DLE

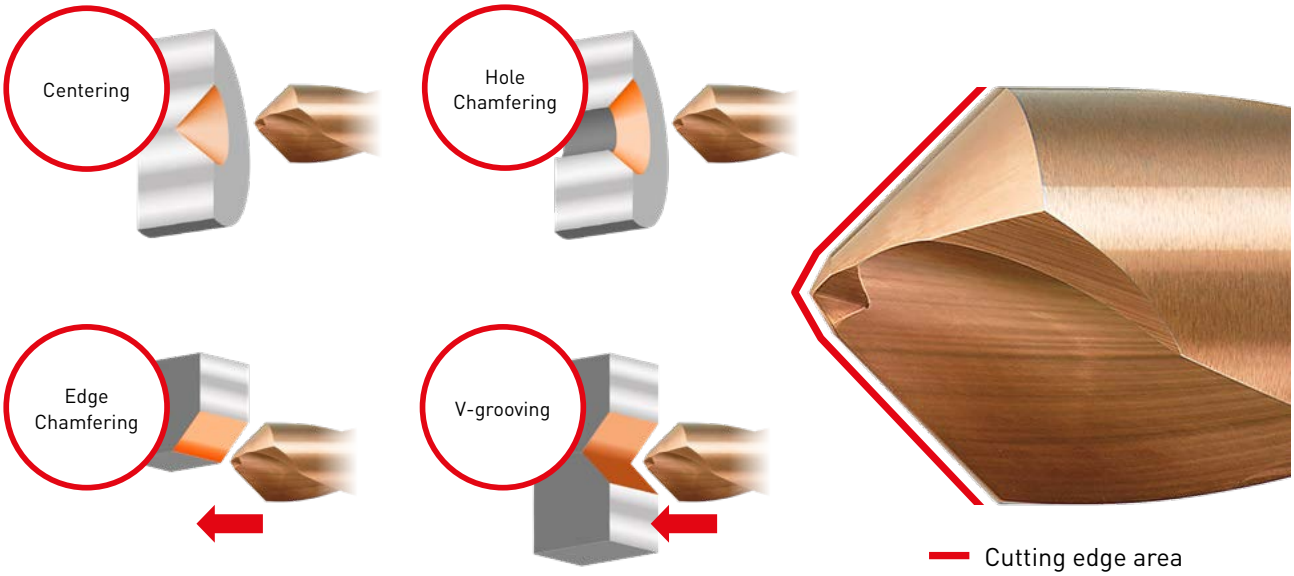
MULTI-FUNCTIONAL SPOT DRILL FOR CENTERING AND CHAMFERING

DIAEDGE

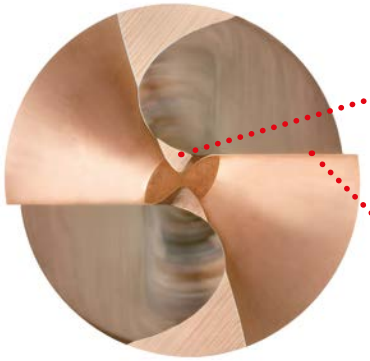
MITSUBISHI MATERIALS

DLE

MULTI-FUNCTIONAL - FOR CENTERING AND CHAMFERING



FEATURES



Point angles 60°, 90°

Point angles 120°, 145°

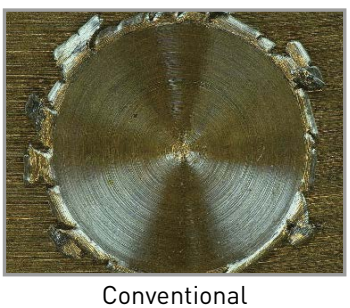
THINNED POINT GEOMETRY

The thinned point geometry promotes smooth chip discharge and provides excellent positional accuracy. The negative geometry of the drill point also offers high cutting edge strength.

SHARP CUTTING EDGE AND HIGH FRACTURE RESISTANCE

A cutting edge with both sharpness and high fracture resistance provides stable machining and prevents burrs.

DLE



Conventional

DLE

EXCELLENT SHARPNESS AND FRACTURE RESISTANCE

DOUBLE ANGLE POINT (60°, 90°)

The double point angles ensure strength at the centre to prevent sudden fracturing.

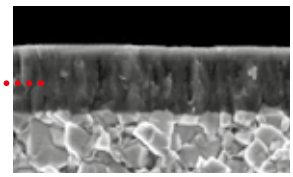
(The central part of the bottom of the hole will not be 60° / 90°)

SINGLE ANGLE POINT (120°, 145°)

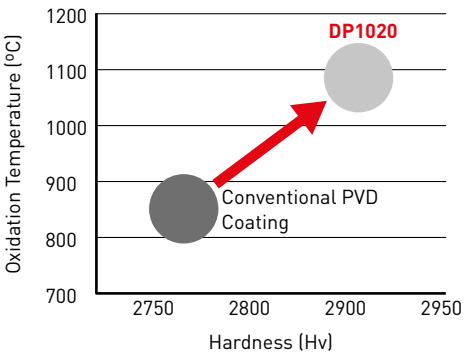
Using 145° point angle drills will improve the accuracy of the hole drilled in the next process.

COATED GRADE DP1020

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



With accumulated AlTiCrN based PVD coating



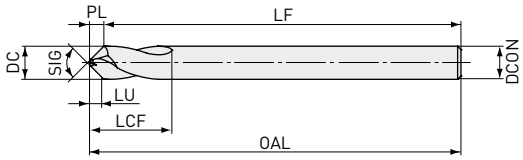
FOR AUTOMATIC LATHES

Shanks compatible with ER collets.

DLE

MULTI-FUNCTIONAL DRILL SERIES

P M K



h7	DCON=3	3<DCON<6	6<DCON<10	10<DCON<16
	0	0	0	0
	−0.010	−0.012	−0.015	−0.018

	Order Number	DP1020	DC	SIG	LU	LCF	OAL	LF	PL	DCON
NEW	DLE0300S030P060	●	3	60°	2	9	45	42.9	2.1	3
NEW	DLE0400S040P060	●	4		2.7	12	50	47.2	2.8	4
NEW	DLE0500S050P060	★	5		3.4	14	60	56.5	3.5	5
NEW	DLE0600S060P060	●	6		4	15	66	61.8	4.2	6
NEW	DLE0700S070P060	★	7		4.7	18	74	69.1	4.9	7
NEW	DLE0800S080P060	●	8		5.4	20	74	68.4	5.6	8
NEW	DLE1000S100P060	●	10		6.8	24	84	77	7	10
NEW	DLE1200S120P060	★	12		8.2	28	95	86.6	8.4	12
	DLE0300S030P090	●	3	90°	1.2	9	45	43.7	1.3	3
	DLE0400S040P090	●	4		1.6	12	50	48.3	1.7	4
	DLE0500S050P090	★	5		2.0	14	60	57.9	2.1	5
	DLE0600S060P090	●	6		2.4	15	66	63.4	2.6	6
	DLE0700S070P090	★	7		2.8	18	74	71.0	3.0	7
	DLE0800S080P090	●	8		3.2	20	74	70.6	3.4	8
	DLE1000S100P090	●	10		4.1	24	84	79.7	4.3	10
	DLE1200S120P090	★	12		4.9	28	95	89.9	5.1	12
	DLE1600S160P090	★	16		6.6	35	113	106.2	6.8	16

1. Due to the double point angle (at approx DC/4), the bottom of the hole will not have a 60°/ 90° angle. Edge chamfering is also not possible in this area.
2. The centering hole diameter should be less than the drill diameter DC, and the usable length LU should be used as a guideline.

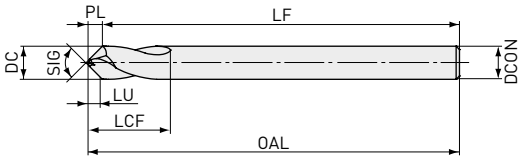
6/7 Vc

● : Inventory maintained. ★ : Inventory maintained in Japan.

DLE

MULTI-FUNCTIONAL DRILL SERIES

P M K



h7	DCON=3	3<DCON<6	6<DCON<10	10<DCON<16
	0	0	0	0
	−0.010	−0.012	−0.015	−0.018

	Order Number	DP1020	DC	SIG	LU	LCF	OAL	LF	PL	DCON
NEW	DLE0300S030P120	●	3	120°	0.8	9	45	44.1	0.9	3
NEW	DLE0400S040P120	●	4		1.1	12	50	48.8	1.2	4
NEW	DLE0500S050P120	★	5		1.3	14	60	58.6	1.4	5
NEW	DLE0600S060P120	●	6		1.5	15	66	64.3	1.7	6
NEW	DLE0700S070P120	★	7		1.8	18	74	72	2	7
NEW	DLE0800S080P120	●	8		2.1	20	74	71.7	2.3	8
NEW	DLE1000S100P120	●	10		2.7	24	84	81.1	2.9	10
NEW	DLE1200S120P120	★	12		3.3	28	95	91.5	3.5	12
NEW	DLE0300S030P145	★	3	145°	0.4	9	45	44.5	0.5	3
NEW	DLE0400S040P145	★	4		0.5	12	50	49.4	0.6	4
NEW	DLE0500S050P145	★	5		0.7	14	60	59.2	0.8	5
NEW	DLE0600S060P145	★	6		0.7	15	66	65.1	0.9	6
NEW	DLE0700S070P145	★	7		0.9	18	74	72.9	1.1	7
NEW	DLE0800S080P145	★	8		1.1	20	74	72.7	1.3	8

1. The centering hole diameter should be less than the drill diameter DC, and the usable length LU should be used as a guideline.

7 Vc

RECOMMENDED CUTTING CONDITIONS

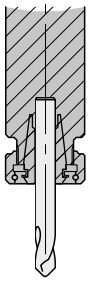
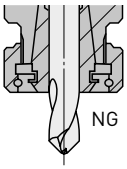
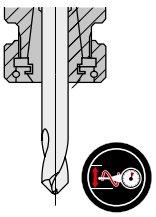
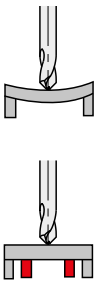
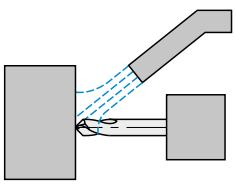
60° POINT ANGLE

	P					
Material	Mild Steels (<180HB) DIN C10E etc.		Carbon Steels, Alloy Steels (180–280HB) DIN Ck45, 41CrMo4 etc.		Carbon Steels, Alloy Steels (280–350HB) DIN 40CrNiMoA etc.	
DC	**n**	**fr**	**n**	**fr**	**n**	**fr**
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)

	M		K			
Material	Austenitic Stainless Steels (<200HB) DIN X5CrNi189, X5CrNiMo1810 etc.		Gray Cast Irons (<350MPa) DIN GG30 etc.		Ductile Cast Irons (<450MPa) DIN GGG40.3 etc.	
DC	**n**	**fr**	**n**	**fr**	**n**	**fr**
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)

1. When chamfering, ensure that the tool diameter(DC) is D <DC <2D.
2. When V-grooving and edge chamfering, please reduce the cutting conditions.
3. When centre drilling on curved or inclined surfaces, please reduce the feed rate.

OPERATIONAL GUIDANCE FOR DLE DRILLS

Drill Holding	Drill Length	Installation Tolerance	Thin Workpiece	Coolant Method
				
Collet chucks hold the drill securely.	Do not clamp on the flutes.	Run-out < 0.03mm		Coolant supply at the end and the centre is ideal.

RECOMMENDED CUTTING CONDITIONS

90°, 120° AND 145° POINT ANGLE

	P					
Material	Mild Steels (<180HB) DIN C10E etc.		Carbon Steels, Alloy Steels (180–280HB) DIN Ck45, 41CrMo4 etc.		Carbon Steels, Alloy Steels (280–350HB) DIN 40CrNiMoA etc.	
DC	**n**	**fr**	**n**	**fr**	**n**	**fr**
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)

	M		K			
Material	Austenitic Stainless Steels (<200HB) DIN X5CrNi189, X5CrNiMo1810 etc.		Gray Cast Irons (<350MPa) DIN GG30 etc.		Ductile Cast Irons (<450MPa) DIN GGG40.3 etc.	
DC	**n**	**fr**	**n**	**fr**	**n**	**fr**
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)

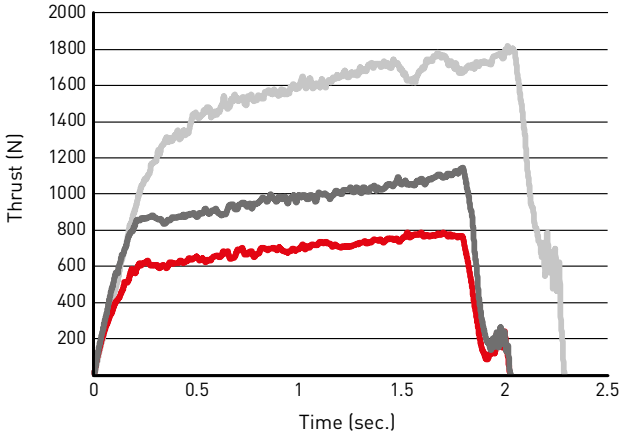
1. When chamfering, ensure that the tool diameter(DC) is D <DC <2D.
2. When V-grooving and edge chamfering, please reduce the cutting conditions.
3. When centre drilling on curved or inclined surfaces, please reduce the feed rate.

CUTTING PERFORMANCE

COMPARISON DURING CENTRE DRILLING

Lower thrust force required compared to conventional products.

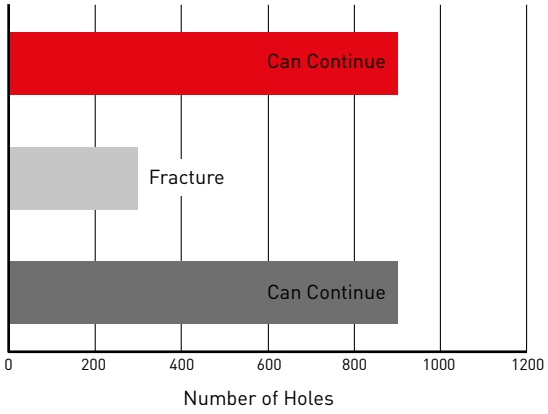
Material	DIN Ck45
Drill	DLE1200S120P090 Ø12
Cutting Speed Vc (m/mm)	60
Feed per Rev. fr (mm/rev)	0.06
Cutting Mode	Wet Cutting External Coolant (Chlorine Free Emulsion)
Machine	Vertical MC



COMPARISON OF TOOL LIFE WHEN CENTRE DRILLING STAINLESS STEEL (POINT ANGLE 120°)

DLE gave less vibration and provided improved surface finishes when compared to conventional products.

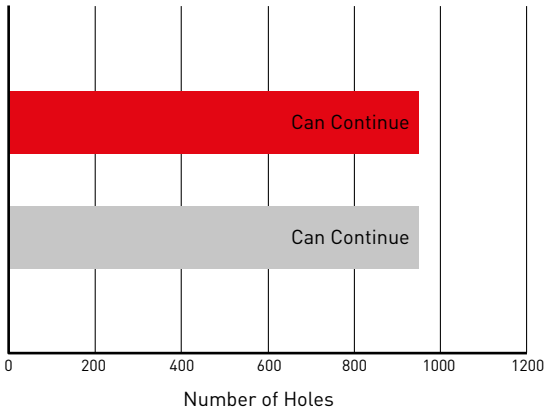
Material	X5CrNi18-10 (1.43.01)
Drill	DLE0600S060P120 Ø6
Cutting Speed Vc (m/mm)	20
Feed per Rev. fr (mm/rev)	0.06
Hole Depth Aim for hole dia. (mm)	Ø5.5
Cutting Mode	Wet Cutting External Coolant (Water-insoluble Coolants)
Machine	Vertical MC



COMPARISON OF TOOL LIFE WHEN CENTRE DRILLING STAINLESS STEEL (POINT ANGLE 60°)

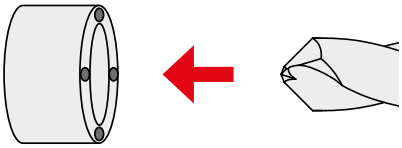
DLE drill displayed less wear compared to conventional centre drills and no edge chipping was found.

Material	X5CrNi18-10 (1.43.01)
Drill	DLE0600S060P060 Ø6
Cutting Speed Vc (m/mm)	15
Feed per Rev. fr (mm/rev)	0.02
Hole Depth Aim for hole dia. (mm)	Ø5.5
Cutting Mode	Wet Cutting External Coolant (Chlorine Free Emulsion)
Machine	Vertical MC



APPLICATION EXAMPLE

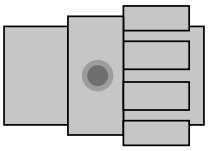
Insert	DLE0400S040P090
Workpiece (Machine Parts)	DIN C10E
Cutting Speed Vc (m/min)	30
Feed per Rev. fr (mm/rev)	0.045
Guide Hole Dia (mm)	Ø3
Cutting Mode	Wet Cutting External Coolant (Chlorine Free Emulsion)
Machine	NC Lathe, Tool Rotation
Results	Compared to conventional products, DLE has a much longer tool life and produces smaller burrs.



Centering and Chamfering

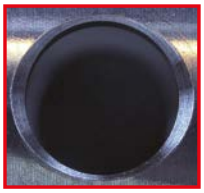
Burrs are suppressed

Insert	DLE0600S060P090
Workpiece (Machine Parts)	DIN X5CrNi189
Cutting Speed Vc (m/min)	25
Feed per Rev. fr (mm/rev)	0.05
Guide Hole Dia (mm)	Ø5
Cutting Mode	Wet Cutting External Coolant (Water-insoluble)
Machine	CNC Automatic Lathe
Results	Conventional products often suffered from edge chipping. DLE was more stable and completed 200 holes with no damage to the cutting edge.

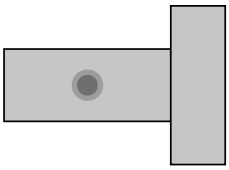


Centering and Chamfering

More than 200 holes
Good surface finish and no tool damage



Insert	DLE0300S030P090
Workpiece (Engine Parts)	DIN X12CrNiS188
Cutting Speed Vc (m/min)	25
Feed per Rev. fr (mm/rev)	0.04
Guide Hole Dia (mm)	Ø2.0
Cutting Mode	Wet Cutting External Coolant (Water-insoluble) Curved Surface
Machine	CNC Automatic Lathe
Results	Conventional products generated burrs during drilling. DLE machined 60 holes without notable damage or burr generation and gave an outstanding surface finish.



Centering and Chamfering

After 60 Holes

After 1 Hole

DLE

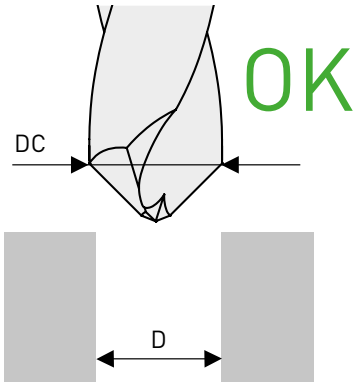
Conventional

DLE

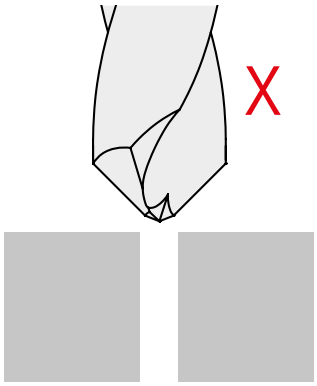
DRILL DIAMETER SELECTION

WHEN CHAMFERING

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

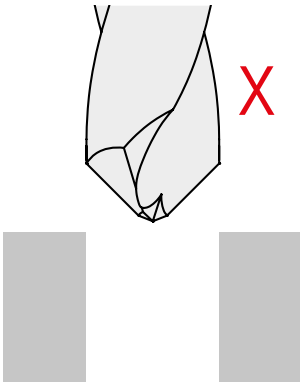


If the guide hole diameter D is 5 mm: Drill diameter DC should be larger than 6 mm but less than 10 mm.



If DC is equal to or greater than double the hole diameter (2D)

If the drill diameter DC is too large compared to the guide hole diameter D, chamfering cannot be performed.

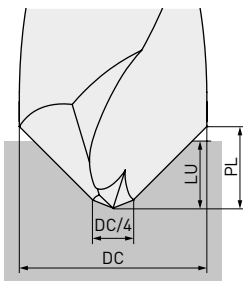


If drill diameter DC equal to or smaller than D

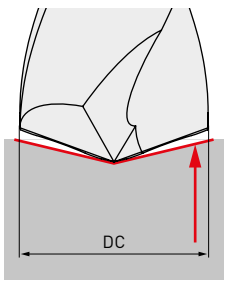
Chamfering cannot be performed if the drill diameter DC is the same as the guide hole diameter D.

WHEN CENTRE DRILLING

Centering should not be performed if the drill diameter DC is the same as the guide hole diameter D.
Refer to the usable length LU (page 234) as a guideline.
Due to the double point angle on 60° and 90° type drills (at approx DC/4), the bottom of the hole will not have a 60°/90° angle.
Using 145° point angle centre drills will improve hole accuracy by preventing shoulder contact with the main drill in the next process, if it has a point angle of less than a 143°.



NEXT PROCESS DRILL



Centering of point angle 145°

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