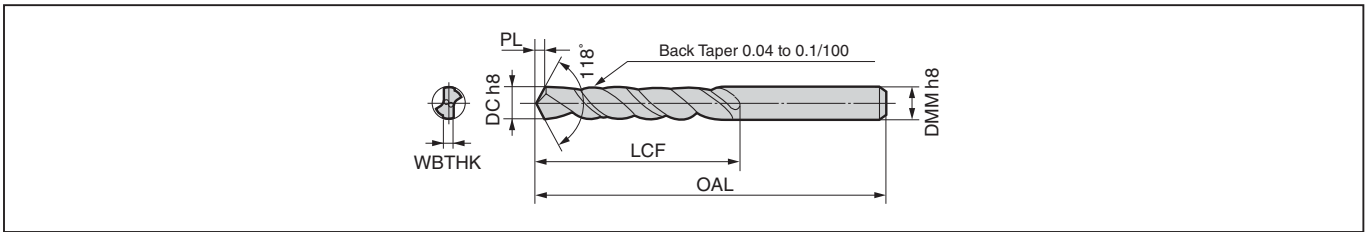


SD Type

Carbon Steel, Alloy Steel Up to 0.28% C From 0.29% C	Tempered Steel	Hardened Steel Up to 45HRC From 46HRC	Stainless Steel	Ti-Alloy	Heat resistant Steels	Cast Iron	Ductile Cast Iron	Aluminum Alloy	Copper Alloy	Composite CFRP
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Carbide **6 to 15 D**



(mm)

Cat. No.	Stock Size	Diameter (Shank Diameter) DC(DMM)	Flute Length LCF	Total Length OAL	Tip PL	Web Thickness WBTHK
SD 080 to 090		0.80 to 0.89	12	30	0.3	0.2
SD 091 to 140		0.90 to 1.39	16	30	0.4	0.2 to 0.3
SD 141 to 190		1.40 to 1.90	20	35	0.5	0.4
SD 191 to 240		1.91 to 2.40	23	41	0.6	0.5
SD 241 to 300		2.41 to 3.00	26	46	0.8	0.6
SD 301 to 350		3.01 to 3.50	29	51	1.0	0.7
SD 351 to 400		3.51 to 4.00	31	56	1.1	0.8
SD 401 to 450		4.01 to 4.50	35	61	1.4	0.9
SD 451 to 550		4.51 to 5.50	40	67	1.5	1.0
SD 551 to 600		5.51 to 6.00	42	72	1.7	1.1
SD 601 to 650		6.01 to 6.50	45	77	1.9	1.2
SD 651 to 700		6.51 to 7.00	48	82	2.0	1.3
SD 701 to 750		7.01 to 7.50	48	82	2.2	1.4
SD 751 to 800		7.51 to 8.00	52	87	2.3	1.5

Note: ordering number for (ex.) ø4.6mm drill is SD460.

Grade: H1

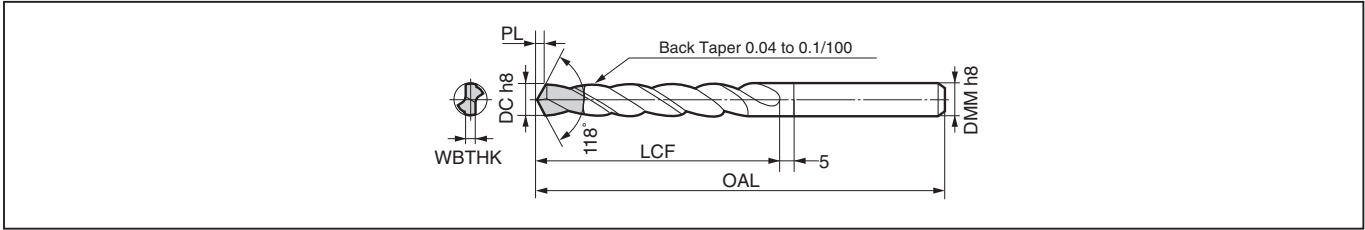
Recommended Cutting Conditions, SD Type

v_c : Cutting Speed (m/min) f : Feed Rate (mm/rev)

Tool Diameter DC (mm)	Cond.	Die steel (About HB250)	Cast Iron	Non Ferrous Metal
Up to ø5.0	v_c	5 - 8 - 10	10 - 30 - 40	20 - 50 - 80
	f	0.03 - 0.04 - 0.05	0.1 - 0.15 - 0.2	0.1 - 0.15 - 0.2
Up to ø13.0	v_c	10 - 15 - 20	20 - 40 - 60	30 - 80 - 100
	f	0.05 - 0.06 - 0.07	0.1 - 0.15 - 0.2	0.1 - 0.15 - 0.2

Min. - Optimum - Max.

Carbon Steel	Alloy Steel	Tempered Steel	Hardened Steel	Stainless Steel	Ti-Alloy	Heat-resistant Steels	Cast Iron	Ductile Cast Iron	Aluminum Alloy	Copper Alloy	Composite CFRP	Carbide	5 to 8 D
Up to 0.28%	From 0.29%		Up to 45HRC	From 46HRC				⊙	⊙	⊙	○		



■ Straight Shank (Cast Iron) (mm)

Cat. No.	Diameter (Shank Diameter) DC(DMM)	Flute Length LCF	Total Length OAL	Tip PL	Web Thickness WBTHK
DLS 060 to 065	6.0 to 6.5	52	97	1.9	1.2
066 to 070	6.6 to 7.0	52	97	2.0	1.3
071 to 075	7.1 to 7.5	52	97	2.2	1.4
076 to 080	7.6 to 8.0	52	97	2.4	1.5
081 to 085	8.1 to 8.5	62	112	2.5	1.5
DLS 086 to 090	8.6 to 9.0	63	113	2.7	1.6
091 to 095	9.1 to 9.5	63	113	2.8	1.7
096 to 100	9.6 to 10.0	63	113	3.0	1.8
101 to 105	10.1 to 10.5	63	128	3.1	1.8
106 to 110	10.6 to 11.0	63	128	3.2	1.9
DLS 111 to 115	11.1 to 11.5	63	128	3.4	2.0
116 to 120	11.6 to 12.0	64	129	3.6	2.0

Note: • Ordering number for (ex.) ø10.5mm drill is DLS105. Please also advise work material.
 • Tang type drills can be made-to-order. Please advise tang dimensions J and K.
 • Helix angle 28°, Web thickness ratio 1.2:1.

■ Straight Shank (Aluminum Alloy) (mm)

Cat. No.	Diameter DC	Flute Length LCF	Total Length OAL	Tip PL	Web Thickness WBTHK
DLS 060A to 065A	6.0 to 6.5	52	97	1.9	1.2
066A to 070A	6.6 to 7.0	52	97	2.0	1.3
071A to 075A	7.1 to 7.5	52	97	2.2	1.4
076A to 080A	7.6 to 8.0	52	97	2.4	1.5
081A to 085A	8.1 to 8.5	62	112	2.5	1.5
DLS 086A to 090A	8.6 to 9.0	63	113	2.7	1.6
091A to 095A	9.1 to 9.5	63	113	2.8	1.7
096A to 100A	9.6 to 10.0	63	113	3.0	1.8
101A to 105A	10.1 to 10.5	63	128	3.1	1.8
106A to 110A	10.6 to 11.0	63	128	3.2	1.9
DLS 111A to 115A	11.1 to 11.5	63	128	3.4	2.0
116A to 120A	11.6 to 12.0	64	129	3.6	2.0

Note: • Ordering number for (ex.) ø7.6mm drill is DLS076A. Please also advise work material.
 • Tang type drills can be made-to-order. Please advise tang dimensions J and K.
 • Helix angle 28°, Web thickness ratio 1.2:1.

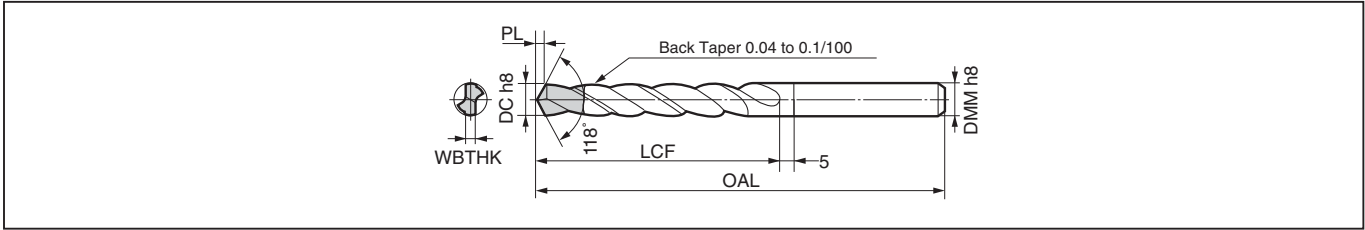
■ Recommended Cutting Conditions

v_c : Cutting Speed (m/min) f : Feed Rate (mm/rev)

Tool Diameter DC (mm)	Cond.	Ductile Cast Iron	Cast Iron	Non Ferrous Metal
Up to ø10.0	v_c	20 - 35 - 55	20 - 40 - 60	50 - 100 - 150
	f	0.2 - 0.3 - 0.4	0.2 - 0.3 - 0.4	0.1 - 0.15 - 0.2
Up to ø15.0	v_c	30 - 50 - 70	30 - 60 - 80	70 - 130 - 200
	f	0.3 - 0.35 - 0.4	0.3 - 0.35 - 0.4	0.1 - 0.15 - 0.2
Up to ø25.0	v_c	50 - 60 - 90	50 - 75 - 100	100 - 150 - 250
	f	0.3 - 0.35 - 0.45	0.3 - 0.4 - 0.5	0.1 - 0.15 - 0.2

Min. - Optimum - Max.

Carbon Steel	Alloy Steel	Tempered Steel	Hardened Steel	Stainless Steel	Ti-Alloy	Heat-resistant Steels	Cast Iron	Ductile Cast Iron	Aluminum Alloy	Copper Alloy	Composite CFRP	Carbide	5 to 8 D
Up to 0.28%	From 0.29%		Up to 45HRC	From 46HRC				⊙	⊙	⊙	○		



■ Straight Shank (Cast Iron) (mm)

Cat. No.	Diameter (Shank Diameter) DC(DMM)	Flute Length LCF	Total Length OAL	Tip PL	Web Thickness WBTHK
DLS 060 to 065	6.0 to 6.5	52	97	1.9	1.2
066 to 070	6.6 to 7.0	52	97	2.0	1.3
071 to 075	7.1 to 7.5	52	97	2.2	1.4
076 to 080	7.6 to 8.0	52	97	2.4	1.5
081 to 085	8.1 to 8.5	62	112	2.5	1.5
DLS 086 to 090	8.6 to 9.0	63	113	2.7	1.6
091 to 095	9.1 to 9.5	63	113	2.8	1.7
096 to 100	9.6 to 10.0	63	113	3.0	1.8
101 to 105	10.1 to 10.5	63	128	3.1	1.8
106 to 110	10.6 to 11.0	63	128	3.2	1.9
DLS 111 to 115	11.1 to 11.5	63	128	3.4	2.0
116 to 120	11.6 to 12.0	64	129	3.6	2.0

Note: • Ordering number for (ex.) ø10.5mm drill is DLS105. Please also advise work material.
 • Tang type drills can be made-to-order. Please advise tang dimensions J and K.
 • Helix angle 28°, Web thickness ratio 1.2:1.

■ Straight Shank (Aluminum Alloy) (mm)

Cat. No.	Diameter DC	Flute Length LCF	Total Length OAL	Tip PL	Web Thickness WBTHK
DLS 060A to 065A	6.0 to 6.5	52	97	1.9	1.2
066A to 070A	6.6 to 7.0	52	97	2.0	1.3
071A to 075A	7.1 to 7.5	52	97	2.2	1.4
076A to 080A	7.6 to 8.0	52	97	2.4	1.5
081A to 085A	8.1 to 8.5	62	112	2.5	1.5
DLS 086A to 090A	8.6 to 9.0	63	113	2.7	1.6
091A to 095A	9.1 to 9.5	63	113	2.8	1.7
096A to 100A	9.6 to 10.0	63	113	3.0	1.8
101A to 105A	10.1 to 10.5	63	128	3.1	1.8
106A to 110A	10.6 to 11.0	63	128	3.2	1.9
DLS 111A to 115A	11.1 to 11.5	63	128	3.4	2.0
116A to 120A	11.6 to 12.0	64	129	3.6	2.0

Note: • Ordering number for (ex.) ø7.6mm drill is DLS076A. Please also advise work material.
 • Tang type drills can be made-to-order. Please advise tang dimensions J and K.
 • Helix angle 28°, Web thickness ratio 1.2:1.

■ Recommended Cutting Conditions

v_c : Cutting Speed (m/min) f : Feed Rate (mm/rev)

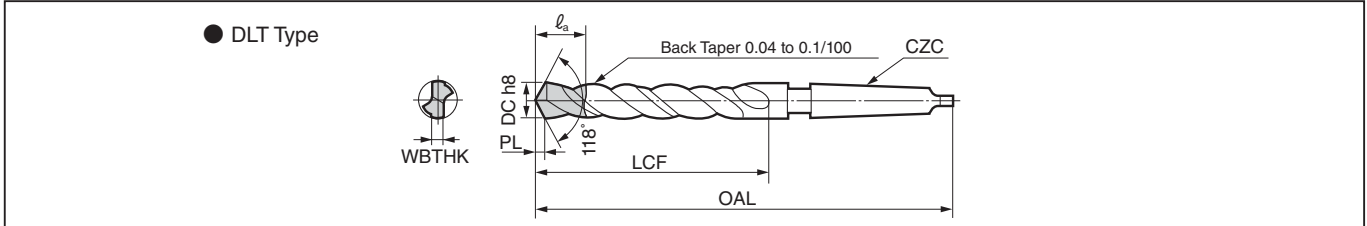
Tool Diameter DC (mm)	Cond.	Ductile Cast Iron	Cast Iron	Non Ferrous Metal
Up to ø10.0	v_c	20 - 35 - 55	20 - 40 - 60	50 - 100 - 150
	f	0.2 - 0.3 - 0.4	0.2 - 0.3 - 0.4	0.1 - 0.15 - 0.2
Up to ø15.0	v_c	30 - 50 - 70	30 - 60 - 80	70 - 130 - 200
	f	0.3 - 0.35 - 0.4	0.3 - 0.35 - 0.4	0.1 - 0.15 - 0.2
Up to ø25.0	v_c	50 - 60 - 90	50 - 75 - 100	100 - 150 - 250
	f	0.3 - 0.35 - 0.45	0.3 - 0.4 - 0.5	0.1 - 0.15 - 0.2

Min. - Optimum - Max.

DLT Type

Cast Iron Non Ferrous Metal

Carbon Steel, Alloy Steel Up to 0.28%	Tempered Steel From 0.29%	Hardened Steel Up to 45HRC From 46HRC	Stainless Steel	Ti-Alloy	Heat-resistant Steels	Cast Iron	Ductile Cast Iron	Aluminum Alloy	Copper Alloy	Composite CFRP	Carbide	6 to 12 D
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Body Diameter ø6.0 to 15.5mm (mm)

Diameter DC (mm)	Stock Size	Cat. No.	Flute Length LCF	Total Length OAL	Tip PL	Web Thickness WB THK	CZC*
6.0 to 6.5	6.0, 6.5	DLT 060 to 065	74	154	1.9	1.2	MT1
6.6 to 7.0	6.8, 7.0	066 to 070	77	157	2.1	1.3	
7.1 to 7.5	7.5	071 to 075	80	160	2.2	1.4	
7.6 to 8.0	8.0	076 to 080	84	164	2.4	1.5	
8.1 to 8.5	8.5	081 to 085	88	171	2.6	1.5	
8.6 to 9.0	8.6, 8.7, 9.0	DLT 086 to 090	91	175	2.7	1.6	
9.1 to 9.5	9.5	091 to 095	95	178	2.8	1.7	
9.6 to 10.0	10.0	096 to 100	98	181	3.0	1.8	
10.1 to 10.5	10.2, 10.3, 10.5	101 to 105	101	185	3.1	1.8	
10.6 to 11.0	11.0	106 to 110	105	188	3.2	1.9	
11.1 to 11.5	11.5	DLT 111 to 115	108	191	3.4	2.0	
11.6 to 12.0	11.7, 12.0	116 to 120	112	196	3.5	2.0	
12.1 to 12.5	12.5	121 to 125	116	199	3.7	2.2	
12.6 to 13.0	13.0	126 to 130	119	202	3.8	2.2	
13.1 to 13.5	13.5	DLT 131 to 135	122	206	4.0	2.3	
13.6 to 14.0	14.0	136 to 140	126	209	4.1	2.3	
14.1 to 14.5	14.5	DLT 141 to 145	126	226	4.3	2.5	
14.6 to 15.0	15.0	146 to 150	130	230	4.4	2.5	
15.1 to 15.5	15.5	151 to 155	130	233	4.6	2.6	

*Morse Taper No. Grade: A1

Body Diameter ø15.6 to 25.0mm (mm)

Diameter DC (mm)	Stock Size	Cat. No.	Flute Length LCF	Total Length OAL	Tip PL	Web Thickness WB THK	CZC*
15.6 to 16.0	16.0	DLT 156 to 160	135	235	4.8	2.6	MT2
16.1 to 16.5	16.5	161 to 165	137	237	4.9	2.7	
16.6 to 17.0	17.0	166 to 170	140	240	5.1	2.7	
17.1 to 17.5	17.5	171 to 175	145	245	5.2	2.9	
17.6 to 18.0	18.0	176 to 180	145	245	5.4	2.9	
18.1 to 18.5	18.5	DLT 181 to 185	150	250	5.5	3.0	
18.6 to 19.0	19.0	186 to 190	151	251	5.6	3.0	
19.1 to 19.5		191 to 195	156	256	5.8	3.1	
19.6 to 20.0	20.0	196 to 200	156	256	5.9	3.1	
20.1 to 20.5	20.5	201 to 205	161	261	6.1	3.3	
20.6 to 21.0	21.0	DLT 206 to 210	161	261	6.3	3.3	
21.1 to 21.5		211 to 215	166	266	6.4	3.4	
21.6 to 22.0	22.0	216 to 220	167	267	6.5	3.4	
22.1 to 22.5		221 to 225	172	272	6.7	3.5	
22.6 to 23.0	23.0	226 to 230	172	272	6.8	3.5	
23.1 to 23.5	23.5	231 to 235	172	292	7.0	3.7	
23.6 to 24.0	24.0	DLT 236 to 240	172	292	7.1	3.7	
24.1 to 24.5	24.5	241 to 245	172	292	7.3	3.8	
24.6 to 25.0		246 to 250	173	293	7.5	3.8	

*Morse Taper No. Grade: A1

Carbide Tip Dimension (l_a)

DC	6.0 to 7.0	7.1 to 8.0	8.1 to 9.0	9.1 to 13.0	13.1 to 18.0	18.1 to 23.0	23.1 to 25.0
l _a	15	20	25	26	27	30	34

- Note: • Ordering number for (ex.) ø8.6mm drill is DLT086.
 • Standard morse-taper shank JIS B4302 is used. The Length LCF and OAL dimension of ø8mm drill is the same as that of ø8.1mm to ø8.5mm drill range.
 • ø25.1mm to ø50.0mm drills can be made to order.

Recommended Cutting Conditions

v_c: Cutting Speed (m/min) f: Feed Rate (mm/rev)

Tool Diameter DC (mm)	Cond.	Ductile Cast Iron	Cast Iron	Non Ferrous Metal
up to ø10.0	v _c	20 - 35 - 55	20 - 40 - 60	50 - 100 - 150
	f	0.2 - 0.3 - 0.4	0.2 - 0.3 - 0.4	0.1 - 0.15 - 0.2
up to ø15.0	v _c	30 - 50 - 70	30 - 60 - 80	70 - 130 - 200
	f	0.3 - 0.35 - 0.4	0.3 - 0.35 - 0.4	0.1 - 0.15 - 0.2
up to ø25.0	v _c	50 - 60 - 90	50 - 75 - 100	100 - 150 - 250
	f	0.3 - 0.35 - 0.45	0.3 - 0.4 - 0.5	0.1 - 0.15 - 0.2

Min. - Optimum - Max.

Work Material	Helix Angle	Web Thickness Ratio
Cast Iron	*28° to 30°	1.2 : 1
Aluminum Alloy	40°	1.6 : 1

*ø13mm - 28°, ø13mm and above - 30°

Drilling
Solid
Special
Indexable
Reamer
Brazed
Others