

# RAINFORD PRECISION

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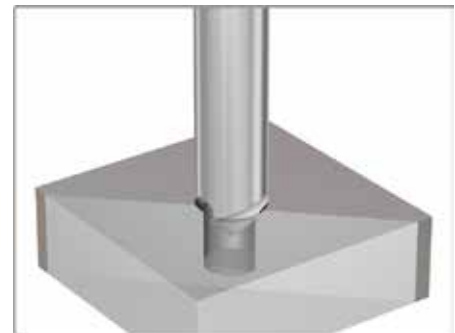
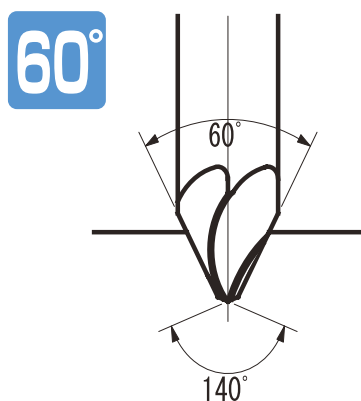
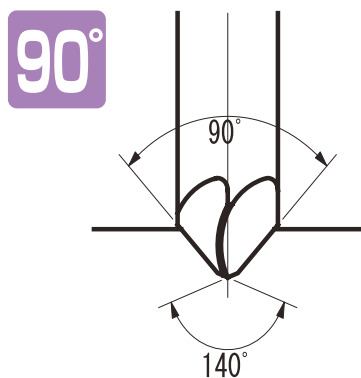
**TOGLON HARD DRILLS, REAMERS, SPOTTING AND CHAMFERING  
TOOLS FOR STEELS BETWEEN 40-75 HRC**



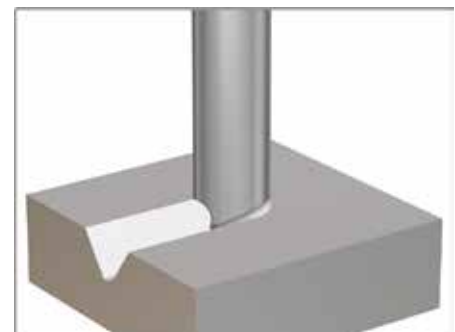
# Toglon Hard SP Guide

The Toglon Hard series is designed for hardened steels, considered between 40-75HRc. These include die steels, kovar, hastelloy and others. This range of tooling provides an outstanding surface finish with a tool life impossible to replicate with conventional tools. The Toglon's high helix cutting edge achieves premium surface finishing, giving an end result close to that of polishing quality. These tools benefit from a three-flute design and extended cutting edge, extending the tool's life further."

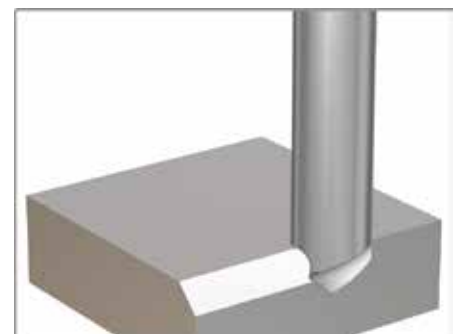
 **IWATA TOOL**



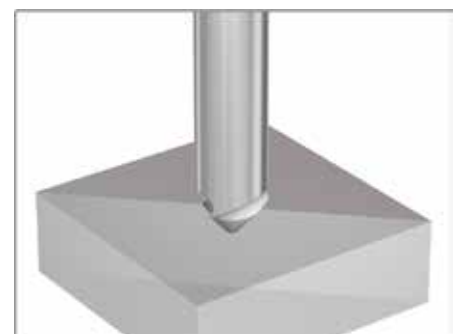
Hole Chamfering



V Grooving

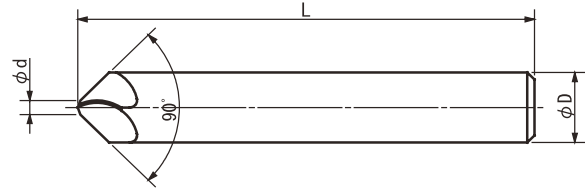
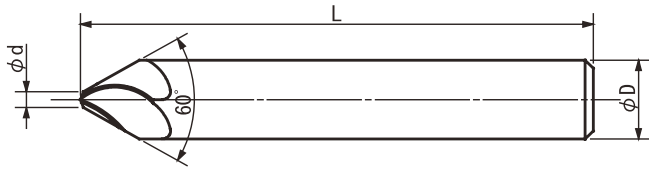


Edge Chamfering



Spot Drilling

# Toglon Hard SP



## IWATA TOOL

### Toglon Hard SP 90°

Product Code	Web Diameter	Shank Diameter	Overall Length
90TGHSP3CBALD	0.6	3	40
90TGHSP4CBALD	0.8	4	40
90TGHSP6CBALD	1.2	6	50
90TGHSP8CBALD	1.6	8	60
90TGHSP10CBALD	2.0	10	70
90TGHSP12CBALD	2.4	12	75
90TGHSP16CBALD	3.0	16	80
90TGHSP20CBALD	4.0	20	100

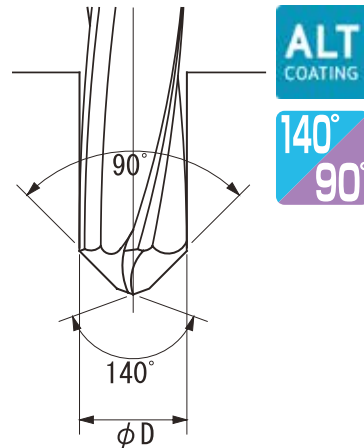
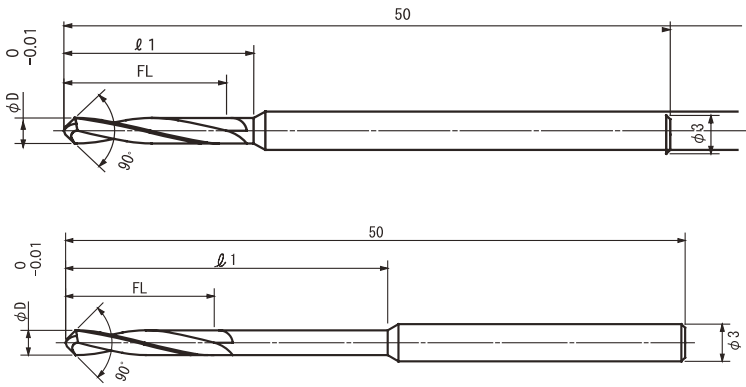
### Toglon Hard SP 60°

Product Code	Web Diameter	Shank Diameter	Overall Length
60TGHSP3CBALD	0.6	3	40
60TGHSP4CBALD	0.8	4	40
60TGHSP6CBALD	1.2	6	50
60TGHSP8CBALD	1.6	8	60
60TGHSP10CBALD	2.0	10	70
60TGHSP12CBALD	2.4	12	75
60TGHSP16CBALD	3.0	16	80
60TGHSP20CBALD	4.0	20	100

Product	Mild Steel	Carbon Steel	Alloy Steel	Hardened Steel	Tool Steel	Quenched & Tempered Steel		Stainless Steel	Cast Iron	Ductile Cast Iron	Titanium Alloy	Aluminium Alloy	Copper	Plastic	Ceramics, etc	
	SS	S45C	SCM SCR	SKD SKS	>40 HRC	40-45 HRC	45-75 HRC	SUS	FC	FDC		Al	Cu		Machinable	Zirconia Glass
TGHSP-CBALD				P		S	MS				P	P			S	

**P – Possible S – Suitable MS – Most Suitable**

# Toglon Hard Drills



## IWATA TOOL

### Toglon Miniature Regular Drill

Product Code	Diameter	Shank Diameter	Flute Length	Clearance Length	Overall Length
TGHMDR0.1CBALT	0.10	3	0.6	1.3	50
TGHMDR0.15CBALT	0.15	3	0.9	2.0	50
TGHMDR0.2CBALT	0.20	3	1.2	2.6	50
TGHMDR0.25CBALT	0.25	3	1.5	3.3	50
TGHMDR0.3CBALT	0.30	3	1.8	3.9	50
TGHMDR0.4CBALT	0.40	3	2.4	5.2	50
TGHMDR0.5CBALT	0.50	3	3.0	6.5	50
TGHMDR0.6CBALT	0.60	3	3.6	7.8	50
TGHMDR0.7CBALT	0.70	3	4.2	9.1	50
TGHMDR0.8CBALT	0.80	3	4.8	10.4	50
TGHMDR0.9CBALT	0.90	3	5.4	11.7	50
TGHMDR1CBALT	1.00	3	6.0	13.0	50
TGHMDR1.1CBALT	1.10	3	6.6	14.3	50
TGHMDR1.2CBALT	1.20	3	7.2	15.6	50
TGHMDR1.3CBALT	1.30	3	7.8	16.9	50
TGHMDR1.4CBALT	1.40	3	8.4	18.2	50
TGHMDR1.5CBALT	1.50	3	9.0	19.5	50
TGHMDR1.6CBALT	1.60	3	9.6	20.8	50
TGHMDR1.7CBALT	1.70	3	10.2	22.1	50
TGHMDR1.8CBALT	1.80	3	10.8	23.4	50
TGHMDR1.9CBALT	1.90	3	11.4	24.7	50
TGHMDR2CBALT	2.00	3	12.0	26.0	50

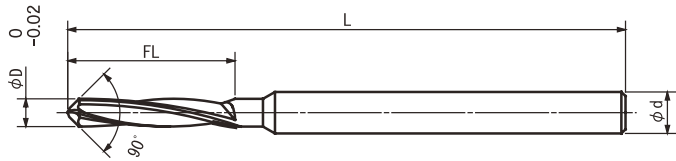
### Toglon Miniature Short Drill

Product Code	Diameter	Shank Diameter	Flute Length	Clearance Length	Overall Length
TGHMDS0.1CBALT	0.10	3	0.6	0.7	50
TGHMDS0.15CBALT	0.15	3	0.9	1.1	50
TGHMDS0.2CBALT	0.20	3	1.2	1.4	50
TGHMDS0.25CBALT	0.25	3	1.5	1.8	50
TGHMDS0.3CBALT	0.30	3	1.8	2.1	50
TGHMDS0.4CBALT	0.40	3	2.4	2.8	50
TGHMDS0.5CBALT	0.50	3	3.0	3.5	50
TGHMDS0.6CBALT	0.60	3	3.6	4.2	50
TGHMDS0.7CBALT	0.70	3	4.2	4.9	50
TGHMDS0.8CBALT	0.80	3	4.8	5.6	50
TGHMDS0.9CBALT	0.90	3	5.4	6.3	50
TGHMDS1CBALT	1.00	3	6.0	7.0	50
TGHMDS1.1CBALT	1.10	3	6.6	7.7	50
TGHMDS1.2CBALT	1.20	3	7.2	8.4	50
TGHMDS1.3CBALT	1.30	3	7.8	9.1	50
TGHMDS1.4CBALT	1.40	3	8.4	9.8	50
TGHMDS1.5CBALT	1.50	3	9.0	10.5	50
TGHMDS1.6CBALT	1.60	3	9.6	11.2	50
TGHMDS1.7CBALT	1.70	3	10.2	11.9	50
TGHMDS1.8CBALT	1.80	3	10.8	12.6	50
TGHMDS1.9CBALT	1.90	3	11.4	13.3	50
TGHMDS2CBALT	2.00	3	12.0	14.0	50

Product	Mild Steel	Carbon Steel	Alloy Steel	Hardened Steel	Tool Steel	Quenched & Tempered Steel		Stainless Steel	Cast Iron	Ductile Cast Iron	Titanium Alloy	Aluminium Alloy	Copper	Plastic	Ceramics, etc	
	SS	S45C	SCM SCR	SKD SKS	>40 HRC	45-75 HRC	45-75 HRC	SUS	FC	FDC		Al	Cu		Machinable	Zirconia Glass
TGHMD S-CBALT				P		MS	MS				P				S	
TGHDR-CBALT				P		MS	MS				P				S	

**P – Possible S – Suitable MS – Most Suitable**

# Toglon Hard Drills



## IWATA TOOL

### Toglon Short Drill

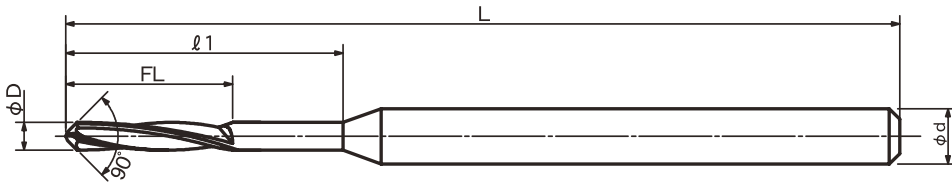
Product Code	Diameter	Shank Diameter	Flute Length	Clearance Length	Overall Length
TGHDS1CBALD	1.00	3	6.0		50
TGHDS1.1CBALD	1.10	3	7.0		50
TGHDS1.2CBALD	1.20	3	7.0		50
TGHDS1.3CBALD	1.30	3	8.0		50
TGHDS1.4CBALD	1.40	3	8.0		50
TGHDS1.5CBALD	1.50	3	9.0		50
TGHDS1.6CBALD	1.60	3	10.0		50
TGHDS1.7CBALD	1.70	3	10.0		50
TGHDS1.8CBALD	1.80	3	11.0		50
TGHDS1.9CBALD	1.90	3	11.0		50
TGHDS2CBALD	2.00	4	12.0		60
TGHDS2.1CBALD	2.10	4	12.0		60
TGHDS2.2CBALD	2.20	4	13.0		60
TGHDS2.3CBALD	2.30	4	13.0		60
TGHDS2.4CBALD	2.40	4	14.0		60
TGHDS2.5CBALD	2.50	4	14.0		60
TGHDS2.6CBALD	2.60	4	14.0		60
TGHDS2.7CBALD	2.70	4	16.0		60
TGHDS2.8CBALD	2.80	4	16.0		60
TGHDS2.9CBALD	2.90	4	16.0		60
TGHDS3CBALD	3.00	4	16.0		60
TGHDS3.1CBALD	3.10	4	18.0		60
TGHDS3.2CBALD	3.20	4	18.0		60
TGHDS3.3CBALD	3.30	4	18.0		60
TGHDS3.4CBALD	3.40	4	20.0		60
TGHDS3.5CBALD	3.50	4	20.0		60
TGHDS3.6CBALD	3.60	4	21.0		60
TGHDS3.7CBALD	3.70	4	21.0		60
TGHDS3.8CBALD	3.80	4	22.0		60
TGHDS3.9CBALD	3.90	4	22.0		60
TGHDS4CBALD	4.00	4	22.0		60
TGHDS4.1CBALD	4.10	6	24.0		60
TGHDS4.2CBALD	4.20	6	24.0		60
TGHDS4.3CBALD	4.30	6	24.0		60
TGHDS4.4CBALD	4.40	6	24.0		60
TGHDS4.5CBALD	4.50	6	24.0		60

Product Code	Diameter	Shank Diameter	Flute Length	Clearance Length	Overall Length
TGHDS4.6CBALD	4.60	6	15.0		60
TGHDS4.7CBALD	4.70	6	25.0		60
TGHDS4.8CBALD	4.80	6	25.0		60
TGHDS4.9CBALD	4.90	6	25.0		60
TGHDS5CBALD	5.00	6	26.0		60
TGHDS5.1CBALD	5.10	6	26.0		60
TGHDS5.2CBALD	5.20	6	26.0		60
TGHDS5.3CBALD	5.30	6	26.0		60
TGHDS5.4CBALD	5.40	6	26.0		60
TGHDS5.5CBALD	5.50	6	28.0		60
TGHDS5.6CBALD	5.60	6	28.0		60
TGHDS5.7CBALD	5.70	6	28.0		60
TGHDS5.8CBALD	5.80	6	28.0		60
TGHDS5.9CBALD	5.90	6	28.0		60
TGHDS6CBALD	6.00	6	28.0		60
TGHDS6.1CBALD	6.10	8	31.0		80
TGHDS6.2CBALD	6.20	8	31.0		80
TGHDS6.5CBALD	6.50	8	31.0		80
TGHDS6.8CBALD	6.80	8	34.0		80
TGHDS6.9CBALD	6.90	8	34.0		80
TGHDS7CBALD	7.00	8	34.0		80
TGHDS7.5CBALD	7.50	8	34.0		80
TGHDS7.8CBALD	7.80	8	37.0		80
TGHDS7.9CBALD	7.90	8	37.0		80
TGHDS8CBALD	8.00	8	37.0		80
TGHDS8.5CBALD	8.50	10	37.0		100
TGHDS8.6CBALD	8.60	10	40.0		100
TGHDS8.7CBALD	8.70	10	40.0		100
TGHDS8.8CBALD	8.80	10	40.0		100
TGHDS9CBALD	9.00	10	40.0		100
TGHDS9.5CBALD	9.50	10	40.0		100
TGHDS9.6CBALD	9.60	10	43.0		100
TGHDS9.7CBALD	9.70	10	43.0		100
TGHDS9.8CBALD	9.80	10	43.0		100
TGHDS10CBALD	10.00	10	43.0		100
TGHDS10.3CBALD	10.30	12	43.0		110
TGHDS10.4CBALD	10.40	12	43.0		110
TGHDS10.5CBALD	10.50	12	43.0		110
TGHDS10.8CBALD	10.80	12	47.0		110
TGHDS11CBALD	11.00	12	47.0		110
TGHDS11.5CBALD	11.50	12	47.0		110
TGHDS11.8CBALD	11.80	12	47.0		110
TGHDS12CBALD	12.00	12	51.0		110

Product	Mild Steel	Carbon Steel	Alloy Steel	Hardened Steel	Tool Steel	Quenched & Tempered Steel		Stainless Steel	Cast Iron	Ductile Cast Iron	Titanium Alloy	Aluminium Alloy	Copper	Plastic	Ceramics, etc	
	SS	S45C	SCM SCR	SKD SKS	>40 HRC	40-45 HRC	45-75 HRC	SUS	FC	FDC		Al	Cu		Machinable	Zirconia Glass
TGHDS-CBALD				P		S	MS				P	P			S	

**P – Possible S – Suitable MS – Most Suitable**

# Toglon Hard Drills



## Toglon Regular Drill

Product Code	Diameter	Shank Diameter	Flute Length	Clearance Length	Overall Length
TGHDR1CBALT	1.00	3	6.0	12.0	50
TGHDR1.1CBALT	1.10	3	6.6	13.2	50
TGHDR1.2CBALT	1.20	3	7.2	14.4	50
TGHDR1.3CBALT	1.30	3	7.8	15.6	50
TGHDR1.4CBALT	1.40	3	8.4	16.8	50
TGHDR1.5CBALT	1.50	3	9.0	18.0	50
TGHDR1.6CBALT	1.60	3	9.6	19.2	50
TGHDR1.7CBALT	1.70	3	10.2	20.4	50
TGHDR1.8CBALT	1.80	3	10.8	21.6	50
TGHDR1.9CBALT	1.90	3	11.4	22.8	50
TGHDR2CBALT	2.00	4	12.0	24.0	60
TGHDR2.1CBALT	2.10	4	12.6	25.2	60
TGHDR2.2CBALT	2.20	4	13.2	26.4	60
TGHDR2.3CBALT	2.30	4	13.8	27.6	60
TGHDR2.4CBALT	2.40	4	14.4	28.8	60
TGHDR2.5CBALT	2.50	4	15.0	30.0	60
TGHDR2.6CBALT	2.60	4	15.6	31.2	60
TGHDR2.7CBALT	2.70	4	16.2	32.4	60
TGHDR2.8CBALT	2.80	4	16.8	33.6	60
TGHDR2.9CBALT	2.90	4	17.4	34.8	60
TGHDR3CBALT	3.00	4	18.0	36.0	60
TGHDR3.1CBALT	3.10	4	18.6	37.2	80
TGHDR3.2CBALT	3.20	4	19.2	38.4	80
TGHDR3.3CBALT	3.30	4	19.8	39.6	80
TGHDR3.4CBALT	3.40	4	20.4	40.8	80
TGHDR3.5CBALT	3.50	4	21.0	42.0	80
TGHDR3.6CBALT	3.60	6	21.6	43.2	100
TGHDR3.7CBALT	3.70	6	22.2	44.4	100
TGHDR3.8CBALT	3.80	6	22.8	45.6	100
TGHDR3.9CBALT	3.90	6	23.4	46.8	100
TGHDR4CBALT	4.00	6	24.0	48.0	100

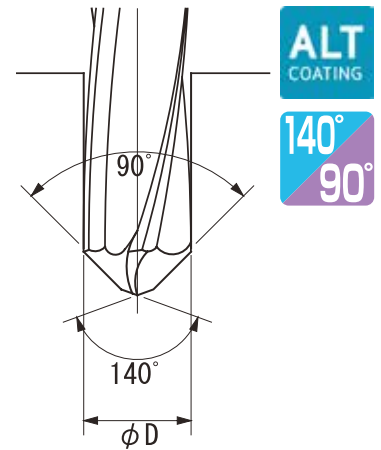
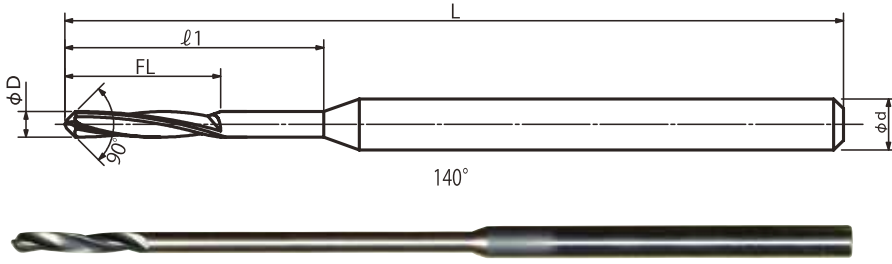
## IWATA TOOL

Product Code	Diameter	Shank Diameter	Flute Length	Clearance Length	Overall Length
TGHDR4.1CBALT	4.10	6	24.6	49.2	100
TGHDR4.2CBALT	4.20	6	25.2	50.4	100
TGHDR4.3CBALT	4.30	6	25.8	51.6	100
TGHDR4.4CBALT	4.40	6	26.4	52.8	100
TGHDR4.5CBALT	4.50	6	27.0	54.0	100
TGHDR4.6CBALT	4.60	6	27.6	55.2	100
TGHDR4.7CBALT	4.70	6	28.2	56.4	100
TGHDR4.8CBALT	4.80	6	28.8	57.6	100
TGHDR4.9CBALT	4.90	6	29.4	58.8	100
TGHDR5CBALT	5.00	6	30.0	60.0	100
TGHDR5.1CBALT	5.10	6	30.6	61.2	120
TGHDR5.2CBALT	5.20	6	31.2	62.4	120
TGHDR5.3CBALT	5.30	6	31.8	63.6	120
TGHDR5.4CBALT	5.40	6	32.4	64.8	120
TGHDR5.5CBALT	5.50	6	33.0	66.0	120
TGHDR5.6CBALT	5.60	8	33.6	67.2	120
TGHDR5.7CBALT	5.70	8	34.2	68.4	120
TGHDR5.8CBALT	5.80	8	34.8	69.6	120
TGHDR5.9CBALT	5.90	8	35.4	70.8	120
TGHDR6CBALT	6.00	8	36.0	72.0	120

Product	Mild Steel	Carbon Steel	Alloy Steel	Hardened Steel	Tool Steel	Quenched & Tempered Steel		Stainless Steel	Cast Iron	Ductile Cast Iron	Titanium Alloy	Aluminium Alloy	Copper	Plastic	Ceramics, etc	
	SS	S45C	SCM SCR	SKD SKS	>40 HRC	40-45 HRC	45-75 HRC	SUS	FC	FDC		Al	Cu		Machinable	Zirconia Glass
TGDR-CBALT				P		MS	MS				P				S	

**P – Possible S – Suitable MS – Most Suitable**

# Toglon Hard Drills



## Toglon Hard Drill Long

Product Code	Diameter	Shank Diameter	Flute Length	Clearance Length	Overall Length
TGHDL1CBALT20D	1.0	4	6.0	23.0	60
TGHDL1.1CBALT20D	1.1	4	6.6	25.3	60
TGHDL1.2CBALT20D	1.2	4	7.2	27.6	60
TGHDL1.3CBALT20D	1.3	4	7.8	29.9	60
TGHDL1.4CBALT20D	1.4	4	8.4	32.2	60
TGHDL1.5CBALT20D	1.5	4	9.0	34.5	60
TGHDL1.6CBALT20D	1.6	4	9.6	36.8	80
TGHDL1.7CBALT20D	1.7	4	10.2	39.1	80
TGHDL1.8CBALT20D	1.8	4	10.8	41.4	80
TGHDL1.9CBALT20D	1.9	4	11.4	43.7	80
TGHDL2CBALT20D	2.0	4	12.0	46.0	80
TGHDL2.1CBALT20D	2.1	4	12.6	48.3	80
TGHDL2.2CBALT20D	2.2	4	13.2	50.6	80
TGHDL2.3CBALT20D	2.3	4	13.8	52.9	80
TGHDL2.4CBALT20D	2.4	4	14.4	55.2	80
TGHDL2.5CBALT20D	2.5	6	15.0	57.5	100
TGHDL2.6CBALT20D	2.6	6	15.6	59.8	100
TGHDL2.7CBALT20D	2.7	6	16.2	62.1	100
TGHDL2.8CBALT20D	2.8	6	16.8	64.4	100
TGHDL2.9CBALT20D	2.9	6	17.4	66.7	100
TGHDL3CBALT20D	3.0	6	18.0	69.0	100
TGHDL3.1CBALT20D	3.1	6	18.6	71.3	120
TGHDL3.2CBALT20D	3.2	6	19.2	73.6	120
TGHDL3.3CBALT20D	3.3	6	19.8	75.9	120
TGHDL3.4CBALT20D	3.4	6	20.4	78.2	120
TGHDL3.5CBALT20D	3.5	6	21.0	80.5	120
TGHDL3.6CBALT20D	3.6	6	21.6	82.8	120

## IWATA TOOL

Product Code	Diameter	Shank Diameter	Flute Length	Clearance Length	Overall Length
TGHDL3.7CBALT20D	3.7	6	22.2	85.1	120
TGHDL3.8CBALT20D	3.8	6	22.8	87.4	120
TGHDL3.9CBALT20D	3.9	6	23.4	89.7	120
TGHDL4CBALT20D	4.0	6	24.0	92.0	120
TGHDL4.1CBALT20D	4.1	6	24.6	94.3	150
TGHDL4.2CBALT20D	4.2	6	25.2	96.6	150
TGHDL4.3CBALT20D	4.3	6	25.8	98.9	150
TGHDL4.4CBALT20D	4.4	6	26.4	101.2	150
TGHDL4.5CBALT20D	4.5	6	27.0	103.5	150
TGHDL4.6CBALT20D	4.6	6	27.6	105.8	150
TGHDL4.7CBALT20D	4.7	6	28.2	108.1	150
TGHDL4.8CBALT20D	4.8	6	28.8	110.4	150
TGHDL4.9CBALT20D	4.9	6	29.4	112.7	150
TGHDL5CBALT20D	5.0	6	30.0	115.0	150
TGHDL5.1CBALT20D	5.1	8	30.6	117.3	200
TGHDL5.2CBALT20D	5.2	8	31.2	119.6	200
TGHDL5.3CBALT20D	5.3	8	31.8	121.9	200
TGHDL5.4CBALT20D	5.4	8	32.4	124.2	200
TGHDL5.5CBALT20D	5.5	8	33.0	126.5	200
TGHDL5.6CBALT20D	5.6	8	33.6	128.8	200
TGHDL5.7CBALT20D	5.7	8	34.2	131.1	200
TGHDL5.8CBALT20D	5.8	8	34.8	133.4	200
TGHDL5.9CBALT20D	5.9	8	35.4	135.7	200
TGHDL6CBALT20D	6.0	8	36.0	138.0	200

Product	Mild Steel	Carbon Steel	Alloy Steel	Hardened Steel	Tool Steel	Quenched & Tempered Steel		Stainless Steel	Cast Iron	Ductile Cast Iron	Titanium Alloy	Aluminium Alloy	Copper	Plastic	Ceramics, etc	
	SS	S45C	SCM SCR	SKD SKS	> 40 HRC	40-45 HRC	40-75 HRC	SUS	FC	FDC		Al	Cu		Machinable	Zirconia Glass
TGH-DL-CBALT				P		MS	MS				P				S	

**P – Possible S – Suitable MS – Most Suitable**

# Toglon Reamers

## Hard Reamers Limits

Limit	A	+0.007	B	+0.009	C	+0.011	D	+0.013
		+0.002		+0.003		+0.004		+0.006

Product Code	Diameter	Diameter Tolerance	Shank Diameter	Flute Length	Clearance Length	Overall Length	Product Code	Diameter	Diameter Tolerance	Shank Diameter	Flute Length	Clearance Length	Overall Length
TGHR2.99CBALT	2.99	A	4	40	44	80	TGHR7.99CBALT	7.99	C	8	50	50	100
TGHR3.00CBALT	3.00	A	4	40	44	80	TGHR8.00CBALT	8.00	C	8	50	50	100
TGHR3.01CBALT	3.01	A	4	40	44	80	TGHR8.01CBALT	8.01	C	8	50	50	100
TGHR3.02CBALT	3.02	A	4	40	44	80	TGHR8.02CBALT	8.02	C	8	50	50	100
TGHR3.99CBALT	3.99	B	4	40	44	80	TGHR8.99CBALT	8.99	C	10	60	73	120
TGHR4.00CBALT	4.00	B	4	40	44	80	TGHR9.00CBALT	9.00	C	10	60	73	120
TGHR4.01CBALT	4.01	B	4	40	44	80	TGHR9.01CBALT	9.01	C	10	60	73	120
TGHR4.02CBALT	4.02	B	4	40	44	80	TGHR9.02CBALT	9.02	C	10	60	73	120
TGHR4.99CBALT	4.99	B	6	50	57	100	TGHR9.99CBALT	9.99	C	10	60	60	120
TGHR5.00CBALT	5.00	B	6	50	57	100	TGHR10.00CBALT	10.00	C	10	60	60	120
TGHR5.01CBALT	5.01	B	6	50	57	100	TGHR10.01CBALT	10.01	C	10	60	60	120
TGHR5.02CBALT	5.02	B	6	50	57	100	TGHR10.02CBALT	10.02	C	10	60	60	120
TGHR5.99CBALT	5.99	B	6	50	57	100	TGHR10.99CBALT	10.99	D	12	70	86	140
TGHR6.00CBALT	6.00	B	6	50	57	100	TGHR11.00CBALT	11.00	D	12	70	86	140
TGHR6.01CBALT	6.01	B	6	50	57	100	TGHR11.01CBALT	11.01	D	12	70	86	140
TGHR6.02CBALT	6.02	B	6	50	57	100	TGHR11.02CBALT	11.02	D	12	70	86	140
TGHR6.99CBALT	6.99	C	8	50	60	100	TGHR11.99CBALT	11.99	D	12	70	70	140
TGHR7.00CBALT	7.00	C	8	50	60	100	TGHR12.00CBALT	12.00	D	12	70	70	140
TGHR7.01CBALT	7.01	C	8	50	60	100	TGHR12.01CBALT	12.01	D	12	70	70	140
TGHR7.02CBALT	7.02	C	8	50	60	100	TGHR12.02CBALT	12.02	D	12	70	70	140

## Toglon Hard Reamer Recommended Drilling Conditions

Work Material	(SKD,HSS) (50-60HRC) Hardened Steel	
Cutting Speed	10~20m/min	
Diameter (mm)	Speed (rpm)	Feed (mm/rev)
3	1,100-2,100	0.02-0.06
4	800-1,600	0.02-0.07
6	500-1,100	0.02-0.07
8	400-800	0.02-0.08
10	320-640	0.03-0.08
12	270-530	0.03-0.09

1. The above values are standard conditions. They need to be adapted for optimal use of the tool.
2. For processing please use ample water soluble coolant or oil mist.
3. Please lower the speed when working conditions are not stable (vibrations, low machine rigidity, unstable work piece fixture, etc.)
4. For smoother surfaces please decrease the feed rate (this may cause shorter tool life).



# Toglon Hard SP

## Toglon Hard SP Recommended Drilling Conditions

Work Material	(SKD,HSS)(50-60HRC) Hardened Steel		
Cutting Speed	20~40m/min		
Max Chamfering Dia	Speed (rpm)	Feed (mm/rev)	Feed (V Grooving)
3	2,100-4,200	0.02-0.06	0.03-0.08
4	1,600-3,200	0.02-0.06	0.03-0.08
6	1,100-2,100	0.02-0.06	0.05-0.1
8	800-1,600	0.03-0.08	0.1-0.2
10	600-1,300	0.05-0.13	0.2-0.3
12	500-1,100	0.1-0.2	0.2-0.5
16	400-800	0.1-0.2	0.3-0.6
20	300-600	0.1-0.2	0.3-0.6

## Toglon Minature Hard SP Recommended Drilling Conditions

Work Material	(SKD,HSS)(50-60HRC) Hardened Steel		
Cutting Speed	10~30m/min		
Max Chamfering Dia	Speed (rpm)	Feed (mm/rev)	Feed (V Grooving)
0.3	10,600-31,800	0.002-0.01	0.003-0.012
0.5	6,400-19,000	0.005-0.015	0.01-0.02
1.0	3,200-9,500	0.01-0.03	0.02-0.04
1.5	2,100-6,400	0.02-0.04	0.03-0.05

1. The above examples are standard conditions. They need to be adapted for optimal use of the tool.
2. For drilling and chamfering please use ample water soluble coolant or oil mist. For milling we recommend oil mist or dry processing.
3. Please lower the speed when drilling into a slope or when working conditions are not stable (vibrations, moving of the work piece etc.)
4. If the actual chamfering diameter is much smaller than the maximum chamfering diameter of the tool please use the actual processing diameter to calculate the cutting speed.
5. If the recommended cutting speed exceeds the maximum speed of the machine used please use the maximum speed of the machine and adjust the work parameters accordingly.
6. For smoother surfaces please decrease the feed rate (this may cause shorter tool life)

# Toglon Hard Drill

## Toglon Hard Drill Recommended Drilling Conditions

Work Material	(SKD,HSS)(50-60HRC) Hardened Steel	
Cutting Speed	20~40m/min	
Diameter	Speed (rpm)	Feed (mm/rev)
1	6,400-12,700	0.01-0.03
2	3,200-6,400	0.02-0.05
4	1,600-3,200	0.02-0.06
6	1,100-2,100	0.02-0.06
8	800-1,600	0.03-0.08
10	600-1,300	0.05-0.13
12	500-1,100	0.1-0.2

## Toglon Minature Hard Drill Recommended Drilling Conditions

Work Material	(SKD,HSS)(50-60HRC) Hardened Steel	
Cutting Speed	10~30m/min	
Diameter	Speed (rpm)	Feed (mm/rev)
0.3	10,600-31,800	0.002-0.01
0.5	6,400-19,000	0.005-0.015
1	3,200-9,500	0.01-0.03
1.5	2,100-6,400	0.02-0.04
2	1,600-4,800	0.02-0.05

1. The above examples are standard conditions. They need to be adapted for optimal use of the tool.
2. For drilling please use ample water soluble coolant or oil mist.
3. Please lower the speed when working conditions are not stable (vibrations, moving of work piece, etc.)
4. If the recommended cutting speed exceeds the maximum speed of the machine, please use the maximum speed of the machine and adjust the other work parameters accordingly.
5. For smoother surfaces please decrease the feed rate (this may cause shorter tool life)
6. Drilling without step cycles is possible. When drilling deeper than 3xD step drilling is recommended for better chip removal. We recommend step cycles of 1/2 to 1/10 of the tool diameter. Shorter step cycles will improve the chip removal, the cooling of the cutting edges and increase tool life.

# Overview

## TOGLON Hard Drills

Capable of processing heat treated steels within the range of 40 to 75HRC. With increasing hardness, the advantages of TOGLON Hard Drills over conventional hard drills become very clear. The processing time in hardened steels exceeding HRC50 compared to conventional hard drills can be reduced by up to 80%, while tool life increases by up to 3 times. TOGLON Hard Drills' ability to process heat treated steels in these hardness ranges reduces production costs and improves hole quality, for example in mould production.

## Spot Drilling

Spot drilling is required for holes with diameters below 2mm or deeper than 5x diameter, preferably using TOGLON Hard SP Spot Drills. The spotting increases accuracy, resulting in improved process stability and an increase in tool life.

## Chucking

Chucking correctly with stable conditions and low runout is essential. It reduces uneven wear on the drill thus avoiding chipping, as well as increasing the straightness, roundness and surface finish of the drilled holes. Ideally the runout of chucked TOGLON Hard Long Drills should not exceed 5µm at the tip of the tool. Bigger runout will negatively influence the straightness of the holes and dramatically reduce tool life. As the axial cutting forces of TOGLON Hard Drills exceed those of conventional drills, please use high precision collet chucks, shrink fit systems, or chucking systems with similar run out precision and clamping forces.

## Cutting Speed

TOGLON Hard Drills do not require high cutting speeds. This feature differs from end mills. Typical circumferential cutting speeds are 20-40 m/min. If heavy land wear occurs please reduce the cutting speed. This wear is caused by the process heat induced by the hard work material. When using peck drilling please decrease the cutting speeds when increasing step depth.

## Feed Rate

Generally a higher feed rate will increase tool life. It will also allow for a reduction in steps when peck drilling. If you encounter problems of chipping, breaking or similar - or if you wish to improve surface roughness and reduce burrs, the feed rate needs to be reduced.

## Peck Drilling

When processing holes with depths exceeding 3x diameter peck drilling is necessary (CNC G83 command). Peck cycles are needed to discard chips but also allow the cooling of the cutting edges. They reduce tool wear and increase the straightness of the hole. The optimal step length of the peck cycles is a compromise between process time, hole accuracy and tool life.

## Coolant

TOGLON Hard Drills are ideally cooled using ample quantities of water soluble oil. Oil or oil mist can be used but its cooling capacity is inferior to water soluble oil, causing a reduction in processing speed and tool life.

## Milling

When using TOGLON Hard SP for chamfering and V-grooving, cutting conditions are similar to milling. Please use oil mist and air blow. Water soluble oil may cause chipping, especially in machining situations with interrupted cuts due to the combination of mechanical and thermal stress. If no chipping occurs, it is best to reduce the number of peck cycles as much as possible thus increasing tool life.

## Pay attention to the following when using TOGLON Hard Drill.

### Discarded Chips

If the chips change colour please reduce cutting speed and increase the number of pecking cycles. If the chips are longer than the flute length, or if the chips are folded in the flute please shorten peck cycles. If the chips are very short and remain inside the drilled hole despite using peck cycles please increase the length of the peck cycles to make sure all chips are evacuated from the hole during every cycle.

### Measuring for Increasing Tool Life

Increase the tool's exposure to the cooling fluid by inserting a short "pause" into the peck cycle when the tool has exited the hole thus increasing its exposure to the coolant. Also the spindle revolutions can be reduced during the retraction step of the peck cycle to reduce friction inside the hole.

### Short Tool Life due to Positioning Errors

If using TOGLON Hard SP for spot drilling followed by a pilot hole drill and finally using TOGLON Hard long drills to finish the hole, positioning errors may occur between the three processes. To reduce these to a minimum do not use fast feed when positioning the tools in the work position during tool changes.

TOGLON Hard Drill requires cutting conditions which are a different style to general drilling. If you have any questions please feel free to contact us.



# RAINFORD PRECISION

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