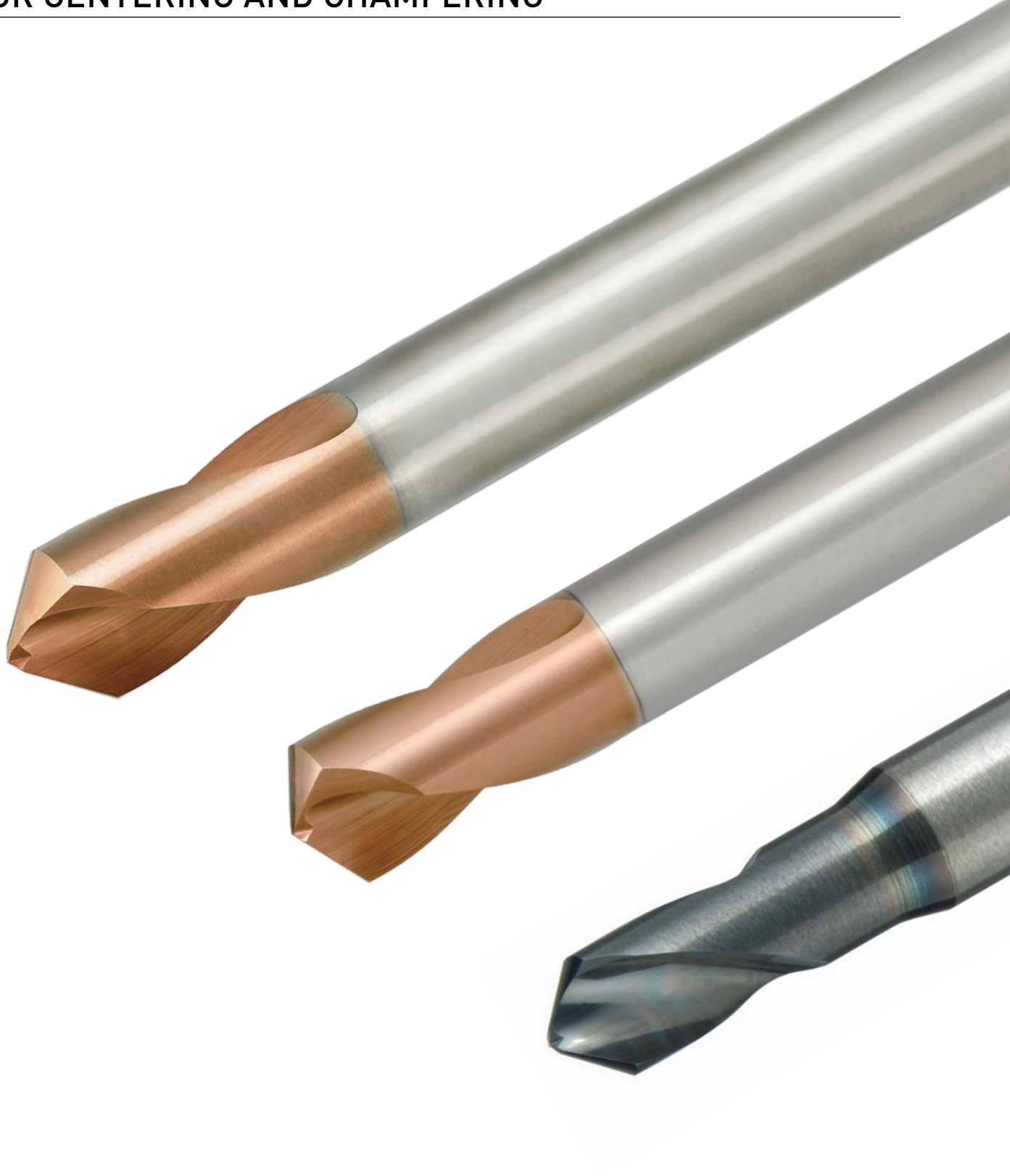
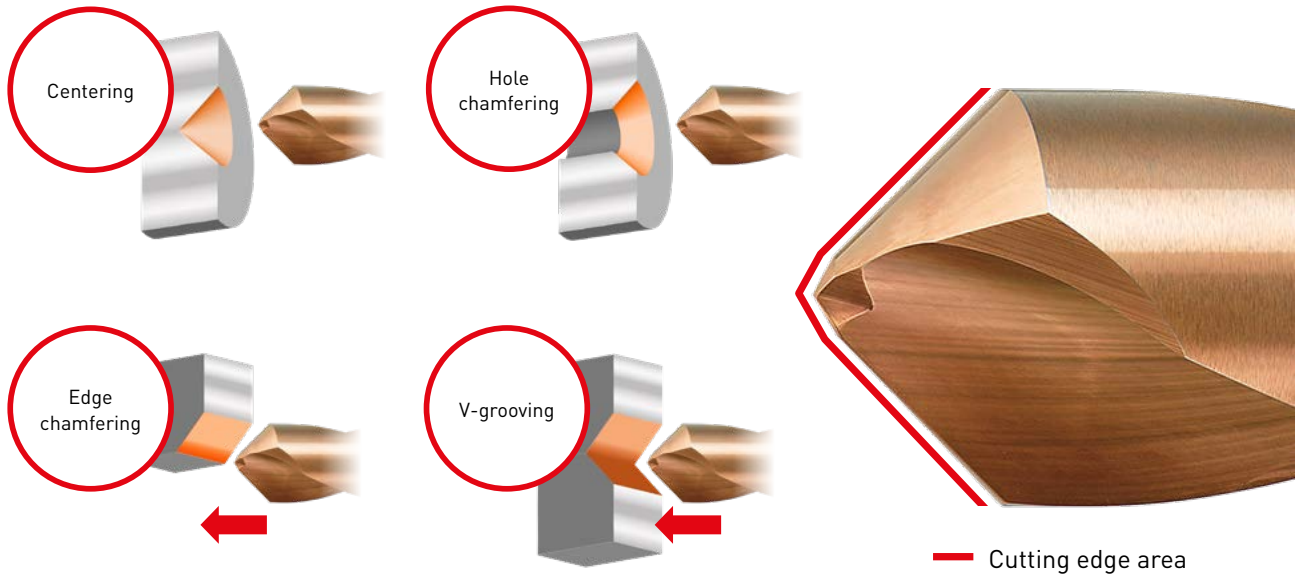

DLE

MULTI-FUNCTIONAL SPOT DRILL
FOR CENTERING AND CHAMFERING

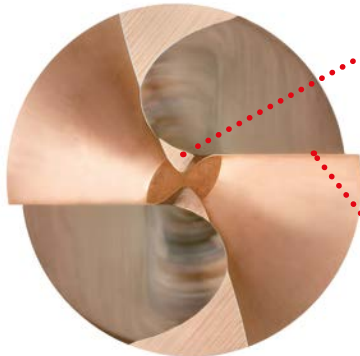


DLE

MULTI-FUNCTIONAL



FEATURES



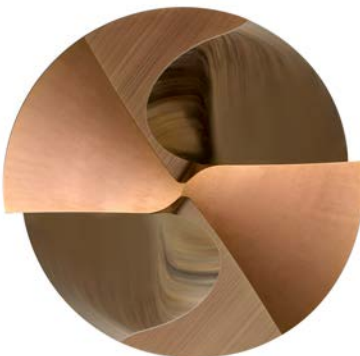
Point angles 60°, 90°

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

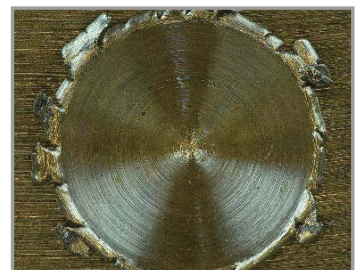
A cutting edge with both sharpness and high fracture resistance provides stable machining and prevents burrs.



Point angles 120°, 145°



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°)

High strength centre



DLE

Prone to fracturing



Conventional

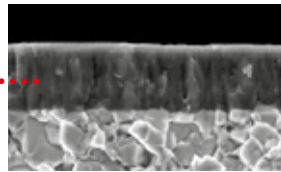
SINGLE ANGLE POINT (120°, 145°)

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

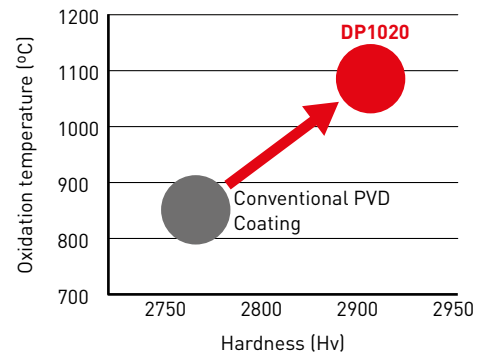


COATED GRADE DP1020

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

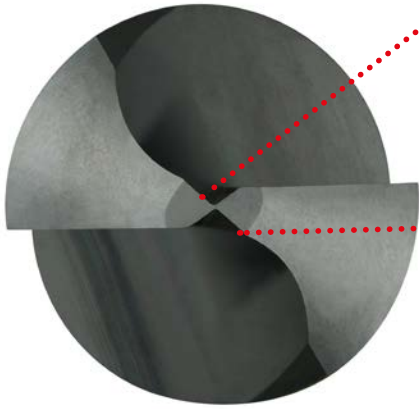


FOR AUTOMATIC LATHES

Shanks compatible with ER collets.

DLE

MINI DLE DIA. Ø1.0 MM – Ø2.5 MM SIG 90°



THINNED POINT GEOMETRY

Chip evacuation space in centre part improves the bite performance, and ensures good finished hole position accuracy.

DOUBLE ANGLE POINT

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 minimise the generation of burrs.

SUS304 Cutting example



DLE



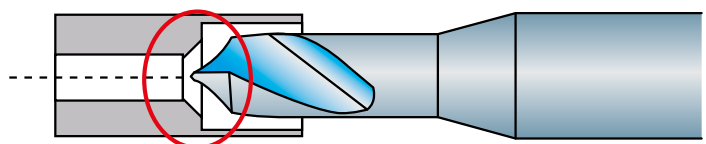
Conventional

NEW GRADE "DP102A" EXCELLENT LUBRICITY AND HEAT RESISTANCE

The PVD-coated carbide grade DP102A has excellent lubricity and heat resistance, and exhibits outstanding wear resistance particularly under low to medium cutting speed.

LONG-NECK DESIGN

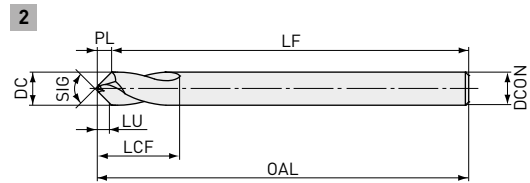
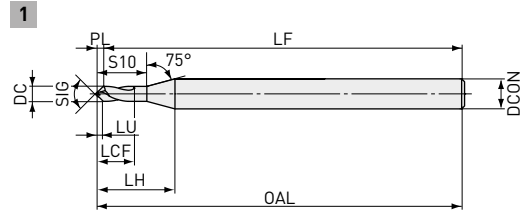
Long neck length allows to use the chamfering even deep inside holes.



DLE



MULTI-FUNCTIONAL DRILL SERIES 60° / 90°



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	DP102A	DC	SIG	LU	LCF	OAL	LH	S10	LF	PL	DCON	Type
DLE0300S030P060	●		3		2	9	45	—	—	42.9	2.1	3	2
DLE0400S040P060	●		4		2.7	12	50	—	—	47.2	2.8	4	2
DLE0500S050P060	★		5		3.4	14	60	—	—	56.5	3.5	5	2
DLE0600S060P060	●		6	60°	4	15	66	—	—	61.8	4.2	6	2
DLE0700S070P060	★		7		4.7	18	74	—	—	69.1	4.9	7	2
DLE0800S080P060	●		8		5.4	20	74	—	—	68.4	5.6	8	2
DLE1000S100P060	●		10		6.8	24	84	—	—	77	7	10	2
DLE1200S120P060	★		12		8.2	28	95	—	—	86.6	8.4	12	2
DLE0100S030P090		●	1			0.35	2	45	6.7	3.0	44.6	0.4	3
DLE0150S030P090		●	1.5		0.55	3	45	7.3	4.5	44.4	0.6	3	1
DLE0200S030P090		●	2		0.80	4	45	7.9	6.1	44.1	0.9	3	1
DLE0250S030P090		●	2.5		1.00	5	45	7.9	7.1	43.9	1.1	3	1
DLE0300S030P090	●		3		1.2	9	45	—	—	43.7	1.3	3	2
DLE0400S040P090	●		4		1.6	12	50	—	—	48.3	1.7	4	2
DLE0500S050P090	★		5	90°	2.0	14	60	—	—	57.9	2.1	5	2
DLE0600S060P090	●		6		2.4	15	66	—	—	63.4	2.6	6	2
DLE0700S070P090	★		7		2.8	18	74	—	—	71.0	3.0	7	2
DLE0800S080P090	●		8		3.2	20	74	—	—	70.6	3.4	8	2
DLE1000S100P090	●		10		4.1	24	84	—	—	79.7	4.3	10	2
DLE1200S120P090	★		12		4.9	28	95	—	—	89.9	5.1	12	2
DLE1600S160P090	★		16		6.6	35	113	—	—	106.2	6.8	16	2

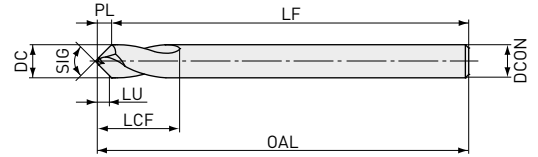
- Due to the double point angle (at approx DC/4), the bottom of the hole will not have a 60°/90° angle. Edge chamfering is also not possible in this area.
- The centering hole diameter should be less than the drill diameter DC, and the usable length LU should be used as a guideline.



DLE



MULTI-FUNCTIONAL DRILL SERIES 120° / 145°



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
DLE0300S030P120	●	3	120°	0.8	9	45	44.1	0.9	3
DLE0400S040P120	●	4		1.1	12	50	48.8	1.2	4
DLE0500S050P120	★	5		1.3	14	60	58.6	1.4	5
DLE0600S060P120	●	6		1.5	15	66	64.3	1.7	6
DLE0700S070P120	★	7		1.8	18	74	72	2	7
DLE0800S080P120	●	8		2.1	20	74	71.7	2.3	8
DLE1000S100P120	●	10		2.7	24	84	81.1	2.9	10
DLE1200S120P120	★	12		3.3	28	95	91.5	3.5	12
DLE0300S030P145	★	3	145°	0.4	9	45	44.5	0.5	3
DLE0400S040P145	★	4		0.5	12	50	49.4	0.6	4
DLE0500S050P145	★	5		0.7	14	60	59.2	0.8	5
DLE0600S060P145	★	6		0.7	15	66	65.1	0.9	6
DLE0700S070P145	★	7		0.9	18	74	72.9	1.1	7
DLE0800S080P145	★	8		1.1	20	74	72.7	1.3	8
NEW DLE1000S100P145	●	10		1.4	24	84	82.4	1.6	10
NEW DLE1200S120P145	●	12		1.7	28	95	93.1	1.9	12

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



DLE

RECOMMENDED CUTTING CONDITIONS

60° POINT ANGLE

Material	DC	n	f
P Mild steel (<180HB) DIN C10E etc.	3	7900	0.05 (0.03–0.07)
	4	5900	0.05 (0.03–0.07)
	5	5000	0.06 (0.04–0.08)
	6	4200	0.06 (0.04–0.08)
	7	3600	0.07 (0.04–0.09)
	8	3100	0.07 (0.04–0.09)
	10	2700	0.08 (0.04–0.10)
P Carbon steel, Alloy steel (180–280HB) DIN Ck45, 41CrMo4 etc.	12	2200	0.08 (0.04–0.10)
	3	6800	0.05 (0.03–0.07)
	4	5100	0.05 (0.03–0.07)
	5	4400	0.06 (0.04–0.08)
	6	3700	0.06 (0.04–0.08)
	7	3100	0.07 (0.04–0.09)
	8	2700	0.07 (0.04–0.09)
Carbon steel, Alloy steel (280–350HB) DIN 40CrNiMoA etc.	10	2300	0.08 (0.04–0.10)
	12	1900	0.08 (0.04–0.10)
	3	6300	0.04 (0.02–0.06)
	4	4700	0.04 (0.02–0.06)
	5	4100	0.05 (0.03–0.07)
	6	3400	0.05 (0.03–0.07)
	7	2900	0.05 (0.03–0.07)
M Austenitic stainless steel (<200HB) DIN X5CrNi189, X5CrNiMo1810 etc.	8	2500	0.05 (0.03–0.07)
	10	2200	0.06 (0.03–0.08)
	12	1800	0.06 (0.03–0.08)
	3	1500	0.03 (0.01–0.05)
	4	1100	0.03 (0.01–0.05)
	5	1200	0.04 (0.02–0.06)
	6	1000	0.04 (0.02–0.06)
K Gray cast iron (<350MPa) DIN GG30 etc.	7	900	0.04 (0.02–0.06)
	8	790	0.04 (0.02–0.06)
	10	630	0.04 (0.02–0.06)
	12	530	0.04 (0.02–0.06)
	3	7900	0.05 (0.03–0.07)
	4	5900	0.05 (0.03–0.07)
	5	5000	0.06 (0.04–0.08)
K Ductile cast iron (<450MPa) DIN GGG40.3 etc.	6	4200	0.06 (0.04–0.08)
	7	3600	0.07 (0.04–0.09)
	8	3100	0.07 (0.04–0.09)
	10	2700	0.08 (0.04–0.10)
	12	2200	0.08 (0.04–0.10)
	3	5800	0.05 (0.03–0.07)
	4	4300	0.05 (0.03–0.07)
	5	3800	0.06 (0.04–0.08)
	6	3100	0.06 (0.04–0.08)
	7	2700	0.06 (0.04–0.08)
	8	2300	0.06 (0.04–0.08)
	10	1900	0.07 (0.04–0.09)
	12	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.

DLE

90°, 120° AND 145° POINT ANGLE

Material	DC	n	f
Mild steel (<180HB) DIN C10E etc.	1	9500	0.02 (0.01–0.03)
	1.5	9500	0.02 (0.01–0.03)
	2	9500	0.04 (0.03–0.05)
	2.5	9500	0.04 (0.03–0.05)
	3	7900	0.06 (0.04–0.08)
	4	5900	0.06 (0.04–0.08)
	5	5000	0.07 (0.05–0.09)
	6	4200	0.07 (0.05–0.09)
	7	3600	0.08 (0.05–0.10)
	8	3100	0.08 (0.05–0.10)
	10	2700	0.09 (0.05–0.11)
	12	2200	0.09 (0.05–0.11)
	16	1700	0.12 (0.10–0.14)
Carbon steel, Alloy steel (180–280HB) DIN Ck45, 41CrMo4 etc.	1	6300	0.02 (0.01–0.03)
	1.5	7400	0.02 (0.01–0.03)
	2	7900	0.04 (0.03–0.05)
	2.5	8200	0.04 (0.03–0.05)
	3	6800	0.06 (0.04–0.08)
	4	5100	0.06 (0.04–0.08)
	5	4400	0.07 (0.05–0.09)
	6	3700	0.07 (0.05–0.09)
	7	3100	0.08 (0.05–0.10)
	8	2700	0.08 (0.05–0.10)
	10	2300	0.09 (0.05–0.11)
	12	1900	0.09 (0.05–0.11)
	16	1500	0.12 (0.10–0.14)
Carbon steel, Alloy steel (280–350HB) DIN 40CrNiMoA etc.	1	4700	0.02 (0.01–0.03)
	1.5	6300	0.02 (0.01–0.03)
	2	7100	0.04 (0.03–0.05)
	2.5	7600	0.04 (0.03–0.05)
	3	6300	0.05 (0.03–0.07)
	4	4700	0.05 (0.03–0.07)
	5	4100	0.06 (0.04–0.08)
	6	3400	0.06 (0.04–0.08)
	7	2900	0.06 (0.04–0.08)
	8	2500	0.06 (0.04–0.08)
	10	2200	0.07 (0.04–0.09)
	12	1800	0.07 (0.04–0.09)
	16	1400	0.08 (0.06–0.10)
Austenitic stainless steel (<200HB) DIN X5CrNi189, X5CrNiMo1810 etc.	1	6300	0.01 (0.005–0.015)
	1.5	4200	0.01 (0.005–0.015)
	2	3100	0.04 (0.03–0.05)
	2.5	2500	0.04 (0.03–0.05)
	3	1500	0.04 (0.02–0.06)
	4	1100	0.04 (0.02–0.06)
	5	1200	0.06 (0.04–0.08)
	6	1000	0.06 (0.04–0.08)
	7	900	0.06 (0.04–0.08)
	8	790	0.06 (0.04–0.08)
	10	630	0.06 (0.04–0.08)
	12	530	0.06 (0.04–0.08)
	16	390	0.08 (0.06–0.10)

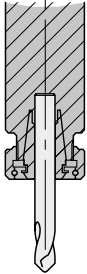
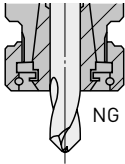
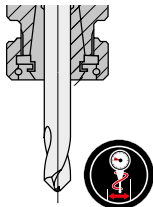
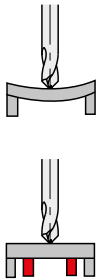
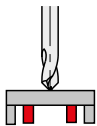
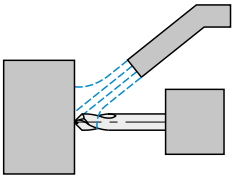
DLE

90°, 120° AND 145° POINT ANGLE

Material	DC	n	f
Gray cast iron (<350MPa) DIN GG30 etc.	1	9500	0.02 (0.01–0.03)
	1.5	9500	0.02 (0.01–0.03)
	2	9500	0.04 (0.03–0.05)
	2.5	9500	0.04 (0.03–0.05)
	3	7900	0.06 (0.04–0.08)
	4	5900	0.06 (0.04–0.08)
	5	5000	0.07 (0.05–0.09)
	6	4200	0.07 (0.05–0.09)
	7	3600	0.08 (0.05–0.10)
	8	3100	0.08 (0.05–0.10)
	10	2700	0.09 (0.05–0.11)
	12	2200	0.09 (0.05–0.11)
	16	1700	0.12 (0.10–0.14)
Ductile cast iron (<450MPa) DIN GGG40.3 etc.	1	3100	0.02 (0.01–0.03)
	1.5	5300	0.02 (0.01–0.03)
	2	6300	0.04 (0.03–0.05)
	2.5	7000	0.04 (0.03–0.05)
	3	5800	0.06 (0.04–0.08)
	4	4300	0.06 (0.04–0.08)
	5	3800	0.07 (0.05–0.09)
	6	3100	0.07 (0.05–0.09)
	7	2700	0.07 (0.05–0.09)
	8	2300	0.07 (0.05–0.09)
	10	1900	0.08 (0.05–0.10)
	12	1500	0.08 (0.05–0.10)
	16	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.

OPERATIONAL GUIDANCE FOR DLE DRILLS

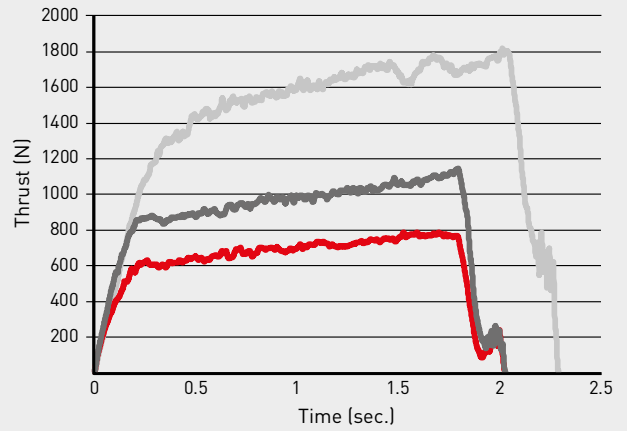
Drill holding	Drill length	Installation tolerance	Thin workpiece	Coolant method
			 <p>X If bending occurs</p>  <p>OK Support the workpiece</p>	
Collet chucks hold the drill securely.	Do not clamp on the flutes.	Run-out < 0.03 mm		Coolant supply at the end and the centre is ideal.

CUTTING PERFORMANCE

COMPARISON DURING CENTRE DRILLING

Lower thrust force required compared to conventional products.

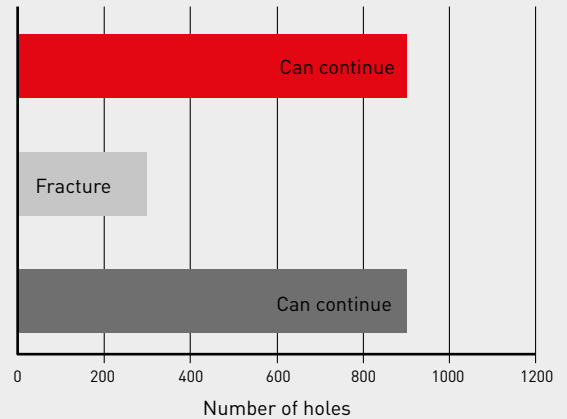
Material	DIN Ck45
Drill	DLE1200S120P090 Ø12
Vc (m/mm)	60
f (mm/rev)	0.06
Cutting mode	Wet cutting External coolant (Chlorine free emulsion)
Machine	Vertical MC



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.

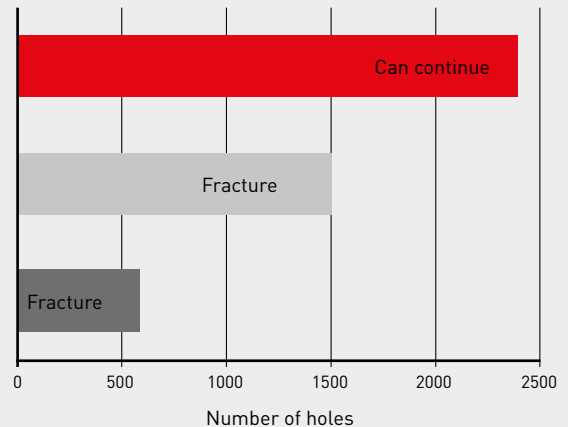
Material	X5CrNi18-10 (1.43.01)
Drill	DLE0600S060P120 Ø6
Vc (m/mm)	20
fr (mm/rev)	0.06
Hole depth aim for hole dia. (mm)	Ø 5.5
Cutting mode	Wet cutting External coolant (Water-insoluble coolants)
Machine	Vertical MC



COMPARISON OF TOOL LIFE WHEN PROCESSING JIS SUS304 : POINT ANGLE 90° (SMALL-DIAMETER Ø2 MM)

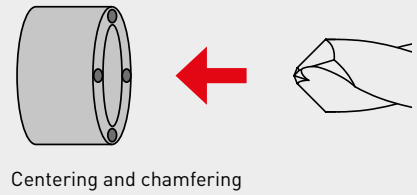
When machining stainless steel, DLE drills realized longer tool life due to outstanding heat and wear resistance.

Material	DIN X5CrNi189
Drill	DLE0200S030P090
Vc (m/mm)	30
fr (mm/rev)	0.045
Cutting mode	Wet cutting External coolant (Water-insoluble coolants)
Machine	Vertical MC



APPLICATION EXAMPLE

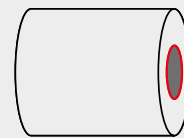
Insert	DLE0400S040P090
Workpiece (Machine parts)	DIN C10E
Vc (m/min)	30
f (mm/rev)	0.045
Guide hole dia (mm)	Ø 3
Cutting mode	Wet cutting, external coolant (Chlorine free emulsion)
Machine	NC Lathe, tool rotation
Results	Compared to conventional products, DLE has a much longer tool life and produces smaller burrs.



Burrs are suppressed



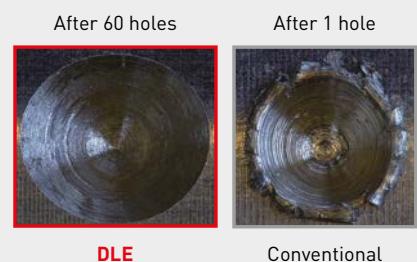
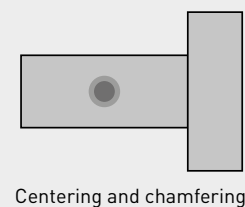
Insert	DLE0200S030P090
Workpiece (Machine parts)	DIN X5CrNi189 (Engine parts)
Vc (m/min)	38
fr (mm/rev)	0.02
Guide hole dia (mm)	Ø 6
Cutting mode	Wet cutting, external coolant (Water-insoluble coolants)
Machine	CNC Automatic lathe
Results	DLE had a tool life twice as long as the conventional product, and was able to carry out cutting with no fractures.



Comparison of rake faces after centering



Insert	DLE0300S030P090
Workpiece (Engine parts)	DIN X12CrNiS188
Vc (m/min)	25
fr (mm/rev)	0.04
Guide hole dia (mm)	Ø 2.0
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.

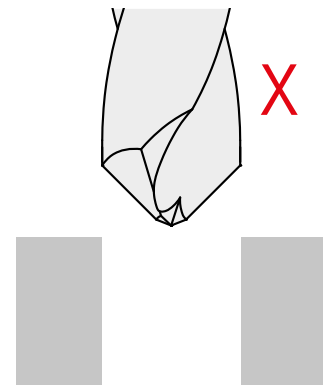
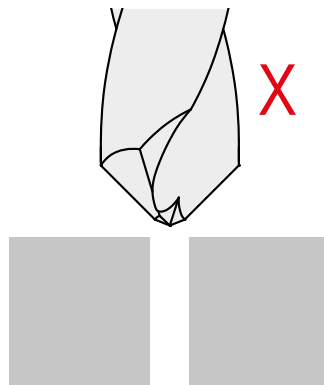
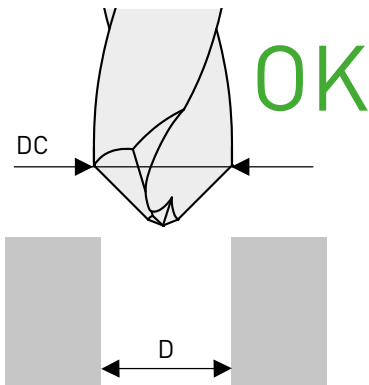


DLE

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

If drill diameter DC equal to or smaller than D

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

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

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

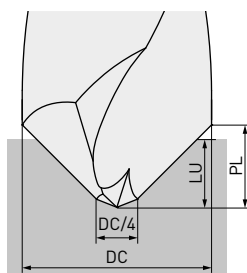
WHEN CENTRE DRILLING

Centering should not be performed if the drill diameter DC is the same as the guide hole diameter D .

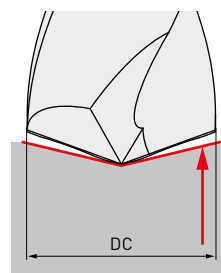
Refer to the usable length LU (page 7) as a guideline.

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 $60^\circ/90^\circ$ 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°

GERMANY

MMC HARTMETALL GMBH
Comeniusstr. 2 . 40670 Meerbusch
Phone +49 2159 91890 . Fax +49 2159 918966
Email admin@mmchg.de

U.K.

MMC HARDMETAL U.K. LTD.
Mitsubishi House . Galena Close . Tamworth . Staffs. B77 4AS
Phone +44 1827 312312 . Fax +44 1827 312314
Email sales@mitsubishicarbide.co.uk

SPAIN

mitsubishi MATERIALS ESPAÑA, S.A.
Calle Emperador 2 . 46136 Museros/Valencia
Phone +34 96 1441711 . Fax +34 96 1443786
Email comercial@mmevalencia.es

FRANCE

MMC METAL FRANCE S.A.R.L.
6, Rue Jacques Monod . 91400 Orsay
Phone +33 1 69 35 53 53 . Fax +33 1 69 35 53 50
Email mmfsales@mmc-metal-france.fr

POLAND

MMC HARDMETAL POLAND SP. Z O.O
Al. Armii Krajowej 61 . 50-541 Wrocław
Phone +48 71335 1620 . Fax +48 71335 1621
Email sales@mitsubishicarbide.com.pl

RUSSIA

MMC HARDMETAL OOO LTD.
Electrozavodskaya St. 24 . build. 3 . Moscow . 107023
Phone +7 495 725 58 85 . Fax +7 495 981 39 79
Email info@mmc-carbide.ru

ITALY

MMC ITALIA S.R.L.
Viale Certosa 144 . 20156 Milano
Phone +39 0293 77031 . Fax +39 0293 589093
Email info@mmc-italia.it

TURKEY

MMC HARTMETALL GMBH ALMANYA - İZMİR MERKEZ ŞUBESİ
Adalet Mahallesi Anadolu Caddesi No: 41-1 . 15001 35580 Bayraklı /İzmir
Phone +90 232 5015000 . Fax +90 232 5015007
Email info@mmchg.com.tr

www.mitsubishicarbide.com | www.mmc-hardmetal.com


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Order Code: B223E 

Published: 2021.04 (0), Printed in Germany