

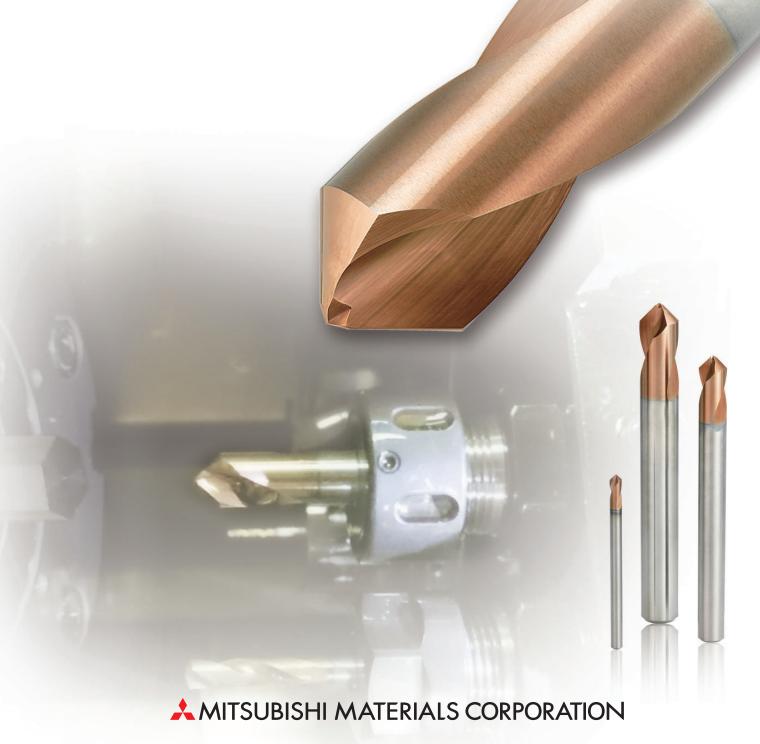
Solid Carbide Drills for Centering and Chamfering

Leading Drill Series DLE





Sharpness and Excellent Fracture Resistance can Achieve Stable Processing for Stainless Steels

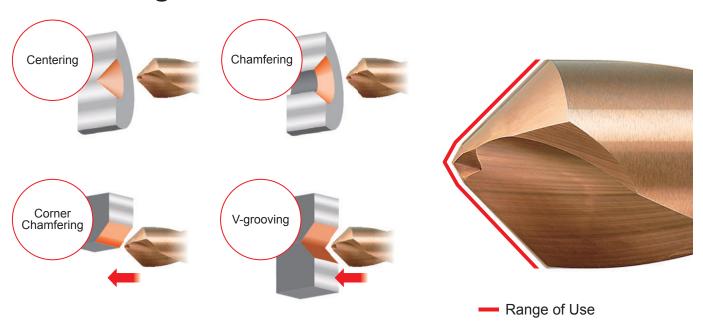


Solid Carbide Drills for Centering and Chamfering

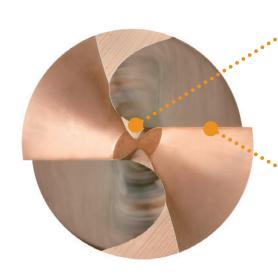
Leading Drill Series DLE



Completes strict standards for centering and chamfering.



Features



Thinning Geometry

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

Sharp Cutting Edge and High Fracture Resistance

A cutting edge shape with sharp and high fracture resistance, stable cutting and burr prevention are possible.



DLE



Conventional



Two-step Point Angles

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

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

DLE



High Strength of Center

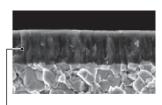
Conventional



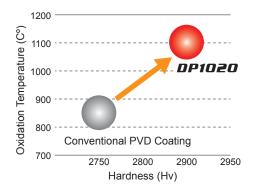
Fractures of Center

Coated Grade **DP1020**

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



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



Extensive Support for CNC Automatic Lathes

Diverse lineup of shanks compatible with ER collets.

DCON(Connection Diameter)
DCON

5mm=ER8

7mm=ER11

Solid Carbide Drills for Centering and Chamfering





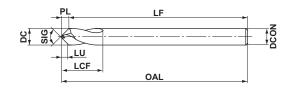












	DCON=3	3 < DCON≤6	6 <dcon≤10< th=""><th>10<dcon≤16< th=""></dcon≤16<></th></dcon≤10<>	10 <dcon≤16< th=""></dcon≤16<>
h71	0	0	0	0
	-0.010	-0.012	-0.015	-0.018

	External Coolant (m							(mm)	
DC	SIG	DP1020	Order Number	LU	LCF	OAL	LF	PL	DCON
3	90°	•	DLE0300S030P090	1.2	9	45	43.7	1.3	3
4	90°	•	DLE0400S040P090	1.6	12	50	48.3	1.7	4
5	90°	•	DLE0500S050P090	2.0	14	60	57.9	2.1	5
6	90°	•	DLE0600S060P090	2.4	15	66	63.4	2.6	6
7	90°	•	DLE0700S070P090	2.8	18	74	71.0	3.0	7
8	90°	•	DLE0800S080P090	3.2	20	74	70.6	3.4	8
10	90°	•	DLE1000S100P090	4.1	24	84	79.7	4.3	10
12	90°	•	DLE1200S120P090	4.9	28	95	89.9	5.1	12
16	90°	•	DLE1600S160P090	6.6	35	113	106.2	6.8	16

(Note 1) In the region of roughly **DC**/4, which is the region of the two-step point angles, the central area will not have a 90° hole bottom. Chamfering will also not be possible in this region.

(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 OAL = Overall Length **DCON** = Connection Diameter LU

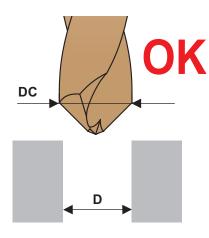
= Usable Length LF = Functional Length SIG = Point Angle

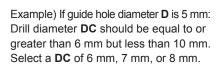
LCF = Length Chip Flute PL = Point Length

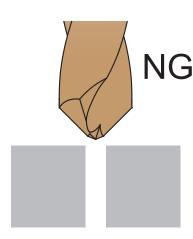
Drill Diameter Selection

When Chamfering

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

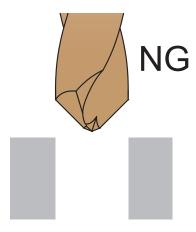






If DC is equal to or greater than 2D:

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



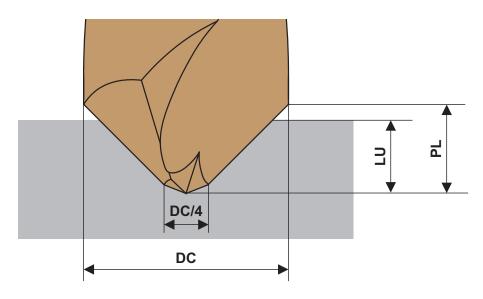
If DC is a drill diameter equal to D:

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

When Centering

The tool cannot be used for processing if the centering diameter has the same guide hole diameter as drill diameter **DC**. Refer to the usable length **LU** (page 3) as a guideline.

In the region of roughly DC/4, which is the region of the two-step point angles, the central area will not have a 90° hole bottom.

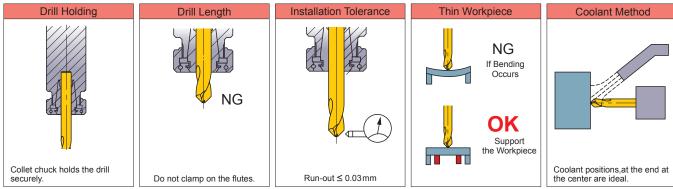


Recommended Cutting Conditions (mm)							
	Mild Steels (≤180HB)		Carbon Steels, Alloy Steels (180-280HB)		Carbon Steels, Alloy Steels (280-350HB)		
Work Material	AISI 1010 etc.		AISI 1045, 4140 etc.		AISI 4340 etc.		
DC	n (min ⁻¹)	fr (Min.—Max.) (mm/rev)	n (min ⁻¹)	fr (Min.—Max.) (mm/rev)	n (min ⁻¹)	fr (Min.—Max.) (mm/rev)	
3	7900	0.06 (0.04-0.08)	6800	0.06 (0.04-0.08)	6300	0.05 (0.03-0.07)	
4	5900	0.06 (0.04-0.08)	5100	0.06 (0.04-0.08)	4700	0.05 (0.03-0.07)	
5	5000	0.07 (0.05-0.09)	4400	0.07 (0.05-0.09)	4100	0.06 (0.04-0.08)	
6	4200	0.07 (0.05-0.09)	3700	0.07 (0.05-0.09)	3400	0.06 (0.04-0.08)	
7	3600	0.08 (0.05-0.10)	3100	0.08 (0.05-0.10)	2900	0.06 (0.04-0.08)	
8	3100	0.08 (0.05-0.10)	2700	0.08 (0.05-0.10)	2500	0.06 (0.04-0.08)	
10	2700	0.09 (0.05-0.11)	2300	0.09 (0.05-0.11)	2200	0.07 (0.04-0.09)	
12	2200	0.09 (0.05-0.11)	1900	0.09 (0.05-0.11)	1800	0.07 (0.04-0.09)	
16	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 (≤200HB)		Gray Cast Irons (≤350MPa) AISI No45B etc.		Ductile Cast Irons (≤450MPa)	
	AISI 304, 316 6	AISI 304, 316 etc.).	AISI 60-40-18 6	etc.
DC	n (min ⁻¹) fr (MinMax.) (mm/rev) n (MinMax.) (min ⁻¹) (min ⁻¹) (mm/rev)		(Min.—Max.)	n (min ⁻¹)	fr (Min. — Max.) (mm/rev)	
3	1500	0.04 (0.02-0.06)	7900	0.06 (0.04-0.08)	5800	0.06 (0.04-0.08)
4	1100	0.04 (0.02-0.06)	5900	0.06 (0.04-0.08)	4300	0.06 (0.04-0.08)
5	1200	0.06 (0.04-0.08)	5000	0.07 (0.05-0.09)	3800	0.07 (0.05-0.09)
6	1000	0.06 (0.04-0.08)	4200	0.07 (0.05-0.09)	3100	0.07 (0.05-0.09)
7	900	0.06 (0.04-0.08)	3600	0.08 (0.05-0.10)	2700	0.07 (0.05-0.09)
8	790	0.06 (0.04-0.08)	3100	0.08 (0.05-0.10)	2300	0.07 (0.05-0.09)
10	630	0.06 (0.04-0.08)	2700	0.09 (0.05-0.11)	1900	0.08 (0.05-0.10)
12	530	0.06 (0.04-0.08)	2200	0.09 (0.05-0.11)	1500	0.08 (0.05-0.10)
16	390	0.08 (0.06-0.10)	1700	0.12 (0.10-0.14)	1100	0.11 (0.09-0.13)

(Note 1) When chamfering a circumference of a guide hole, make sure that the tool diameter(DC) is D < DC < 2D. (Note 2) When V-grooving and chamfering, please reduce cutting conditions.

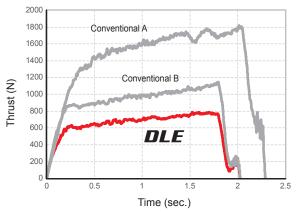
Operational Guidance



Cutting Performance

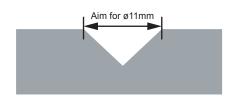
Comparison of Cutting Performance during Centering

Ideal for processing at low power, when compared to conventional products.



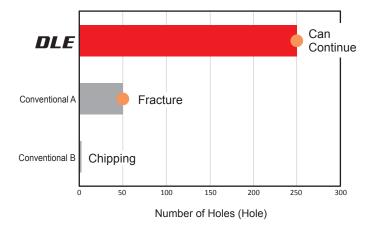
<Cutting Conditions> Work Material: AISI 1045 Cutting Mode: Wet Cutting : DLE1200S120P090 ø12 **External Coolant** Cutting Speed: vc = 60 m/min (Chlorine Free Emulsion) Feed per Rev. : fr = 0.06 mm/rev

Machine : Vertical MC

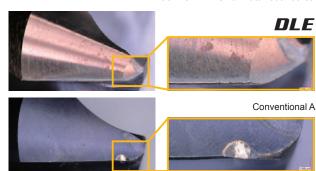


Comparison of Centering Life when Processing AISI 304

The two-step point angles, together with the negative cutting edge shape and cutting edge treatment of the thinning pocket, provide outstanding durability with no abnormal damage.

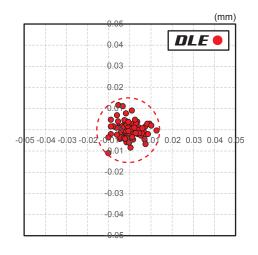


<Cutting Conditions> Work Material: AISI 304 Hole Depth : Aim for hole dia. ø5 mm : DLE0600S060P090 Cutting Mode: Wet Cutting Cutting Speed: vc=25 m/min External Coolant Feed per Rev. : fr=0.06 mm/rev (Water-insoluble Coolants) Machine : Small Automatic Lathes



Centering Hole Position Precision for JIS SUS420J2

Stainless steels are likely to experience abnormal damage from build-up edge. Compared to conventional products which often suffered early fractures, the DLE has a long tool life.



<Cutting Conditions> Work Material: JIS SUS420J2 : DLE0600S060P090 Drill Cutting Speed: vc=15 m/min

Feed per Rev. : fr = 0.04 mm/rev

Hole Depth : Aim for hole dia. ø5.5mm Cutting Mode: Wet Cutting

External Coolant (Chlorine Free Emulsion)

Machine · Vertical MC



Conventional A Measurement impossible

Conventional B

Measurement impossible due to early fracture due to early fracture

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

Application Example

Drill	DLE0400S040P090	DLE0600S060P090		
Workpiece	AISI 1010 (Equipment Parts) Centerring and Chamfering	AISI 304 (Machine Parts) Centerring and Chamfering		
Cutting Speed vc(m/min) Feed per Rev. fr(mm/rev) Guide Hole Dia. (mm)	30	25		
Feed per Rev. fr (mm/rev)	0.045	0.05		
<u> </u>	ø3	ø5		
Cutting Mode Machine	Wet Cutting Extarnal Coolant (Chlorine Free Emulsion) NC Lathe, Tool Rotation	Wet Cutting Extarnal Coolant (Water-insoluble) CNC Automatic Lathe		
Results	Burrs are suppressed Compared to conventional products, the DLE has smaller burrs and a longer expected life.	More than 200 holes Good surface finishes and no tool damage While conventional products often caused chipping to occur, the DLE is more stable and has been used to complete drilling of 200 holes with no damage on the cutting edge.		

Drill		DLE0300S030P090				
	Workpiece	AISI 303 (Engine Parts) Centerring and Chamfering				
Cutting Conditions	Cutting Speed vc(m/min)	25				
Conc	Feed per Rev. fr (mm/rev)	0.04				
Cuffin	Guide Hole Dia. (mm)	ø2.0				
	Cutting Mode	Wet Cutting Extarnal Coolant (Water-insoluble) Curved Surface				
	Machine	CNC Automatic Lathe				
Results		Conventional While conventional products generated burns during the first hole drilling, the DLE achieved 60 hole drilling without notable damage and burn generation, and provides outstanding surface quality.				

The above application examples are customer's applications, so it can be different from the recommended conditions.

After 60 Holes

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.

After 1 Hole

MITSUBISHI MATERIALS CORPORATION

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(Tools specifications subject to change without notice.)