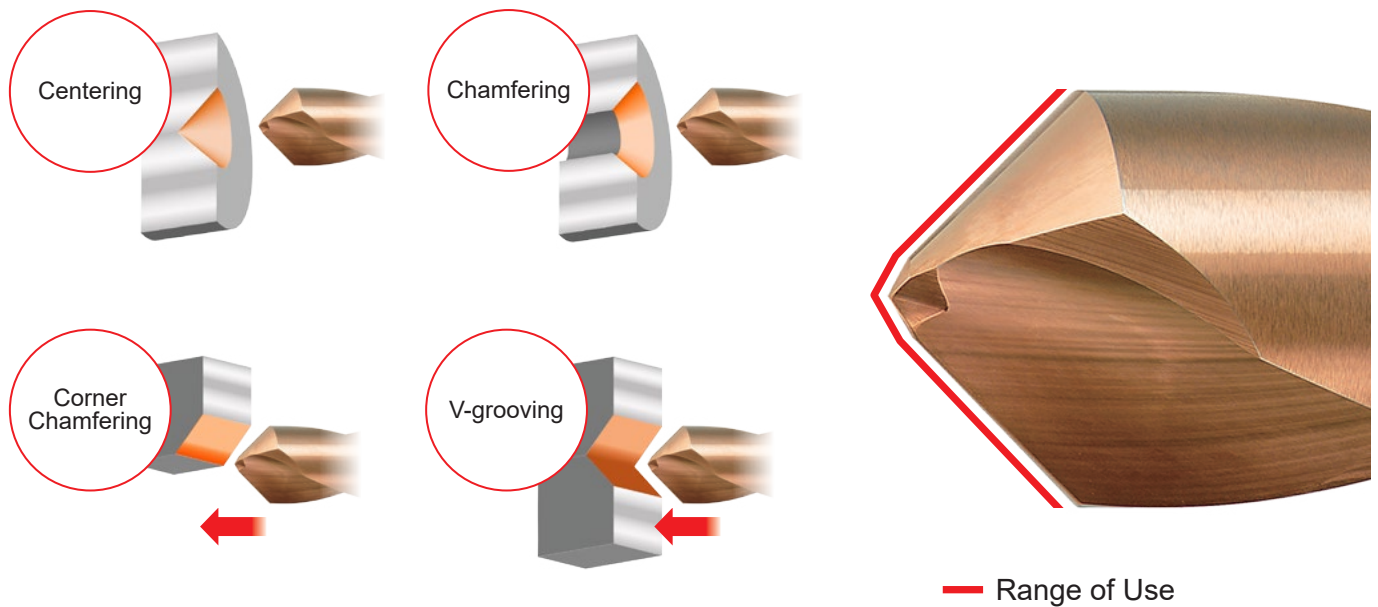
Solid Carbide Drills **DLE**

Cobalt HSS Solid Drill **GKCD**

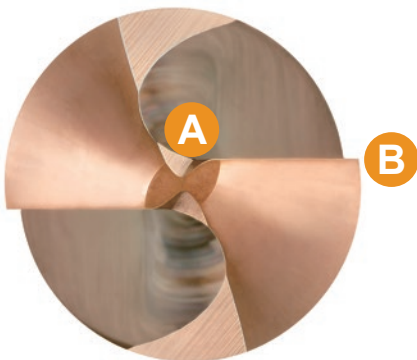
Solid Carbide Drills for Centering and Chamfering

Leading Drill Series **DLE**

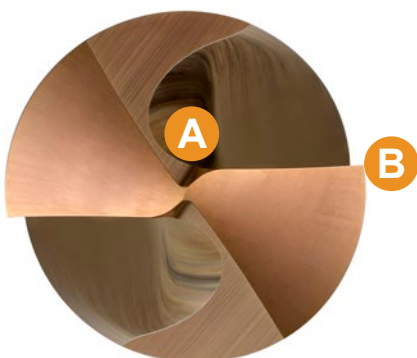
The ultimate multi-functional performance for centering and chamfering.



Features



Point Angles SIG 60° 90°



Point Angles SIG 120° 145°

A Thinned Point Geometry

Point thinning promotes smooth chip discharge and brings excellent hole position accuracy. Additionally, the negative cutting edge of the drill point offers high cutting edge strength.

B Sharp Cutting Edge and High Fracture Resistance

Straight cutting edge geometry with sharpness and fracture resistance. Providing a stable cutting action and reduction of burrs.



DLE



Conventional

Two-step Point Angles 60°, 90°

Two-step point angles ensure strength at the centre and prevent sudden fracturing.

*The central area will not have a 60°, 90° hole bottom.

DLE



High Strength Centre

Conventional



Fractured Centre Point

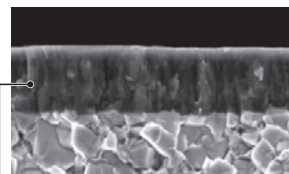
Single Step Point Angles 120°, 145°

Single step point angle provides accuracy and good entry for the drill in the hole machining process.

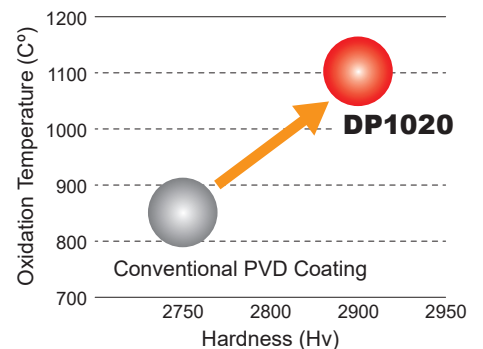


Coated Grade **DP1020**

DP1020 grade offers excellent wear resistance and reduced friction for longer tool life over a wide range of applications.



With Accumulated Al-Ti-Cr-N Based PVD Coating



Designed Especially for CNC Automatic Lathes

Diverse lineup of shanks compatible with ER collets.

DCON(Connection Diameter)

ø5mm=ER8

DCON

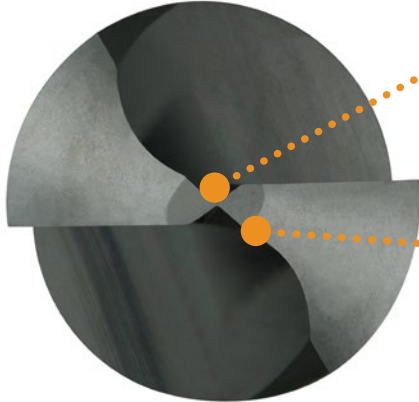
ø7mm=ER11

Solid Carbide Drills for Centering and Chamfering

Leading Drill Series

DLE

SIG 90° Mini Size $\varnothing 1.0\text{ mm}$ — $\varnothing 2.5\text{ mm}$



Point Thinning Geometry

The chip evacuation space in the centre improves the initial bite and ensures good finished hole positional accuracy.

Two-step Point Angles

Two-step point angles ensure strength at the centre and prevent sudden fracturing.

*The central area will not have a 90° hole bottom.

Unique Cutting Edge Shape

Large rake angle and sharp cutting edges can minimize the generation of burrs.

SUS304
Cutting Example



DLE



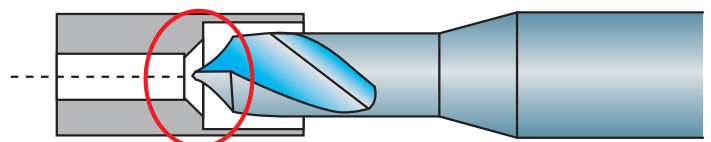
Conventional

New **DP102A** Carbide Grade Excellent Lubricity and Heat Resistance

The PVD-coated carbide grade DP102A has excellent lubricity and heat resistance. It displays outstanding wear resistance especially at low to medium cutting speeds.

Long-neck Design

Long neck permits chamfering inside deep holes.



Cobalt HSS Solid Drills for Centering and Chamfering

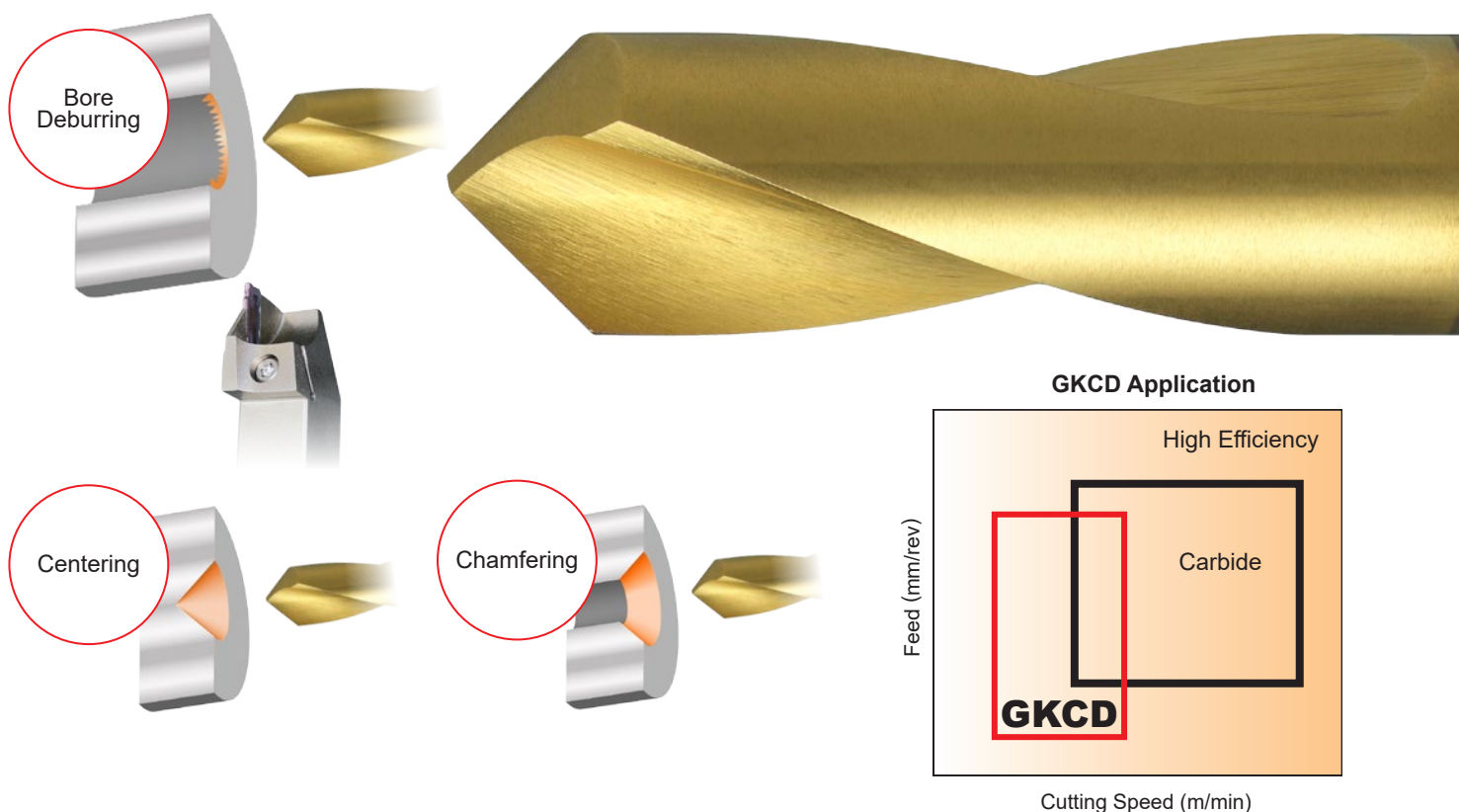
Leading Drill Series

GKCD

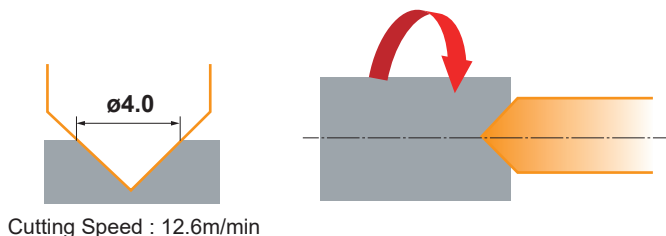


HSS Cobalt material is used for its excellent heat, wear and chipping resistance and is ideal for use over a wide range of materials, from carbon through to stainless steels. Achieves an excellent cost performance ratio on low feed and speed applications.

Point Angle SIG 60° 90° 120°



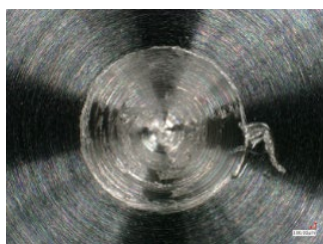
Cutting Performance



<Cutting Conditions>
 Work Material : JIS SUS304
 Drill : GKCD060P090 (ø6x90°)
 Revolution : $n = 1000 \text{ min}^{-1}$
 Feed : $vf = 50 \text{ mm/min}$
 Cutting Depth : 4.0mm
 Cutting Mode : Wet Cutting
 External Coolant (Oil)
 Machine : Small Lathe



GKCD



Conventional A



Conventional B

Solid Drills for Centering and Chamfering

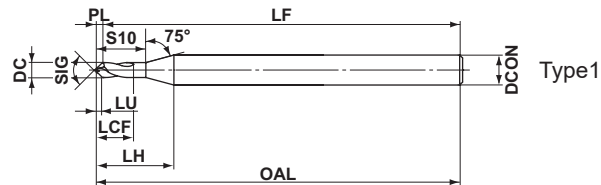
DLE

Leading Drill Series, Cemented Carbide, Point Angle 60° 90°

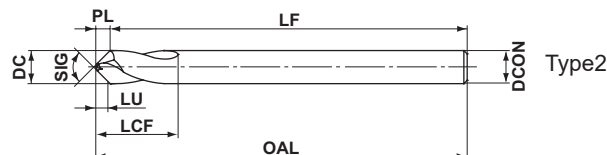


P M K N S H

External Coolant



Type1



Type2



DCON=3	3 < DCON ≤ 6	6 < DCON ≤ 10	10 < DCON ≤ 16
$\begin{smallmatrix} 0 \\ -0.010 \end{smallmatrix}$	$\begin{smallmatrix} 0 \\ -0.012 \end{smallmatrix}$	$\begin{smallmatrix} 0 \\ -0.015 \end{smallmatrix}$	$\begin{smallmatrix} 0 \\ -0.018 \end{smallmatrix}$



(mm)

DC	SIG	DP1020	DP102A	Order Number	LU	LCF	LH	S10	OAL	LF	PL	KAPR	DCON	Fig.
3.0	60°	●		DLE0300S030P060	2.0	9	—	—	45	42.9	2.1	60°	3	2
4.0	60°	●		DLE0400S040P060	2.7	12	—	—	50	47.2	2.8	60°	4	2
5.0	60°	●		DLE0500S050P060	3.4	14	—	—	60	56.5	3.5	60°	5	2
6.0	60°	●		DLE0600S060P060	4.0	15	—	—	66	61.8	4.2	60°	6	2
7.0	60°	●		DLE0700S070P060	4.7	18	—	—	74	69.1	4.9	60°	7	2
8.0	60°	●		DLE0800S080P060	5.4	20	—	—	74	68.4	5.6	60°	8	2
10.0	60°	●		DLE1000S100P060	6.8	24	—	—	84	77.0	7.0	60°	10	2
12.0	60°	●		DLE1200S120P060	8.1	28	—	—	95	86.6	8.4	60°	12	2
NEW 1.0	90°	●		DLE0100S030P090	0.35	2	6.7	3.0	45	44.6	0.4	45°	3	1
NEW 1.5	90°	●		DLE0150S030P090	0.55	3	7.3	4.5	45	44.4	0.6	45°	3	1
NEW 2.0	90°	●		DLE0200S030P090	0.80	4	7.9	6.1	45	44.1	0.9	45°	3	1
NEW 2.5	90°	●		DLE0250S030P090	1.00	5	7.9	7.1	45	43.9	1.1	45°	3	1
3.0	90°	●		DLE0300S030P090	1.2	9	—	—	45	43.7	1.3	45°	3	2
4.0	90°	●		DLE0400S040P090	1.6	12	—	—	50	48.3	1.7	45°	4	2
5.0	90°	●		DLE0500S050P090	2.0	14	—	—	60	57.9	2.1	45°	5	2
6.0	90°	●		DLE0600S060P090	2.4	15	—	—	66	63.4	2.6	45°	6	2
7.0	90°	●		DLE0700S070P090	2.8	18	—	—	74	71.0	3.0	45°	7	2
8.0	90°	●		DLE0800S080P090	3.2	20	—	—	74	70.6	3.4	45°	8	2
10.0	90°	●		DLE1000S100P090	4.1	24	—	—	84	79.7	4.3	45°	10	2
12.0	90°	●		DLE1200S120P090	4.9	28	—	—	95	89.9	5.1	45°	12	2
16.0	90°	●		DLE1600S160P090	6.6	35	—	—	113	106.2	6.8	45°	16	2

Note 1) The central area of holes (approx 25% of the full diameter) formed by two step point angles will not have their respective 60° and 90° angles. Chamfering is also not possible in the centre areas.

Note 2) The centering diameter should be less than the drill diameter (processing diameter) **DC** and the usable length **LU** should be referred to as a guideline.

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

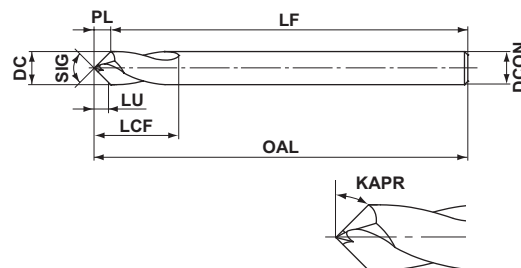
OAL = Overall Length
LF = Functional Length
PL = Point Length
DCON = Connection Diameter

SIG = Point Angle

● : Inventory maintained in Japan.

P M K N S H

External Coolant



DCON=3	3 < DCON ≤ 6	6 < DCON ≤ 10	10 < DCON ≤ 16
$\begin{smallmatrix} 0 \\ -0.010 \end{smallmatrix}$	$\begin{smallmatrix} 0 \\ -0.012 \end{smallmatrix}$	$\begin{smallmatrix} 0 \\ -0.015 \end{smallmatrix}$	$\begin{smallmatrix} 0 \\ -0.018 \end{smallmatrix}$

(mm)

DC	SIG	DP1020	Order Number	LU	LCF	OAL	LF	PL	KAPR	DCON
3.0	120°	●	DLE0300S030P120	0.8	9	45	44.1	0.9	30°	3
4.0	120°	●	DLE0400S040P120	1.1	12	50	48.8	1.2	30°	4
5.0	120°	●	DLE0500S050P120	1.3	14	60	58.6	1.4	30°	5
6.0	120°	●	DLE0600S060P120	1.6	15	66	64.3	1.7	30°	6
7.0	120°	●	DLE0700S070P120	1.9	18	74	72.0	2.0	30°	7
8.0	120°	●	DLE0800S080P120	2.2	20	74	71.7	2.3	30°	8
10.0	120°	●	DLE1000S100P120	2.8	24	84	81.1	2.9	30°	10
12.0	120°	●	DLE1200S120P120	3.3	28	95	91.5	3.5	30°	12
3.0	145°	●	DLE0300S030P145	0.4	9	45	44.5	0.5	17.5°	3
4.0	145°	●	DLE0400S040P145	0.5	12	50	49.4	0.6	17.5°	4
5.0	145°	●	DLE0500S050P145	0.7	14	60	59.2	0.8	17.5°	5
6.0	145°	●	DLE0600S060P145	0.8	15	66	65.1	0.9	17.5°	6
7.0	145°	●	DLE0700S070P145	1.0	18	74	72.9	1.1	17.5°	7
8.0	145°	●	DLE0800S080P145	1.1	20	74	72.7	1.3	17.5°	8
NEW 10.0	145°	●	DLE1000S100P145	1.4	24	84	82.4	1.6	17.5°	10
NEW 12.0	145°	●	DLE1200S120P145	1.7	28	95	93.1	1.9	17.5°	12

Note 1) The centering diameter should be less than the drill diameter (processing diameter) **DC** and the usable length **LU** should be referred to as a guideline.

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

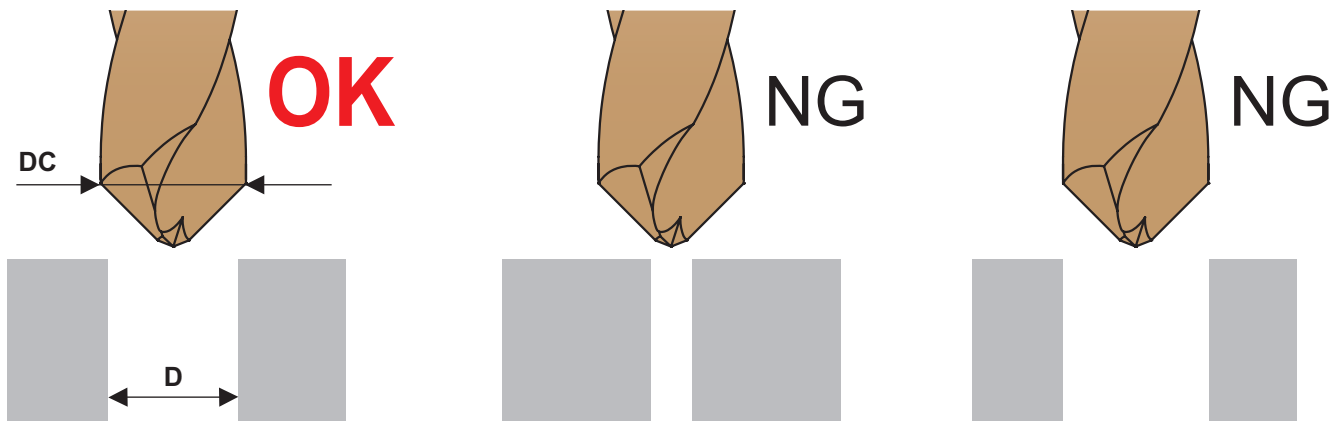
OAL = Overall Length
LF = Functional Length
PL = Point Length

DCON = Connection Diameter
SIG = Point Angle

Drill Diameter Selection

When Chamfering

With respect to guide hole diameter **D**, select the drill diameter (cutting diameter) **DC** to be within the range of $D < DC < 2D$.



Example) If guide hole diameter **D** is 5 mm: Drill diameter **DC** should be greater than 6 mm but less than 10 mm. Select a **DC** of 6 mm, 7 mm, or 8 mm.

If **DC** is equal to or greater than $2D$:

If drill diameter **DC** is too large compared to guide hole diameter **D** (equal to or greater than $2D$), chamfering cannot be performed.

If **DC** is a drill diameter equal to **D**:

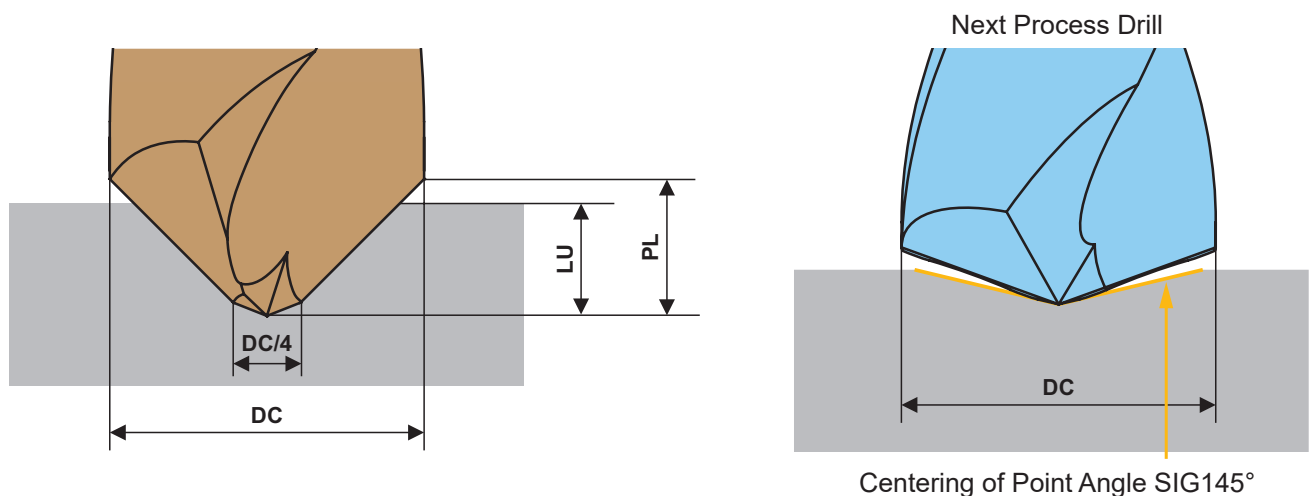
Chamfering cannot be performed if drill diameter **DC** is the same as guide hole diameter **D**.

When Centering

The centering diameter should be less than the drill diameter (processing diameter) **DC** and the usable length **LU** should be referred to as a guideline.

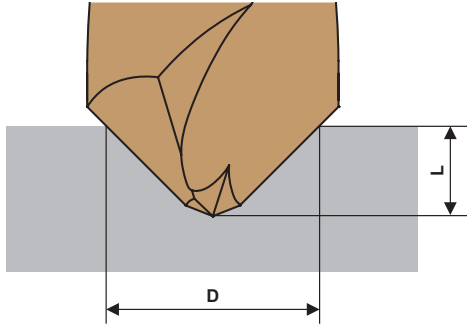
The central area of holes (approx 25% of the full diameter) formed by two step point angles will not have their respective 60° and 90° angles. Chamfering is also not possible in the centre areas.

Select a centering drill with a larger point angle than the final hole drill if is desired to make initial contact with the centre.



DLE

Drilling Depth (L) Chart by Tool Diameter



DC	SIG 90°			
	Min.		Max.	
	D	L	D	L
1.0	0.5	0.18	0.8	0.33
1.5	0.8	0.29	1.3	0.54
2.0	1.0	0.35	1.9	0.80
2.5	1.3	0.47	2.4	1.00
3.0	1.5	0.5	2.8	1.2
4.0	2.0	0.7	3.8	1.6
5.0	2.5	0.9	4.7	2.0
6.0	3.0	1.1	5.7	2.4
7.0	3.5	1.2	6.6	2.8
8.0	4.0	1.4	7.6	3.2
10.0	5.0	1.8	9.7	4.1
12.0	6.0	2.1	11.6	4.9
16.0	8.0	2.8	15.5	6.6

DC	SIG 60°				SIG 120°				SIG 145°			
	Min.		Max.		Min.		Max.		Min.		Max.	
	D	L	D	L	D	L	D	L	D	L	D	L
3.0	1.5	0.8	2.9	2.0	1.5	0.4	2.8	0.8	1.5	0.2	2.5	0.4
4.0	2.0	1.1	3.9	2.7	2.0	0.6	3.8	1.1	2.0	0.3	3.2	0.5
5.0	2.5	1.3	4.9	3.4	2.5	0.7	4.5	1.3	2.5	0.4	4.4	0.7
6.0	3.0	1.6	5.8	4.0	3.0	0.9	5.5	1.6	3.0	0.5	5.1	0.8
7.0	3.5	1.9	6.8	4.7	3.5	1.0	6.6	1.9	3.5	0.6	6.3	1.0
8.0	4.0	2.1	7.8	5.4	4.0	1.2	7.6	2.2	4.0	0.6	7.0	1.1
10.0	5.0	2.7	9.8	6.8	5.0	1.4	9.7	2.8	5.0	0.8	8.9	1.4
12.0	6.0	3.2	11.6	8.1	6.0	1.7	11.4	3.3	6.0	0.9	10.8	1.7

Solid Drills for Centering and Chamfering

Point Angle SIG 60°

Recommended Cutting Conditions

(mm)

Work Material	Mild Steels ($\leq 180\text{HB}$) JIS SS400, S10C etc.		Carbon Steels, Alloy Steels (180—280HB) JIS S45C, SCM440 etc.		Carbon Steels, Alloy Steels (280—350HB) JIS SNCM439 etc.	
DC	n (min ⁻¹)	fr (Min.—Max.) (mm/rev)	n (min ⁻¹)	fr (Min.—Max.) (mm/rev)	n (min ⁻¹)	fr (Min.—Max.) (mm/rev)
3	7900	0.05(0.03—0.07)	6800	0.05(0.03—0.07)	6300	0.04(0.02—0.06)
4	5900	0.05(0.03—0.07)	5100	0.05(0.03—0.07)	4700	0.04(0.02—0.06)
5	5000	0.06(0.04—0.08)	4400	0.06(0.04—0.08)	4100	0.05(0.03—0.07)
6	4200	0.06(0.04—0.08)	3700	0.06(0.04—0.08)	3400	0.05(0.03—0.07)
7	3600	0.07(0.04—0.09)	3100	0.07(0.04—0.09)	2900	0.05(0.03—0.07)
8	3100	0.07(0.04—0.09)	2700	0.07(0.04—0.09)	2500	0.05(0.03—0.07)
10	2700	0.08(0.04—0.10)	2300	0.08(0.04—0.10)	2200	0.06(0.03—0.08)
12	2200	0.08(0.04—0.10)	1900	0.08(0.04—0.10)	1800	0.06(0.03—0.08)

Work Material	Austenitic Stainless Steels ($\leq 200\text{HB}$) JIS SUS304, SUS316 etc.		Gray Cast Irons ($\leq 350\text{MPa}$) JIS FC300 etc.		Ductile Cast Irons ($\leq 450\text{MPa}$) JIS FCD450 etc.	
DC	n (min ⁻¹)	fr (Min.—Max.) (mm/rev)	n (min ⁻¹)	fr (Min.—Max.) (mm/rev)	n (min ⁻¹)	fr (Min.—Max.) (mm/rev)
3	1500	0.03(0.01—0.05)	7900	0.05(0.03—0.07)	5800	0.05(0.03—0.07)
4	1100	0.03(0.01—0.05)	5900	0.05(0.03—0.07)	4300	0.05(0.03—0.07)
5	1200	0.04(0.02—0.06)	5000	0.06(0.04—0.08)	3800	0.06(0.04—0.08)
6	1000	0.04(0.02—0.06)	4200	0.06(0.04—0.08)	3100	0.06(0.04—0.08)
7	900	0.04(0.02—0.06)	3600	0.07(0.04—0.09)	2700	0.06(0.04—0.08)
8	790	0.04(0.02—0.06)	3100	0.07(0.04—0.09)	2300	0.06(0.04—0.08)
10	630	0.04(0.02—0.06)	2700	0.08(0.04—0.10)	1900	0.07(0.04—0.09)
12	530	0.04(0.02—0.06)	2200	0.08(0.04—0.10)	1500	0.07(0.04—0.09)

Note 1) Use a tool larger (DC) than the centre hole required but less than 2 x DC.

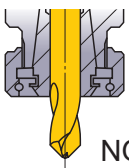
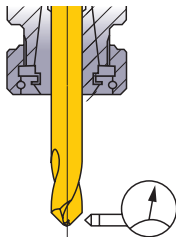
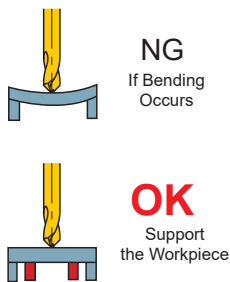
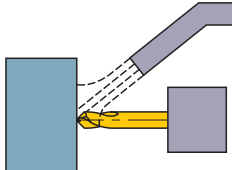
Note 2) When centering into curved or inclined surfaces, please reduce the feed rate.

Note 3) When V-grooving and chamfering, please reduce cutting conditions.

Note 4) When chatter vibration or abnormal noise is generated, please shorten the dwell time or reduce the revolutions.

Note 5) When centering, please do not exceed the LU (usable length).

Operational Guidance

Drill Holding	Drill Length	Installation Tolerance	Thin Workpiece	Coolant Method
 Collet chuck holds the drill securely.	 Do not clamp on the flutes.	 Run-out $\leq 0.03\text{mm}$	 NG If Bending Occurs OK Support the Workpiece	 Coolant positions, at the end at the centre are ideal.

Point Angle SIG 90°, 120° and 145°

Recommended Cutting Conditions

(mm)

Work Material	Mild Steels ($\leq 180\text{HB}$)		Carbon Steels, Alloy Steels (180—280HB)		Carbon Steels, Alloy Steels (280—350HB)	
	JIS SS400, S10C etc.		JIS S45C, SCM440 etc.		JIS SNCM439 etc.	
DC	n (min ⁻¹)	fr (Min.—Max.) (mm/rev)	n (min ⁻¹)	fr (Min.—Max.) (mm/rev)	n (min ⁻¹)	fr (Min.—Max.) (mm/rev)
1.0	9500	0.02 (0.01—0.03)	6300	0.02 (0.01—0.03)	4700	0.02 (0.01—0.03)
1.5	9500	0.02 (0.01—0.03)	7400	0.02 (0.01—0.03)	6300	0.02 (0.01—0.03)
2.0	9500	0.04 (0.03—0.05)	7900	0.04 (0.03—0.05)	7100	0.04 (0.03—0.05)
2.5	9500	0.04 (0.03—0.05)	8200	0.04 (0.03—0.05)	7600	0.04 (0.03—0.05)
3.0	7900	0.06 (0.04—0.08)	6800	0.06 (0.04—0.08)	6300	0.05 (0.03—0.07)
4.0	5900	0.06 (0.04—0.08)	5100	0.06 (0.04—0.08)	4700	0.05 (0.03—0.07)
5.0	5000	0.07 (0.05—0.09)	4400	0.07 (0.05—0.09)	4100	0.06 (0.04—0.08)
6.0	4200	0.07 (0.05—0.09)	3700	0.07 (0.05—0.09)	3400	0.06 (0.04—0.08)
7.0	3600	0.08 (0.05—0.10)	3100	0.08 (0.05—0.10)	2900	0.06 (0.04—0.08)
8.0	3100	0.08 (0.05—0.10)	2700	0.08 (0.05—0.10)	2500	0.06 (0.04—0.08)
10.0	2700	0.09 (0.05—0.11)	2300	0.09 (0.05—0.11)	2200	0.07 (0.04—0.09)
12.0	2200	0.09 (0.05—0.11)	1900	0.09 (0.05—0.11)	1800	0.07 (0.04—0.09)
16.0	1700	0.12 (0.10—0.14)	1500	0.12 (0.10—0.14)	1400	0.08 (0.06—0.10)

Work Material	Austenitic Stainless Steels ($\leq 200\text{HB}$)		Gray Cast Irons ($\leq 350\text{MPa}$)		Ductile Cast Irons ($\leq 450\text{MPa}$)	
	JIS SUS304, SUS316 etc.		JIS FC300 etc.		JIS FCD450 etc.	
DC	n (min ⁻¹)	fr (Min.—Max.) (mm/rev)	n (min ⁻¹)	fr (Min.—Max.) (mm/rev)	n (min ⁻¹)	fr (Min.—Max.) (mm/rev)
1.0	6300	0.01 (0.005—0.015)	9500	0.02 (0.01—0.03)	3100	0.02 (0.01—0.03)
1.5	4200	0.01 (0.005—0.015)	9500	0.02 (0.01—0.03)	5300	0.02 (0.01—0.03)
2.0	3100	0.04 (0.03—0.05)	9500	0.04 (0.03—0.05)	6300	0.04 (0.03—0.05)
2.5	2500	0.04 (0.03—0.05)	9500	0.04 (0.03—0.05)	7000	0.04 (0.03—0.05)
3.0	2100	0.04 (0.02—0.06)	7900	0.06 (0.04—0.08)	5800	0.06 (0.04—0.08)
4.0	1600	0.04 (0.02—0.06)	5900	0.06 (0.04—0.08)	4300	0.06 (0.04—0.08)
5.0	1200	0.06 (0.04—0.08)	5000	0.07 (0.05—0.09)	3800	0.07 (0.05—0.09)
6.0	1000	0.06 (0.04—0.08)	4200	0.07 (0.05—0.09)	3100	0.07 (0.05—0.09)
7.0	900	0.06 (0.04—0.08)	3600	0.08 (0.05—0.10)	2700	0.07 (0.05—0.09)
8.0	790	0.06 (0.04—0.08)	3100	0.08 (0.05—0.10)	2300	0.07 (0.05—0.09)
10.0	630	0.06 (0.04—0.08)	2700	0.09 (0.05—0.11)	1900	0.08 (0.05—0.10)
12.0	530	0.06 (0.04—0.08)	2200	0.09 (0.05—0.11)	1500	0.08 (0.05—0.10)
16.0	390	0.08 (0.06—0.10)	1700	0.12 (0.10—0.14)	1100	0.11 (0.09—0.13)

Note 1) Use a tool larger (DC) than the centre hole required but less than 2 x DC.

Note 2) When centering into curved or inclined surfaces, please reduce the feed rate.

Note 3) When V-grooving and chamfering, please reduce cutting conditions.

Note 4) When chatter vibration or abnormal noise is generated, please shorten the dwell time or reduce the revolutions.

Note 5) When centering, please do not exceed the LU (usable length).

Solid Drills for Centering and Chamfering

GKCD NEW

Leading Drill Series, Cobalt HSS, Point Angle 60° 90° 120°



60° 90° DC>12
120°

P

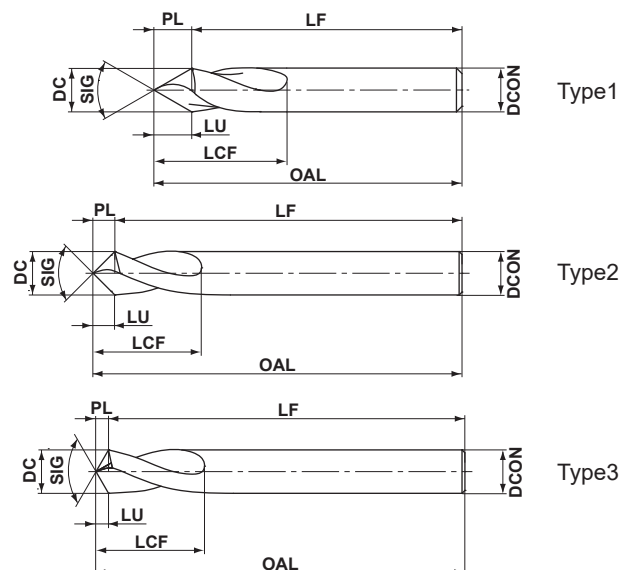
M

K

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S

H



(mm)

DC	SIG	Stock	Order Number	LU	LCF	OAL	LF	PL	KAPR	DCON	Fig.
3.0	60°	●	GKCDD030P060	2.4	10	50	47.4	2.6	60°	3	1
4.0	60°	●	GKCDD040P060	3.3	12	52	48.5	3.4	60°	4	1
5.0	60°	●	GKCDD050P060	4.1	15	60	55.6	4.3	60°	5	1
6.0	60°	●	GKCDD060P060	4.9	20	66	60.8	5.2	60°	6	1
8.0	60°	●	GKCDD080P060	6.6	25	79	72.0	6.9	60°	8	1
10.0	60°	●	GKCDD100P060	8.3	25	89	80.3	8.6	60°	10	1
12.0	60°	●	GKCDD120P060	9.9	30	102	91.6	10.4	60°	12	1
3.0	90°	●	GKCDD030P090	1.4	10	50	48.5	1.5	45°	3	2
4.0	90°	●	GKCDD040P090	1.9	12	52	50.0	2.0	45°	4	2
5.0	90°	●	GKCDD050P090	2.4	15	60	57.5	2.5	45°	5	2
6.0	90°	●	GKCDD060P090	2.8	20	66	63.0	3.0	45°	6	2
8.0	90°	●	GKCDD080P090	3.8	25	79	75.0	4.0	45°	8	2
10.0	90°	●	GKCDD100P090	4.8	25	89	84.0	5.0	45°	10	2
12.0	90°	●	GKCDD120P090	5.7	30	102	96.0	6.0	45°	12	2
16.0	90°	●	GKCDD160P090	7.7	35	115	107.0	8.0	45°	16	2
20.0	90°	●	GKCDD200P090	9.6	40	131	121.0	10.0	45°	20	2
3.0	120°	●	GKCDD030P120	0.8	10	50	49.1	0.8	30°	3	3
4.0	120°	●	GKCDD040P120	1.1	12	52	50.8	1.1	30°	4	3
6.0	120°	●	GKCDD060P120	1.6	20	66	64.2	1.7	30°	6	3
8.0	120°	●	GKCDD080P120	2.2	25	79	76.7	2.3	30°	8	3
10.0	120°	●	GKCDD100P120	2.7	25	89	86.2	2.8	30°	10	3
12.0	120°	●	GKCDD120P120	3.3	30	102	98.6	3.4	30°	12	3

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

OAL = Overall Length
LF = Functional Length
PL = Point Length

DCON = Connection Diameter
SIG = Point Angle

● : Inventory maintained in Japan.

Recommended Cutting Conditions

(mm)

Work Material	Mild Steels ($\leq 180\text{HB}$)		Carbon Steels, Alloy Steels (180—280HB)		Carbon Steels, Alloy Steels (280—350HB)	
	JIS SS400, S10C etc.		JIS S45C, SCM440 etc.		JIS SNCM439 etc.	
DC	n (min ⁻¹)	fr (mm/rev)	n (min ⁻¹)	fr (mm/rev)	n (min ⁻¹)	fr (mm/rev)
3.0	3800	0.06	2400	0.06	1200	0.04
4.0	2900	0.08	1800	0.08	910	0.05
5.0	2300	0.10	1400	0.10	730	0.05
6.0	1900	0.10	1200	0.10	610	0.06
8.0	1400	0.12	900	0.12	450	0.08
10.0	1100	0.15	710	0.15	360	0.10
12.0	950	0.15	600	0.15	300	0.12
16.0	720	0.20	450	0.20	220	0.16
20.0	560	0.25	360	0.20	180	0.20

Work Material	Austenitic Stainless Steels ($\leq 200\text{HB}$)		Gray Cast Irons ($\leq 350\text{MPa}$)		Ductile Cast Irons ($\leq 450\text{MPa}$)	
	JIS SUS304, SUS316 etc.		JIS FC300 etc.		JIS FCD450 etc.	
DC	n (min ⁻¹)	fr (mm/rev)	n (min ⁻¹)	fr (mm/rev)	n (min ⁻¹)	fr (mm/rev)
3.0	1100	0.06	3800	0.06	2600	0.06
4.0	800	0.08	2900	0.08	1900	0.08
5.0	640	0.10	2300	0.10	1500	0.08
6.0	530	0.10	1900	0.10	1300	0.08
8.0	400	0.12	1400	0.12	990	0.10
10.0	320	0.15	1100	0.15	790	0.13
12.0	270	0.15	950	0.15	660	0.13
16.0	200	0.20	720	0.20	490	0.18
20.0	160	0.25	560	0.25	390	0.22

Note 1) When chamfering a circumference of a guide hole, make sure that the tool diameter(DC) is $D < DC < 2D$.

Note 2) When centering into curved or inclined surfaces, please reduce the feed rate.

Note 3) When chamfering, please reduce cutting conditions.

Note 4) When chatter vibration or abnormal noise is generated, please shorten the dwell time or reduce the revolutions.

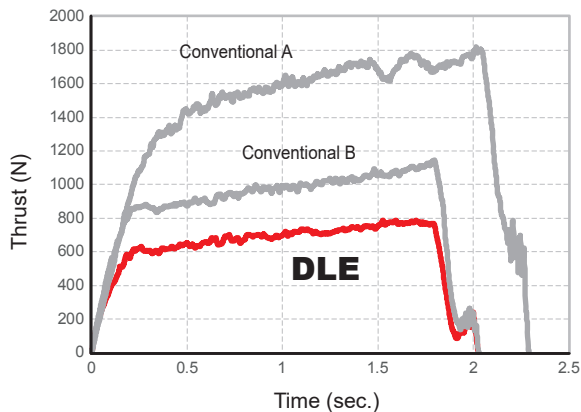
Note 5) When centering, please do not exceed the LU (usable length).

Note 6) When chamfering with a large diameter tool, please select cutting speed according to actual cutting diameter.

Cutting Performance

Comparison of Cutting Performance during Centering

Ideal for low power applications.



*Differences along the time axis are a result of differences in processing depth.

<Cutting Conditions>

Work Material : JIS S45C

Drill : DLE1200S120P090 ø12

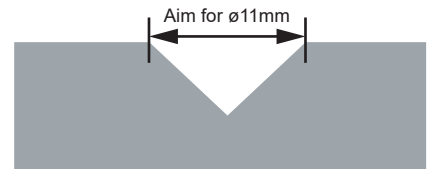
Cutting Speed : $v_c = 60 \text{ m/min}$

Feed per Rev. : $f_r = 0.06 \text{ mm/rev}$

Cutting Mode : Wet Cutting

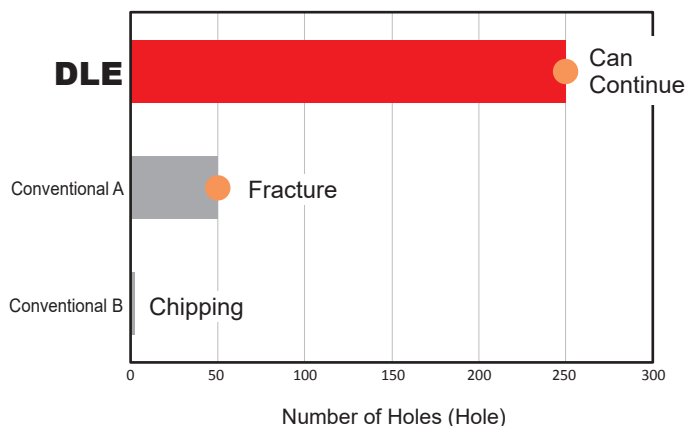
External Coolant
(Chlorine Free Emulsion)

Machine : Vertical MC



Comparison of Tool Life when Machining JIS SUS304

The two step point angles together with the negative cutting edge and thinned point provide outstanding durability with no abnormal wear.



<Cutting Conditions>

Work Material : JIS SUS304

Drill : DLE0600S060P090

Cutting Speed : $v_c = 25 \text{ m/min}$

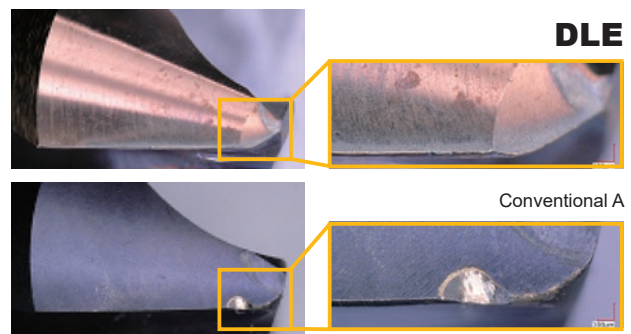
Feed per Rev. : $f_r = 0.06 \text{ mm/rev}$

Hole Depth : Aim for hole dia. ø5mm

Cutting Mode : Wet Cutting

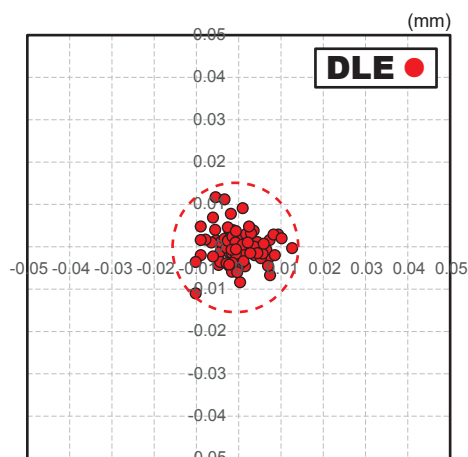
External Coolant
(Water-insoluble Coolants)

Machine : Small Automatic Lathes



Precise Centre Hole Positioning in JIS SUS420J2

Machining stainless steels is likely to create abnormal damage caused by a built up edge. DLE displayed a longer tool life compared to conventional products.



<Cutting Conditions>

Work Material : JIS SUS420J2

Drill : DLE0600S060P090

Cutting Speed : $v_c = 15 \text{ m/min}$

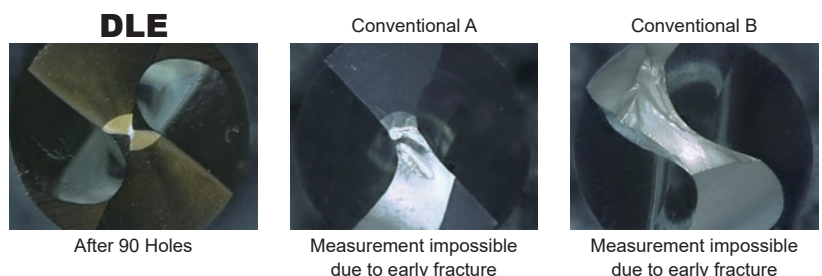
Feed per Rev. : $f_r = 0.04 \text{ mm/rev}$

Hole Depth : Aim for hole dia. ø5.5mm

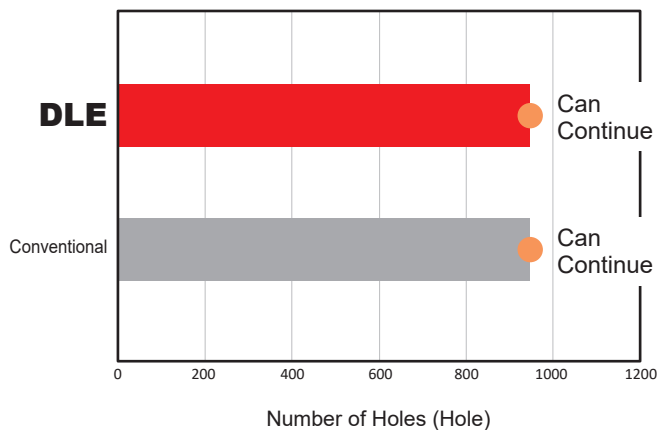
Cutting Mode : Wet Cutting

External Coolant
(Chlorine Free Emulsion)

Machine : Vertical MC



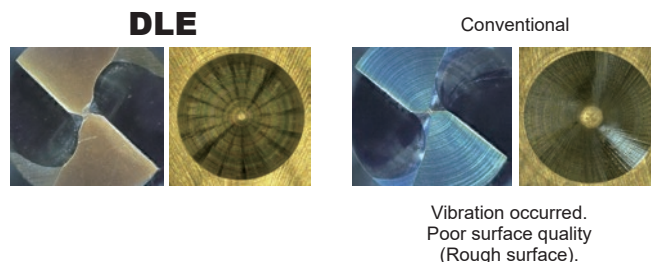
Comparison of Tool Life when Machining JIS SUS304 : Point Angle 120°



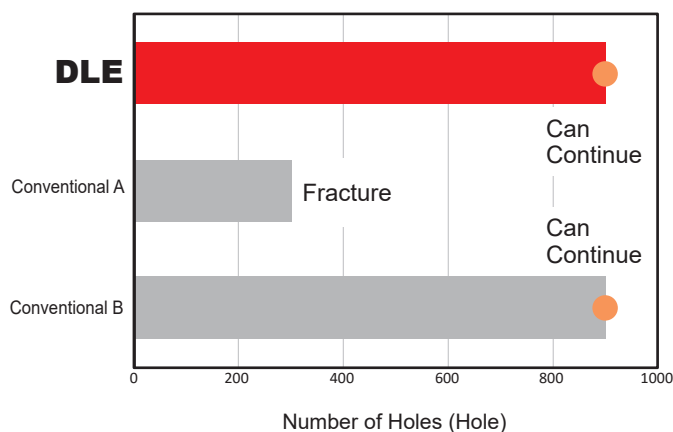
<Cutting Conditions>

Work Material : JIS SUS304
 Drill : DLE0600S060P120
 Cutting Speed : $vc=20$ m/min
 Feed per Rev. : $fr=0.06$ mm/rev

Hole Depth : Aim for hole dia. $\phi 5.5$ mm
 Cutting Mode : Wet Cutting
 External Coolant
 (Water-insoluble Coolants)
 Machine : Vertical MC



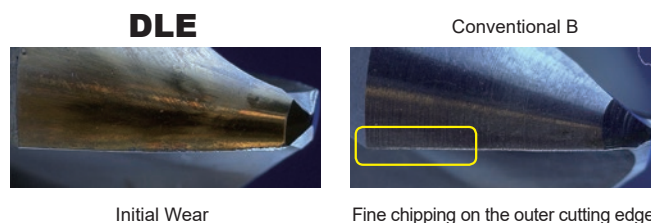
Comparison of Tool Life when Machining JIS SUS304 : Point Angle 60°



<Cutting Conditions>

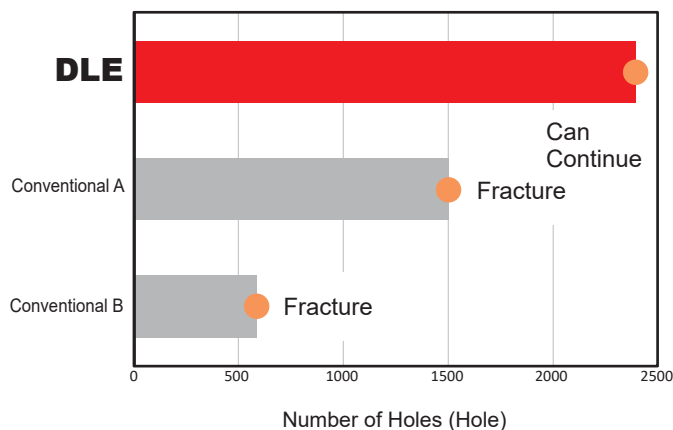
Work Material : JIS SUS304
 Drill : DLE0600S060P060
 Cutting Speed : $vc=15$ m/min
 Feed per Rev. : $fr=0.02$ mm/rev

Hole Depth : Aim for hole dia. $\phi 5.5$ mm
 Cutting Mode : Wet Cutting
 External Coolant
 (Chlorine Free Emulsion)
 Machine : Vertical MC



Comparison of Tool Life when Machining JIS SUS304 : Point Angle 90° (small-diameter $\phi 2$ mm)

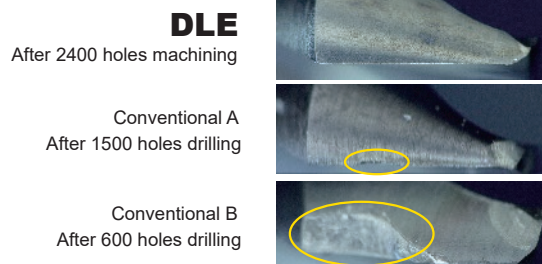
When machining stainless steel, DLE drills gave longer tool life due to excellent heat and boundary wear resistance.



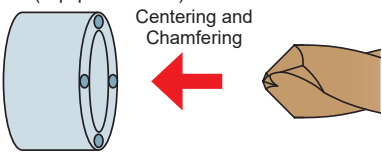
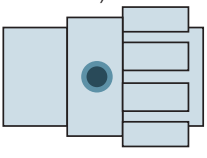
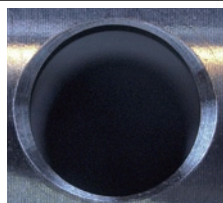
<Cutting Conditions>

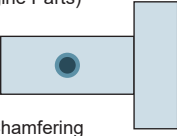
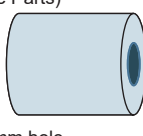
Work Material : JIS SUS304
 Drill : DLE0200S030P090
 Cutting Speed : $vc=30$ m/min
 Feed per Rev. : $fr=0.045$ mm/rev

Cutting Mode : Wet Cutting
 External Coolant
 (Water-soluble Coolants)
 Machine : Vertical MC



Application Example

Drill		DLE0400S040P090	DLE0600S060P090
Cutting Conditions	Workpiece	JIS S10C (Equipment Parts) 	JIS SUS304 (Machine Parts) 
	Cutting Speed vc (m/min)	30	25
	Feed per Rev. fr (mm/rev)	0.045	0.05
	Guide Hole Dia. (mm)	ø3	ø5
Cutting Mode		Wet Cutting External Coolant (Chlorine Free Emulsion)	Wet Cutting External Coolant (Water-insoluble)
Machine		NC Lathe, With Driven Tooling	CNC Automatic Lathe
Results		 Burrs are suppressed Compared to conventional products, DLE gave a longer than expected tool life and created less burrs.	 More than 200 holes Good surface finishes and no tool damage Conventional products tended to chip, DLE was more stable and machined 200 holes with no cutting edge damage.

Drill		DLE0300S030P090	DLE0200S030P090
Cutting Conditions	Workpiece	JIS SUS303 (Engine Parts)  Centering and Chamfering	JIS SUS303 (Engine Parts)  Centering of ø0.6 mm hole
	Cutting Speed vc (m/min)	25	38
	Feed per Rev. fr (mm/rev)	0.04	0.02
	Guide Hole Dia. (mm)	ø2.0	ø0.6
Cutting Mode		Wet Cutting External Coolant (Water-insoluble) Curved Surface	Wet Cutting External Coolant (Water-insoluble)
Machine		CNC Automatic Lathe	CNC Automatic Lathe
Results		DLE  After 60 Holes  After 1 Hole While the conventional product generated burrs after drilling 1 hole, DLE achieved good surface quality with no sudden fractures even after drilling 60 holes.	Comparison of Rake Faces after centering DLE  60000 holes Conventional  30000 holes DLE had a tool life twice as long as the conventional product, and was able to carry out cutting with no fractures.

The details above are customer samples and therefore can differ from the recommended conditions.

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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