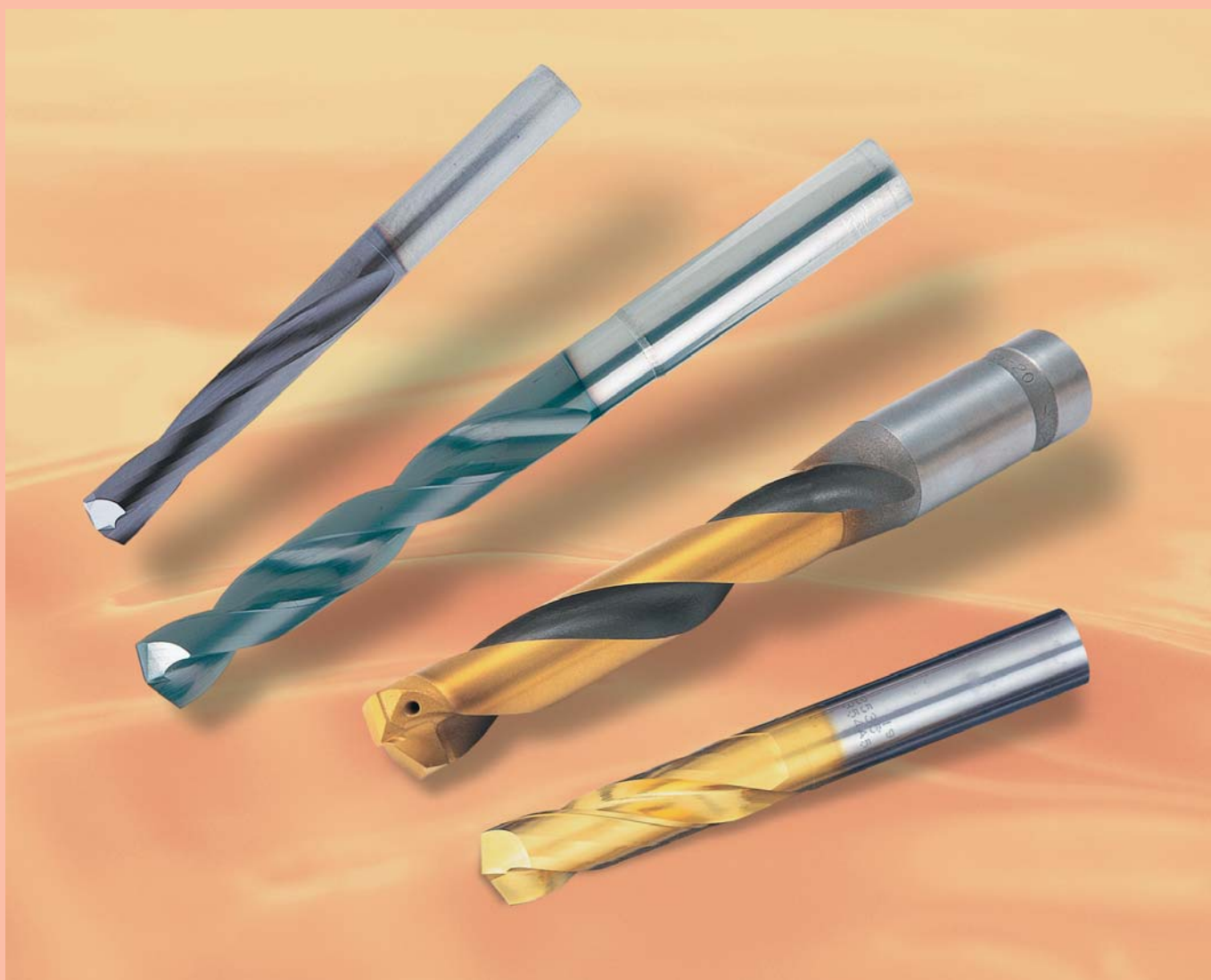











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## “ Drills ”



## “ Drills ”

### Drills Choice

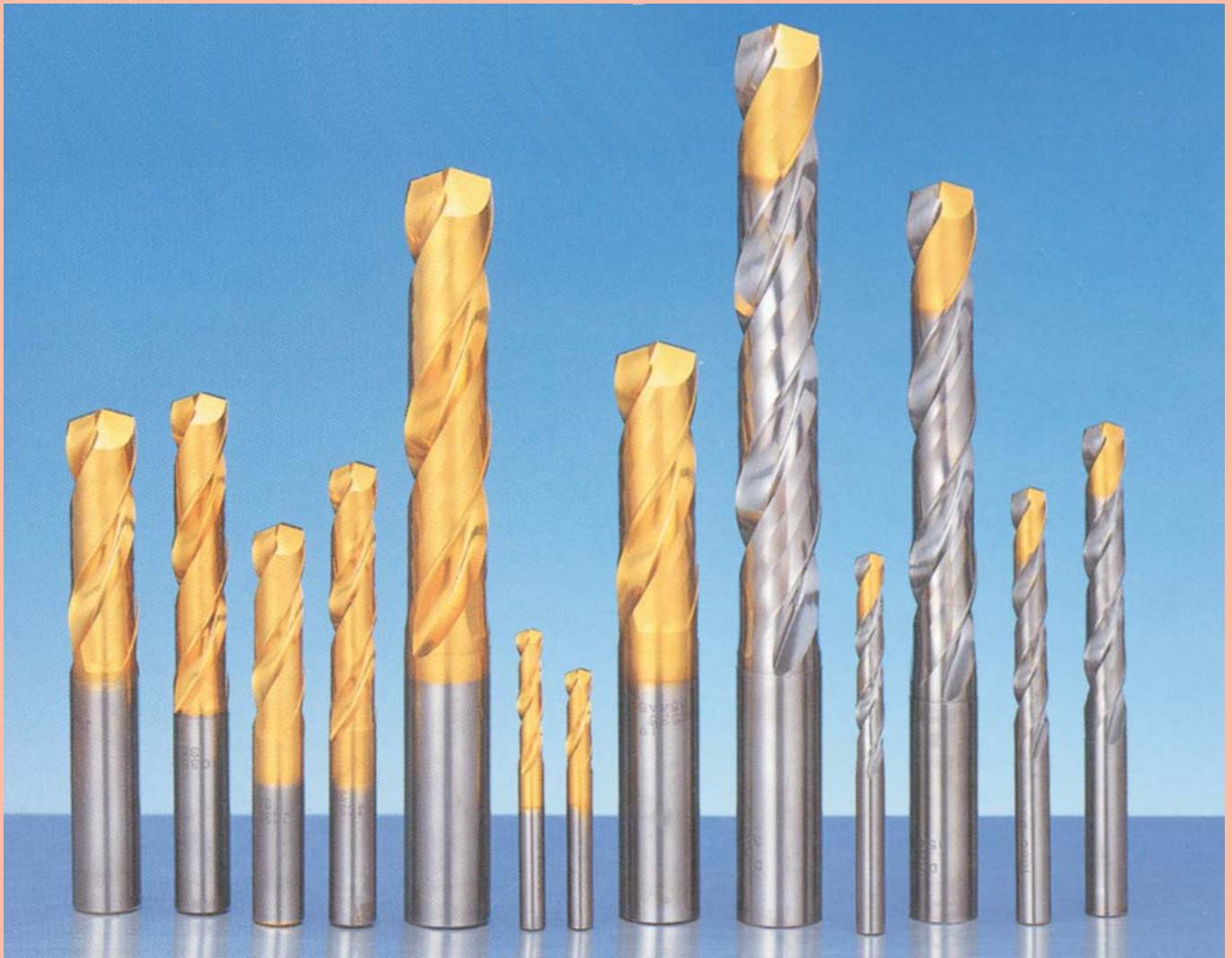
Tool name	Sigma Drill				Sigma Drill Hard	Final Drill	EZ-Drill	S-CUT	
Type	Solid				Solid	Solid	Solid	Brazed	
Pictures					 <b>NEW</b>		 <b>NEW</b>		
Page	204	206	208	211	214/215	218	222-224	228	230
Cod. No.	DDS-S	DDS-M	DDS-L	FC-DDSM	DZ-DHS/L	FDM	EZDM/L	SCD-MS	SCD-ML
Range of size	ø3~ø20	ø3~ø20	ø6~ø13	ø3~ø20	ø2~ø12 / ø3~ø5	ø3~ø12	ø3~ø16 ø3~ø12	ø10~ø30.5	ø10~ø30
Type of lubrication	External coolant					Dry	Internal coolant		
Deep of cut	2 x D	4 x D	6 x D	4 x D	5 x D	3 x D	3 x D-5 x D	3 x D	5 x D
Base Material	P25			K15	Micro Grain	P25	K10	Brazed Carbide	
Coating	JC-Coat (TiN)			Uncoated	DZ-Coat (TiAlN)	DD-Coat (TiAlN)	JC-Coat (TiCN)	JC-Coat (TiN)	
Mild steel	☺	☺	☺		☹	☹	☺	☺	☺
Carbon & Alloy steel	☺	☺	☺		☹	☺☹	☺	☺	☺
Hardened steel up to ~ HRC 50	☹	☹	☹		☺		☹	☹	
Hardened steel up to ~ HRC 70					☺				
Stainless steel	☹	☹	☹				☺	☹	☹
Cast iron	☺	☺	☺	☺			☺	☺	☺
Aluminium alloys	☺	☺	☺	☺		☹	☺		
Graphite Carbon Ceramics	☺	☺	☺						
Features	For general steel and Cast iron Increased drill rigidity	For general steel and Cast iron Increased drill rigidity	For general steel and Cast iron Increased drill rigidity	For general Cast iron Increased drill rigidity Longer tool life	For High Hardened steel from 50 ~ 70HRC Tap drills available from M4 ~ M12	For dry cutting on Carbon steel	For high speed and high efficiency on steel cast iron and Inox.	Wider application areas One piece carbide blade Hosoi-Point geometry	Wider application areas One piece carbide blade Hosoi-Point geometry

☺ = Very Good    ☹ = OK    ☹ = Not recommended



## “ Drills ”

- **DDS “ Sigma Drill ”**
- **FC-DDSM “ Sigma Drill Cast”**



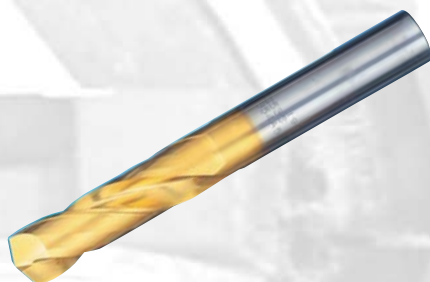




## “ Sigma Drill ”

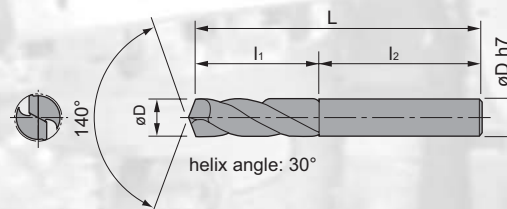
### ■ DDS-S (Short Type 2xD)

1. Increase drill rigidity.
2. Smooth chip ejection.
3. Longer tool life.
4. Easy regrinding.



#### ■ Tolerance for $\phi D$ (mm)

$\phi D$	Tolerance
3 up to	0 -0.010
3 Over ~ 5.9 Up to	0 -0.012
5.9 Over ~ 10 Up to	0 -0.015
10 Over ~ 18 Up to	0 -0.018
18 Over ~ 20 Up to	0 -0.021



- Drilling depth 2 x  $\phi D$
- JC-coat (TiN)

Cat. No.	Stock	Dimensions (mm)			
		$\phi D$	$l_1$	$l_2$	L
DDS-030S	●	3.0	13	32	45
DDS-031S	●	3.1	13	32	45
DDS-032S	●	3.2	13	32	45
DDS-033S	●	3.3	14	34	48
DDS-034S	●	3.4	14	34	48
DDS-035S	●	3.5	14	34	48
DDS-036S	●	3.6	15	34	49
DDS-037S	●	3.7	15	34	49
DDS-038S	●	3.8	15	34	49
DDS-039S	●	3.9	16	34	50
DDS-040S	●	4.0	16	34	50
DDS-041S	●	4.1	16	34	50
DDS-042S	●	4.2	18	34	52
DDS-043S	●	4.3	18	34	52
DDS-044S	●	4.4	18	34	52
DDS-045S	●	4.5	18	34	52
DDS-046S	●	4.6	19	36	55
DDS-047S	●	4.7	19	36	55
DDS-048S	●	4.8	19	36	55
DDS-049S	●	4.9	19	36	55
DDS-050S	●	5.0	19	36	55
DDS-051S	●	5.1	22	38	60
DDS-052S	●	5.2	22	38	60
DDS-053S	●	5.3	22	38	60
DDS-054S	●	5.4	22	38	60
DDS-055S	●	5.5	22	38	60

Cat. No.	Stock	Dimensions (mm)			
		$\phi D$	$l_1$	$l_2$	L
DDS-056S	●	5.6	25	40	65
DDS-057S	●	5.7	25	40	65
DDS-058S	●	5.8	25	40	65
DDS-059S	●	5.9	25	40	65
DDS-060S	●	6.0	25	40	65
DDS-061S	●	6.1	28	42	70
DDS-062S	●	6.2	28	42	70
DDS-063S	●	6.3	28	42	70
DDS-064S	●	6.4	28	42	70
DDS-065S	●	6.5	28	42	70
DDS-066S	●	6.6	30	45	75
DDS-067S	●	6.7	30	45	75
DDS-068S	●	6.8	30	45	75
DDS-069S	●	6.9	30	45	75
DDS-070S	●	7.0	30	45	75
DDS-071S	●	7.1	30	45	75
DDS-072S	●	7.2	30	45	75
DDS-073S	●	7.3	30	45	75
DDS-074S	●	7.4	30	45	75
DDS-075S	●	7.5	30	45	75
DDS-076S	●	7.6	32	45	77
DDS-077S	●	7.7	32	45	77
DDS-078S	●	7.8	32	45	77
DDS-079S	●	7.9	32	45	77
DDS-080S	●	8.0	32	45	77
DDS-081S	●	8.1	35	45	80



# “ Sigma Drill ”

## ■ DDS-S (Short Type 2xD)

Cat. No.	Stock	Dimensions (mm)			
		øD	l1	l2	L
DDS-082S	●	8.2	35	45	80
DDS-083S	●	8.3	35	45	80
DDS-084S	●	8.4	35	45	80
DDS-085S	●	8.5	35	45	80
DDS-086S	●	8.6	35	45	80
DDS-087S	●	8.7	35	45	80
DDS-088S	●	8.8	35	45	80
DDS-089S	●	8.9	35	45	80
DDS-090S	●	9.0	35	45	80
DDS-091S	●	9.1	40	45	85
DDS-092S	●	9.2	40	45	85
DDS-093S	●	9.3	40	45	85
DDS-094S	●	9.4	40	45	85
DDS-095S	●	9.5	40	45	85
DDS-096S	●	9.6	40	45	85
DDS-097S	●	9.7	40	45	85
DDS-098S	●	9.8	40	45	85
DDS-099S	●	9.9	40	45	85
DDS-100S	●	10.0	40	45	85
DDS-101S	●	10.1	44	46	90
DDS-102S	●	10.2	44	46	90
DDS-103S	●	10.3	44	46	90
DDS-104S	●	10.4	44	46	90
DDS-105S	●	10.5	44	46	90
DDS-106S	●	10.6	44	46	90
DDS-107S	●	10.7	44	46	90
DDS-108S	●	10.8	44	46	90
DDS-109S	●	10.9	44	46	90
DDS-110S	●	11.0	44	46	90
DDS-111S	●	11.1	48	47	95
DDS-112S	●	11.2	48	47	95
DDS-113S	●	11.3	48	47	95
DDS-114S	●	11.4	48	47	95
DDS-115S	●	11.5	48	47	95
DDS-116S	●	11.6	52	48	100
DDS-117S	●	11.7	52	48	100
DDS-118S	●	11.8	52	48	100
DDS-119S	●	11.9	52	48	100
DDS-120S	●	12.0	52	48	100
DDS-121S	●	12.1	54	51	105
DDS-122S	●	12.2	54	51	105
DDS-123S	●	12.3	54	51	105
DDS-124S	●	12.4	54	51	105
DDS-125S	●	12.5	54	51	105

Cat. No.	Stock	Dimensions (mm)			
		øD	l1	l2	L
DDS-126S	●	12.6	54	51	105
DDS-127S	●	12.7	54	51	105
DDS-128S	●	12.8	54	51	105
DDS-129S	●	12.9	54	51	105
DDS-130S	●	13.0	54	51	105
DDS-138S	●	13.8	57	53	110
DDS-140S	●	13.9	57	53	110
DDS-141S	●	14.1	59	56	115
DDS-143S	●	14.3	59	56	115
DDS-147S	●	14.7	64	56	120
DDS-150S	●	15.0	64	56	120
DDS-160S	●	16.0	65	60	125
DDS-170S	●	17.0	67	68	135
DDS-180S	●	18.0	72	68	140
DDS-190S	●	19.0	75	70	145
DDS-200S	●	20.0	80	70	150

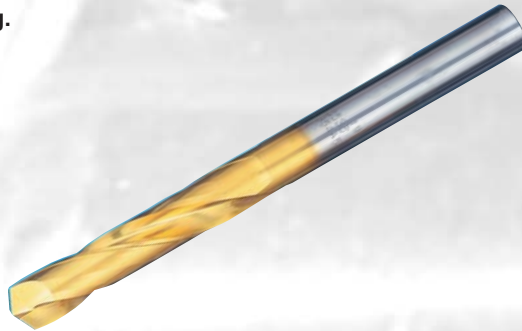
● Stock in Japan



## “ Sigma Drill ”

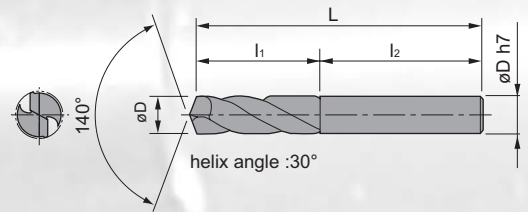
### ■ DDS-M (Medium Type 4xD)

1. Increase drill rigidity.
2. Smooth chip ejection.
3. Deep hole drilling with external coolant supply.
4. Longer tool life.
5. Easy regrinding.



#### ■ Tolerance for $\phi D$ (mm)

$\phi D$	Tolerance
3 Up to	0 -0.010
3.1 Over ~ 5.9 Up to	0 -0.012
6.0 Over ~ 10 Up to	0 -0.015
10 Over ~ 18 Up to	0 -0.018
18 Over ~ 20 Up to	0 -0.021



- Drilling depth 4 x  $\phi D$
- JC-coat (TiN)

Cat. No.	Stock	Dimensions (mm)			
		$\phi D$	$l_1$	$l_2$	L
DDS-030M	●	3.0	18	32	50
DDS-031M	●	3.1	19	34	53
DDS-032M	●	3.2	19	34	53
DDS-033M	●	3.3	19	34	53
DDS-034M	●	3.4	19	34	53
DDS-035M	●	3.5	21	34	55
DDS-036M	●	3.6	21	34	55
DDS-037M	●	3.7	21	34	55
DDS-038M	●	3.8	23	34	57
DDS-039M	●	3.9	23	34	57
DDS-040M	●	4.0	23	34	57
DDS-041M	●	4.1	26	34	60
DDS-042M	●	4.2	26	34	60
DDS-043M	●	4.3	26	34	60
DDS-044M	●	4.4	26	34	60
DDS-045M	●	4.5	26	34	60
DDS-046M	●	4.6	29	36	65
DDS-047M	●	4.7	29	36	65
DDS-048M	●	4.8	29	36	65
DDS-049M	●	4.9	29	36	65
DDS-050M	●	5.0	29	36	65
DDS-051M	●	5.1	32	38	70
DDS-052M	●	5.2	32	38	70
DDS-053M	●	5.3	32	38	70
DDS-054M	●	5.4	32	38	70
DDS-055M	●	5.5	32	38	70

Cat. No.	Stock	Dimensions (mm)			
		$\phi D$	$l_1$	$l_2$	L
DDS-056M	●	5.6	35	40	75
DDS-057M	●	5.7	35	40	75
DDS-058M	●	5.8	35	40	75
DDS-059M	●	5.9	35	40	75
DDS-060M	●	6.0	35	40	65
DDS-061M	●	6.1	38	42	80
DDS-062M	●	6.2	38	42	80
DDS-063M	●	6.3	38	42	80
DDS-064M	●	6.4	38	42	80
DDS-065M	●	6.5	38	42	80
DDS-066M	●	6.6	42	43	85
DDS-067M	●	6.7	42	43	85
DDS-068M	●	6.8	42	43	85
DDS-069M	●	6.9	42	43	85
DDS-070M	●	7.0	42	43	85
DDS-071M	●	7.1	45	45	90
DDS-072M	●	7.2	45	45	90
DDS-073M	●	7.3	45	45	90
DDS-074M	●	7.4	45	45	90
DDS-075M	●	7.5	45	45	90
DDS-076M	●	7.6	47	45	92
DDS-077M	●	7.7	47	45	92
DDS-078M	●	7.8	47	45	92
DDS-079M	●	7.9	47	45	92
DDS-080M	●	8.0	47	45	92
DDS-081M	●	8.1	50	45	95



# “ Sigma Drill ”

## ■ DDS-M (Medium Type 4xD)

Cat. No.	Stock	Dimensions (mm)			
		øD	l1	l2	L
DDS-082M	●	8.2	50	45	95
DDS-083M	●	8.3	50	45	95
DDS-084M	●	8.4	50	45	95
DDS-085M	●	8.5	50	45	95
DDS-086M	●	8.6	53	45	98
DDS-087M	●	8.7	53	45	98
DDS-088M	●	8.8	53	45	98
DDS-089M	●	8.9	53	45	98
DDS-090M	●	9.0	53	45	98
DDS-091M	●	9.1	55	45	100
DDS-092M	●	9.2	55	45	100
DDS-093M	●	9.3	55	45	100
DDS-094M	●	9.4	55	45	100
DDS-095M	●	9.5	55	45	100
DDS-096M	●	9.6	60	45	105
DDS-097M	●	9.7	60	45	105
DDS-098M	●	9.8	60	45	105
DDS-099M	●	9.9	60	45	105
DDS-100M	●	10.0	60	45	105
DDS-101M	●	10.1	64	46	110
DDS-102M	●	10.2	64	46	110
DDS-103M	●	10.3	64	46	110
DDS-104M	●	10.4	64	46	110
DDS-105M	●	10.5	64	46	110
DDS-106M	●	10.6	68	47	115
DDS-107M	●	10.7	68	47	115
DDS-108M	●	10.8	68	47	115
DDS-109M	●	10.9	68	47	115
DDS-110M	●	11.0	68	47	115
DDS-111M	●	11.1	68	47	115
DDS-112M	●	11.2	68	47	115
DDS-113M	●	11.3	68	47	115
DDS-114M	●	11.4	68	47	115
DDS-115M	●	11.5	68	47	115
DDS-116M	●	11.6	72	48	120
DDS-117M	●	11.7	72	48	120
DDS-118M	●	11.8	72	48	120
DDS-119M	●	11.9	72	48	120
DDS-120M	●	12.0	72	48	120
DDS-121M	●	12.1	74	51	125
DDS-122M	●	12.2	74	51	125
DDS-123M	●	12.3	74	51	125
DDS-124M	●	12.4	74	51	125
DDS-125M	●	12.5	74	51	125

Cat. No.	Stock	Dimensions (mm)			
		øD	l1	l2	L
DDS-126M	●	12.6	79	51	130
DDS-127M	●	12.7	79	51	130
DDS-128M	●	12.8	79	51	130
DDS-129M	●	12.9	79	51	130
DDS-130M	●	13.0	79	51	130
DDS-140M	●	14.0	82	53	135
DDS-141M	●	14.1	84	56	140
DDS-147M	●	14.7	89	56	145
DDS-148M	●	14.8	89	56	145
DDS-149M	●	14.9	89	56	145
DDS-150M	●	15.0	89	56	145
DDS-151M	●	15.1	90	60	150
DDS-160M	●	16.0	95	60	155
DDS-170M	●	17.0	102	68	170
DDS-180M	●	18.0	107	68	175
DDS-190M	●	19.0	115	70	185
DDS-200M	●	20.0	120	70	190

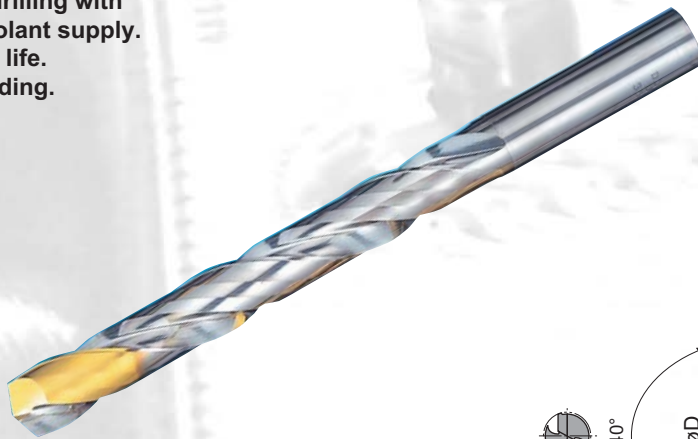




## “Sigma Drill”

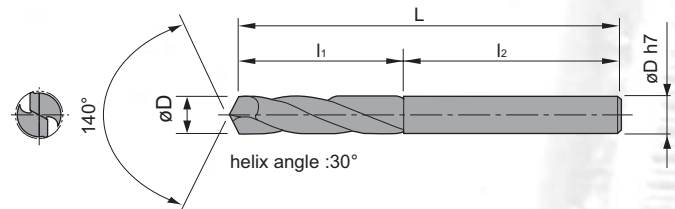
### ■ DDS-L (Long Type 6xD)

1. Increase drill rigidity.
2. Smooth chip ejection.
3. Deep hole drilling with external coolant supply.
4. Longer tool life.
5. Easy regrinding.



#### ■ Tolerance for $\phi D$ (mm)

$\phi D$	Tolerance
6.0 Over ~ 10 Up to	0 -0.015
10 Over ~ 18 Up to	0 -0.018
18 Over ~ 20 Up to	0 -0.021



- Drilling depth 6 x  $\phi D$
- JC-coat (TiN)

Cat. No.	Stock	Dimensions (mm)			
		$\phi D$	l <sub>1</sub>	l <sub>2</sub>	L
DDS-060L	●	6.0	47	38	85
DDS-061L	●	6.1	50	40	90
DDS-062L	●	6.2	50	40	90
DDS-063L	●	6.3	50	40	90
DDS-064L	●	6.4	50	40	90
DDS-065L	●	6.5	50	40	90
DDS-066L	●	6.6	55	40	95
DDS-067L	●	6.7	55	40	95
DDS-068L	●	6.8	55	40	95
DDS-069L	●	6.9	55	40	95
DDS-070L	●	7.0	55	40	95
DDS-071L	●	7.1	58	42	100
DDS-072L	●	7.2	58	42	100
DDS-073L	●	7.3	58	42	100
DDS-074L	●	7.4	58	42	100
DDS-075L	●	7.5	58	42	100
DDS-076L	●	7.6	63	42	105
DDS-077L	●	7.7	63	42	105
DDS-078L	●	7.8	63	42	105
DDS-079L	●	7.9	63	42	105
DDS-080L	●	8.0	63	42	105
DDS-081L	●	8.1	67	43	110
DDS-082L	●	8.2	67	43	110
DDS-083L	●	8.3	67	43	110
DDS-084L	●	8.4	67	43	110
DDS-085L	●	8.5	67	43	110

Cat. No.	Stock	Dimensions (mm)			
		$\phi D$	l <sub>1</sub>	l <sub>2</sub>	L
DDS-086L	●	8.6	72	43	115
DDS-087L	●	8.7	72	43	115
DDS-088L	●	8.8	72	43	115
DDS-089L	●	8.9	72	43	115
DDS-090L	●	9.0	72	43	115
DDS-091L	●	9.1	76	44	120
DDS-092L	●	9.2	76	44	120
DDS-093L	●	9.3	76	44	120
DDS-094L	●	9.4	76	44	120
DDS-095L	●	9.5	76	44	120
DDS-096L	●	9.6	80	45	125
DDS-097L	●	9.7	80	45	125
DDS-098L	●	9.8	80	45	125
DDS-099L	●	9.9	80	45	125
DDS-100L	●	10.0	80	45	125
DDS-101L	●	10.1	84	46	130
DDS-102L	●	10.2	84	46	130
DDS-103L	●	10.3	84	46	130
DDS-104L	●	10.4	84	46	130
DDS-105L	●	10.5	84	46	130
DDS-106L	●	10.6	89	46	135
DDS-107L	●	10.7	89	46	135
DDS-108L	●	10.8	89	46	135
DDS-109L	●	10.9	89	46	135
DDS-110L	●	11.0	89	46	135
DDS-111L	●	11.1	93	47	140





## “ Sigma Drill ”

### ■ Features of Sigma Drill

#### ● Tool Life

##### ● Medium Carbon Steel (DIN C50)

Cutting length (m)	10	20	30	40
Tools				
DDS-080M	35m(Vs MAX0.22mm)			
DDS-160L	30m(Vs MAX0.14mm)			

##### ● Cutting condition

- |   |  |
|---|--|
| 1) DDS-080M (4D)<br>Vc=60 m/min.<br>f =0.24 mm/rev.<br>d=32 mm (blind hole) | 2) DDS-160L (6D)<br>Vc=50 m/min.<br>f =0.35 mm/rev.<br>d=105 mm (through hole) |
|---|--|

##### ● Low Carbon Steel (DIN C15)

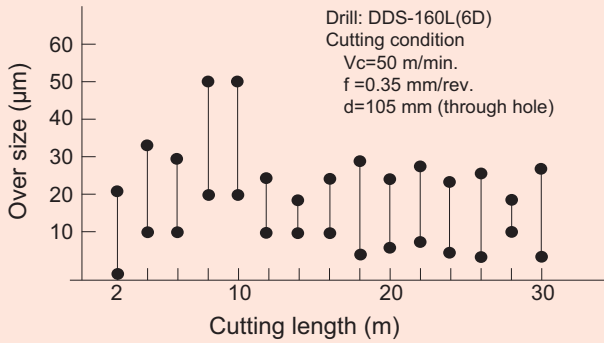
Cutting length (m)	10	20	30	40
Tools				
DDS-080M	34m(Vs MAX0.20mm)			
DDS-160L	30m(Vs MAX0.14mm)			

##### ● Cutting condition

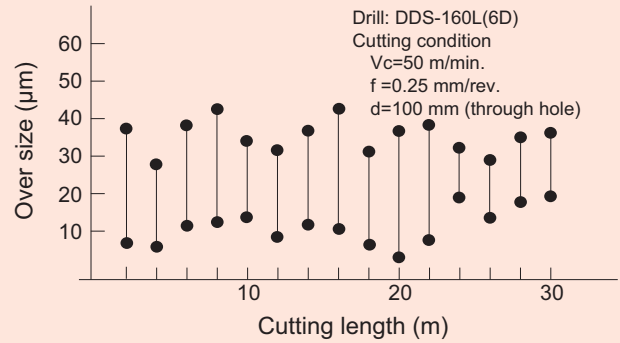
- |  |  |
|--|--|
| 1) DDS-080M (4D)<br>Vc=50 m/min.<br>f =0.2 mm/rev.<br>d=32 mm (blind hole) | 2) DDS-160L (6D)<br>Vc=50 m/min.<br>f =0.25 mm/rev.<br>d=100 mm (through hole) |
|--|--|

#### ● Tolerance condition

##### ● Medium Carbon Steel (DIN C50)



##### ● Medium Carbon Steel (DIN C15)



### ■ Cutting condition of Sigma Drill

#### ● DDS-S, DDS-M

Materials	Low carbon steel (DIN C15)		Medium carbon steel (DIN C50)		Alloy steel (DIN 42CrMo4)		Nodular cast iron (DIN GGG40)	
	Vc (m/min)	f (mm/rev)	Vc (m/min)	f (mm/rev)	Vc (m/min)	f (mm/rev)	Vc (m/min)	f (mm/rev)
Ø3.0 ~ 5.9	30 - 40 - 50	0.05 - 0.07 - 0.10	30 - 40 - 50	0.07 - 0.10 - 0.12	30 - 40 - 50	0.05 - 0.07 - 0.10	30 - 40 - 50	0.05 - 0.10 - 0.12
Ø6.0 ~ 9.9	40 - 50 - 60	0.10 - 0.15 - 0.20	40 - 50 - 60	0.15 - 0.20 - 0.25	40 - 50 - 60	0.12 - 0.17 - 0.22	40 - 50 - 60	0.15 - 0.20 - 0.25
Ø10.0 ~ 15.9	40 - 50 - 60	0.12 - 0.17 - 0.22	40 - 50 - 60	0.20 - 0.25 - 0.30	40 - 50 - 60	0.15 - 0.20 - 0.25	40 - 50 - 60	0.20 - 0.25 - 0.30
Ø16.0 ~ 18.9	40 - 50 - 60	0.15 - 0.20 - 0.25	40 - 50 - 60	0.25 - 0.30 - 0.35	40 - 50 - 60	0.20 - 0.25 - 0.30	40 - 50 - 60	0.25 - 0.30 - 0.35
Ø19.0 ~ 20.0	40 - 50 - 60	0.20 - 0.25 - 0.30	40 - 50 - 60	0.30 - 0.35 - 0.40	40 - 50 - 60	0.25 - 0.30 - 0.35	40 - 50 - 60	0.30 - 0.35 - 0.40

#### ● DDS-L

Materials	Low carbon steel (DIN C15)		Medium carbon steel (DIN C50)		Alloy steel (DIN 42CrMo4)		Nodular cast iron (DIN GGG40)	
	Vc (m/min)	f (mm/rev)	Vc (m/min)	f (mm/rev)	Vc (m/min)	f (mm/rev)	Vc (m/min)	f (mm/rev)
Ø6.0 ~ 9.9	40 - 45 - 50	0.10 - 0.15 - 0.20	40 - 45 - 50	0.15 - 0.20 - 0.25	40 - 45 - 50	0.12 - 0.17 - 0.22	40 - 45 - 50	0.15 - 0.20 - 0.25
Ø10.0 ~ 15.9	40 - 45 - 50	0.12 - 0.17 - 0.22	40 - 45 - 50	0.20 - 0.25 - 0.30	40 - 45 - 50	0.15 - 0.20 - 0.25	40 - 45 - 50	0.20 - 0.25 - 0.30
Ø16.0 ~ 18.9	40 - 45 - 50	0.15 - 0.20 - 0.25	40 - 45 - 50	0.25 - 0.30 - 0.35	40 - 45 - 50	0.20 - 0.25 - 0.30	40 - 45 - 50	0.25 - 0.30 - 0.35
Ø19.0 ~ 20.0	40 - 45 - 50	0.20 - 0.25 - 0.30	40 - 45 - 50	0.30 - 0.35 - 0.40	40 - 45 - 50	0.25 - 0.30 - 0.35	40 - 45 - 50	0.30 - 0.35 - 0.40

Drills



# “ Sigma Drill-Cast ”

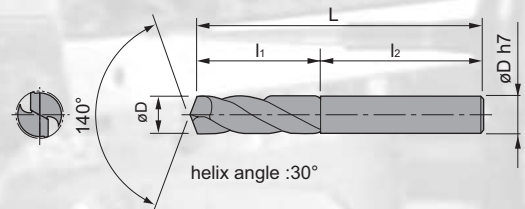
## ■ FC-DDSM (Medium Type 4xD) Non-coated

1. Increase drill rigidity.
2. Smooth chip ejection.
3. Deep hole drilling with external coolant supply.
4. Longer tool life.
5. Easy regrinding.
6. For cast iron



■ Tolerance for  $\varnothing D$  (mm)

$\varnothing D$	Tolerance
3 Up to	0 -0.010
3.1 Over ~ 5.9 Up to	0 -0.012
6.0 Over ~ 10 Up to	0 -0.015
10 Over ~ 18 Up to	0 -0.018
18 Over ~ 20 Up to	0 -0.021



- Drilling depth 4 x  $\varnothing D$
- Uncoated for cast iron

Cat. No.	Stock	Dimensions (mm)			
		$\varnothing D$	l <sub>1</sub>	l <sub>2</sub>	L
FC-DDSM030	●	3.0	18	32	50
FC-DDSM031	●	3.1	19	34	53
FC-DDSM032	●	3.2	19	34	53
FC-DDSM033	●	3.3	19	34	53
FC-DDSM034	●	3.4	19	34	53
FC-DDSM035	●	3.5	21	34	55
FC-DDSM036	●	3.6	21	34	55
FC-DDSM037	●	3.7	21	34	55
FC-DDSM038	●	3.8	23	34	57
FC-DDSM039	●	3.9	23	34	57
FC-DDSM040	●	4.0	23	34	57
FC-DDSM041	●	4.1	26	34	60
FC-DDSM042	●	4.2	26	34	60
FC-DDSM043	●	4.3	26	34	60
FC-DDSM044	●	4.4	26	34	60
FC-DDSM045	●	4.5	26	34	60
FC-DDSM046	●	4.6	29	36	65
FC-DDSM047	●	4.7	29	36	65
FC-DDSM048	●	4.8	29	36	65
FC-DDSM049	●	4.9	29	36	65
FC-DDSM050	●	5.0	29	36	65
FC-DDSM051	●	5.1	32	38	70
FC-DDSM052	●	5.2	32	38	70
FC-DDSM053	●	5.3	32	38	70
FC-DDSM054	●	5.4	32	38	70
FC-DDSM055	●	5.5	32	38	70
FC-DDSM056	●	5.6	35	40	75
FC-DDSM057	●	5.7	35	40	75

Cat. No.	Stock	Dimensions (mm)			
		$\varnothing D$	l <sub>1</sub>	l <sub>2</sub>	L
FC-DDSM058	●	5.8	35	40	75
FC-DDSM059	●	5.9	35	40	75
FC-DDSM060	●	6.0	35	40	75
FC-DDSM061	●	6.1	38	42	80
FC-DDSM062	●	6.2	38	42	80
FC-DDSM063	●	6.3	38	42	80
FC-DDSM064	●	6.4	38	42	80
FC-DDSM065	●	6.5	38	42	80
FC-DDSM066	●	6.6	42	43	85
FC-DDSM067	●	6.7	42	43	85
FC-DDSM068	●	6.8	42	43	85
FC-DDSM069	●	6.9	42	43	85
FC-DDSM070	●	7.0	42	43	85
FC-DDSM071	●	7.1	45	45	90
FC-DDSM072	●	7.2	45	45	90
FC-DDSM073	●	7.3	45	45	90
FC-DDSM074	●	7.4	45	45	90
FC-DDSM075	●	7.5	45	45	90
FC-DDSM076	●	7.6	47	45	92
FC-DDSM077	●	7.7	47	45	92
FC-DDSM078	●	7.8	47	45	92
FC-DDSM079	●	7.9	47	45	92
FC-DDSM080	●	8.0	47	45	92
FC-DDSM-081	●	8.1	50	45	95
FC-DDSM082	●	8.2	50	45	95
FC-DDSM083	●	8.3	50	45	95
FC-DDSM084	●	8.4	50	45	95
FC-DDSM085	●	8.5	50	45	95



## “Sigma Drill-Cast”

### FC-DDSM (Medium Type 4xD) Non-coated

Cat. No.	Stock	Dimensions (mm)			
		øD	l <sub>1</sub>	l <sub>2</sub>	L
FC-DDSM086	●	8.6	53	45	98
FC-DDSM087	●	8.7	53	45	98
FC-DDSM088	●	8.8	53	45	98
FC-DDSM089	●	8.9	53	45	98
FC-DDSM090	●	9.0	53	45	98
FC-DDSM091	●	9.1	55	45	100
FC-DDSM092	●	9.2	55	45	100
FC-DDSM093	●	9.3	55	45	100
FC-DDSM094	●	9.4	55	45	100
FC-DDSM095	●	9.5	55	45	100
FC-DDSM096	●	9.6	60	45	105
FC-DDSM097	●	9.7	60	45	105
FC-DDSM098	●	9.8	60	45	105
FC-DDSM099	●	9.9	60	45	105
FC-DDSM100	●	10.0	60	45	105
FC-DDSM101	●	10.1	64	46	110
FC-DDSM102	●	10.2	64	46	110
FC-DDSM103	●	10.3	64	46	110
FC-DDSM104	●	10.4	64	46	110
FC-DDSM105	●	10.5	64	46	110
FC-DDSM106	●	10.6	68	47	115
FC-DDSM107	●	10.7	68	47	115
FC-DDSM108	●	10.8	68	47	115
FC-DDSM109	●	10.9	68	47	115
FC-DDSM110	●	11.0	68	47	115
FC-DDSM111	●	11.1	68	47	115
FC-DDSM112	●	11.2	68	47	115
FC-DDSM113	●	11.3	68	47	115
FC-DDSM114	●	11.4	68	47	115
FC-DDSM115	●	11.5	68	47	115
FC-DDSM116	●	11.6	72	48	120
FC-DDSM117	●	11.7	72	48	120

Cat. No.	Stock	Dimensions (mm)			
		øD	l <sub>1</sub>	l <sub>2</sub>	L
FC-DDSM118	●	11.8	72	48	120
FC-DDSM119	●	11.9	72	48	120
FC-DDSM120	●	12.0	72	48	120
FC-DDSM121	●	12.1	74	51	125
FC-DDSM122	●	12.2	74	51	125
FC-DDSM123	●	12.3	74	51	125
FC-DDSM124	●	12.4	74	51	125
FC-DDSM125	●	12.5	74	51	125
FC-DDSM126	●	12.6	79	51	130
FC-DDSM127	●	12.7	79	51	130
FC-DDSM128	●	12.8	79	51	130
FC-DDSM129	●	12.9	79	51	130
FC-DDSM130	●	13.0	79	51	130
FC-DDSM132	●	13.2	82	53	135
FC-DDSM135	●	13.5	82	53	135
FC-DDSM136	●	13.6	82	53	135
FC-DDSM138	●	13.8	82	53	135
FC-DDSM140	●	14.0	82	53	135
FC-DDSM142	●	14.2	84	56	140
FC-DDSM145	●	14.5	84	56	140
FC-DDSM148	●	14.8	89	56	145
FC-DDSM150	●	15.0	89	56	145
FC-DDSM152	●	15.2	90	60	150
FC-DDSM155	●	15.5	90	60	150
FC-DDSM158	●	15.8	95	60	155
FC-DDSM160	●	16.0	95	60	155
FC-DDSM170	●	17.0	102	68	170
FC-DDSM175	●	17.5	107	68	175
FC-DDSM180	●	18.0	107	68	175
FC-DDSM185	●	18.5	115	70	185
FC-DDSM190	●	19.0	115	70	185
FC-DDSM200	●	20.0	120	70	190

### Recommended cutting conditions for FC-DDSM

Works Materials	Nodular cast iron (DIN GGG40) 230HB			Cast iron (DIN GG25) 220HB			Remarks	
	Drill dia. Ø (mm)	V <sub>c</sub> (m/min)	n (rev/min)	f (mm/rev)	V <sub>c</sub> (m/min)	n (rev/min)		f (mm/rev)
	3	35	3,710	0.07~0.15	40	4,240	0.1~0.2	1. This cutting condition table shall be applied to use water soluble coolant. We recommend to use water soluble coolant type suitable for heavy duty cutting. Contained extreme pressure addition. 2. High rigidity chuck like milling chuck must be used to maintain high precision run-out.
	4	40	3,180	0.1~0.2	45	3,580	0.15~0.25	
	5	40	2,250	0.1~0.2	45	2,860	0.15~0.25	
	6	45	2,390	0.15~0.25	50	2,650	0.2~0.3	
	8	45	1,790	0.15~0.25	50	1,990	0.2~0.3	
	10	50	1,590	0.2~0.3	55	1,750	0.25~0.35	
	12	50	1,330	0.2~0.3	55	1,460	0.25~0.35	
	13	55	1,350	0.2~0.3	60	1,470	0.25~0.35	
	14	55	1,250	0.2~0.3	60	1,360	0.25~0.35	
	16	55	1,090	0.25~0.35	60	1,190	0.3~0.4	
	18	55	970	0.25~0.35	60	1,060	0.3~0.4	
	20	55	880	0.3~0.4	60	950	0.35~0.45	

Drills



## “ Drills ”



■ **DZ-DHS “ Sigma Drill Hard ”**

■ **DZ-DHL “ Sigma Drill Hard ”** 





## “Sigma Drill Hard”

### ■ DZ-DHS (5 x øD)

#### Exclusive drill for hardened materials up to 70 HRC.

Excellent wear resistance and breaking resistance allows the drill to cut high hardened materials which require high wear resistance, heat resistance and plastic deformation resistance for cutting the edge. No need electric discharge!

#### ■ Tolerance for øD (mm)

øD	Tolerance
Up to 3	0 -0.010
From 3.1 ~ 5.9	0 -0.012
From 6 ~ 10	0 -0.015
From 10.1 ~ 12	0 -0.018

#### 1. High drill rigidity.

Over 1.6 times thicker web thickness than competitor's drill.  
High drill rigidity against bending & torsion.

#### 2. High breaking and chipping resistance.

Adopting Sub Micro grain carbide as substrate which gives chipping & breaking resistance.

#### 3. High heat and wear resistance.

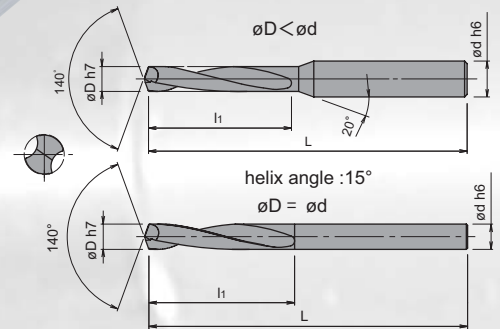
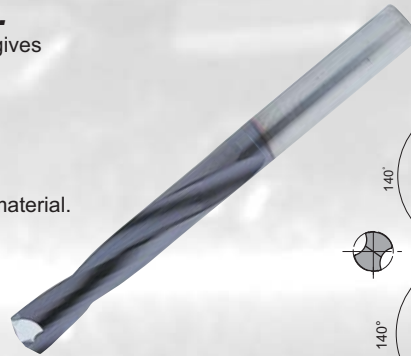
Adopting DZ-COAT which provides oxidization & wear resistance, gives longer tool life.

#### 4. Incredibly strong against chipping!

- Adopted the exclusive thinning for high hardened material.
  - > Improved the chipping resistance at the center and the chip ejection.
- Reduced the helix from 30° to 15°.
- Added corner radius at outer corner.
  - > Solved the problem of chipping outer corner.

● For high hardened steel up to 70 HRC.

● DZ-coat (TiAlN)



Cat. No.	Stock	Dimensions (mm)			
		øD	l1	L	ød
DZ-DHS0200	●	2.0	16	55	3
DZ-DHS0200-12	●	2.0	12	55	3
DZ-DHS0200-21	●	2.0	21	55	3
DZ-DHS0210	●	2.1	16	55	3
DZ-DHS0220	●	2.2	16	55	3
DZ-DHS0230	●	2.3	16	55	3
DZ-DHS0240	●	2.4	16	55	3
DZ-DHS0250	●	2.5	16	55	3
NEW DZ-DHS0250-21	●	2.5	21	55	3
DZ-DHS0260	●	2.6	16	55	3
DZ-DHS0270	●	2.7	16	55	3
DZ-DHS0280	●	2.8	16	55	3
DZ-DHS0290	●	2.9	16	55	3
DZ-DHS0300	●	3.0	21	60	4
NEW DZ-DHS0330	●	3.3	24	60	4
DZ-DHS0340	●	3.4	24	60	4
DZ-DHS0350	●	3.5	24	60	4
NEW DZ-DHS0380	●	3.8	27	60	4
DZ-DHS0400	●	4.0	27	60	4
NEW DZ-DHS0420	●	4.2	29	63	6
DZ-DHS0430	●	4.3	29	63	6
DZ-DHS0440	●	4.4	29	64	6
NEW DZ-DHS0450	●	4.5	29	64	6
DZ-DHS0500	●	5.0	32	68	6
DZ-DHS0510	●	5.1	34	72	6
DZ-DHS0520	●	5.2	34	72	6

Cat. No.	Stock	Dimensions (mm)			
		øD	l1	L	ød
DZ-DHS0600	●	6.0	41	81	6
DZ-DHS0680	●	6.8	43	83	8
DZ-DHS0690	●	6.9	43	83	8
DZ-DHS0700	●	7.0	43	83	8
DZ-DHS0800	●	8.0	48	90	8
DZ-DHS0850	●	8.5	53	96	10
DZ-DHS0860	●	8.6	55	98	10
DZ-DHS0900	●	9.0	55	98	10
DZ-DHS1000	●	10.0	60	105	10
DZ-DHS1030	●	10.3	66	112	12
DZ-DHS1040	●	10.4	66	112	12
DZ-DHS1100	●	11.0	68	114	12
DZ-DHS1200	●	12.0	73	121	12



# “ Sigma Drill Hard ”

## ■ DZ-DHL (5 x øD)

### Exclusive drill for hardened materials up to 70 HRc.

Excellent wear resistance and breaking resistance allows the drill to cut high hardened materials which require high wear resistance, heat resistance and plastic deformation resistance for cutting the edge. No need electric discharge!

#### 1. High drill rigidity.

Over 1.6 times thicker web thickness than competitor's drill.  
High drill rigidity against bending & torsion.

#### 2. High breaking and chipping resistance.

Adopting Sub Micro grain carbide as substrate which gives chipping & breaking resistance.

#### 3. High heat and wear resistance.

Adopting DZ-COAT which provides oxidization & wear resistance, gives longer tool life.

#### 4. Incredibly strong against chipping!

- Adopted the exclusive thinning for high hardened material.
  - > Improved the chipping resistance at the center and the chip ejection.
- Reduced the helix from 30° to 15°.
- Added corner radius at outer corner.
  - > Solved the problem of chipping outer corner.

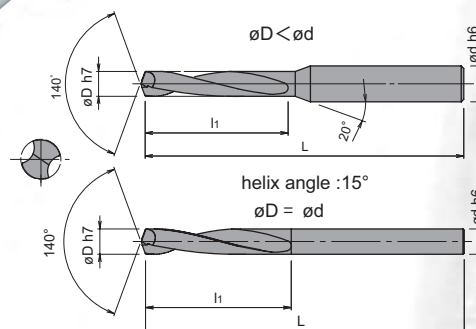
● For high hardened steel up to 70 HRc.

● DZ-coat (TiAlN)



#### ■ Tolerance for øD (mm)

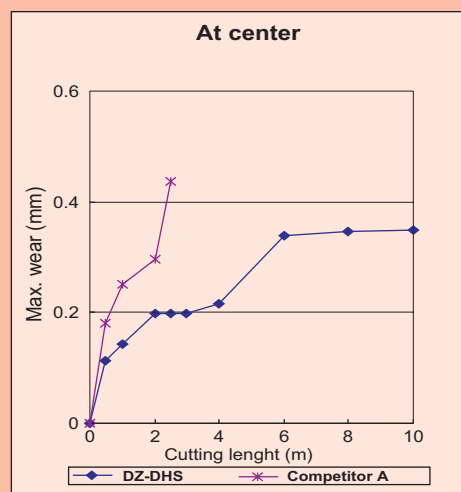
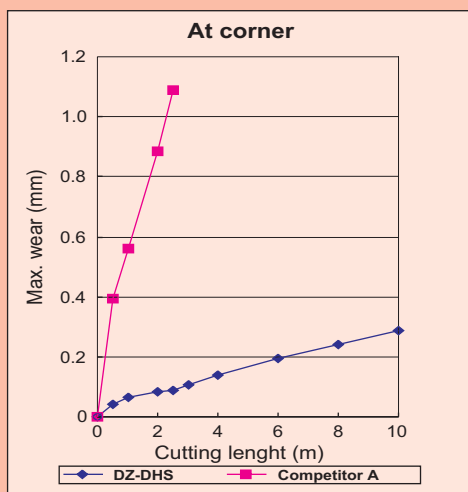
øD	Tolerance
Up to 3	0 -0.010
From 3.1 ~ 5.9	0 -0.012



Cat. No.	Stock	Dimensions (mm)			
		øD	l1	L	ød
DZ-DHL0300	●	3.0	25	70	4
DZ-DHL0330	●	3.3	25	80	4
DZ-DHL0380	●	3.8	30	80	4
DZ-DHL0400	●	4.0	30	80	4
DZ-DHL0420S5	●	4.2	30	85	5
DZ-DHL0500S5	●	5.0	35	85	5

## ■ Cutting data

Tool	DZ-DHS0600	<b>Result</b>	Competitor's drill got over 1 mm chipping at corner edge, after 2.48 m at center edge also got 0.45 mm excessive wear and finished. Damage of Sigma Drill-Hard after 10 m was below 0.3 mm V <sub>b</sub> at corner edge and below 0.35 mm V <sub>b</sub> at the center edge. Five times longer tool life
Tool Ø	6 mm.		
Material	SKD11(60HRc)		
Vc	10m/min		
f	0.05mm/rev		
Deep	20mm depth/(Through hole)		
Coolant	Water soluble		





## “ Sigma Drill Hard ”

### ■ Recommended cutting conditions for DZ-DHS

Materials	SKT,SKD61 (48 ~ 56 HRC) Tool steel		SKD11,SKH (57 ~ 62 HRC) Tool steel		SKD11,SKH (63 ~ 70 HRC) Tool steel	
	N (min <sup>-1</sup> )	Vf (mm/min)	N (min <sup>-1</sup> )	Vf (mm/min)	N (min <sup>-1</sup> )	Vf (mm/min)
	Vc (m/min)	f (mm/rev)	Vc (m/min)	f (mm/rev)	Vc (m/min)	f (mm/rev)
2	2,860	115	2,070	83	1,270	38
	15 ~ 20	0.03 ~ 0.05	10 ~ 15	0.03 ~ 0.05	5 ~ 10	0.02 ~ 0.04
2.5	2,550	102	1,660	66	1,270	38
	15 ~ 25	0.03 ~ 0.05	10 ~ 15	0.03 ~ 0.05	7 ~ 12	0.02 ~ 0.04
3	2,100	84	1,380	55	1,060	31
	15 ~ 25	0.03 ~ 0.05	10 ~ 15	0.03 ~ 0.05	7 ~ 12	0.02 ~ 0.04
4	1,590	63	1,035	41	795	23
	15 ~ 25	0.03 ~ 0.05	10 ~ 15	0.03 ~ 0.05	7 ~ 12	0.02 ~ 0.04
5	1,270	62	830	41	635	25
	15 ~ 25	0.04 ~ 0.06	10 ~ 15	0.04 ~ 0.06	7 ~ 12	0.03 ~ 0.05
6	1,060	74	690	41	530	26
	15 ~ 25	0.06 ~ 0.08	10 ~ 15	0.05 ~ 0.07	7 ~ 12	0.04 ~ 0.06
7	910	63	590	35	455	22
	15 ~ 25	0.06 ~ 0.08	10 ~ 15	0.05 ~ 0.07	7 ~ 12	0.04 ~ 0.06
8	795	60	520	34	400	20
	15 ~ 25	0.06 ~ 0.09	10 ~ 15	0.05 ~ 0.08	7 ~ 12	0.04 ~ 0.06
9	710	53	460	30	355	18
	15 ~ 25	0.06 ~ 0.09	10 ~ 15	0.05 ~ 0.08	7 ~ 12	0.04 ~ 0.06
10	640	51	415	29	320	17
	15 ~ 25	0.06 ~ 0.1	10 ~ 15	0.05 ~ 0.09	7 ~ 12	0.04 ~ 0.07
11	580	46	375	26	290	15
	15 ~ 25	0.06 ~ 0.1	10 ~ 15	0.05 ~ 0.09	7 ~ 12	0.04 ~ 0.07
12	530	47	345	25	265	15
	15 ~ 25	0.06 ~ 0.12	10 ~ 15	0.05 ~ 0.1	7 ~ 12	0.04 ~ 0.08

### ■ Attention for use.

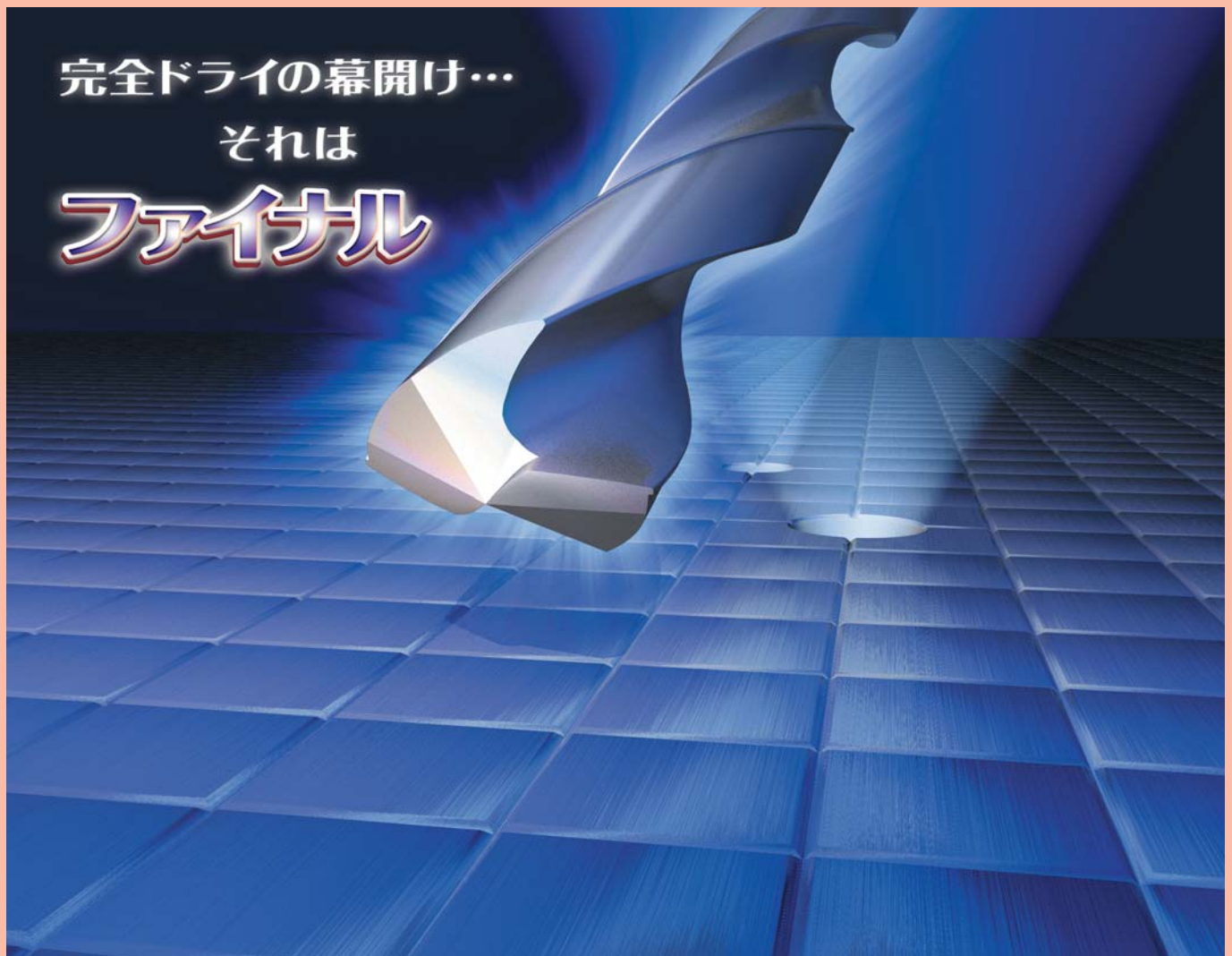
1. Use water soluble oil.
2. Not recommended to use for non-heat treated material. Recommended to use Sigma drill.
3. Recommended to use for over 50 HRC to 70 HRC.
4. Use a rigid machine and precise holder.
5. This data is relevant for cutting depth at 3 x Ø.
6. Recommended to use for blind hole. In case of through hole, use back up under the work piece.
7. Above data is relevant to DZ-DHS type drills. In case of use DZ-DHL type drills, recommend apply lower cutting conditions. Also recommend to make center hole by DZ-DHS drills as below.



## “ Drills ”



### ■ FDM “ Final Drill ”





## “ Final Drill ”

### ■ FDM (for dry machining completely)

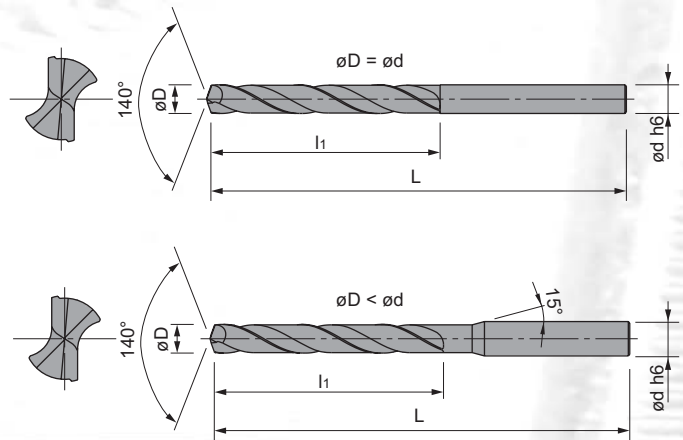
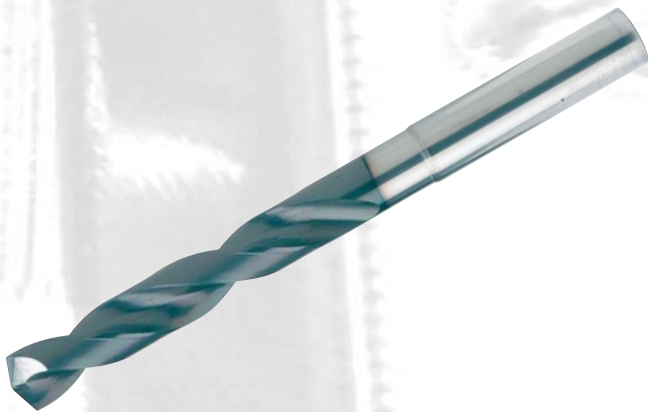
#### 1. The first realization of perfect dry cutting drill for steel in metal cutting industry.

- Adoption of new high harden coating layer (DD coat - Dijet dry coat) provided with heat resistant and excellent lubricant.
- Development of special substrate
- Improvement of conventional Hosoi geometry.

#### 2. Excellent chip evacuation, control of cutting heat and cutting resistant.

#### ■ Tolerance for $\phi D$ (mm)

$\phi D$	Tolerance
3 Up to	0 -0.014
3 Over ~ 5.9 Up to	0 -0.018
6.0 Over ~ 10 Up to	0 -0.022
10 Over ~ 12 Up to	0 -0.027



- Carbon steel and cast iron cutting
- DD coat (TiAlN coating layer)
- Effective drilling depth: 3 x D

Cat. No.	Stock	Dimensions (mm)			
		$\phi D$	$l_1$	L	$\phi d$
FDM-030	●	3.0	19	51	3
FDM-031	●	3.1	21	53	4
FDM-032	●	3.2	21	53	4
FDM-033	●	3.3	21	53	4
FDM-034	●	3.4	24	56	4
FDM-035	●	3.5	24	56	4
FDM-036	●	3.6	24	56	4
FDM-037	●	3.7	24	56	4
FDM-038	●	3.8	27	59	4
FDM-039	●	3.9	27	59	4
FDM-040	●	4.0	27	59	4
FDM-041	●	4.1	27	71	6
FDM-042	●	4.2	27	71	6
FDM-043	●	4.3	31	75	6
FDM-044	●	4.4	31	75	6
FDM-045	●	4.5	31	75	6
FDM-046	●	4.6	31	75	6
FDM-047	●	4.7	31	75	6
FDM-048	●	4.8	33	77	6
FDM-049	●	4.9	33	77	6
FDM-050	●	5.0	38	82	6
FDM-051	●	5.1	38	82	6

Cat. No.	Stock	Dimensions (mm)			
		$\phi D$	$l_1$	L	$\phi d$
FDM-052	●	5.2	38	82	6
FDM-053	●	5.3	38	82	6
FDM-054	●	5.4	38	82	6
FDM-055	●	5.5	38	82	6
FDM-056	●	5.6	41	85	6
FDM-057	●	5.7	41	85	6
FDM-058	●	5.8	41	85	6
FDM-059	●	5.9	41	85	6
FDM-060	●	6.0	41	85	6
FDM-061	●	6.1	41	85	8
FDM-062	●	6.2	41	85	8
FDM-063	●	6.3	41	85	8
FDM-064	●	6.4	41	85	8
FDM-065	●	6.5	41	85	8
FDM-066	●	6.6	43	87	8
FDM-067	●	6.7	43	87	8
FDM-068	●	6.8	43	87	8
FDM-069	●	6.9	43	87	8
FDM-070	●	7.0	43	87	8
FDM-071	●	7.1	45	89	8
FDM-072	●	7.2	45	89	8
FDM-073	●	7.3	45	89	8



# “ Final Drill ”

## ■ FDM (for dry machining completely)




Cat. No.	Stock	Dimensions (mm)			
		øD	l1	L	ød
FDM-074	●	7.4	45	89	8
FDM-075	●	7.5	45	89	8
FDM-076	●	7.6	48	92	8
FDM-077	●	7.7	48	92	8
FDM-078	●	7.8	48	92	8
FDM-079	●	7.9	48	92	8
FDM-080	●	8.0	48	92	8
FDM-081	●	8.1	53	103	10
FDM-082	●	8.2	53	103	10
FDM-083	●	8.3	53	103	10
FDM-084	●	8.4	53	103	10
FDM-085	●	8.5	53	103	10
FDM-086	●	8.6	55	105	10
FDM-087	●	8.7	55	105	10
FDM-088	●	8.8	55	105	10
FDM-089	●	8.9	55	105	10
FDM-090	●	9.0	55	105	10
FDM-091	●	9.1	58	108	10
FDM-092	●	9.2	58	108	10
FDM-093	●	9.3	58	108	10
FDM-094	●	9.4	58	108	10
FDM-095	●	9.5	58	108	10
FDM-096	●	9.6	60	110	10
FDM-097	●	9.7	60	110	10

Cat. No.	Stock	Dimensions (mm)			
		øD	l1	L	ød
FDM-098	●	9.8	60	110	10
FDM-099	●	9.9	60	110	10
FDM-100	●	10.0	60	110	10
FDM-101	●	10.1	66	123	12
FDM-102	●	10.2	66	123	12
FDM-103	●	10.3	66	123	12
FDM-104	●	10.4	66	123	12
FDM-105	●	10.5	66	123	12
FDM-106	●	10.6	68	125	12
FDM-107	●	10.7	68	125	12
FDM-108	●	10.8	68	125	12
FDM-109	●	10.9	68	125	12
FDM-110	●	11.0	68	125	12
FDM-111	●	11.1	71	128	12
FDM-112	●	11.2	71	128	12
FDM-113	●	11.3	71	128	12
FDM-114	●	11.4	71	128	12
FDM-115	●	11.5	71	128	12
FDM-116	●	11.6	72	130	12
FDM-117	●	11.7	72	130	12
FDM-118	●	11.8	72	130	12
FDM-119	●	11.9	72	130	12
FDM-120	●	12.0	72	130	12

● Stock in Japan

## “ Final Drill ”

### ■ Dry cutting data for C50

Normal wear after 20 m.		<b>Work</b>	<b>Material</b>	C50
 			<b>Hardness</b>	200 HB
		<b>Tool</b>	<b>Tool No.</b>	FDM-100
			<b>Ø</b>	10 mm.
<b>Result</b>		<b>Cutting conditions</b>	<b>Cutting speed</b>	80 m/min. (2547 RPM)
			<b>feed</b>	0.15mm/rev.
			<b>Feed speed</b>	382 mm/min
			<b>Depth of hole</b>	32 mm thru
			<b>Coolant</b>	Dry cut
Tool shows normal wear after 20 m drilling, still able to continue to use.		<b>Machine</b>	MC	

### ■ Recommended cutting conditions for FDM

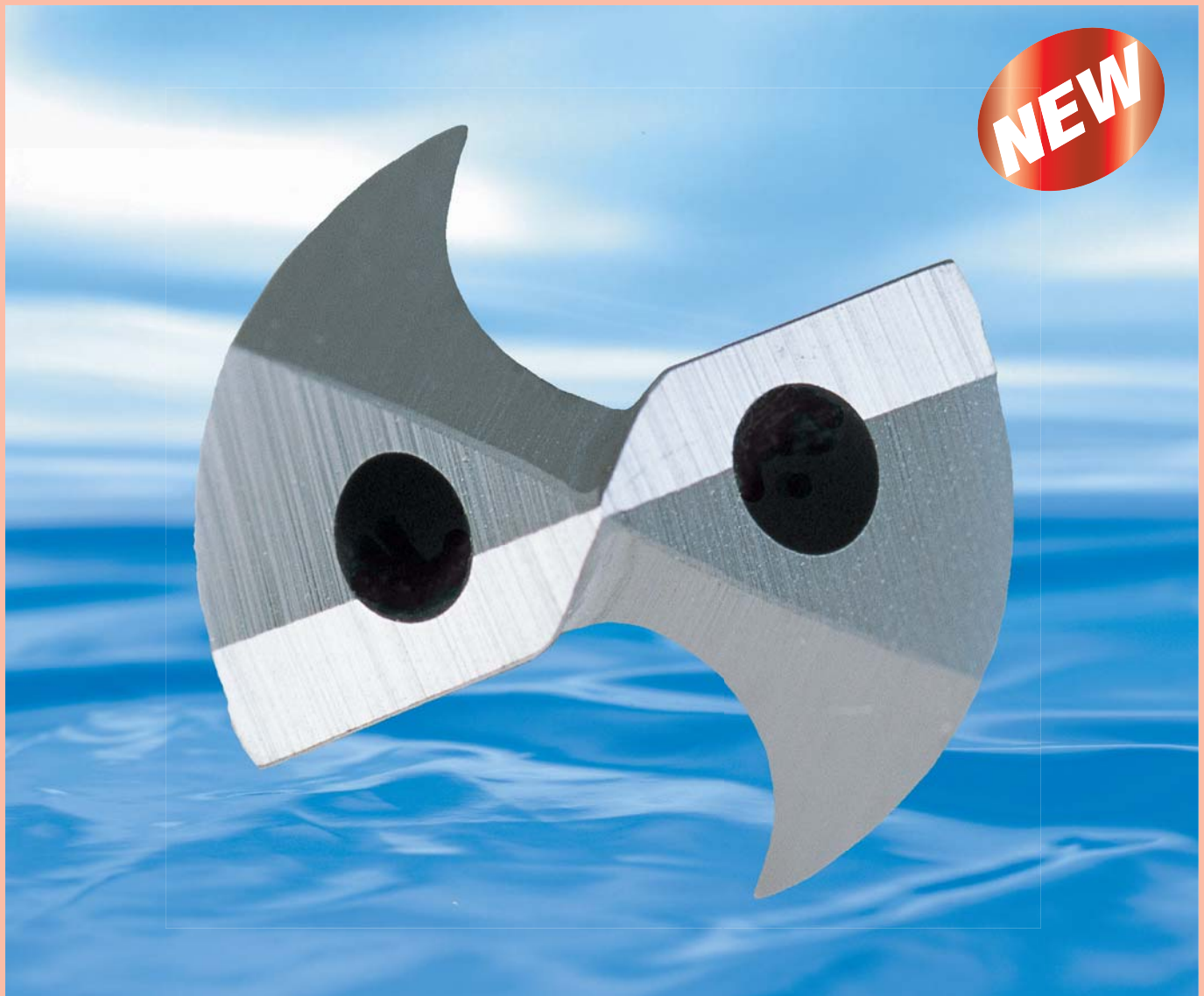
Materials	Low carbon steel (C15)		Medium carbon steel (C50)		Ductile cast iron (GGG 40)	
	Tool dia. (mm)	Vc (m/min)	f (mm/rev)	Vc (m/min)	f (mm/rev)	Vc (m/min)
Ø3.0 ~ 5.9	30 - 40 - 50	0.12-0.15-0.18	50 - 60 - 80	0.12-0.15-0.18	30 - 40 - 50	0.12-0.15-0.18
Ø6.0 ~ 12.0	40 - 50 - 60	0.12-0.15-0.18	55 - 70 - 85	0.12-0.15-0.18	30 - 40 - 50	0.12-0.15-0.18





## “ Drills ”

- **EZ-Drill** (with trough coolant hole)





## “ EZ Drill ”

### ■ EZD-M (Medium Type 3xD) with trough coolant hole.

#### ■ Features:

1. EZ drill is the energy-conserving and environmental compatible drill which could reduce cutting resistance and 30% power consumption compared with conventional drill.
2. High speed and high efficient drilling is possible.
3. Easy to regrind geometry is adopted.



#### ■ Tolerance for $\phi D$ (mm)

$\phi D$	Tolerance
3 up to	0 -0.014
3 Over ~ 6.0 Up to	0 -0.018
6.0 Over ~ 10 Up to	0 -0.022
10 Over ~ 16 Up to	0 -0.027



- Drilling depth 3 x  $\phi D$
- DX-coat (TiCN) coated area 1.3  $\phi D$

Cat. No.	Stock	Dimensions (mm)			
		$\phi D$	$l_1$	L	$\phi d$
EZDM030	●	3.0	15	68	3
EZDM031	●	3.1	18	71	4
EZDM032	●	3.2	18	71	4
EZDM033	●	3.3	18	71	4
EZDM034	●	3.4	18	71	4
EZDM035	●	3.5	18	71	4
EZDM036	●	3.6	20	73	4
EZDM037	●	3.7	20	73	4
EZDM038	●	3.8	20	73	4
EZDM039	●	3.9	20	73	4
EZDM040	●	4.0	20	73	4
EZDM041	●	4.1	23	78	5
EZDM042	●	4.2	23	78	5
EZDM043	●	4.3	23	78	5
EZDM044	●	4.4	23	78	5
EZDM045	●	4.5	23	78	5
EZDM046	●	4.6	25	80	5
EZDM047	●	4.7	25	80	5
EZDM048	●	4.8	25	80	5
EZDM049	●	4.9	25	80	5
EZDM050	●	5.0	25	80	5
EZDM051	●	5.1	28	82	6
EZDM052	●	5.2	28	82	6
EZDM053	●	5.3	28	82	6
EZDM054	●	5.4	28	82	6
EZDM055	●	5.5	28	82	6

Cat. No.	Stock	Dimensions (mm)			
		$\phi D$	$l_1$	L	$\phi d$
EZDM056	●	5.6	30	82	6
EZDM057	●	5.7	30	82	6
EZDM058	●	5.8	30	82	6
EZDM059	●	5.9	30	82	6
EZDM060	●	6.0	30	82	6
EZDM061	●	6.1	33	86	7
EZDM062	●	6.2	33	86	7
EZDM063	●	6.3	33	86	7
EZDM064	●	6.4	33	86	7
EZDM065	●	6.5	33	86	7
EZDM066	●	6.6	35	88	7
EZDM067	●	6.7	35	88	7
EZDM068	●	6.8	35	88	7
EZDM069	●	6.9	35	88	7
EZDM070	●	7.0	35	88	7
EZDM071	●	7.1	38	92	8
EZDM072	●	7.2	38	92	8
EZDM073	●	7.3	38	92	8
EZDM074	●	7.4	38	92	8
EZDM075	●	7.5	38	92	8
EZDM076	●	7.6	40	94	8
EZDM077	●	7.7	40	94	8
EZDM078	●	7.8	40	94	8
EZDM079	●	7.9	40	94	8
EZDM080	●	8.0	40	94	8
EZDM081	●	8.1	43	100	9







## “ EZ Drill ”

### ■ EZD-L (Long Type 5xD) with trough coolant hole.

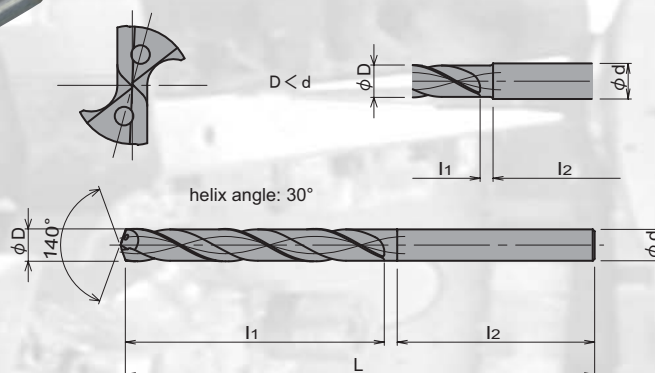
#### ■ Features:

1. EZ drill is the energy-conserving and environmental compatible drill which could reduce cutting resistance and 30% power consumption compared with conventional drill.
2. High speed and high efficient drilling is possible.
3. Easy to regrind geometry is adopted.



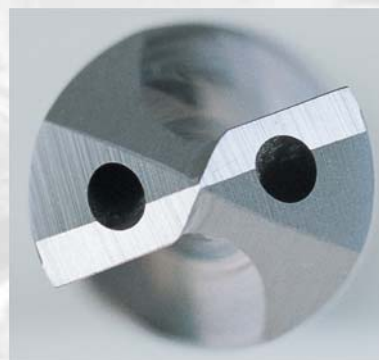
#### ■ Tolerance for $\phi D$ (mm)

$\phi D$	Tolerance
3 up to	0 -0.014
3 Over ~ 6.0 Up to	0 -0.012
6.0 Over ~ 10 Up to	0 -0.018
10 Over ~ 12 Up to	0 -0.027



- Drilling depth 5 x  $\phi D$
- JC-coat (TiCN) coated area 1.3  $\phi D$

Cat. No.	Stock	Dimensions (mm)			
		$\phi D$	l1	L	$\phi d$
EZDL030	●	3.0	24	77	3
EZDL033	●	3.3	28	81	4
EZDL035	●	3.5	28	81	4
EZDL040	●	4.0	32	85	4
EZDL042	●	4.2	36	91	5
EZDL045	●	4.5	36	91	5
EZDL050	●	5.0	40	94	5
EZDL055	●	5.5	44	96	6
EZDL060	●	6.0	48	100	6
EZDL068	●	6.8	56	109	7
EZDL070	●	7.0	56	109	7
EZDL075	●	7.5	60	114	8
EZDL080	●	8.0	64	118	8
EZDL085	●	8.5	68	127	9
EZDL090	●	9.0	72	127	9
EZDL095	●	9.5	76	136	10
EZDL100	●	10.0	80	136	10
EZDL103	●	10.3	84	149	11
EZDL105	●	10.5	84	149	11
EZDL110	●	11.0	88	149	11
EZDL120	●	12.0	96	158	12

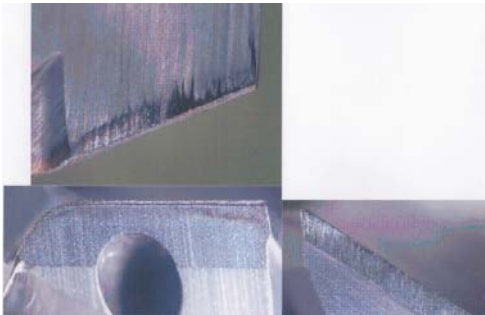






# “ EZ Drill ”

## ■ EZ-Drill Cutting Data

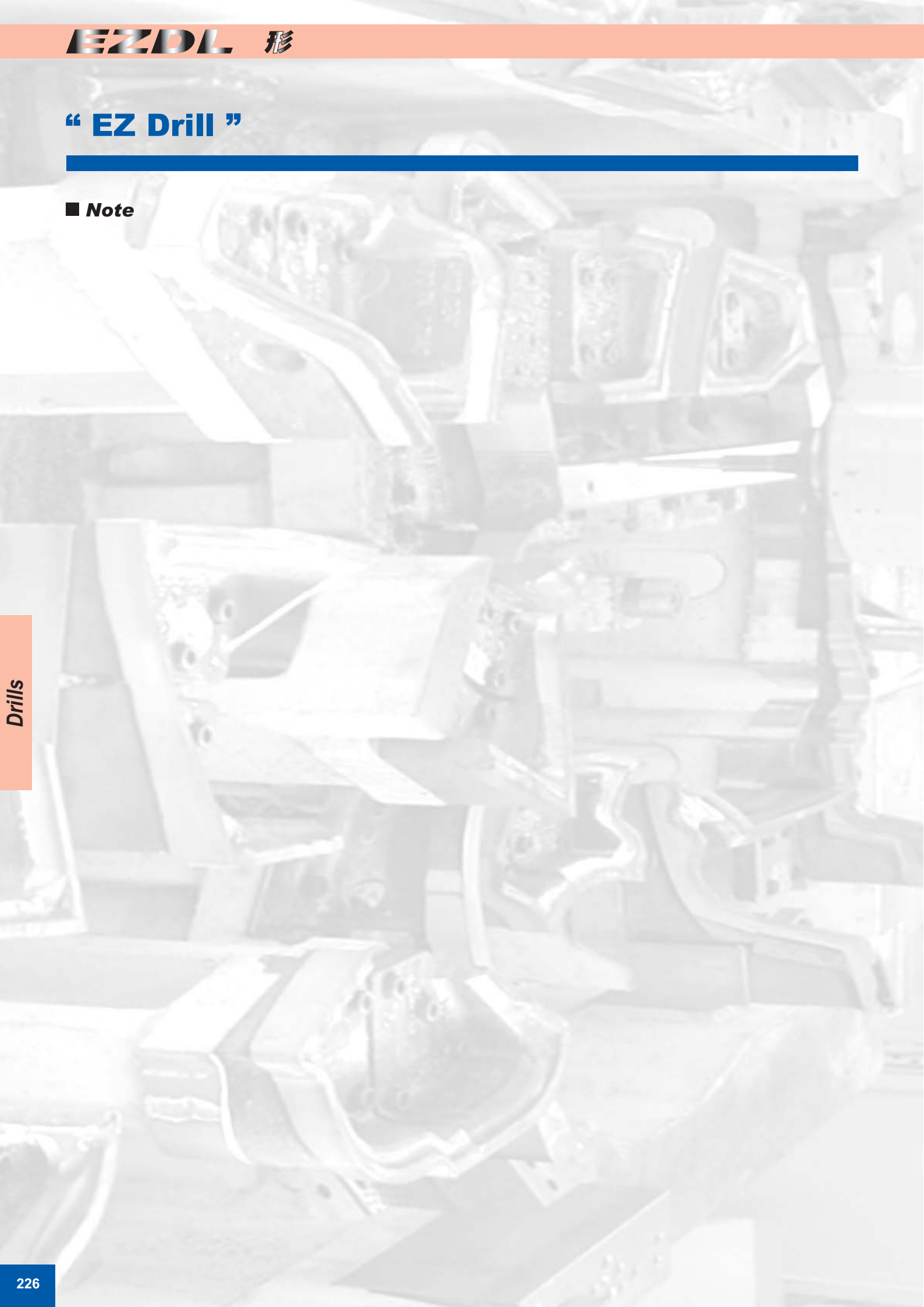
Drilling deep 5 x $\phi$ D. Wear condition after 20 m. drilling. 	<b>Work</b>	<b>Part name</b>	Test piece
		<b>Material</b>	S55C
<b>Hardness</b>		200 HB	
	<b>Tool</b>	<b>Tool No.</b>	EZDL 085
		<b>Insert No.</b>	-
<b>Result</b>	<b>Cutting conditions</b>	<b>Cutting speed</b>	120 m/min
		<b>Feed speed</b>	0.2 mm/rev
		<b>Ap</b>	43 mm thru (5D)
		<b>Ae</b>	-
		<b>Coolant</b>	Flood coolant
<b>Machine</b>		Vertical MC	
Tool shows normal wear after 20 m. drilling, still able to continue to use			

## ■ Recommended cutting conditions for EZ-Drill

	Work Materials	Drill Dia. Hardness	$\phi 3 \sim \phi 6$		$\sim \phi 10$		$\sim \phi 14$		$\sim \phi 16$	
			Vc (m/min)	f (mm/rev)	Vc (m/min)	f (mm/rev)	Vc (m/min)	f (mm/rev)	Vc (m/min)	f (mm/rev)
<b>P</b>	Mild steel	~ 180 HB	50 ~ 120	0.10~0.25	80 ~ 140	0.15~0.30	80 ~ 160	0.20~0.35	80 ~ 170	0.20~0.35
	Carbon Steel	~ 280 HB	50 ~ 100	0.10~0.25	80 ~ 120	0.10~0.25	80 ~ 140	0.15~0.35	80 ~ 150	0.20~0.35
	Alloy steel	280 ~ 350 HB	30 ~ 80	0.10~0.20	35 ~ 90	0.10~0.25	50 ~ 100	0.15~0.35	60 ~ 110	0.20~0.35
<b>M</b>	Stainless steel	~ 280 HB	20 ~ 60	0.05~0.15	30 ~ 80	0.10~0.25	40 ~ 100	0.15~0.35	40 ~ 110	0.15~0.30
<b>K</b>	Grey cast iron	~ 250 HB	70 ~ 120	0.15~0.30	80 ~ 140	0.15~0.35	110 ~ 160	0.25~0.40	120 ~ 170	0.25~0.35
	Nodular cast iron	~ 300 HB	30 ~ 80	0.10~0.25	35 ~ 90	0.10~0.25	50 ~ 110	0.15~0.35	60 ~ 110	0.20~0.35
<b>N</b>	Aluminium alloys	-	60 ~ 130	0.05~0.15	70 ~ 160	0.10~0.30	80 ~ 150	0.15~0.35	80 ~ 180	0.20~0.40
<b>S</b>	Heat-resistance alloy	-	10 ~ 25	0.04~0.15	15 ~ 30	0.05~0.15	15 ~ 30	0.10~0.20	25 ~ 35	0.10~0.25

## “ EZ Drill ”

■ **Note**





## “ Drills ”

### ■ **S-CUT** *(with trough coolant hole)*







## “ S-Cut Drill ”

### ■ SCD-MS

#### 1. Increased point strength.

The S-CUT geometry together with one piece blade design greatly improves cutting edge strength and reliability .

#### 2. Longer tool life.

The secure S-CUT geometry coupled with the high performance coated tungsten carbide grade provides longer and consistent tool life.

#### 3. Improved chip ejection.

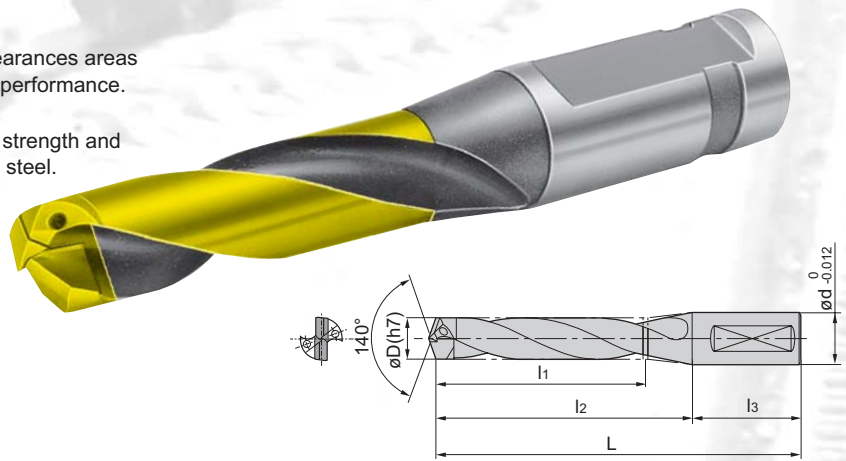
By redeveloping the flute configuration and point clearances areas chip evacuation is enhanced for consistent drilling performance.

#### 4. Wider application areas.

The overall concept of S-CUT drill offers maximum strength and reliability when drilling steel, cast iron and stainless steel.

#### ■ Tolerance for $\phi D$ (mm)

$\phi D$	Tolerance
10 Over ~ 18 Up to	0 -0.018
18 Over ~ 30 Up to	0 -0.021



- For Steel, Cast iron, Stainless steel, etc.
- JC-coat (TiN coating)
- Drilling depth  $3 \times \phi D$

Cod. No.	Stock	Dimensions (mm)					
		$\phi D$	$l_1$	$l_2$	$l_3$	L	$\phi d$
SCD-1000-MS	●	10.00	35	45	48	93	16
SCD-1025-MS	●	10.25	35	45	48	93	16
SCD-1050-MS	●	10.50	35	45	48	93	16
SCD-1075-MS	●	10.75	39	50	48	98	16
SCD-1100-MS	●	11.00	39	50	48	98	16
SCD-1125-MS	●	11.25	39	50	48	98	16
SCD-1150-MS	●	11.50	39	50	48	98	16
SCD-1175-MS	●	11.75	43	55	48	103	16
SCD-1200-MS	●	12.00	43	55	48	103	16
SCD-1225-MS	●	12.25	43	55	48	103	16
SCD-1240-MS	●	12.40	43	55	48	103	16
SCD-1250-MS	●	12.50	43	55	48	103	16
SCD-1275-MS	●	12.75	47	60	48	108	16
SCD-1280-MS	●	12.80	47	60	48	108	16
SCD-1300-MS	●	13.00	47	60	48	108	16
SCD-1325-MS	●	13.25	47	60	48	108	16
SCD-1350-MS	●	13.50	47	60	48	108	16
SCD-1370-MS	●	13.70	51	65	48	113	16
SCD-1375-MS	●	13.75	51	65	48	113	16
SCD-1400-MS	●	14.00	51	65	48	113	16
SCD-1420-MS	●	14.20	51	65	48	113	16
SCD-1425-MS	●	14.25	51	65	48	113	16
SCD-1450-MS	●	14.50	51	65	48	113	16
SCD-1475-MS	●	14.75	60	75	50	125	20
SCD-1500-MS	●	15.00	60	75	50	125	20
SCD-1525-MS	●	15.25	60	75	50	125	20

Drills





# “ S-Cut Drill ”

## ■ SCD-MS

Cod. No.	Stock	Dimensions (mm)					
		øD	l1	l2	l3	L	ød
SCD-1550-MS	●	15.50	60	75	50	125	20
SCD-1575-MS	●	15.75	64	80	50	130	20
SCD-1580-MS	●	15.80	64	80	50	130	20
SCD-1600-MS	●	16.00	64	80	50	130	20
SCD-1625-MS	●	16.25	64	80	50	130	20
SCD-1650-MS	●	16.50	64	80	50	130	20
SCD-1675-MS	●	16.75	68	85	50	135	20
SCD-1700-MS	●	17.00	68	85	50	135	20
SCD-1725-MS	●	17.25	68	85	50	135	20
SCD-1750-MS	●	17.50	68	85	50	135	20
SCD-1775-MS	●	17.75	68	90	50	140	20
SCD-1800-MS	●	18.00	72	90	50	140	20
SCD-1825-MS	●	18.25	72	90	50	140	20
SCD-1850-MS	●	18.50	72	90	50	140	20
SCD-1875-MS	●	18.75	76	95	56	151	25
SCD-1900-MS	●	19.00	76	95	56	151	25
SCD-1925-MS	●	19.25	76	95	56	151	25
SCD-1930-MS	●	19.30	76	95	56	151	25
SCD-1950-MS	●	19.50	76	95	56	151	25
SCD-1975-MS	●	19.75	80	100	56	156	25
SCD-2000-MS	●	20.00	80	100	56	156	25
SCD-2050-MS	●	20.50	80	100	56	156	25
SCD-2100-MS	●	21.00	84	105	56	161	25
SCD-2150-MS	●	21.50	84	105	56	161	25
SCD-2200-MS	●	22.00	88	110	56	166	25
SCD-2250-MS	●	22.50	88	110	56	166	25
SCD-2300-MS	●	23.00	92	115	56	171	25
SCD-2350-MS	●	23.50	92	115	56	171	25
SCD-2400-MS	●	24.00	96	120	60	180	32
SCD-2450-MS	●	24.50	96	120	60	180	32
SCD-2500-MS	●	25.00	100	125	60	185	32
SCD-2550-MS	●	25.50	100	125	60	185	32
SCD-2600-MS	●	26.00	104	130	60	190	32
SCD-2650-MS	●	26.50	104	130	60	190	32
SCD-2700-MS	●	27.00	108	135	60	195	32
SCD-2750-MS	●	27.50	108	135	60	195	32
SCD-2800-MS	●	28.00	112	140	60	200	32
SCD-2850-MS	●	28.50	112	140	60	200	32
SCD-2900-MS	●	29.00	116	145	60	205	32
SCD-2950-MS	●	29.50	116	145	60	205	32
SCD-3000-MS	●	30.00	120	150	60	210	32
SCD-3050-MS	●	30.50	120	150	60	210	32



## “ S-Cut Drill ”

### ■ SCD-ML

#### 1. Increased point strength.

The S-CUT geometry together with one piece blade design greatly improves cutting edge strength and reliability.

#### 2. Longer tool life.

The secure S-CUT geometry coupled with the high performance coated tungsten carbide grade provides longer and consistent tool life.

#### 3. Improved chip ejection.

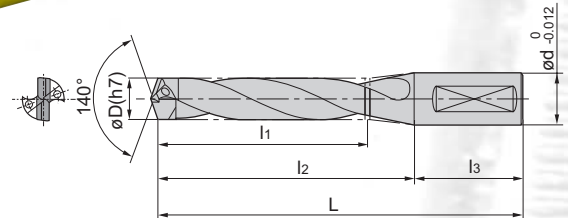
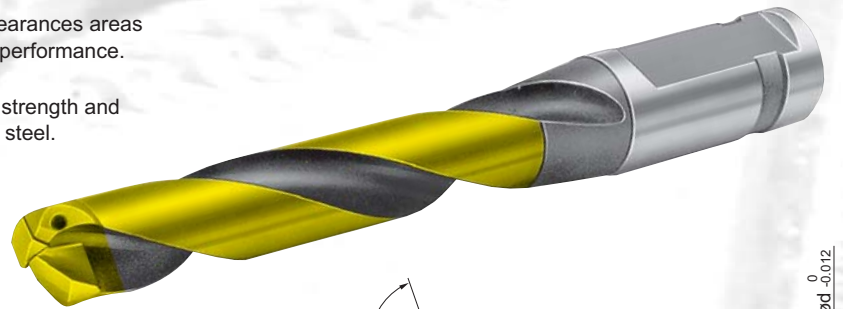
By redeveloping the flute configuration and point clearances areas chip evacuation is enhanced for consistent drilling performance.

#### 4. Wider application areas.

The overall concept of S-CUT drill offers maximum strength and reliability when drilling steel, cast iron and stainless steel.

#### ■ Tolerance for $\phi D$ (mm)

$\phi D$	Tolerance
10 Over ~ 18 Up to	0 -0.018
18 Over ~ 30 Up to	0 -0.021



- For Steel, Cast iron, Stainless steel, etc.
- JC-coat (TiN coating)
- Drilling depth 5 x  $\phi D$

Cat. No.	Stock	Dimensions (mm)					
		$\phi D$	$l_1$	$l_2$	$l_3$	L	$\phi d$
SCD-1000-ML	●	10.00	55	65	48	113	16
SCD-1025-ML	●	10.25	55	65	48	113	16
SCD-1050-ML	●	10.50	55	65	48	113	16
SCD-1075-ML	●	10.75	64	75	48	118	16
SCD-1100-ML	●	11.00	64	75	48	123	16
SCD-1125-ML	●	11.25	64	75	48	123	16
SCD-1150-ML	●	11.50	68	75	48	123	16
SCD-1175-ML	●	11.75	68	80	48	128	16
SCD-1200-ML	●	12.00	68	80	48	128	16
SCD-1225-ML	●	12.25	68	80	48	128	16
SCD-1250-ML	●	12.50	68	80	48	128	16
SCD-1275-ML	●	12.75	72	85	48	133	16
SCD-1300-ML	●	13.00	72	85	48	133	16
SCD-1325-ML	●	13.25	72	85	48	133	16
SCD-1350-ML	●	13.50	72	85	48	133	16
SCD-1375-ML	●	13.75	81	95	48	143	16
SCD-1400-ML	●	14.00	81	95	48	143	16
SCD-1425-ML	●	14.25	81	95	48	143	16
SCD-1450-ML	●	14.50	81	95	48	143	16
SCD-1475-ML	●	14.75	90	105	50	155	20
SCD-1500-ML	●	15.00	90	105	50	155	20
SCD-1525-ML	●	15.25	90	105	50	155	20
SCD-1550-ML	●	15.50	90	105	50	155	20
SCD-1575-ML	●	15.75	94	110	50	160	20
SCD-1600-ML	●	16.00	94	110	50	160	20



# “ S-Cut Drill ”

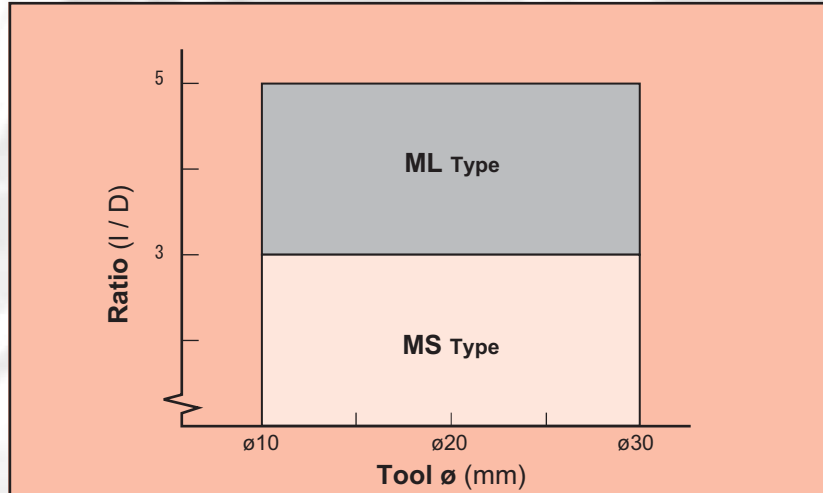
## ■ SCD-ML

Cat. No.	Stock	Dimensions (mm)					
		øD	l1	l2	l3	L	ød
SCD-1650-ML	●	16.50	94	110	50	160	20
SCD-1675-ML	●	16.75	103	120	50	170	20
SCD-1700-ML	●	17.00	103	120	50	170	20
SCD-1725-ML	●	17.25	103	120	50	170	20
SCD-1750-ML	●	17.50	103	120	50	170	20
SCD-1775-ML	●	17.75	107	125	50	175	20
SCD-1800-ML	●	18.00	107	125	50	175	20
SCD-1850-ML	●	18.50	107	125	50	175	20
SCD-1875-ML	●	18.75	116	135	56	191	25
SCD-1900-ML	●	19.00	116	135	56	191	25
SCD-1925-ML	●	19.25	116	135	56	191	25
SCD-1950-ML	●	19.50	116	135	56	191	25
SCD-1975-ML	●	19.75	120	140	56	196	25
SCD-2000-ML	●	20.00	120	140	56	196	25
SCD-2050-ML	●	20.50	120	140	56	196	25
SCD-2100-ML	●	21.00	124	145	56	201	25
SCD-2150-ML	●	21.50	124	145	56	201	25
SCD-2200-ML	●	22.00	133	155	56	211	25
SCD-2250-ML	●	22.50	133	155	56	211	25
SCD-2300-ML	●	23.00	137	160	56	216	25
SCD-2350-ML	●	23.50	137	160	56	216	25
SCD-2400-ML	●	24.00	146	170	60	230	32
SCD-2450-ML	●	24.50	146	170	60	230	32
SCD-2500-ML	●	25.00	150	175	60	235	32
SCD-2550-ML	●	25.50	150	175	60	235	32
SCD-2600-ML	●	26.00	154	180	60	240	32
SCD-2650-ML	●	26.50	154	180	60	240	32
SCD-2700-ML	●	27.00	163	190	60	250	32
SCD-2750-ML	●	27.50	163	190	60	250	32
SCD-2800-ML	●	28.00	167	195	60	255	32
SCD-2850-ML	●	28.50	167	195	60	255	32
SCD-2900-ML	●	29.00	176	205	60	265	32
SCD-2950-ML	●	29.50	176	205	60	265	32
SCD-3000-ML	●	30.00	180	210	60	270	32

## “ S-Cut Drill ”

### ■ Features of S-CUT drill

#### ● S-Cut Range



#### ● Tool Life

##### ● Medium Carbon Steel (DIN C50) after 25 m.

Tools	Max. wear (mm)	
	0.1	0.2
SCD-2000-MS	V <sub>B</sub> MAX. 0.12 mm	
SCD-2000-ML	V <sub>B</sub> MAX. 0.18	

##### ● Cutting condition

- 1) SCD-2000-MS (ø20mm)  
V<sub>c</sub>=75m/min, f=0.35mm/rev  
d=50mm (through hole)
- 2) SCD-2000-ML (ø20mm)  
V<sub>c</sub>=75m/min, f=0.35mm/rev  
d=100mm (through hole)

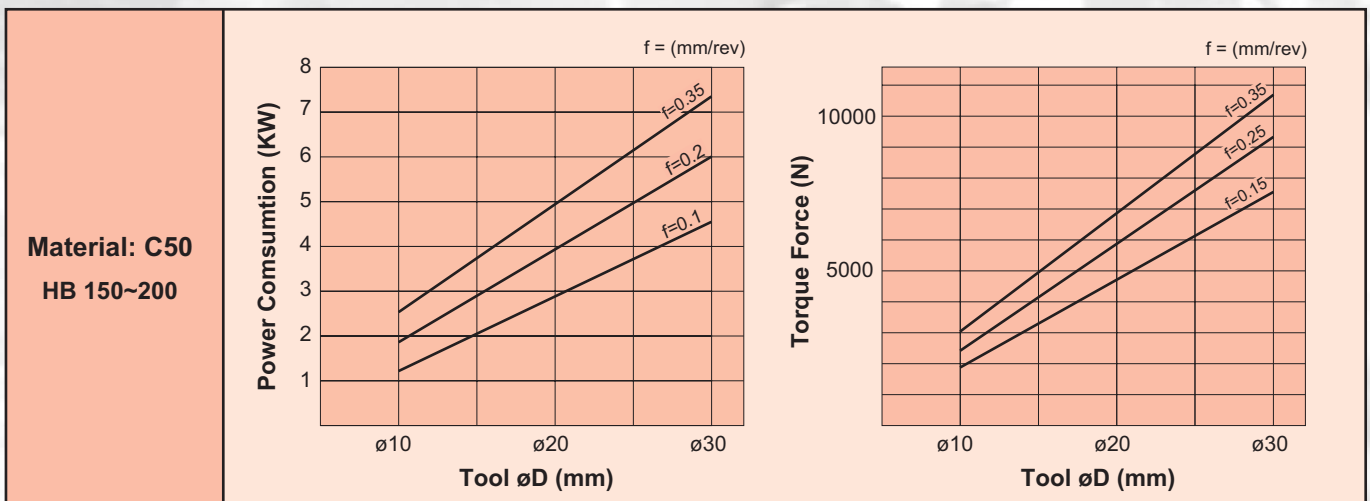
##### ● Low Carbon Steel (DIN C15) after 25 m.

Tools	Max. wear (mm)	
	0.1	0.2
SCD-2000-MS	V <sub>B</sub> MAX.0.10	
SCD-2000-ML	V <sub>B</sub> MAX. 0.16	

##### ● Cutting condition

- 1) SCD-2000-MS (ø20mm)  
V<sub>c</sub>=75m/min, f=0.35mm/rev  
d=50mm (through hole)
- 2) SCD-2000-ML (ø20mm)  
V<sub>c</sub>=75m/min, f=0.35mm/rev  
d=100mm (through hole)

#### ● 1) Test at Cutting speed ( V=70 m/min.)

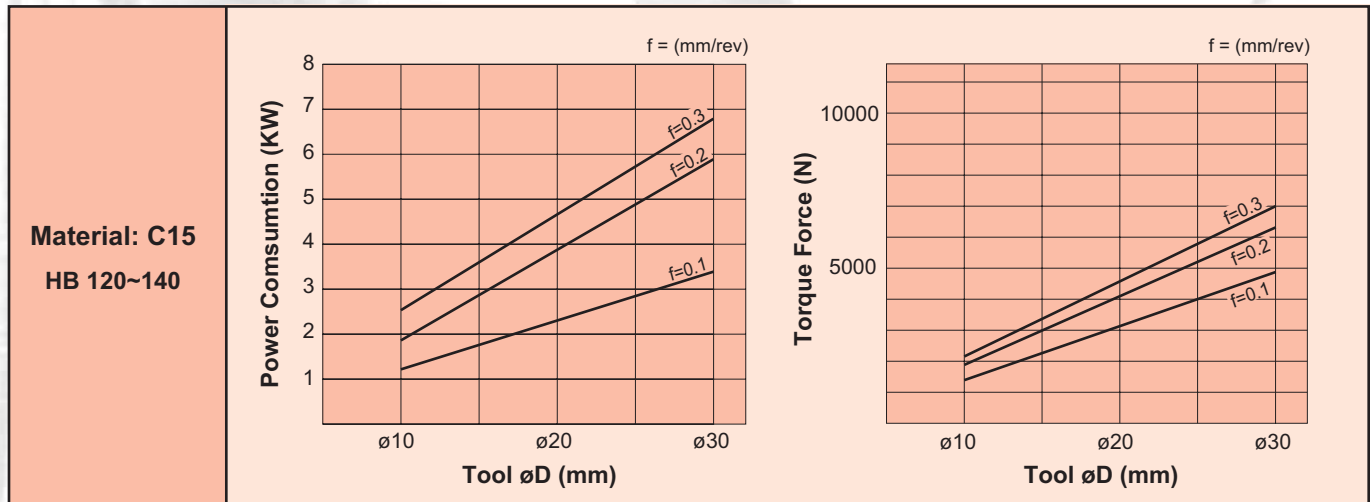




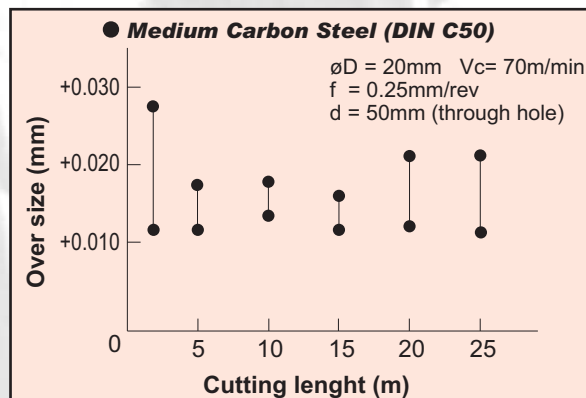
# “ S-Cut Drill ”

## ■ Features of S-CUT drill

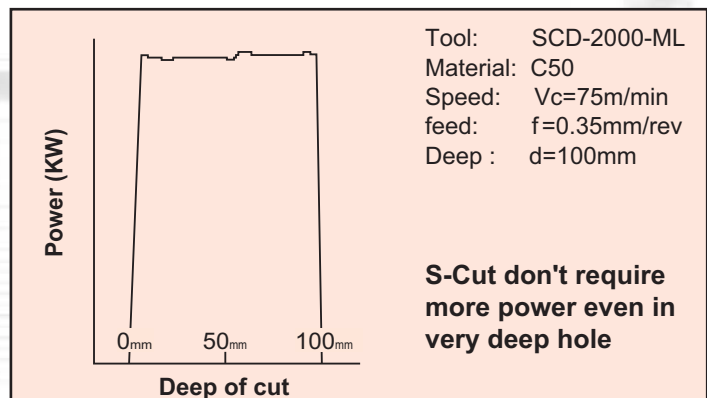
### ● 2) Test at Cutting speed ( V=70 m/min.)



### ● 3) Tolerance condition



### ● 4) Power require for deep hole



## ■ Recommended cutting conditions for SCD

Materials	Carbon steel (DIN C15) 200HB		Carbon steel (DIN C50) 255HB		Alloy steel (DIN 42CrMo4) 275 HB		Alloy steel (DIN 42CrMo4) 360HB		Cast iron (DIN GG25) 220HB	
	Vc (m/min)	f (mm/rev)	Vc (m/min)	f (mm/rev)	Vc (m/min)	f (mm/rev)	Vc (m/min)	f (mm/rev)	Vc (m/min)	f (mm/rev)
10.0 ~ 14.5	90-70-60	0.15-0.20-0.30	90-70-60	0.15-0.25-0.30	90-60-50	0.15-0.20-0.30	40-30-20	0.15-0.18-0.20	100-70-60	0.20-0.30-0.40
14.5 ~ 24.5	90-75-60	0.15-0.25-0.40	90-70-60	0.15-0.30-0.40	90-70-50	0.15-0.25-0.35	40-30-20	0.15-0.20-0.25	100-80-60	0.20-0.35-0.50
24.5 ~ 30.0	80-75-60	0.20-0.30-0.40	80-70-60	0.20-0.30-0.40	80-60-50	0.20-0.30-0.35	40-30-20	0.15-0.20-0.25	100-80-60	0.20-0.40-0.50

Materials	Nodular cast iron (DIN GGG40) 230HB		Stainless steel (AISI 304) 255HB		Die steel (1.2379) 255HB		Bearing steel (1.2311) 275HB			
	Vc (m/min)	f (mm/rev)	Vc (m/min)	f (mm/rev)	Vc (m/min)	f (mm/rev)	Vc (m/min)	f (mm/rev)		
10.0 ~ 14.5	90-65-50	0.20-0.30-0.40	45-30-20	0.15-0.15-0.20	45-30-20	0.15-0.15-0.20	70-50-40	0.15-0.20-0.30		
14.5 ~ 24.5	90-70-50	0.20-0.35-0.50	45-35-20	0.15-0.20-0.30	45-35-20	0.15-0.25-0.35	70-50-40	0.15-0.25-0.30		
24.5 ~ 30.0	90-70-50	0.20-0.35-0.50	45-35-20	0.20-0.25-0.35	45-35-20	0.15-0.25-0.35	70-50-40	0.15-0.25-0.30		