

The background of the cover features a close-up, blue-tinted photograph of a large industrial drill bit mounted on a machine. The bit is positioned vertically, with its cutting edge near a metal plate that has a grid of small, circular holes. In the foreground, several smaller drill bits of various colors (gold, silver, blue) are arranged diagonally, overlapping each other. The overall aesthetic is industrial and technical.

NACHI

**GENERAL
CATALOG
2007**

DRILLS ENDMILLS TAPS



DRILLS

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

Features

- Utilizes a high accuracy shape of lip relief (3 rake, 2 rake + x-thinning)
- Made from premium powder metal with Composite Multi-Layer SG Coating (TiCN)
- End mill style shanks for highly precise and accurate drilling

Work Materials

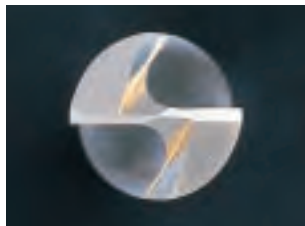
Structural Steels, Carbon Steels, Alloy Steels, Stainless Steels, Cast Irons, Aluminum Alloys

Performance

- Streamline the process and reduce machining time dramatically.
- Eliminate the center drill operation with our SG-ESS drills (Stub length)
- Stable positioning within 0.0006" (15µm)
- Faster feed & speed rates than regular HSS-Co drills
- Better cost performance than carbide drills



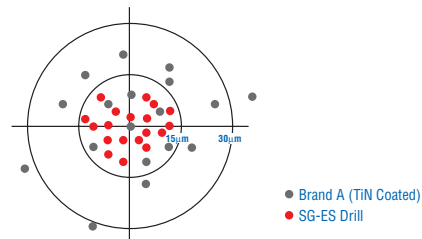
SG-ESS Drills (stub length)
Self centering point:



SG-ES Drill (jobber's length):

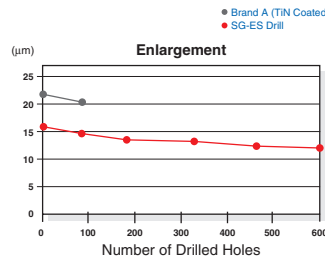
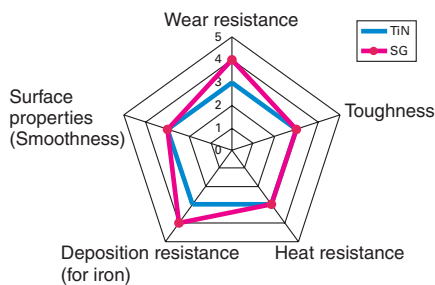


Positioning



Performance and cutting data of SG drill series

Characteristics of SG coating



Cutting condition

Drill Dia : 9.0mm.
Hole Depth : 32mm
Cutting Speed : 20m/min. (65.6 SFM)
Feed : 142mm/min (5.6 IPM)
Work piece Material : Alloy steel (300HB)
Machine : Vertical machining center

Composite multi-layer film coating method characterized by improved wear resistance as compared to TiN.

Stocked Size	Drill Name	List No.	Page
	SG-ESS Drill/Metric Sizes	7572P	46
	SG-ESS Drill/Fractional Sizes	7573P	47
	SG-ESS Drill/Wire & Letter Sizes	7573P	47
	SG-ES Drill/Metric Sizes	7570P	48
	SG-ES Drill/Fractional Sizes	7571P	49
	SG-ES Drill/Wire & Letter Sizes	7571P	49
	SG-OH Drill/Fractional Sizes	7591P	50
	SG-OH Drill/Metric Sizes	7596P	50

Features

- Utilizes a high accuracy shape of lip relief (3 rake thinning)
- Made from New HSS (FM-HSS: Fine melting HSS) with Composite Multi-Layer AG Coating (TiAlN)

	Conventional HSS	Powder Metal HSS	FM-HSS
Micro Structure			
Toughness	○	○	●
Heat Resistance	○	●	●
Wear Resistance	○	●	●

○ GOOD ● EXCELLENT

- End mill style shanks for highly precise and accurate drilling

Work Materials

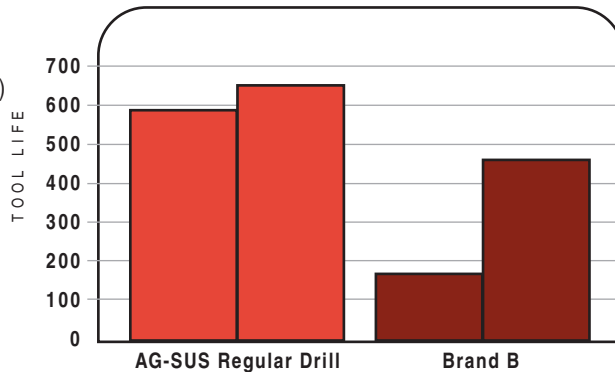
Austenitic Stainless Steels, Martensitic Stainless Steels, Ferritic Stainless Steels, Structural Steels, Low Carbon Steels



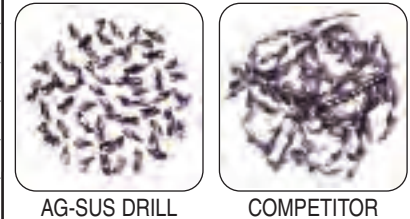
Performance

CUTTING CONDITION

Drill Dia.: 6mm
 Material: S42020 (SUS420J2)
 Hole Depth: 20mm through
 Speed: 78 SFM (1.275 rpm)
 Feed: 190mm/min (7.48 IPM)
 Pecking: Non
 Coolant: Emulsion

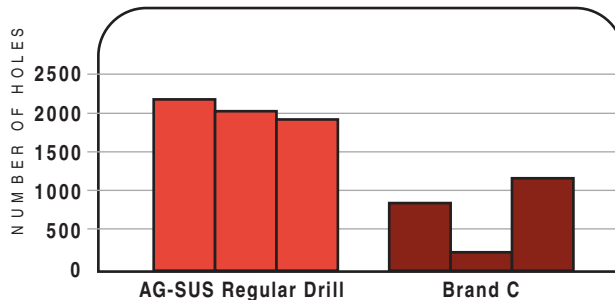


CHIP SHAPE-
 NACHI AG-SUS DRILL VS. COMPETITOR
 FOR STAINLESS STEEL



CUTTING CONDITION

Drill Dia.: 1mm (0.039")
 Material: S304 (175 HB)
 Hole Depth: 5mm blind
 Speed: 49 SFM (4.775 rpm)
 Feed: 100mm/min (3.94 IPM)
 Pecking: 1mm
 Coolant: Emulsion



Stocked Size	Drill Name	List No.	Page
	AG-SUS Drill Short/Metric Sizes	6596P	53
	AG-SUS Drill Regular/Metric Sizes	6594P	54
	AG-SUS Drill Regular/Fractional Sizes	6595P	55

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

Technical Data

Features

New style Parabolic Drills

The Nachi UG-Power drill is designed for deep hole drilling. Flute geometry allows for easy chip removal and enable non pecking drilling up to 7X diameter.

Work Materials

APPLICABLE MATERIAL

- Carbon Steel
- Alloy Steel
- Tool Steel
- Die Steel
- Cast Iron
- Stabilized Steel (under 35HRC)

UNSUITABLE MATERIAL

- Soft Steel
- Aluminum
- Copper Alloy
- Hardened Steel (over 40HRC)



DRILLS

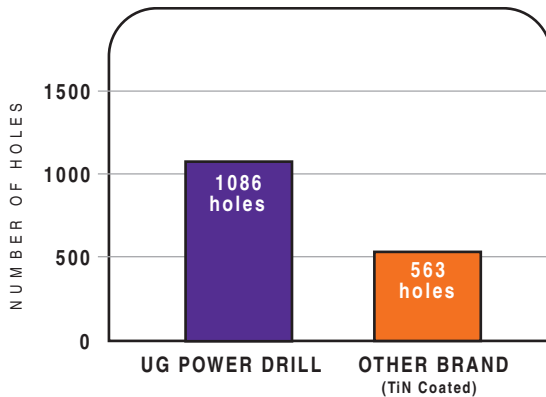
DRILLS Cutting Condition

Performance

TOOL LIFE- NACHI UG DRILL VS. OTHER PARABOLIC BRAND DRILLS

CONDITION

Drill Dia. : 1/4"
 Material : AISI 1049
 Hole Depth : 1-3/4" (7D)
 Speed : 105'/min (1800 RPM)
 Feed : 12.4"/min (.007"/rev)
 Without pecking



END MILLS

END MILLS Cutting Condition



UG Power Drills



Competitor

Tool life is 1.5 times longer than competitor

UG Power Drills

Competitor

Cutting condition
 Drill : 6mm (0.236in)
 Speed : 33m/min (108 SFM)
 Feed : 0.18mm/rev (12.4 IPM)
 Depth : 48mm (1.9in) blind hole
 Material : C45 (180HB) / S45C / 1045
 Fluid : Emulsion

TAPS

TAPS Cutting Condition

Others

Stocked Size	Drill Name	List No.	Page
	UG-POWER Drill/Fractional Sizes	6517U	51
	UG-POWER Drill/Metric Sizes	6528P	52

* JAPAN STOCK ITEM : Please allow 2-3 weeks delivery.

Features

New style Parabolic Drills

- Flute geometry and coating enables non pecking deep hole drilling up to 20XD.
- AG Coating (TiAlN) and HSS-Co material increases tool life.

Work Materials

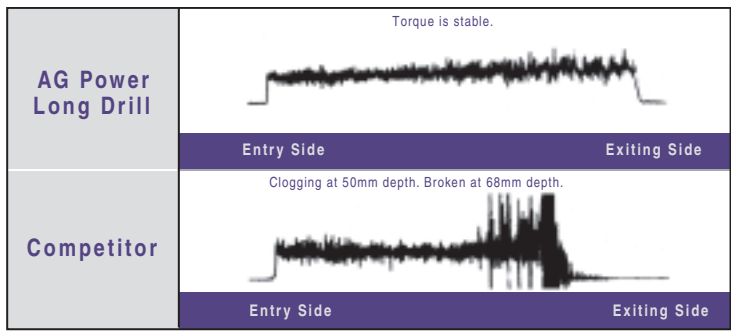
Carbon Steels, Alloy Steels, Mold Steels,
Hardened Steels (under 40HRC), Cast Irons

Performance

AG POWER LONG DRILL VS. STANDARD DRILL



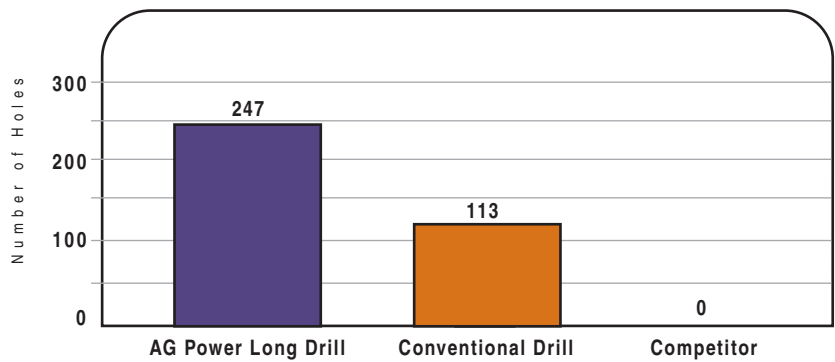
Stable torque



CUTTING CONDITION

Drill : 6mm (0.236in)
Material : 1050 (217HB) S50C
Hole Depth : 102mm (4.01in : 17D) through
Speed : 1590rpm (98 SFM)
Feed : 0.1mm/rev (6.26 IPM)
non-pecking drilling
Fluid : Emulsion

Long tool life



Stocked Size	Drill Name	List No.	Page
	AG Power Long Drill/Metric Sizes	6540P	56
	AG Power Long Drill/Fractional Sizes	6541P	56

* JAPAN STOCK ITEM : Please allow 2-3 weeks delivery.

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

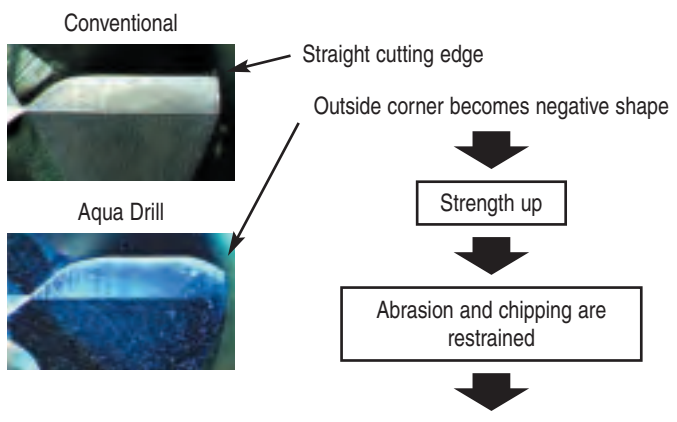
TAPS

TAPS Cutting Condition

Others

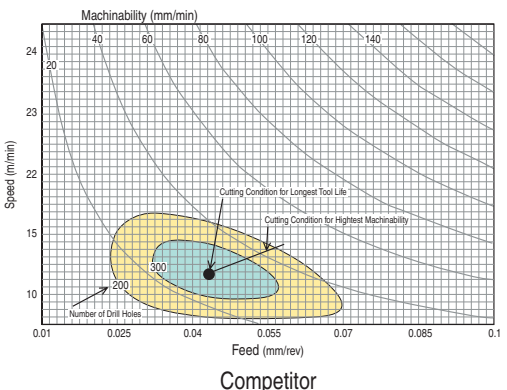
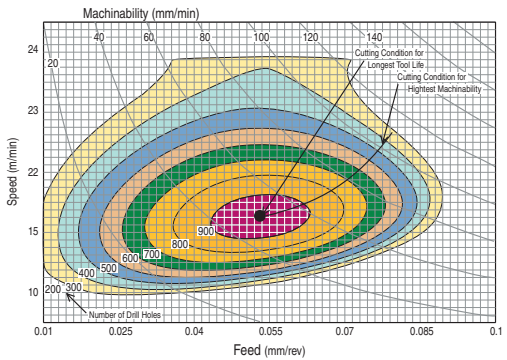
Features

- Aqua coating has a self-lubricant and offers superior heat resistance. (Composite and multi-layered TiAlN + original lubricant film)
- Tough micro grain carbide enables a longer tool life.
- End mill type shank (List 9550, 9551, 9552, 9546, 9548, 9544)
- Cylindrical type shank (List 9556, 9569)
- Negative corner edge design prevents chipping.

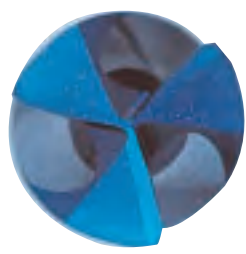


It is suitable for dry cutting and high speed cutting with fluid

Wide range of Cutting condition



AQUA Drills 3flutes



AQUA Drills Stub



Stocked Size	Drill Name	List No.	Page
*	AQUA Drill Stub/Metric Sizes	9550	58
	AQUA Drill Stub/Fractional Sizes	9551	59
	AQUA Drill Regular/Metric Sizes	9552	60
	AQUA Drill with Mist Hole 3D	9558	61
	AQUA Drill with Mist Hole 5D	9554	62
	AQUA Drill with Mist Hole 7D/Metric Sizes	9556	63
	AQUA Drill with Mist Hole 7D/Fractional Sizes	9569	63
*	AQUA Drill 3 Flute/Metric Sizes	9546	64
*	AQUA Drill Hard/Metric Sizes	9548	65
*	AQUA Drill Micro/Metric Sizes	9544	66

* JAPAN STOCK ITEM : Please allow 2-3 weeks delivery.

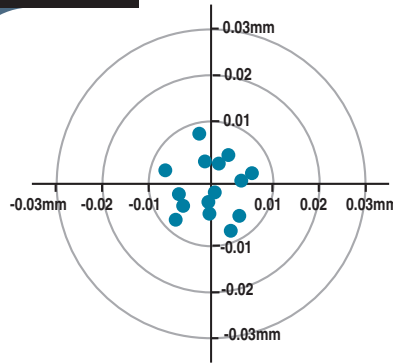
Work Materials

- Structural Steel
- Carbon Steel
- Alloy Steel
- Pre-Hardened Steel
- Cast Iron
- Stainless Steel (*AQUA Micro Drill)
- Die Steel
- Annealed Steel (30 - 40HRC)
- Hardened Steel (40 - 50HRC)
- * AQUA Drill Hard.
- Hardened Steel (50 - 70HRC)

Performance

Excellent for accurate drilling

- Has accurate point geometry for high rigidity
- Superior positioning within 0.01mm (0.0004") without center drill

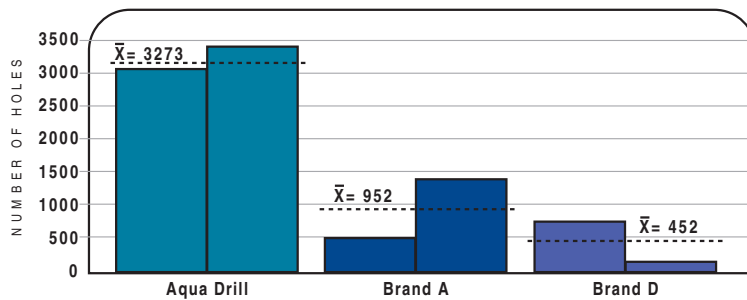


Drill Dia. : 1/4"
 Material : S50C (1050), 185 HB
 Hole Depth : 18mm through
 Speed : 108m/min (5000 RPM)
 Feed : 0.16mm/rev (800mm/min)
 Coolant : Water base coolant

HIGH SPEED DRY DRILLING—THE NACHI AQUA DRILL VS. OTHER BRANDS

CONDITION

Drill : 6mm (0.2362")
 Material : Alloy steel
 (Hardness : 310 HB)
 Hole Depth : 18mm blind
 Speed : 60m/min (196 SFM)
 Revolution : 3183 RPM
 Feed : 477mm/min (18.7 IPM)
 Dry (Air blow)



CHIP SHAPE

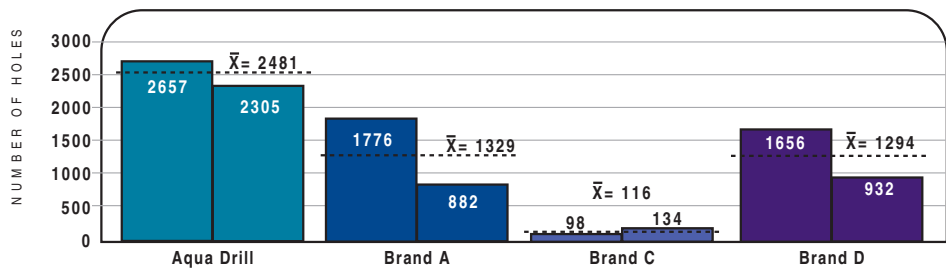
The Aqua Drill produces chips which will dissipate heat quickly.



HIGH SPEED WET DRILLING—THE NACHI AQUA DRILL VS. OTHER BRANDS

CONDITION

Drill : 6mm (0.2362")
 Material : Alloy steel
 (Hardness : 310 HB)
 Hole Depth : 21mm through
 Speed : 100m/min (328 SFM)
 Revolution : 5305 RPM
 Feed : 1061mm/min (41.7 IPM)
 Water Soluble



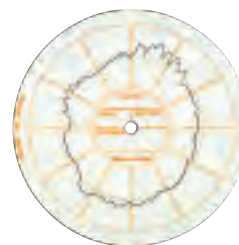
Roundness is under 3µm in pre-hardened steels

Drilling condition

Drill : 10mm
 Speed : 80m/min (2,550min⁻¹)
 Feed : 0.27mm/rev (680mm/min)
 Hole Depth : 30mm (Blind)
 Material : NAK80 (40HRC) / Die Steel
 Coolant : Emulsion



Roundness 2.8µm



Roundness 17.2µm

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

TECHNICAL INFORMATION / MQL POWER LONG DRILL

Solid Carbide Long Drill with OH for MQL (Custom-made)

Technical Data

Features

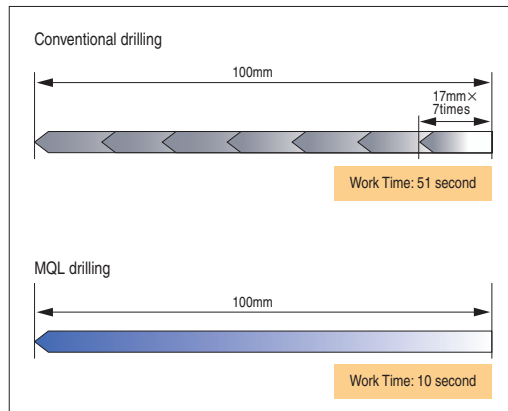
- Rigid Flute design for deep hole drilling.
- Best oil hole design for MQL.
- Specially developed lubricant coating has a high heat resistance to prevent premature tool failure.
- Special carbide material.

Work Materials

Crankshaft oil hole

Performance

Non-step drilling, efficiency 5 times



Drilling condition

HSS Long drill : $\phi 5\text{mm}$
(0.197in)
Cutting Speed : 20m/min
(65.6 SFM)
Feed : 150mm/min
(5.91 IPM)

Drilling condition

MQL Power Long Drill : $\phi 5\text{mm}$ (0.197in)
Cutting Speed : 80m/min(262 SFM)
Feed : 750mm/min(29.5 IPM)

Up to $30 \times D$ DRILLS
Cutting Condition

END MILLS

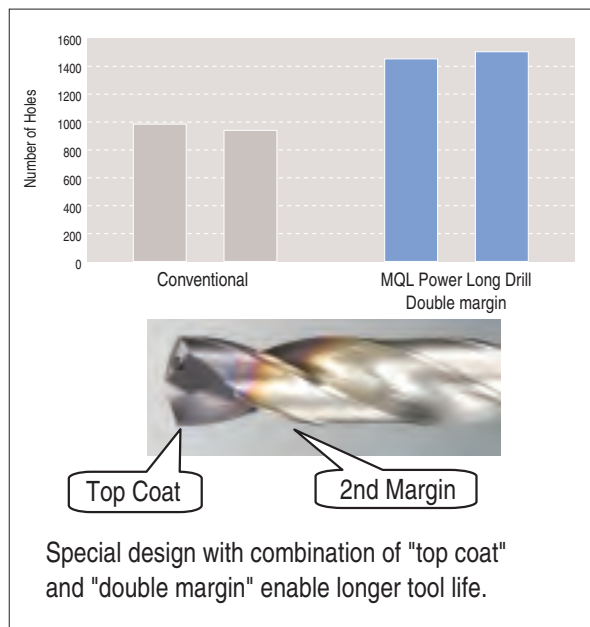
END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

Comparison of tool life



Drilling condition

Tool : $\phi 5 \times 130 \times 180$ (0.197in \times 5.118in \times 7.087in)
Cutting Speed : 80m/min(262 SFM)(5093min⁻¹)
Feed : 764mm/min(30.1 IPM)
Hole Depth : 100mm(3.94in)(blind)
Work Material : 1050(S50C),180HB
Cutting Fluid : MQL

What's MQL

MQL = Minimum Quantity Lubrication
= Mist Machining = Semi Dry Machining

Use a very small quantity of oil of 1~3cc per one hour, make oil mist of 1~2 μm and machining while jetting in cutting edge.

Features

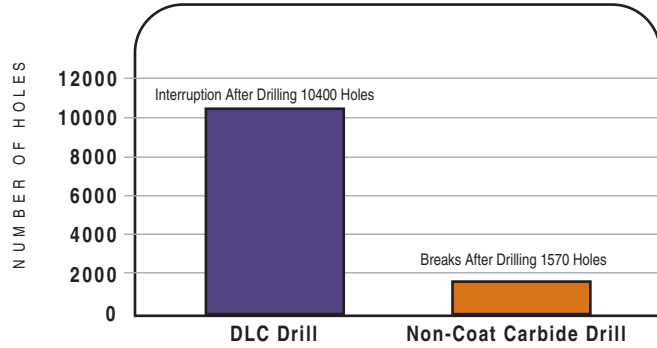
- Utilizes high accuracy shape of lip relief (2 rake thinning)
- Utilizes flute geometry resulting in excellent chip control and dry milling with no edge build-up
- End mill style shanks for highly precise and accurate drilling

Work Materials

Aluminums, Aluminum alloys, Aluminum Alloy Casting, Aluminum Alloy Die-casting, Copper alloys

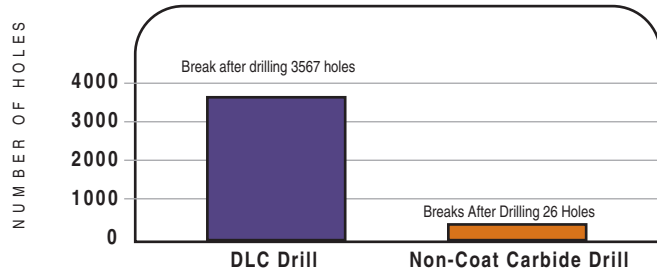
Performance

WET DRILLING BY DLC DRILL



Small wear after drilling 10400 holes

DRY DRILLING BY DLC DRILL



CONDITION

Drill: 5.5mm (0.2165")
 Material: AlMg2.5 (A5052)
 Hole Depth: 27.5mm (1.06") blind
 Speed: 100m/min (328 SFM)
 Feed: 0.08mm/rev (18.26 IPM)
 Coolant: Emulsion

CONDITION

Drill: 5.5mm (0.2165")
 Material: ADC12
 Hole Depth: 16.5mm (0.65") blind
 Speed: 100m/min (328 SFM)
 Feed: 0.08mm/rev (18.26 IPM)
 Coolant: Dry

Stocked Size	Drill Name	List No.	Page
	DLC HSS Drill/Metric Sizes	544	68
	DLC Micro Drill/Metric Sizes	9524	69
	DLC Drill Regular/Metric Sizes	9520	70

* JAPAN STOCK ITEM : Please allow 2-3 weeks delivery.

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

Drills / Selection Chart

HIGH PERFORMANCE DRILLS

Drill Name	Material	Coating		Stock Size	Stock USA ● Japan ○	LIST No		Image	
						Page Size	Page Cutting Condition		
SG-ESS Drills	PM-HSS	SG	Metric	1.0 to 20.0	●	7572P p.46 p.88			
			Fractional	3/32 to 3/4	●	7573P p.47 p.88			
			Letter Wire	B to Z #1 to #45	●	7573P p.47 p.88			
Metric			2.0 to 20.0	●	7570P p.48 p.88				
Fractional			3/32 to 3/4	●	7571P p.49 p.88				
Letter Wire			B to Z #1 to #45	●	7571P p.49 p.88				
Metric			5.0 to 20.0	●	7596P p.50 p.89				
Fractional			15/64 to 3/4	●	7591P p.50 p.89				
UG-POWER Drills			HSS-Co	UG	Fractional	3/64 to 1/2	●	6517U p.51 p.89	
			Metric	1.0 to 3.0 3.1 to 13.0	● ○	6528P p.52 p.89			
AG-SUS Drills Short	FMX	AG	Metric	1.0 to 20.0	●	6596P p.53 p.90			
AG-SUS Drills Regular			Fractional	3/32 to 3/4	●	6595P p.55 p.90			
			Metric	1.0 to 20.0	●	6594P p.54 p.90			
AG-Power Long Drills	HSS-Co		Fractional	1/8 to 23/64	●	6541P p.56 p.90			
			Metric	1.0 to 13.0	●○ Mixed	6540P p.56 p.90			
AQUA Drills Stub	Carbide	AQUA	Metric	3.0 to 20.0	○	9550 p.58 p.91			
			Fractional	1/8 to 3/4	●	9551 p.59 p.91			
AQUA Drills Regular			Metric	2.0 to 2.95 3.0 to 20.0	○ ●	9552 p.60 p.92			
AQUA Drills with Mist Hole 3D			Metric	4.5 to 16.0	○	9558 p.61 p.94			
AQUA Drills with Mist Hole 5D			Metric	4.5 to 16.0	●○ Mixed	9554 p.62 p.94			
AQUA Drills with Mist Hole 7D			Metric	5.0 to 16.0	●	9556 p.63 p.95			
			Fractional	3/16 to 5/8	●	9569 p.63 p.95			
AQUA Drills 3Flute			Metric	3.0 to 12.0	○	9546 p.64 p.92			
AQUA Drills Hard			Metric	2.0 to 12.0	○	9548 p.65 p.93			
AQUA Micro Drills			Metric	0.20 to 1.99	○	9544 p.66 p.93			
DIAMOND COATED Drills			DIAMOND	Fractional	1/16 to 1/2	●	9501D p.67 p.95		

Continue to next page.

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

●:Great ○:Good △:OK

	Drilling Depth *1				Workpiece Material																
	≤3D	≤5D	≤7D	>7D	Carbon Steel		Alloy Steel	Die Steel	Hardened Steel			Stainless Steel		Titanium Alloys	Nickel Alloys	Cast Iron		Aluminum			Copper Alloys
					Low Carbon	High Carbon			HRC			Austenitic	Martensitic			Soft	Hard	6061	Casting	High Si	
					1010,1018	1045,1065	4140,4330	D2	up to 35	35 to 45	45 to 65	300 Series	400 Series	< 200HB	> 200HB	7075	Si ≤ 12%	Si > 13%			
●				●	●	●	●	○			●	●	●	●	○	△	○	○		○	
●				●	●	●	●	○			●	●	●	●	○	△	○	○		○	
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●	●	●	○	●	●	●	●	○				●			○	△	○	○			
●	●			●	●	●	●	○			●	●	●	●	○		○	○		△	
●	●			●	●	●	●	○			●	●	●	●	○		○	○		△	
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		△	●	●	●	●	●	△							●	○					
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○	●	●		●	●	●	●	●	○	△		●	●		○	△					
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●	●	●	○	●	●	●	●	●	○	△		●	●	○	○	○	△				
●	○			●	●	●	●	●	○								○	●	●		

*Some sizes does not meet this preference. Please make sure of flute length of each sizes before use.

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

Drills / Selection Chart

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS




END MILLS Cutting Condition

TAPS












TAPS Cutting Condition

Others

High performance drills (Continued)

Drill Name	Material	Coating		Stock Size	Stock USA ● Japan ○	LIST No		
						Page Size	Cutting Condition	
DLC HSS Drills	HSS	DLC	Metric	1.0 to 13.0	○	544		
DLC Micro Drills	Carbide		Metric	0.5 to 1.9	○	p.68	p.96	
DLC Drills Regular			Metric	2.0 to 12.0	○	9520		
						p.69	p.96	
						p.70	p.96	

STRAIGHT SHANK DRILLS

Drill Name	Material	Coating		Stock Size	Stock USA ● Japan ○	LIST No				
						Page Size	Cutting Condition			
Jobbers Length	HSS	Black Oxide	Metric	0.2 to 17.5	●	500				
			Fractional	3/64 to 11/16	●	p.71	p.97			
			Wire	#1 to #60	●	501				
			Letter	A to Z	●	p.74	p.97			
		Bright	Fractional	1/64 to 11/16	●	501A				
			Wire	#1 to #80	●	p.74	p.97			
			Letter	A to Z	●	501A				
			Fractional	1/16 to 1/2	●	p.74	p.97			
		TiN	Wire	#1 to #52	●	501P				
			Metric	0.5 to 13.0	○	p.74	p.97			
		High Helix	HSS-Co	Black Oxide	Metric	0.5 to 13.0	○	520P		
								p.73	p.97	
	Aircraft NAS 907-B	HSS-Co	Black Oxide	Fractional	1/64 to 1/2	●	6501			
				Wire	#1 to #80	●	p.74	p.97		
				Letter	A to Z	●	6501			
	Fractional	1/16 to 1/2	●	p.74	p.97					
Parabolic	HSS	TiN	Fractional	1/16 to 1/2	●	517P				
			Wire	#1 to #52	●	p.74	p.98			
						517P				
						p.74	p.98			

●:Great ○:Good △:OK

	Drilling Depth *1				Workpiece Material																
	≤3D	≤5D	≤7D	>7D	Carbon Steel		Alloy Steel	Die Steel	Hardened Steel			Stainless Steel		Titanium Alloys	Nickel Alloys	Cast Iron		Aluminum			Copper Alloys
					Low Carbon	High Carbon			HRc			Austenitic	Martensitic			Soft	Hard	6061	Casting	High Si	
					1010,1018	1045,1065	4140,4330	D2	up to 35	35 to 45	45 to 65	300 Series	400 Series	< 200HB	> 200HB	7075	Si ≤ 12%	Si > 13%			
○	●	●															●	○		●	
●	●																●	●		●	
●	●																●	●		●	

●:Great ○:Good △:OK

	Drilling Depth *1				Workpiece Material																
	≤3D	≤5D	≤7D	>7D	Carbon Steel		Alloy Steel	Die Steel	Hardened Steel			Stainless Steel		Titanium Alloys	Nickel Alloys	Cast Iron		Aluminum			Copper Alloys
					Low Carbon	High Carbon			HRc			Austenitic	Martensitic			Soft	Hard	6061	Casting	High Si	
					1010,1018	1045,1065	4140,4330	D2	up to 35	35 to 45	45 to 65	300 Series	400 Series	< 200HB	> 200HB	7075	Si ≤ 12%	Si > 13%			
●	●	●		○	○	○										△		△	△		△
●	●	●		○	○	○										△		△	△		△
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●	●	●		○	○	○										△		△	△		△
●	●	●		○	○	○										△		△	△		△
●	●	●		○	○	○										△		△	△		△
●	●	●		○	●	●	△					△	△	△	△	○	△	△	△		△
●	●	●		○	●	●	△					△	△	△	△	○	△	△	△		△
●	●		○	○	○	○	△					○	○	△	△			△	△		△
●	●	●		○	○	○	△					△	○	○	△	△	△	△	△		△
●	●	●		○	○	○	△					△	○	○	△	△	△	△	△		△
●	●	●		○	○	○	△					△	○	○	△	△	△	△	△		△
●	●	●		○	●	●	△						△			○	△	△	△		△
●	●	●		○	●	●	△						△			○	△	△	△		△

*Some sizes does not meet this preference. Please make sure of flute length of each sizes before use.

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

STRAIGHT SHANK DRILLS

Drill Name	Material	Coating	Stock Size	Stock USA ● Japan ○	LIST No		Image	
					Page Size	Page Cutting Condition		
Screw Machine Length	HSS	Black Oxide	Fractional	3/64 to 2	●	561		
			Wire	#1 to #60	●	p.76 p.97	561	
			Letter	A to Z	●	p.76 p.97	561	
		TiN	Fractional	1/16 to 1/2	●	561P	p.76 p.97	
			Wire	#1 to #52	●	561P	p.76 p.97	
			Letter	A to Z	●	563	p.76 p.97	
	HSS-Co	Black Oxide	Fractional	3/64 to 1/2	●	563	p.76 p.97	
			Wire	#1 to #52	●	563	p.76 p.97	
			Letter	A to Z	●	563	p.76 p.97	
		Black Oxide	Fractional	3/64 to 1/2	●	6563	p.76 p.97	
			Wire	#1 to #52	●	6563	p.76 p.97	
			Letter	A to Z	●	6563	p.76 p.97	
Taper Length	HSS	Black Oxide	Fractional	1/64 to 1/2	●	531	p.78 p.97	
	HSS-Co	Black Oxide	Fractional	1/16 to 3/4	●	6531	p.78 p.97	
	HSS	TiN	Fractional	1/16 to 1/2	●	545P	p.78 p.98	
Extra Length	HSS	Bright	Fractional	1/8 to 1	●	551	p.80 p.98	
			Fractional	1/8 to 1	●	551	p.80 p.98	
	HSS-Co	Black Oxide	Fractional	3/16 to 1/2	●	6551	p.80 p.98	
Oil Hole Drills	HSS-Co	Bright	Fractional	3/8 to 1 1/2	●	581	p.81 p.99	

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

● :Great ○ :Good △ :OK

	Drilling Depth *1				Workpiece Material																
	≤3D	≤5D	≤7D	>7D	Carbon Steel		Alloy Steel	Die Steel	Hardened Steel			Stainless Steel		Titanium Alloys	Nickel Alloys	Cast Iron		Aluminum			Copper Alloys
					Low Carbon	High Carbon			HRC			Austenitic	Martensitic			Soft	Hard	6061	Casting	High Si	
					1010,1018	1045,1065	4140,4330	D2	up to 35	35 to 45	45 to 65	300 Series	400 Series	< 200HB	> 200HB	7075	Si ≤ 12%	Si > 13%			
●				○	○	○												△		△	
●				○	○	○												△		△	
●				○	○	○												△		△	
●				○	●	●	△				△	△	△	△	○	△	△	△	△	△	
●				○	●	●	△				△	△	△	△	○	△	△	△	△	△	
●				○	○	○					△	△	△	△	△	△	△	△		△	
●				○	○	○					△	△	△	△	△	△	△	△		△	
●				○	○	○	△				△	○	○	△	△	△	△	△		△	
●				○	○	○	△				△	○	○	△	△	△	△	△		△	
●	●			○	○	○					△	△			△	△	△	△		△	
●	●			○	○	○	△				△	○			△	△	△	△		△	
●	●			○	●	●	△				△	△			○	△	△	△		△	
			●	○	○	○									△	△	○	△		△	
			●	○	○	○									△	△	○				
			●	○	○	○	△				△	○			△	△	△	△		△	
●	●	○		○	○	○	○				△	○	○	△	○	△	△	△		△	

*Some sizes does not meet this preference. Please make sure of flute length of each sizes before use.

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition


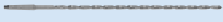


TAPS

TAPS Cutting Condition

Others

44 Drills / Selection Chart

TAPER SHANK DRILLS

Drill Name	Material	Coating		Stock Size	Stock USA ● Japan ○	LIST No		
						Page Size	Page Cutting Condition	
Regular Shank	HSS	Black Oxide	Fractional	1/8 to 3 1/2	●	601		
Extra Length	HSS	Bright	Fractional	1/4 to 2 1/2	●	651		
						18" Overall	p.82 p.100	
Extra Length	HSS	Bright	Fractional	1/4 to 2 1/2	●	651		
						24" Overall	p.83 p.98	
Oil Hole Drills	HSS-Co	Bright	Fractional	3/8 to 1 1/2	●	683		
						p.84	p.100	

SPECIAL

Drill Name	Material	Coating		Stock Size	Stock USA ● Japan ○	LIST No		
						Page Size	Page Cutting Condition	
SILVER AND DEMING DRILLS	HSS	Bright	Fractional	1/2 to 1 1/2	●	575		
						p.85	p.100	
JOBBER'S LENGTH/Set Drills	HSS, HSS-Co	Black Oxide, Bright	Several	Several	●	599		
							p.86 p.97	

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

●:Great ○:Good △:OK

	Drilling Depth *1				Workpiece Material																
	≤3D	≤5D	≤7D	>7D	Carbon Steel		Alloy Steel	Die Steel	Hardened Steel			Stainless Steel		Titanium Alloys	Nickel Alloys	Cast Iron		Aluminum			Copper Alloys
					Low Carbon	High Carbon			HRc			Austenitic	Martensitic			Soft	Hard	6061	Casting	High Si	
					1010,1018	1045,1065	4140,4330	D2	up to 35	35 to 45	45 to 65	300 Series	400 Series	< 200HB	> 200HB	7075	Si ≤ 12%	Si > 13%			
●	○			○	○	○									△		△	△		△	
			●	○	○	○												○	△		△
			●	○	○	○												○	△		△
	●	●	○		●	●	●				△	○	○	△	○	△	△	△	△		△

●:Great ○:Good △:OK

	Drilling Depth *1				Workpiece Material																
	≤3D	≤5D	≤7D	>7D	Carbon Steel		Alloy Steel	Die Steel	Hardened Steel			Stainless Steel		Titanium Alloys	Nickel Alloys	Cast Iron		Aluminum			Copper Alloys
					Low Carbon	High Carbon			HRc			Austenitic	Martensitic			Soft	Hard	6061	Casting	High Si	
					1010,1018	1045,1065	4140,4330	D2	up to 35	35 to 45	45 to 65	300 Series	400 Series	< 200HB	> 200HB	7075	Si ≤ 12%	Si > 13%			
●				○	○	○													△		△
●	●	●		○	○	○	△								△		△	△			△

*Some sizes does not meet this preference. Please make sure of flute length of each sizes before use.

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

STUB LENGTH SG-ESS / METRIC SIZES

List No.7572P High Performance



Range 1.0 to 20.0

PM-HSS SG COATED



This drill having stub length is suited for high-speed drilling and precise positioning and diameter. This is useful in material from Carbon Steels and Stainless Steels to Aluminum.

(Unit) : mm

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
1.0	0.0394	6	38	3
1.05	0.0413	6	38	3
1.1	0.0433	7	39	3
1.15	0.0453	7	39	3
1.2	0.0472	8	40	3
1.25	0.0492	8	40	3
1.3	0.0512	8	40	3
1.35	0.0531	9	41	3
1.4	0.0551	9	41	3
1.45	0.0571	9	41	3
1.5	0.0591	9	41	3
1.55	0.0610	10	42	3
1.6	0.0630	10	42	3
1.65	0.0650	10	42	3
1.7	0.0669	10	42	3
1.75	0.0689	11	43	3
1.8	0.0709	11	43	3
1.85	0.0728	11	43	3
1.9	0.0748	11	43	3
1.95	0.0768	12	44	3
2.0	0.0787	12	44	3
2.1	0.0827	12	44	3
2.2	0.0866	13	45	3
2.3	0.0906	13	45	3
2.4	0.0945	14	46	3
2.5	0.0984	14	46	3
2.6	0.1024	14	46	3
2.7	0.1063	16	48	3
2.8	0.1102	16	48	3
2.9	0.1142	16	48	3
3.0	0.1181	16	48	3
3.1	0.1220	18	50	4
3.2	0.1260	18	50	4
3.3	0.1299	18	50	4
3.4	0.1339	20	52	4
3.5	0.1378	20	52	4
3.6	0.1417	20	52	4
3.7	0.1457	20	52	4
3.8	0.1496	22	54	4
3.9	0.1535	22	54	4
4.0	0.1575	22	54	4
4.1	0.1614	22	66	6
4.2	0.1654	22	66	6
4.3	0.1693	24	68	6
4.4	0.1732	24	68	6
4.5	0.1772	24	68	6
4.6	0.1811	24	68	6
4.7	0.1850	24	68	6
4.8	0.1890	26	70	6

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
4.9	0.1929	26	70	6
5.0	0.1969	26	70	6
5.1	0.2008	26	70	6
5.2	0.2047	26	70	6
5.3	0.2087	26	70	6
5.4	0.2126	28	72	6
5.5	0.2165	28	72	6
5.6	0.2205	28	72	6
5.7	0.2244	28	72	6
5.8	0.2283	28	72	6
5.9	0.2323	28	72	6
6.0	0.2362	28	72	6
6.1	0.2402	31	75	8
6.2	0.2441	31	75	8
6.3	0.2480	31	75	8
6.4	0.2520	31	75	8
6.5	0.2559	31	75	8
6.6	0.2598	31	75	8
6.7	0.2638	31	75	8
6.8	0.2677	34	78	8
6.9	0.2717	34	78	8
7.0	0.2756	34	78	8
7.1	0.2795	34	78	8
7.2	0.2835	34	78	8
7.3	0.2874	34	78	8
7.4	0.2913	34	78	8
7.5	0.2953	34	78	8
7.6	0.2992	37	81	8
7.7	0.3031	37	81	8
7.8	0.3071	37	81	8
7.9	0.3110	37	81	8
8.0	0.3150	37	81	8
8.1	0.3189	37	87	10
8.2	0.3228	37	87	10
8.3	0.3268	37	87	10
8.4	0.3307	37	87	10
8.5	0.3346	37	87	10
8.6	0.3386	40	90	10
8.7	0.3425	40	90	10
8.8	0.3465	40	90	10
8.9	0.3504	40	90	10
9.0	0.3543	40	90	10
9.1	0.3583	40	90	10
9.2	0.3622	40	90	10
9.3	0.3661	40	90	10
9.4	0.3701	40	90	10
9.5	0.3740	40	90	10
9.6	0.3780	43	93	10
9.7	0.3819	43	93	10

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
9.8	0.3858	43	93	10
9.9	0.3898	43	93	10
10.0	0.3937	43	93	10
10.1	0.3976	43	100	12
10.1	0.3976	43	100	12
10.2	0.4016	43	100	12
10.3	0.4055	43	100	12
10.4	0.4094	43	100	12
10.5	0.4134	43	100	12
10.6	0.4173	43	100	12
10.7	0.4213	47	104	12
10.8	0.4252	47	104	12
10.9	0.4291	47	104	12
11.0	0.4331	47	104	12
11.1	0.4370	47	104	12
11.2	0.4409	47	104	12
11.3	0.4449	47	104	12
11.4	0.4488	47	104	12
11.5	0.4528	47	104	12
11.6	0.4567	47	104	12
11.7	0.4606	47	104	12
11.8	0.4646	47	104	12
11.9	0.4685	51	108	12
12.0	0.4724	51	108	12
12.1	0.4764	51	108	12
12.2	0.4803	51	108	12
12.3	0.4843	51	108	12
12.4	0.4882	51	108	12
12.5	0.4921	51	108	12
12.6	0.4961	51	108	12
12.7	0.5000	51	108	12
12.8	0.5039	51	108	12
12.9	0.5079	51	108	12
13.0	0.5118	51	108	12
13.5	0.5315	72	132	16
14.0	0.5512	72	132	16
14.5	0.5709	76	136	16
15.0	0.5906	76	142	20
15.5	0.6102	80	146	20
16.0	0.6299	80	146	20
16.5	0.6496	84	150	20
17.0	0.6693	84	150	20
17.5	0.6890	87	153	20
18.0	0.7087	87	153	20
18.5	0.7283	90	156	20
19.0	0.7480	90	164	25
19.5	0.7677	94	168	25
20.0	0.7874	94	168	25

1 per tube

Technical Data

DRILLS

DRILLS

END MILLS

END MILLS

TAPS

TAPS

Others

Cutting Condition

Cutting Condition

Cutting Condition

STUB LENGTH SG-ESS / FRACTIONAL SIZES

List No.7573P High Performance



Range 3/32 to 3/4

PM-HSS SG COATED



This drill having stub length is suited for high-speed drilling and precise positioning and diameter. This is useful in material from Carbon Steels and Stainless Steels to Aluminum.

Size		Decimal	Metric	Flute	Overall	Shank
Fractional	Wire	Equivalent	Equivalent	Length	Length	Dia.
	#45	0.0820	2.08	3/4	2	1/8
	#44	0.0860	2.18	3/4	2	1/8
	#43	0.0890	2.26	3/4	2	1/8
	#42	0.0935	2.37	3/4	2	1/8
3/32		0.0938	2.38	1/2	1 3/4	1/8
	#41	0.0960	2.44	13/16	2 1/16	1/8
	#40	0.0980	2.49	13/16	2 1/16	1/8
	#39	0.0995	2.53	13/16	2 1/4	1/8
	#38	0.1015	2.58	13/16	2 1/4	1/8
	#37	0.1040	2.64	13/16	2 1/4	1/8
	#36	0.1065	2.71	13/16	2 1/4	1/8
7/64		0.1094	2.78	5/8	1 7/8	1/8
	#34	0.1110	2.82	7/8	2 5/16	1/8
	#33	0.1130	2.87	7/8	2 5/16	1/8
1/8		0.1250	3.18	3/4	2	1/8
	#30	0.1285	3.26	15/16	2 3/8	3/16
	#29	0.1365	3.47	15/16	2 3/8	3/16
	#28	0.1405	3.57	15/16	2 3/8	3/16
9/64		0.1406	3.57	13/16	2 1/8	3/16
	#27	0.1440	3.66	1	2 7/16	3/16
	#26	0.1470	3.73	1	2 7/16	3/16
	#25	0.1495	3.80	1	2 7/16	3/16
	#24	0.1520	3.86	1	2 7/16	3/16
	#23	0.1540	3.91	1	2 7/16	3/16
5/32		0.1563	3.97	13/16	2 1/8	3/16
	#22	0.1570	3.99	1 1/16	2 1/2	3/16
	#21	0.1590	4.04	1 1/16	2 1/2	3/16
	#20	0.1610	4.09	1 1/16	2 1/2	3/16
	#19	0.1660	4.22	1 1/16	2 1/2	3/16
11/64		0.1719	4.37	1	2 3/8	3/16
	#15	0.1800	4.57	1 1/18	2 9/16	3/16
	#14	0.1820	4.62	1 1/18	2 9/16	3/16
3/16		0.1875	4.76	1	2 3/8	3/16
	#10	0.1935	4.91	1 3/16	3	1/4
	#9	0.1960	4.98	1 3/16	3	1/4
	#8	0.1990	5.05	1 3/16	3	1/4
	#7	0.2010	5.11	1 3/16	3	1/4
13/64		0.2031	5.16	1 1/8	2 7/8	1/4
	#6	0.2040	5.18	1 1/4	3 1/16	1/4
	#5	0.2055	5.22	1 1/4	3 1/16	1/4
	#4	0.2090	5.31	1 1/4	3 1/16	1/4
	#3	0.2130	5.41	1 1/4	3 1/16	1/4
7/32		0.2188	5.56	1 1/8	2 7/8	1/4
	#2	0.2210	5.61	1 5/16	3 1/8	1/4
	#1	0.2280	5.79	1 5/16	3 1/8	1/4

Size		Decimal	Metric	Flute	Overall	Shank
Fractional	Letter	Equivalent	Equivalent	Length	Length	Dia.
15/64		0.2344	5.95	1 1/4	3	1/4
	B	0.2380	6.05	1 3/8	3 3/16	1/4
	C	0.2420	6.15	1 3/8	3 3/16	1/4
	D	0.2460	6.25	1 3/8	3 3/16	1/4
1/4		0.2500	6.35	1 1/4	3	1/4
	F	0.2570	6.53	1 7/16	3 1/4	3/8
	G	0.2610	6.63	1 7/16	3 1/4	3/8
17/64		0.2656	6.75	1 3/8	3 3/16	3/8
	I	0.2720	6.91	1 1/2	3 5/16	3/8
	J	0.2770	7.04	1 1/2	3 5/16	3/8
9/32		0.2813	7.14	1 3/8	3 3/16	3/8
	L	0.2900	7.37	1 9/16	3 3/8	3/8
	M	0.2950	7.49	1 9/16	3 3/8	3/8
19/64		0.2969	7.54	1 3/8	3 3/16	3/8
	N	0.3020	7.67	1 5/8	3 7/16	3/8
5/16		0.3125	7.94	1 1/2	3 3/8	3/8
	O	0.3160	8.03	1 11/16	3 1/2	3/8
21/64		0.3281	8.33	1 1/2	3 3/8	3/8
	Q	0.3320	8.43	1 11/16	3 1/2	3/8
	R	0.3390	8.61	1 11/16	3 1/2	3/8
11/32		0.3438	8.73	1 5/8	3 1/2	3/8
23/64		0.3594	9.13	1 5/8	3 1/2	3/8
	U	0.3680	9.35	1 13/16	3 5/8	3/8
3/8		0.3750	9.53	1 5/8	3 1/2	3/8
	V	0.3770	9.58	1 7/8	3 31/32	1/2
25/64		0.3906	9.92	1 11/16	3 7/8	1/2
	X	0.3970	10.08	1 15/16	4 1/32	1/2
	Y	0.4040	10.26	1 15/16	4 1/32	1/2
13/32		0.4063	10.32	1 11/16	3 7/8	1/2
	Z	0.4130	10.49	2	4 3/32	1/2
27/64		0.4219	10.72	1 7/8	4 1/8	1/2
7/16		0.4375	11.11	1 7/8	4 1/8	1/2
29/64		0.4531	11.51	1 7/8	4 1/8	1/2
15/32		0.4688	11.91	2	4 1/4	1/2
31/64		0.4844	12.30	2	4 1/4	1/2
1/2		0.5000	12.70	2	4 1/4	1/2
17/32		0.5313	13.49	2 7/8	5 3/16	5/8
9/16		0.5625	14.29	3	5 3/8	5/8
19/32		0.5938	15.08	3	5 5/8	3/4
5/8		0.6250	15.88	3 3/16	5 3/4	3/4
21/32		0.6563	16.67	3 3/8	5 15/16	3/4
11/16		0.6875	17.46	3 7/16	6	3/4
23/32		0.7188	18.26	3 7/16	6	7/8
3/4		0.7500	19.05	3 9/16	6 1/2	7/8

1 per tube

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

List No.7570P High Performance

PM-HSS SG COATED



Range 2.0 to 20.0 mm



Jobber length drill provides stable high-speed drilling and long tool life in a variety of materials; not suitable for Austenitic Stainless Steel.

(Unit) : mm

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
2.0	0.0787	24	56	3
2.1	0.0827	24	56	3
2.2	0.0866	25	56	3
2.3	0.0906	25	56	3
2.4	0.0945	30	61	3
2.5	0.0984	30	61	3
2.6	0.1024	30	61	3
2.7	0.1063	33	64	3
2.8	0.1102	33	64	3
2.9	0.1142	33	64	3
3.0	0.1181	33	64	3
3.1	0.1220	36	68	4
3.2	0.1260	36	68	4
3.3	0.1299	36	68	4
3.4	0.1339	39	71	4
3.5	0.1378	39	71	4
3.6	0.1417	39	71	4
3.7	0.1457	39	71	4
3.8	0.1496	43	75	4
3.9	0.1535	43	75	4
4.0	0.1575	43	75	4
4.1	0.1614	43	85	6
4.2	0.1654	43	85	6
4.3	0.1693	47	89	6
4.4	0.1732	47	89	6
4.5	0.1772	47	89	6
4.6	0.1811	47	89	6
4.7	0.1850	47	89	6
4.8	0.1890	52	94	6
4.9	0.1929	52	94	6
5.0	0.1969	52	94	6
5.1	0.2008	52	94	6
5.2	0.2047	52	94	6
5.3	0.2087	52	94	6
5.4	0.2126	57	99	6
5.5	0.2165	57	99	6
5.6	0.2205	57	99	6
5.7	0.2244	57	99	6
5.8	0.2283	57	99	6
5.9	0.2323	57	99	6
6.0	0.2362	57	99	6
6.1	0.2402	63	107	8

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
6.2	0.2441	63	107	8
6.3	0.2480	63	107	8
6.4	0.2520	63	107	8
6.5	0.2559	63	107	8
6.6	0.2598	63	107	8
6.7	0.2638	63	107	8
6.8	0.2677	69	113	8
6.9	0.2717	69	113	8
7.0	0.2756	69	113	8
7.1	0.2795	69	113	8
7.2	0.2835	69	113	8
7.3	0.2874	69	113	8
7.4	0.2913	69	113	8
7.5	0.2953	69	113	8
7.6	0.2992	75	119	8
7.7	0.3031	75	119	8
7.8	0.3071	75	119	8
7.9	0.3110	75	119	8
8.0	0.3150	75	119	8
8.1	0.3189	75	125	10
8.2	0.3228	75	125	10
8.3	0.3268	75	125	10
8.4	0.3307	75	125	10
8.5	0.3346	75	125	10
8.6	0.3386	81	131	10
8.7	0.3425	81	131	10
8.8	0.3465	81	131	10
8.9	0.3504	81	131	10
9.0	0.3543	81	131	10
9.1	0.3583	81	131	10
9.2	0.3622	81	131	10
9.3	0.3661	81	131	10
9.4	0.3701	81	131	10
9.5	0.3740	81	131	10
9.6	0.3780	87	137	10
9.7	0.3819	87	137	10
9.8	0.3858	87	137	10
9.9	0.3898	87	137	10
10.0	0.3937	87	137	10
10.1	0.3976	87	144	12
10.1	0.3976	87	144	12
10.2	0.4016	87	144	12

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
10.3	0.4055	87	144	12
10.4	0.4094	87	144	12
10.5	0.4134	87	144	12
10.6	0.4173	87	144	12
10.7	0.4213	94	151	12
10.8	0.4252	94	151	12
10.9	0.4291	94	151	12
11.0	0.4331	94	151	12
11.1	0.4370	94	151	12
11.2	0.4409	94	151	12
11.3	0.4449	94	151	12
11.4	0.4488	94	151	12
11.5	0.4528	94	151	12
11.6	0.4567	94	151	12
11.7	0.4606	94	151	12
11.8	0.4646	94	151	12
11.9	0.4685	101	158	12
12.0	0.4724	101	158	12
12.1	0.4764	101	158	12
12.2	0.4803	101	158	12
12.3	0.4843	101	158	12
12.4	0.4882	101	158	12
12.5	0.4921	101	158	12
12.6	0.4961	101	158	12
12.7	0.5000	101	158	12
12.8	0.5039	101	158	12
12.9	0.5079	101	158	12
13.0	0.5118	101	158	12
13.5	0.5315	108	168	16
14.0	0.5512	108	168	16
14.5	0.5709	114	173	16
15.0	0.5906	114	180	20
15.5	0.6102	120	185	20
16.0	0.6299	120	185	20
16.5	0.6496	125	189	20
17.0	0.6693	125	189	20
17.5	0.6890	130	194	20
18.0	0.7087	130	194	20
18.5	0.7283	135	198	20
19.0	0.7480	135	206	25
19.5	0.7677	140	210	25
20.0	0.7874	140	210	25

Not recommended for Austenite type of stainless steel

1 per tube

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

List No.7571P High Performance



Range 3/32 to 3/4

PM-HSS SG COATED



Jobber length drill provides stable high-speed drilling and long tool life in a variety of materials; not suitable for Austenitic Stainless Steel.

Size		Decimal Equivalent	Metric Equivalent	Flute Length	Overall Length	Shank Dia.
Fractional	Wire					
	#45	0.0820	2.08	1 1/8	2 3/8	1/8
	#44	0.0860	2.18	1 1/8	2 3/8	1/8
	#43	0.0890	2.26	1 1/4	2 1/2	1/8
	#42	0.0935	2.37	1 1/4	2 1/2	1/8
3/32		0.0938	2.38	1 1/8	2 3/8	1/8
	#41	0.0960	2.44	1 3/8	2 5/8	1/8
	#40	0.0980	2.49	1 3/8	2 5/8	1/8
	#39	0.0995	2.53	1 3/8	2 13/16	1/8
	#38	0.1015	2.58	1 7/16	2 7/8	1/8
	#37	0.1040	2.64	1 7/16	2 7/8	1/8
	#36	0.1065	2.71	1 7/16	2 7/8	1/8
7/64		0.1094	2.78	1 1/4	2 1/2	1/8
	#34	0.1110	2.82	1 1/2	2 15/16	1/8
	#33	0.1130	2.87	1 1/2	2 15/16	1/8
1/8		0.1250	3.18	1 3/8	2 5/8	1/8
	#30	0.1285	3.26	1 5/8	3 1/16	3/16
	#29	0.1365	3.47	1 3/4	3 3/16	3/16
	#28	0.1405	3.57	1 3/4	3 3/16	3/16
9/64		0.1406	3.57	1 1/2	2 7/8	3/16
	#27	0.1440	3.66	1 7/8	3 5/16	3/16
	#26	0.1470	3.73	1 7/8	3 5/16	3/16
	#25	0.1495	3.80	1 7/8	3 5/16	3/16
	#24	0.1520	3.86	2	3 7/16	3/16
	#23	0.1540	3.91	2	3 7/16	3/16
5/32		0.1563	3.97	1 3/4	3 1/8	3/16
	#22	0.1570	3.99	2	3 7/16	3/16
	#21	0.1590	4.04	2 1/8	3 9/16	3/16
	#20	0.1610	4.09	2 1/8	3 9/16	3/16
	#19	0.1660	4.22	2 1/8	3 9/16	3/16
11/64		0.1719	4.37	1 7/8	3 1/4	3/16
	#15	0.1800	4.57	2 3/16	3 5/8	3/16
	#14	0.1820	4.62	2 3/16	3 5/8	3/16
3/16		0.1875	4.76	2	3 3/8	3/16
	#10	0.1935	4.91	2 7/16	4 1/4	1/4
	#9	0.1960	4.98	2 7/16	4 1/4	1/4
	#8	0.1990	5.05	2 7/16	4 1/4	1/4
	#7	0.2010	5.11	2 7/16	4 1/4	1/4
13/64		0.2031	5.16	2 1/16	3 7/8	1/4
	#6	0.2040	5.18	2 7/16	4 1/4	1/4
	#5	0.2055	5.22	2 1/2	4 5/16	1/4
	#4	0.2090	5.31	2 1/2	4 5/16	1/4
	#3	0.2130	5.41	2 1/2	4 5/16	1/4
7/32		0.2188	5.56	2 1/16	3 7/8	1/4
	#2	0.2210	5.61	2 5/8	4 7/16	1/4
	#1	0.2280	5.79	2 5/8	4 7/16	1/4

Not recommended for Austenite type of stainless steel

Size		Decimal Equivalent	Metric Equivalent	Flute Length	Overall Length	Shank Dia.
Fractional	Letter					
15/64		0.2344	5.95	2 3/8	4 1/4	1/4
	B	0.2380	6.05	2 3/4	4 9/16	1/4
	C	0.2420	6.15	2 3/4	4 9/16	1/4
	D	0.2460	6.25	2 3/4	4 9/16	1/4
1/4		0.2500	6.35	2 3/8	4 1/4	1/4
	F	0.2570	6.53	2 7/8	4 11/16	3/8
	G	0.2610	6.63	2 7/8	4 11/16	3/8
17/64		0.2656	6.75	2 3/4	4 5/8	3/8
	I	0.2720	6.91	2 7/8	4 11/16	3/8
	J	0.2770	7.04	2 7/8	4 11/16	3/8
9/32		0.2813	7.14	2 3/4	4 5/8	3/8
	L	0.2900	7.37	2 15/16	4 3/4	3/8
	M	0.2950	7.49	3 1/16	4 7/8	3/8
19/64		0.2969	7.54	2 7/8	4 3/4	3/8
	N	0.3020	7.67	3 1/16	4 7/8	3/8
5/16		0.3125	7.94	2 7/8	4 3/4	3/8
	O	0.3160	8.03	3 3/16	5	3/8
21/64		0.3281	8.33	2 7/8	4 3/4	3/8
	Q	0.3320	8.43	3 7/16	5 1/4	3/8
	R	0.3390	8.61	3 7/16	5 1/4	3/8
11/32		0.3438	8.73	3 1/4	5 1/8	3/8
23/64		0.3594	9.13	3 1/4	5 1/8	3/8
	U	0.3680	9.35	3 5/8	5 7/16	3/8
3/8		0.3750	9.53	3 1/4	5 1/8	3/8
	V	0.3770	9.58	3 5/8	5 23/32	1/2
25/64		0.3906	9.92	3 3/8	5 1/2	1/2
	X	0.3970	10.08	3 3/4	5 27/32	1/2
	Y	0.4040	10.26	3 7/8	5 31/32	1/2
13/32		0.4063	10.32	3 3/8	5 1/2	1/2
	Z	0.4130	10.49	3 7/8	5 31/32	1/2
27/64		0.4219	10.72	3 3/4	5 7/8	1/2
7/16		0.4375	11.11	3 3/4	5 7/8	1/2
29/64		0.4531	11.51	3 3/4	5 7/8	1/2
15/32		0.4688	11.91	4	6 1/4	1/2
31/64		0.4844	12.30	4	6 1/4	1/2
1/2		0.5000	12.70	4	6 1/4	1/2
17/32		0.5313	13.49	4 1/4	6 3/4	5/8
9/16		0.5625	14.29	4 1/2	7	5/8
37/64		0.5781	14.68	4 1/2	7	5/8
19/32		0.5938	15.08	4 3/4	7 1/4	3/4
5/8		0.6250	15.88	4 3/4	7 1/4	3/4
21/32		0.6563	16.67	5	7 1/2	3/4
11/16		0.6875	17.46	5 1/8	7 5/8	3/4
23/32		0.7188	18.26	5 3/8	7 3/4	7/8
3/4		0.7500	19.05	5 1/2	7 7/8	7/8

1 per tube

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

SG DRILLS WITH OIL-HOLES / METRIC SIZES FRACTIONAL SIZES

List No.7596P Metric Sizes

List No.7591P Fractional


L7596P Range 5.0 to 20.0
L7591P Range 15/64 to 3/4

PM-HSS SG COATED


This oil hole drill is suitable for high-speed and long life drilling, and adapted in workpiece material from Carbon Steels and Stainless Steels to Aluminum.

L7596P

(Unit) : mm

L7591P

Size	Decimal Equivalent	Flute Length	Overall Length
5.0	0.1969	52	94
5.5	0.2165	57	99
6.0	0.2362	57	99
6.5	0.2559	63	107
7.0	0.2756	69	113
7.5	0.2953	69	113
8.0	0.3150	75	119
8.5	0.3346	75	125
9.0	0.3543	81	131
9.5	0.3740	81	131
10.0	0.3937	87	137
10.5	0.4134	87	144
11.0	0.4331	94	151
11.5	0.4528	94	151
12.0	0.4724	101	158
12.5	0.4921	101	158
13.0	0.5118	101	158
13.5	0.5315	108	168
14.0	0.5512	108	168
14.5	0.5709	114	173
15.0	0.5906	114	180
15.5	0.6102	120	185
16.0	0.6299	120	185
16.5	0.6496	125	189
17.0	0.6693	125	189
17.5	0.6890	130	194
18.0	0.7087	130	194
18.5	0.7283	135	198
19.0	0.7480	135	206
19.5	0.7677	140	210
20.0	0.7874	140	210

Size	Decimal Equivalent	Flute Length	Overall Length
15/64	0.2344	2-3/8	4-1/4
1/4	0.2500	2-3/8	4-1/4
17/64	0.2656	2-3/4	4-5/8
9/32	0.2813	2-3/4	4-5/8
19/64	0.2969	2-7/8	4-3/4
5/16	0.3125	2-7/8	4-3/4
21/64	0.3281	2-7/8	4-3/4
11/32	0.3438	3-1/4	5-1/8
23/64	0.3594	3-1/4	5-1/8
3/8	0.3750	3-1/4	5-1/8
25/64	0.3906	3-3/8	5-1/2
13/32	0.4063	3-3/8	5-1/2
27/64	0.4219	3-3/4	5-7/8
7/16	0.4375	3-3/4	5-7/8
29/64	0.4531	3-3/4	5-7/8
15/32	0.4688	4	6-1/4
31/64	0.4844	4	6-1/4
1/2	0.5000	4	6-1/4
17/32	0.5313	4-1/4	6-3/4
9/16	0.5625	4-1/2	7
37/64	0.5781	4-1/2	7
19/32	0.5938	4-3/4	7-1/4
5/8	0.6250	4-3/4	7-1/4
21/32	0.6563	5	7-1/2
11/16	0.6875	5-1/8	7-5/8
23/32	0.7188	5-3/8	7-3/4
3/4	0.7500	5-1/2	7-7/8

1 per tube

Technical Data

DRILLS

 DRILLS
Cutting Condition

END MILLS

 END MILLS
Cutting Condition

TAPS

 TAPS
Cutting Condition

Others

List No.6517U High Performance



Range 3/64 to 1/2

HSS-Co UG COATED



This drill is designed for deep hole drilling Flute geometry allows for easy chip removal and can be drilled up to 7 times of drill diameter without pecking.

Size	Decimal Equivalent	Flute Length	Overall Length
3/64	0.0469	3/4	1 3/4
1/16	0.0625	7/8	1 7/8
5/64	0.0781	1	2
3/32	0.0938	1 1/4	2 1/4
7/64	0.1094	1 1/2	2 5/8
1/8	0.1250	1 5/8	2 3/4
9/64	0.1406	1 3/4	2 7/8
5/32	0.1563	2	3 1/8
11/64	0.1719	2 1/8	3 1/4
3/16	0.1875	2 5/16	3 1/2
13/64	0.2031	2 7/16	3 5/8
7/32	0.2188	2 1/2	3 3/4
15/64	0.2344	2 5/8	3 7/8
1/4	0.2500	2 3/4	4
17/64	0.2656	2 7/8	4 1/8
9/32	0.2813	2 15/16	4 1/4
19/64	0.2969	3 1/16	4 3/8
5/16	0.3125	3 3/16	4 1/2
21/64	0.3281	3 5/16	4 5/8
11/32	0.3438	3 7/16	4 3/4
23/64	0.3594	3 1/2	4 7/8
3/8	0.3750	3 5/8	5
25/64	0.3906	3 3/4	5 1/8
13/32	0.4063	3 7/8	5 1/4
27/64	0.4219	3 15/16	5 3/8
7/16	0.4375	4 1/16	5 1/2
29/64	0.4531	4 3/16	5 5/8
15/32	0.4688	4 5/16	5 3/4
31/64	0.4844	4 3/8	5 7/8
1/2	0.5000	4 1/2	6

"UG" Coating is NACHI's Special Multi-Layered TiCN Coating

3/64 to 5/64 in package of 10, 3/32 to 1/2 1 per tube

"UG" Power Drills is suitable for 7D Non-Step Drilling

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

USA & JAPAN STOCK ITEM*

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

List No.6528P

High Performance

HSS-Co UG COATED



Range 1.0 to 13.0

This drill can proceed non-step drilling deeply up to 7 times of drill diameter.

(Unit) : mm

Size	Decimal Equivalent	Flute Length	Overall Length
1.0	0.0394	12	34
1.1	0.0433	14	36
1.2	0.0472	16	38
1.3	0.0512	16	38
1.4	0.0551	18	40
1.5	0.0591	18	40
1.6	0.0630	20	43
1.7	0.0669	20	43
1.8	0.0709	22	46
1.9	0.0748	22	46
2.0	0.0787	24	49
2.1	0.0827	24	49
2.2	0.0866	27	53
2.3	0.0906	27	53
2.4	0.0945	30	57
2.5	0.0984	30	57
2.6	0.1024	30	57
2.7	0.1063	33	61
2.8	0.1102	33	61
2.9	0.1142	33	61
3.0	0.1181	33	61
* 3.1	0.1220	36	65
* 3.2	0.1260	36	65
* 3.3	0.1299	36	65
* 3.4	0.1339	39	70
* 3.5	0.1378	39	70
* 3.6	0.1417	39	70
* 3.7	0.1457	39	70
* 3.8	0.1496	43	75
* 3.9	0.1535	43	75
* 4.0	0.1575	43	75
* 4.1	0.1614	43	75
* 4.2	0.1654	43	75
* 4.3	0.1693	47	80
* 4.4	0.1732	47	80
* 4.5	0.1772	47	80
* 4.6	0.1811	47	80
* 4.7	0.1850	47	80
* 4.8	0.1890	52	86
* 4.9	0.1929	52	86
* 5.0	0.1969	52	86
* 5.1	0.2008	52	86
* 5.2	0.2047	52	86
* 5.3	0.2087	52	86
* 5.4	0.2126	57	93
* 5.5	0.2165	57	93
* 5.6	0.2205	57	93
* 5.7	0.2244	57	93
* 5.8	0.2283	57	93
* 5.9	0.2323	57	93
* 6.0	0.2362	57	93
* 6.1	0.2402	63	101
* 6.2	0.2441	63	101
* 6.3	0.2480	63	101
* 6.4	0.2520	63	101
* 6.5	0.2559	63	101
* 6.6	0.2598	63	101
* 6.7	0.2638	63	101
* 6.8	0.2677	69	109
* 6.9	0.2717	69	109
* 7.0	0.2756	69	109

Size	Decimal Equivalent	Flute Length	Overall Length
* 7.1	0.2795	69	109
* 7.2	0.2835	69	109
* 7.3	0.2874	69	109
* 7.4	0.2913	69	109
* 7.5	0.2953	69	109
* 7.6	0.2992	75	117
* 7.7	0.3031	75	117
* 7.8	0.3071	75	117
* 7.9	0.3110	75	117
* 8.0	0.3150	75	117
* 8.1	0.3189	75	117
* 8.2	0.3228	75	117
* 8.3	0.3268	75	117
* 8.4	0.3307	75	117
* 8.5	0.3346	75	117
* 8.6	0.3386	81	125
* 8.7	0.3425	81	125
* 8.8	0.3465	81	125
* 8.9	0.3504	81	125
* 9.0	0.3543	81	125
* 9.1	0.3583	81	125
* 9.2	0.3622	81	125
* 9.3	0.3661	81	125
* 9.4	0.3701	81	125
* 9.5	0.3740	81	125
* 9.6	0.3780	87	133
* 9.7	0.3819	87	133
* 9.8	0.3858	87	133
* 9.9	0.3898	87	133
* 10.0	0.3937	87	133
* 10.1	0.3976	87	133
* 10.2	0.4016	87	133
* 10.3	0.4055	87	133
* 10.4	0.4094	87	133
* 10.5	0.4134	87	133
* 10.6	0.4173	87	133
* 10.7	0.4213	94	142
* 10.8	0.4252	94	142
* 10.9	0.4291	94	142
* 11.0	0.4331	94	142
* 11.1	0.4370	94	142
* 11.2	0.4409	94	142
* 11.3	0.4449	94	142
* 11.4	0.4488	94	142
* 11.5	0.4528	94	142
* 11.6	0.4567	94	142
* 11.7	0.4606	94	142
* 11.8	0.4646	94	142
* 11.9	0.4685	101	151
* 12.0	0.4724	101	151
* 12.1	0.4764	101	151
* 12.2	0.4803	101	151
* 12.3	0.4843	101	151
* 12.4	0.4882	101	151
* 12.5	0.4921	101	151
* 12.6	0.4961	101	151
* 12.7	0.5000	101	151
* 12.8	0.5039	101	151
* 12.9	0.5079	101	151
* 13.0	0.5118	101	151

1.0 to 1.9 in package of 10, 20 to 13.0 1 per tube

* JAPAN STOCK ITEM : Please allow 2-3 weeks delivery

AG-SUS DRILLS SHORT / METRIC SIZES

List No.6596P High Performance

FM HSS AG COATED



Range 1.0 to 20.0

This drill meets stable drilling by AG coat, and is very suitable for drilling of Stainless Steel.

(Unit) : mm

Size	Flute Length	Overall Length	Shank Dia.
1.0	6	40	3
1.1	7	40	3
1.2	8	40	3
1.3	8	40	3
1.4	9	40	3
1.5	9	40	3
1.6	10	44	3
1.7	10	44	3
1.8	11	44	3
1.9	11	44	3
2.0	12	44	3
2.1	12	44	3
2.2	13	44	3
2.3	13	44	3
2.4	14	48	3
2.5	14	48	3
2.6	14	48	3
2.7	16	48	3
2.8	16	48	3
2.9	16	48	3
3.0	16	48	3
3.1	18	54	4
3.2	18	54	4
3.3	18	54	4
3.4	20	54	4
3.5	20	54	4
3.6	20	54	4
3.7	20	54	4
3.8	22	54	4
3.9	22	54	4
4.0	22	54	4
4.1	22	66	6
4.2	22	66	6
4.3	24	68	6
4.4	24	68	6
4.5	24	68	6
4.6	24	68	6
4.7	24	68	6
4.8	26	70	6
4.9	26	70	6
5.0	26	70	6
5.1	26	70	6
5.2	26	70	6
5.3	26	70	6
5.4	28	72	6

Size	Flute Length	Overall Length	Shank Dia.
5.5	28	72	6
5.6	28	72	6
5.7	28	72	6
5.8	28	72	6
5.9	28	72	6
6.0	28	72	6
6.1	31	75	8
6.2	31	75	8
6.3	31	75	8
6.4	31	75	8
6.5	31	75	8
6.6	31	75	8
6.7	31	75	8
6.8	34	78	8
6.9	34	78	8
7.0	34	78	8
7.1	34	78	8
7.2	34	78	8
7.3	34	78	8
7.4	34	78	8
7.5	34	78	8
7.6	37	81	8
7.7	37	81	8
7.8	37	81	8
7.9	37	81	8
8.0	37	81	8
8.1	37	87	10
8.2	37	87	10
8.3	37	87	10
8.4	37	87	10
8.5	37	87	10
8.6	40	90	10
8.7	40	90	10
8.8	40	90	10
8.9	40	90	10
9.0	40	90	10
9.1	40	90	10
9.2	40	90	10
9.3	40	90	10
9.4	40	90	10
9.5	40	90	10
9.6	43	93	10
9.7	43	93	10
9.8	43	93	10
9.9	43	93	10

Size	Flute Length	Overall Length	Shank Dia.
10.0	43	93	10
10.1	43	100	12
10.2	43	100	12
10.3	43	100	12
10.4	43	100	12
10.5	43	100	12
10.6	43	100	12
10.7	47	104	12
10.8	47	104	12
10.9	47	104	12
11.0	47	104	12
11.1	47	104	12
11.2	47	104	12
11.3	47	104	12
11.4	47	104	12
11.5	47	104	12
11.6	47	104	12
11.7	47	104	12
11.8	47	104	12
11.9	51	108	12
12.0	51	108	12
12.1	51	108	12
12.2	51	108	12
12.3	51	108	12
12.4	51	108	12
12.5	51	108	12
12.6	51	108	12
12.7	51	108	12
12.8	51	108	12
12.9	51	108	12
13.0	51	108	12
13.5	72	132	16
14.0	72	132	16
14.5	76	136	16
15.0	76	142	20
15.5	80	146	20
16.0	80	146	20
16.5	84	150	20
17.0	84	150	20
17.5	87	153	20
18.0	87	153	20
18.5	90	156	20
19.0	90	164	25
19.5	94	168	25
20.0	94	168	25

1 per tube

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

AG-SUS DRILLS REGULAR / METRIC SIZES

List No.6594P

High Performance

FM HSS AG COATED



Range 2.0 to 20.0



This drill meets stable drilling by AG coat, and is very suitable for drilling of Stainless Steel.

(Unit) : mm

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Diameter
1.0	0.0394	12	50	3
1.1	0.0433	14	50	3
1.2	0.0472	16	50	3
1.3	0.0512	16	50	3
1.4	0.0551	18	50	3
1.5	0.0591	18	50	3
1.6	0.0630	20	56	3
1.7	0.0669	20	56	3
1.8	0.0709	22	56	3
1.9	0.0748	22	56	3
2.0	0.0787	24	56	3
2.1	0.0827	24	56	3
2.2	0.0866	25	56	3
2.3	0.0906	25	56	3
2.4	0.0945	30	61	3
2.5	0.0984	30	61	3
2.6	0.1024	30	61	3
2.7	0.1063	33	64	3
2.8	0.1102	33	64	3
2.9	0.1142	33	64	3
3.0	0.1181	33	64	3
3.1	0.1220	36	71	4
3.2	0.1260	36	71	4
3.3	0.1299	36	71	4
3.4	0.1339	39	71	4
3.5	0.1378	39	71	4
3.6	0.1417	39	71	4
3.7	0.1457	39	71	4
3.8	0.1496	43	75	4
3.9	0.1535	43	75	4
4.0	0.1575	43	75	4
4.1	0.1614	43	85	6
4.2	0.1654	43	85	6
4.3	0.1693	47	89	6
4.4	0.1732	47	89	6
4.5	0.1772	47	89	6
4.6	0.1811	47	89	6
4.7	0.1850	47	89	6
4.8	0.1890	52	94	6
4.9	0.1929	52	94	6
5.0	0.1969	52	94	6
5.1	0.2008	52	94	6
5.2	0.2047	52	94	6
5.3	0.2087	52	94	6
5.4	0.2126	57	99	6

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Diameter
5.5	0.2165	57	99	6
5.6	0.2205	57	99	6
5.7	0.2244	57	99	6
5.8	0.2283	57	99	6
5.9	0.2323	57	99	6
6.0	0.2362	57	99	6
6.1	0.2402	63	107	8
6.2	0.2441	63	107	8
6.3	0.2480	63	107	8
6.4	0.2520	63	107	8
6.5	0.2559	63	107	8
6.6	0.2598	63	107	8
6.7	0.2638	63	107	8
6.8	0.2677	69	113	8
6.9	0.2717	69	113	8
7.0	0.2756	69	113	8
7.1	0.2795	69	113	8
7.2	0.2835	69	113	8
7.3	0.2874	69	113	8
7.4	0.2913	69	113	8
7.5	0.2953	69	113	8
7.6	0.2992	75	119	8
7.7	0.3031	75	119	8
7.8	0.3071	75	119	8
7.9	0.3110	75	119	8
8.0	0.3150	75	119	8
8.1	0.3189	75	125	10
8.2	0.3228	75	125	10
8.3	0.3268	75	125	10
8.4	0.3307	75	125	10
8.5	0.3346	75	125	10
8.6	0.3386	81	131	10
8.7	0.3425	81	131	10
8.8	0.3465	81	131	10
8.9	0.3504	81	131	10
9.0	0.3543	81	131	10
9.1	0.3583	81	131	10
9.2	0.3622	81	131	10
9.3	0.3661	81	131	10
9.4	0.3701	81	131	10
9.5	0.3740	81	131	10
9.6	0.3780	87	137	10
9.7	0.3819	87	137	10
9.8	0.3858	87	137	10
9.9	0.3898	87	137	10

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Diameter
10.0	0.3937	87	137	10
10.1	0.3976	87	144	12
10.2	0.4016	87	144	12
10.3	0.4055	87	144	12
10.4	0.4094	87	144	12
10.5	0.4134	87	144	12
10.6	0.4173	87	144	12
10.7	0.4213	94	151	12
10.8	0.4252	94	151	12
10.9	0.4291	94	151	12
11.0	0.4331	94	151	12
11.1	0.4370	94	151	12
11.2	0.4409	94	151	12
11.3	0.4449	94	151	12
11.4	0.4488	94	151	12
11.5	0.4528	94	151	12
11.6	0.4567	94	151	12
11.7	0.4606	94	151	12
11.8	0.4646	94	151	12
11.9	0.4685	101	158	12
12.0	0.4724	101	158	12
12.1	0.4764	101	158	12
12.2	0.4803	101	158	12
12.3	0.4843	101	158	12
12.4	0.4882	101	158	12
12.5	0.4921	101	158	12
12.6	0.4961	101	158	12
12.7	0.5000	101	158	12
12.8	0.5039	101	158	12
12.9	0.5079	101	158	12
13.0	0.5118	101	158	12
13.5	0.5315	108	168	16
14.0	0.5512	108	168	16
14.5	0.5709	114	173	16
15.0	0.5906	114	180	20
15.5	0.6102	120	185	20
16.0	0.6299	120	185	20
16.5	0.6496	125	189	20
17.0	0.6693	125	189	20
17.5	0.6890	130	194	20
18.0	0.7087	130	194	20
18.5	0.7283	135	198	20
19.0	0.7480	135	206	25
19.5	0.7677	140	210	25
20.0	0.7874	140	210	25

1 per tube

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

List No.6595P High Performance



Range 3/32 to 3/4

FM HSS AG COATED



This drill meets stable drilling by AG coat, and is very suitable for drilling of Stainless Steel.

DIAMETER	DECIMAL EQUIVALENT	FLUTE LENGTH	OVERALL LENGTH	SHANK DIAMETER
3/32	0.0938	1-1/8	2-3/8	1/8
7/64	0.1094	1-1/4	2-1/2	1/8
1/8	0.1250	1-3/8	2-5/8	1/8
9/64	0.1406	1-1/2	2-7/8	3/16
5/32	0.1563	1-3/4	3-1/8	3/16
11/64	0.1719	1-7/8	3-1/4	3/16
3/16	0.1875	2	3-3/8	3/16
13/64	0.2031	2-1/16	3-7/8	1/4
7/32	0.2188	2-1/16	3-7/8	1/4
15/64	0.2344	2-3/8	4-1/4	1/4
1/4	0.2500	2-3/8	4-1/4	1/4
17/64	0.2656	2-3/4	4-5/8	3/8
9/32	0.2813	2-3/4	4-5/8	3/8
19/64	0.2969	2-7/8	4-3/4	3/8
5/16	0.3125	2-7/8	4-3/4	3/8
21/64	0.3281	2-7/8	4-3/4	3/8
11/32	0.3438	3-1/4	5-1/8	3/8
23/64	0.3594	3-1/4	5-1/8	3/8
3/8	0.3750	3-1/4	5-1/8	3/8
25/64	0.3906	3-3/8	5-1/2	1/2
13/32	0.4063	3-3/8	5-1/2	1/2
27/64	0.4219	3-3/4	5-7/8	1/2
7/16	0.4375	3-3/4	5-7/8	1/2
29/64	0.4531	3-3/4	5-7/8	1/2
15/32	0.4688	4	6-1/4	1/2
31/64	0.4844	4	6-1/4	1/2
1/2	0.5000	4	6-1/4	1/2
17/32	0.5313	4-1/4	6-3/4	5/8
9/16	0.5625	4-1/2	7	5/8
37/64	0.5781	4-1/2	7	5/8
19/32	0.5938	4-3/4	7-1/4	3/4
5/8	0.6250	4-3/4	7-1/4	3/4
21/32	0.6563	5	7-1/2	3/4
11/16	0.6875	5-1/8	7-5/8	3/4
23/32	0.7188	5-3/8	7-3/4	7/8
3/4	0.7500	5-1/2	7-7/8	7/8

1 per tube

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

List No.6540P Metric Sizes

List No.6541P Fractional



Series 1 Range 1.0 to 13.0
Series 2 Range 1.0 to 10.0
Series 3 Range 3.0 to 10.0

HSS-Co AG COATED



This drill meets non-step drilling of deep holes up to 20 times of a diameter, and is used for workpiece materials from raw materials to Mold Die Steels.

Note : Pre-hole should be drilled.

Series 1

(Unit) : mm

Size		Decimal Equivalent	Flute Length	Overall Length
Fractional L6541P	Metric L6540P			
	1.0	0.0394	33	56
	1.1	0.0433	37	60
	1.2	0.0472	41	65
*	1.3	0.0512	41	65
	1.4	0.0551	45	70
	1.5	0.0591	45	70
*	1.6	0.0630	50	76
	1.7	0.0669	50	76
*	1.8	0.0709	53	80
	1.9	0.0748	53	80
*	2.0	0.0787	56	85
	2.1	0.0827	56	85
*	2.2	0.0866	59	90
	2.3	0.0906	59	90
*	2.4	0.0945	62	95
	2.5	0.0984	62	95
*	2.6	0.1024	62	95
	2.7	0.1063	66	100
*	2.8	0.1102	66	100
	2.9	0.1142	66	100
*	3.0	0.1181	66	100
	3.1	0.1220	69	106
*	1/8	3.175	69	106
	3.2	0.1260	69	106
*	3.3	0.1299	69	106
	3.4	0.1339	73	112
*	3.5	0.1378	73	112
△	9/64	3.572	73	112
	3.6	0.1417	73	112
*	3.7	0.1457	73	112
*	3.8	0.1496	78	119
*	3.9	0.1535	78	119
△	5/32	3.969	78	119
	4.0	0.1575	78	119
*	4.1	0.1614	78	119
*	4.2	0.1654	78	119
*	4.3	0.1693	82	126
△	11/64	4.366	82	126
	4.4	0.1732	82	126
*	4.5	0.1772	82	126
	4.6	0.1811	82	126

Size		Decimal Equivalent	Flute Length	Overall Length	
Fractional L6541P	Metric L6540P				
*		4.7	0.1850	82	126
	3/16	4.762	0.1875	87	132
		4.8	0.1890	87	132
*		4.9	0.1929	87	132
		5.0	0.1969	87	132
*		5.1	0.2008	87	132
△	13/64	5.159	0.2031	87	132
		5.2	0.2047	87	132
*		5.3	0.2087	87	132
*		5.4	0.2126	91	139
		5.5	0.2165	91	139
△	7/32	5.556	0.2187	91	139
		5.6	0.2205	91	139
*		5.7	0.2244	91	139
*		5.8	0.2283	91	139
*		5.9	0.2323	91	139
		6.0	0.2362	91	139
	1/4	6.35	0.2500	97	148
		6.5	0.2559	97	148
△	17/64	6.747	0.2656	102	156
		6.8	0.2677	102	156
*		7.0	0.2756	102	156
	9/32	7.144	0.2813	102	156
		7.5	0.2953	102	156
△	19/64	7.541	0.2969	109	165
	5/16	7.933	0.3123	109	165
		8.0	0.3150	109	165
	21/64	8.334	0.3281	109	165
		8.5	0.3346	109	165
	11/32	8.731	0.3437	115	175
		9.0	0.3543	115	175
	23/64	9.128	0.3594	115	175
		9.5	0.3740	115	175
△	3/8	9.525	0.3750	121	184
		10.0	0.3937	121	184
*		10.5	0.4134	121	184
*		11.0	0.4331	128	195
*		11.5	0.4528	128	195
*		12.0	0.4724	134	205
*		12.5	0.4921	134	205
*		13.0	0.5118	134	205

1 per tube

* JAPAN STOCK ITEM : Please allow 2-3 weeks delivery

△ CUSTOM-MADE ITEM : Please choose nearest metric size. If it is not acceptable, please contact our office 1-888-340-8665.



Series 2

(Unit) : mm

	Size		Decimal Equivalent	Flute Length	Overall Length
	Fractional L6541P	Metric L6540P			
*		1.0	0.0394	60	100
*		1.1	0.0433	60	100
*		1.2	0.0472	65	105
*		1.3	0.0512	65	105
*		1.4	0.0551	70	110
*		1.5	0.0591	70	110
*		1.6	0.0630	75	115
*		1.7	0.0669	75	115
*		1.8	0.0709	80	120
*		1.9	0.0748	80	120
*		2.0	0.0787	85	125
*		2.1	0.0827	85	125
*		2.2	0.0866	90	135
*		2.3	0.0906	90	135
		2.4	0.0945	95	140
		2.5	0.0984	95	140
		2.6	0.1024	95	140
*		2.7	0.1063	100	150
		2.8	0.1102	100	150
*		2.9	0.1142	100	150
		3.0	0.1181	100	150
*		3.1	0.1220	105	155
	1/8	3.175	0.1250	105	155
		3.2	0.1260	105	155
*		3.3	0.1299	105	155
*		3.4	0.1339	115	165
		3.5	0.1378	115	165
△	9/64	3.572	0.1406	115	165
		3.6	0.1417	115	165
*		3.7	0.1457	115	165
*		3.8	0.1496	120	175
*		3.9	0.1535	120	175
△	5/32	3.969	0.1563	120	175
		4.0	0.1575	120	175
*		4.1	0.1614	120	175
*		4.2	0.1654	120	175
*		4.3	0.1693	125	185
△	11/64	4.366	0.1719	125	185

	Size		Decimal Equivalent	Flute Length	Overall Length
	Fractional L6541P	Metric L6540P			
		4.4	0.1732	125	185
		4.5	0.1772	125	185
*		4.6	0.1811	125	185
*		4.7	0.1850	125	185
	3/16	4.762	0.1875	135	195
		4.8	0.1890	135	195
*		4.9	0.1929	135	195
		5.0	0.1969	135	195
*		5.1	0.2008	135	195
△	13/64	5.159	0.2031	135	195
		5.2	0.2047	135	195
*		5.3	0.2087	135	195
*		5.4	0.2126	140	205
		5.5	0.2165	140	205
△	7/32	5.556	0.2187	140	205
		5.6	0.2205	140	205
*		5.7	0.2244	140	205
*		5.8	0.2283	140	205
*		5.9	0.2323	140	205
		6.0	0.2362	140	205
	1/4	6.35	0.2500	150	215
		6.5	0.2559	150	215
△	17/64	6.747	0.2656	155	225
		6.8	0.2677	155	225
		7.0	0.2756	155	225
	9/32	7.144	0.2813	155	225
		7.5	0.2953	155	225
△	19/64	7.541	0.2969	165	240
	5/16	7.933	0.3123	165	240
		8.0	0.3150	165	240
	21/64	8.334	0.3281	165	240
		8.5	0.3346	165	240
	11/32	8.731	0.3437	175	250
		9.0	0.3543	175	250
	23/64	9.128	0.3594	175	250
		9.5	0.3740	175	250
△	3/8	9.525	0.3750	185	265
		10.0	0.3937	185	265



Series 3

(Unit) : mm

	Size		Decimal Equivalent	Flute Length	Overall Length
	Fractional L6541P	Metric L6540P			
*		3.0	0.1181	130	190
	1/8	3.175	0.1250	135	200
*		3.5	0.1378	145	210
△	9/64	3.572	0.1406	145	210
*	5/32	3.969	0.1563	150	220
*		4.0	0.1575	150	220
△	11/64	4.366	0.1719	160	235
*		4.5	0.1772	160	235
	3/16	4.762	0.1875	170	245
		5.0	0.1969	170	245
		5.5	0.2165	180	260
△	7/32	5.556	0.2187	180	260

	Size		Decimal Equivalent	Flute Length	Overall Length
	Fractional L6541P	Metric L6540P			
		6.0	0.2362	180	260
	1/4	6.35	0.2500	190	275
		6.5	0.2559	190	275
*		7.0	0.2756	200	290
*		7.5	0.2953	200	290
	5/16	7.933	0.3123	210	305
*		8.0	0.3150	210	305
*		8.5	0.3346	210	305
*		9.0	0.3543	220	320
*		9.5	0.3740	220	320
*		10.0	0.3937	235	340

• Other size manufactured upon request.

1 per tube

* JAPAN STOCK ITEM : Please allow 2-3 weeks delivery
 △ CUSTOM-MADE ITEM : Please choose nearest metric size. If it is not acceptable, please contact our office 1-888-340-8665.

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

Technical Data

List No.9550 High Performance



Range 3.0 to 20.0

SOLID CARBIDE AQUA COATED



This drill having stub length is suited for high-speed and long life drilling, and is useful in dry-process. This is suitable for most workpiece materials from raw material to hardened material.

(Unit) : mm

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
3.0	0.1181	16	48	3
3.1	0.1220	18	50	4
3.2	0.1260	18	50	4
3.3	0.1299	18	50	4
3.4	0.1339	20	52	4
3.5	0.1378	20	52	4
3.6	0.1417	20	52	4
3.7	0.1457	20	52	4
3.8	0.1496	22	54	4
3.9	0.1535	22	54	4
4.0	0.1575	22	54	4
4.1	0.1614	22	66	6
4.2	0.1654	22	66	6
4.3	0.1693	24	68	6
4.4	0.1732	24	68	6
4.5	0.1772	24	68	6
4.6	0.1811	24	68	6
4.7	0.1850	24	68	6
4.8	0.1890	26	70	6
4.9	0.1929	26	70	6
5.0	0.1969	26	70	6
5.1	0.2008	26	70	6
5.2	0.2047	26	70	6
5.3	0.2087	26	70	6
5.4	0.2126	28	72	6
5.5	0.2165	28	72	6
5.6	0.2205	28	72	6
5.7	0.2244	28	72	6
5.8	0.2283	28	72	6
5.9	0.2323	28	72	6
6.0	0.2362	28	72	6
6.1	0.2402	31	75	8
6.2	0.2441	31	75	8
6.3	0.2480	31	75	8
6.4	0.2520	31	75	8
6.5	0.2559	31	75	8
6.6	0.2598	31	75	8
6.7	0.2638	31	75	8
6.8	0.2677	34	78	8
6.9	0.2717	34	78	8
7.0	0.2756	34	78	8
7.1	0.2795	34	78	8
7.2	0.2835	34	78	8
7.3	0.2874	34	78	8
7.4	0.2913	34	78	8
7.5	0.2953	34	78	8
7.6	0.2992	37	81	8
7.7	0.3031	37	81	8
7.8	0.3071	37	81	8
7.9	0.3110	37	81	8
8.0	0.3150	37	81	8
8.1	0.3189	37	87	10
8.2	0.3228	37	87	10
8.3	0.3268	37	87	10
8.4	0.3307	37	87	10
8.5	0.3346	37	87	10
8.6	0.3386	40	90	10
8.7	0.3425	40	90	10
8.8	0.3465	40	90	10

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
8.9	0.3504	40	90	10
9.0	0.3543	40	90	10
9.1	0.3583	40	90	10
9.2	0.3622	40	90	10
9.3	0.3661	40	90	10
9.4	0.3701	40	90	10
9.5	0.3740	40	90	10
9.6	0.3780	43	93	10
9.7	0.3819	43	93	10
9.8	0.3858	43	93	10
9.9	0.3898	43	93	10
10.0	0.3937	43	93	10
10.1	0.3976	43	100	12
10.2	0.4016	43	100	12
10.3	0.4055	43	100	12
10.4	0.4094	43	100	12
10.5	0.4134	43	100	12
10.6	0.4173	43	100	12
10.7	0.4213	47	104	12
10.8	0.4252	47	104	12
10.9	0.4291	47	104	12
11.0	0.4331	47	104	12
11.1	0.4370	47	104	12
11.2	0.4409	47	104	12
11.3	0.4449	47	104	12
11.4	0.4488	47	104	12
11.5	0.4528	47	104	12
11.6	0.4567	47	104	12
11.7	0.4606	47	104	12
11.8	0.4646	47	104	12
11.9	0.4685	51	108	12
12.0	0.4724	51	108	12
12.1	0.4764	51	110	14
12.2	0.4803	51	110	14
12.3	0.4843	51	110	14
12.4	0.4882	51	110	14
12.5	0.4921	51	110	14
12.6	0.4961	51	110	14
12.7	0.5000	51	110	14
12.8	0.5039	51	110	14
12.9	0.5079	51	110	14
13.0	0.5118	51	110	14
13.5	0.5315	72	130	14
14.0	0.5512	72	130	14
14.1	0.5551	76	136	16
14.5	0.5709	76	136	16
14.6	0.5748	76	136	16
15.0	0.5906	76	136	16
15.5	0.6102	80	144	16
16.0	0.6299	80	144	16
16.5	0.6496	84	150	18
17.0	0.6693	84	150	18
17.5	0.6890	87	153	18
18.0	0.7087	87	153	18
18.5	0.7283	90	156	20
19.0	0.7480	90	156	20
19.5	0.7677	94	160	20
20.0	0.7874	94	160	20

1 per tube

* JAPAN STOCK ITEM : Please allow 2-3 weeks delivery

List No.9551 High Performance



Range 1/8 to 3/4

SOLID CARBIDE AQUA COATED



This drill having stub length is suited for high-speed and long life drilling, and is useful in dry-process. This is suitable for most workpiece materials from raw material to hardened material.

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
1/8	0.1250	3/4	2	1/8
9/64	0.1406	13/16	2-1/8	3/16
5/32	0.1563	13/16	2-1/8	3/16
11/64	0.1719	1	2-3/8	3/16
3/16	0.1875	1	2-3/8	3/16
13/64	0.2031	1-1/8	2-7/8	1/4
7/32	0.2188	1-1/8	2-7/8	1/4
15/64	0.2344	1-1/4	3	1/4
1/4	0.2500	1-1/4	3	1/4
17/64	0.2656	1-3/8	3-3/16	3/8
9/32	0.2813	1-3/8	3-3/16	3/8
19/64	0.2969	1-3/8	3-3/16	3/8
5/16	0.3125	1-1/2	3-3/8	3/8
21/64	0.3281	1-1/2	3-3/8	3/8
11/32	0.3438	1-5/8	3-1/2	3/8
23/64	0.3594	1-5/8	3-1/2	3/8
3/8	0.3750	1-5/8	3-1/2	3/8
25/64	0.3906	1-11/16	3-7/8	1/2
13/32	0.4063	1-11/16	3-7/8	1/2
27/64	0.4219	1-7/8	4-1/8	1/2
7/16	0.4375	1-7/8	4-1/8	1/2
29/64	0.4531	1-7/8	4-1/8	1/2
15/32	0.4688	2	4-1/4	1/2
31/64	0.4844	2	4-1/4	1/2
1/2	0.5000	2	4-1/4	1/2
17/32	0.5313	2-7/8	5-3/16	5/8
9/16	0.5625	3	5-3/8	5/8
19/32	0.5938	3	5-5/8	3/4
5/8	0.6250	3-3/16	5-3/4	3/4
21/32	0.6563	3-3/8	5-15/16	3/4
11/16	0.6875	3-7/16	6	3/4
23/32	0.7188	3-7/16	6	7/8
3/4	0.7500	3-9/16	6-1/2	7/8

1 per tube

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

Technical Data

List No.9552 High Performance



Range 2.0 to 20.0

SOLID CARBIDE AQUA COATED



This drill having 5 times flute of drill diameter is suited for high-speed and long life drilling, and is useful in dry-process. This is suitable for most workpiece materials from raw material to hardened material.

(Unit) : mm

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

	Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
*	2.0	0.0787	15	47	3
*	2.05	0.0807	15	47	3
*	2.1	0.0827	15	47	3
*	2.15	0.0846	16	48	3
*	2.2	0.0866	16	48	3
*	2.25	0.0886	16	48	3
*	2.3	0.0906	16	48	3
*	2.35	0.0925	16	48	3
*	2.4	0.0945	17	49	3
*	2.45	0.0965	17	49	3
*	2.5	0.0984	17	49	3
*	2.55	0.1004	17	49	3
*	2.6	0.1024	17	49	3
*	2.65	0.1043	17	49	3
*	2.7	0.1063	19	51	3
*	2.75	0.1083	19	51	3
*	2.8	0.1102	19	51	3
*	2.85	0.1122	19	51	3
*	2.9	0.1142	19	51	3
*	2.95	0.1161	19	51	3
*	3.0	0.1181	19	51	3
*	3.1	0.1220	21	53	4
*	3.2	0.1260	21	53	4
*	3.3	0.1299	21	53	4
*	3.4	0.1339	24	56	4
*	3.5	0.1378	24	56	4
*	3.6	0.1417	24	56	4
*	3.7	0.1457	24	56	4
*	3.8	0.1496	27	59	4
*	3.9	0.1535	27	59	4
*	4.0	0.1575	27	59	4
*	4.1	0.1614	27	71	6
*	4.2	0.1654	27	71	6
*	4.3	0.1693	31	75	6
*	4.4	0.1732	31	75	6
*	4.5	0.1772	31	75	6
*	4.6	0.1811	31	75	6
*	4.7	0.1850	31	75	6
*	4.8	0.1890	33	77	6
*	4.9	0.1929	33	77	6
*	5.0	0.1969	38	82	6
*	5.1	0.2008	38	82	6
*	5.2	0.2047	38	82	6
*	5.3	0.2087	38	82	6
*	5.4	0.2126	38	82	6

	Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
*	5.5	0.2165	38	82	6
*	5.6	0.2205	41	85	6
*	5.7	0.2244	41	85	6
*	5.8	0.2283	41	85	6
*	5.9	0.2323	41	85	6
*	6.0	0.2362	41	85	6
*	6.1	0.2402	41	85	8
*	6.2	0.2441	41	85	8
*	6.3	0.2480	41	85	8
*	6.4	0.2520	41	85	8
*	6.5	0.2559	41	85	8
*	6.6	0.2598	43	87	8
*	6.7	0.2638	43	87	8
*	6.8	0.2677	43	87	8
*	6.9	0.2717	43	87	8
*	7.0	0.2756	43	87	8
*	7.1	0.2795	45	89	8
*	7.2	0.2835	45	89	8
*	7.3	0.2874	45	89	8
*	7.4	0.2913	45	89	8
*	7.5	0.2953	45	89	8
*	7.6	0.2992	48	92	8
*	7.7	0.3031	48	92	8
*	7.8	0.3071	48	92	8
*	7.9	0.3110	48	92	8
*	8.0	0.3150	48	92	8
*	8.1	0.3189	53	103	10
*	8.2	0.3228	53	103	10
*	8.3	0.3268	53	103	10
*	8.4	0.3307	53	103	10
*	8.5	0.3346	53	103	10
*	8.6	0.3386	55	105	10
*	8.7	0.3425	55	105	10
*	8.8	0.3465	55	105	10
*	8.9	0.3504	55	105	10
*	9.0	0.3543	55	105	10
*	9.1	0.3583	58	108	10
*	9.2	0.3622	58	108	10
*	9.3	0.3661	58	108	10
*	9.4	0.3701	58	108	10
*	9.5	0.3740	58	108	10
*	9.6	0.3780	60	110	10
*	9.7	0.3819	60	110	10
*	9.8	0.3858	60	110	10
*	9.9	0.3898	60	110	10

	Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
*	10.0	0.3937	60	110	10
*	10.1	0.3976	66	123	12
*	10.2	0.4016	66	123	12
*	10.3	0.4055	66	123	12
*	10.4	0.4094	66	123	12
*	10.5	0.4134	66	123	12
*	10.6	0.4173	68	125	12
*	10.7	0.4213	68	125	12
*	10.8	0.4252	68	125	12
*	10.9	0.4291	68	125	12
*	11.0	0.4331	68	125	12
*	11.1	0.4370	71	128	12
*	11.2	0.4409	71	128	12
*	11.3	0.4449	71	128	12
*	11.4	0.4488	71	128	12
*	11.5	0.4528	71	128	12
*	11.6	0.4567	73	130	12
*	11.7	0.4606	73	130	12
*	11.8	0.4646	73	130	12
*	11.9	0.4685	73	130	12
*	12.0	0.4724	73	130	12
*	12.1	0.4764	76	135	14
*	12.2	0.4803	76	135	14
*	12.3	0.4843	76	135	14
*	12.4	0.4882	76	135	14
*	12.5	0.4921	76	135	14
*	12.6	0.4961	78	137	14
*	12.7	0.5000	78	137	14
*	12.8	0.5039	78	137	14
*	12.9	0.5079	78	137	14
*	13.0	0.5118	78	137	14
*	13.5	0.5315	84	144	14
*	14.0	0.5512	86	144	14
*	14.5	0.5709	89	149	16
*	15.0	0.5906	91	151	16
*	15.5	0.6102	94	158	16
*	16.0	0.6299	96	160	16
*	16.5	0.6496	102	168	18
*	17.0	0.6693	102	168	18
*	17.5	0.6890	102	168	18
*	18.0	0.7087	102	168	18
*	18.5	0.7283	114	184	20
*	19.0	0.7480	114	184	20
*	19.5	0.7677	114	184	20
*	20.0	0.7874	114	184	20

1 per tube

* JAPAN STOCK ITEM : Please allow 2-3 weeks delivery

AQUA DRILLS WITH MIST-HOLE 3D / METRIC SIZES

JAPAN STOCK ITEM*

List No.9558 Metric Sizes



Range 4.5 to 16.0

SOLID CARBIDE AQUA COATED



This mist-hole drill having 3 times flute of drill diameter is most suitable for "Semi-dry(MQL)" drilling, and applied in high-speed and long life drilling of most workpiece materials from raw materials to hardened materials.

(Unit) : mm

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
4.5	0.1772	25	78	5
5.0	0.1969	28	78	5
5.1	0.2008	31	82	6
5.5	0.2165	31	82	6
5.6	0.2205	33	82	6
6.0	0.2362	33	82	6
6.1	0.2402	36	88	7
6.5	0.2559	36	88	7
6.7	0.2638	39	88	7
6.8	0.2677	39	88	7
6.9	0.2717	39	88	7
7.0	0.2756	39	88	7
7.1	0.2795	42	94	8
7.5	0.2953	42	94	8
7.9	0.3110	44	94	8
8.0	0.3150	44	94	8
8.5	0.3346	47	100	9
8.6	0.3386	50	100	9
8.8	0.3465	50	100	9
9.0	0.3543	50	100	9
9.1	0.3583	53	106	10
9.3	0.3661	53	106	10
9.5	0.3740	53	106	10
9.7	0.3819	55	106	10
9.8	0.3858	55	106	10
9.9	0.3898	55	106	10
10.0	0.3937	55	106	10
10.1	0.3976	58	116	11

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
10.2	0.4016	58	116	11
10.3	0.4055	58	116	11
10.4	0.4094	58	116	11
10.5	0.4134	58	116	11
10.6	0.4173	61	116	11
10.7	0.4213	61	116	11
10.8	0.4252	61	116	11
10.9	0.4291	61	116	11
11.0	0.4331	61	116	11
11.1	0.4370	64	122	12
11.2	0.4409	64	122	12
11.3	0.4449	64	122	12
11.4	0.4488	64	122	12
11.5	0.4528	64	122	12
11.6	0.4567	66	122	12
11.7	0.4606	66	122	12
11.8	0.4646	66	122	12
11.9	0.4685	66	122	12
12.0	0.4724	66	122	12
12.1	0.4764	69	128	13
12.2	0.4803	69	128	13
12.3	0.4843	69	128	13
12.4	0.4882	69	128	13
12.5	0.4921	69	128	13
12.6	0.4961	72	128	13
12.8	0.5039	72	128	13
13.0	0.5118	72	128	13
13.3	0.5236	75	134	14

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
13.4	0.5276	75	134	14
13.5	0.5315	75	134	14
13.6	0.5354	77	134	14
13.7	0.5394	77	134	14
13.8	0.5433	77	134	14
13.9	0.5472	77	134	14
14.0	0.5512	77	134	14
14.1	0.5551	80	140	15
14.3	0.5630	80	140	15
14.4	0.5669	80	140	15
14.5	0.5709	80	140	15
14.6	0.5748	83	140	15
14.7	0.5787	83	140	15
14.8	0.5827	83	140	15
14.9	0.5866	83	140	15
15.0	0.5906	83	140	15
15.1	0.5945	86	146	16
15.2	0.5984	86	146	16
15.3	0.6024	86	146	16
15.4	0.6063	86	146	16
15.5	0.6102	86	146	16
15.6	0.6142	88	146	16
15.7	0.6181	88	146	16
15.8	0.6220	88	146	16
15.9	0.6260	88	146	16
16.0	0.6299	88	146	16

1 per tube

* JAPAN STOCK ITEM : Please allow 2-3 weeks delivery

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

AQUA DRILLS WITH MIST-HOLE 5D / METRIC SIZES

USA & JAPAN STOCK ITEM*

List No.9554 Metric Sizes



Range 4.2 to 16.0

SOLID CARBIDE AQUA COATED



This mist-hole drill having 5 times flute of drill diameter is most suitable for "Semi-dry(MQL)" drilling, and applied in high-speed and long life drilling of most workpiece materials from raw materials to hardened materials.

(Unit) : mm

	Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
*	4.2	0.1654	34	88	5
*	4.3	0.1693	34	88	5
	4.5	0.1772	34	88	5
*	4.6	0.1811	38	88	5
	4.8	0.1890	38	88	5
	4.9	0.1929	38	88	5
	5.0	0.1969	38	88	5
*	5.1	0.2008	42	95	6
*	5.2	0.2047	42	95	6
*	5.4	0.2126	42	95	6
	5.5	0.2165	42	95	6
	5.6	0.2205	45	95	6
*	5.7	0.2244	45	95	6
	5.8	0.2283	45	95	6
	6.0	0.2362	45	95	6
*	6.1	0.2402	49	103	7
*	6.2	0.2441	49	103	7
	6.3	0.2480	49	103	7
	6.4	0.2520	49	103	7
	6.5	0.2559	49	103	7
*	6.6	0.2598	53	103	7
*	6.7	0.2638	53	103	7
*	6.8	0.2677	53	103	7
*	6.9	0.2717	53	103	7
	7.0	0.2756	53	103	7
*	7.2	0.2835	57	111	8
*	7.3	0.2874	57	111	8
*	7.4	0.2913	57	111	8
	7.5	0.2953	57	111	8
*	7.6	0.2992	60	111	8
*	7.7	0.3031	60	111	8
*	7.8	0.3071	60	111	8
	8.0	0.3150	60	111	8
*	8.2	0.3228	64	119	9
*	8.4	0.3307	64	119	9

	Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
	8.5	0.3346	64	119	9
*	8.6	0.3386	68	119	9
	8.7	0.3425	68	119	9
*	8.8	0.3465	68	119	9
*	8.9	0.3504	68	119	9
	9.0	0.3543	68	119	9
*	9.2	0.3622	72	127	10
*	9.4	0.3701	72	127	10
	9.5	0.3740	72	127	10
*	9.6	0.3780	75	127	10
*	9.7	0.3819	75	127	10
*	9.8	0.3858	75	127	10
*	9.9	0.3898	75	127	10
	10.0	0.3937	75	127	10
*	10.1	0.3976	79	140	11
	10.3	0.4055	79	140	11
*	10.4	0.4094	79	140	11
	10.5	0.4134	79	140	11
*	10.6	0.4173	83	140	11
*	10.8	0.4252	83	140	11
	11.0	0.4331	83	140	11
	11.1	0.4370	87	148	12
*	11.2	0.4409	87	148	12
*	11.3	0.4449	87	148	12
*	11.4	0.4488	87	148	12
	11.5	0.4528	87	148	12
*	11.6	0.4567	90	148	12
*	11.8	0.4646	90	148	12
	11.9	0.4685	90	148	12
	12.0	0.4724	90	148	12
*	12.1	0.4764	94	156	13
*	12.2	0.4803	94	156	13
*	12.3	0.4843	94	156	13
*	12.4	0.4882	94	156	13

	Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
	12.5	0.4921	94	156	13
*	12.6	0.4961	98	156	13
	12.7	0.5000	98	156	13
*	12.8	0.5039	98	156	13
*	12.9	0.5079	98	156	13
	13.0	0.5118	98	156	13
*	13.1	0.5157	102	164	14
*	13.2	0.5197	102	164	14
*	13.4	0.5276	102	164	14
	13.5	0.5315	102	164	14
*	13.6	0.5354	105	164	14
*	13.7	0.5394	105	164	14
*	13.8	0.5433	105	164	14
*	13.9	0.5472	105	164	14
	14.0	0.5512	105	164	14
*	14.2	0.5591	109	172	15
	14.3	0.5630	109	172	15
*	14.4	0.5669	109	172	15
	14.5	0.5709	109	172	15
*	14.6	0.5748	113	172	15
*	14.7	0.5787	113	172	15
*	14.8	0.5827	113	172	15
*	14.9	0.5866	113	172	15
	15.0	0.5906	113	172	15
*	15.2	0.5984	117	180	16
*	15.3	0.6024	117	180	16
*	15.4	0.6063	117	180	16
	15.5	0.6102	117	180	16
*	15.6	0.6142	120	180	16
*	15.7	0.6181	120	180	16
*	15.8	0.6220	120	180	16
	15.9	0.6260	120	180	16
	16.0	0.6299	120	180	16

1 per tube

* JAPAN STOCK ITEM : Please allow 2-3 weeks delivery

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

**AQUA DRILLS WITH MIST-HOLE 7D / METRIC SIZES
FRACTIONAL SIZES**

List No.9556 Metric Sizes

List No.9569 Fractional



Range L9556 5.0 to 16.0
Range L9569 3/16 to 5/8

SOLID CARBIDE AQUA COATED



This mist-hole drill having 7 times flute of drill diameter is most suitable for "Semi-dry(MQL)" drilling, and applied in high-speed and long life drilling of most workpiece materials from raw materials to hardened materials.

L9556

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
5.0	0.1969	48	97	5
5.1	0.2008	53	110	6
5.5	0.2165	53	110	6
6.0	0.2362	57	110	6
6.1	0.2402	62	120	7
6.5	0.2559	62	120	7
6.8	0.2677	67	120	7
6.9	0.2717	67	120	7
7.0	0.2756	67	120	7
7.5	0.2953	72	130	8
8.0	0.3150	76	130	8
8.5	0.3346	81	140	9
8.6	0.3386	86	140	9
8.8	0.3465	86	140	9
9.0	0.3543	86	140	9
9.5	0.3740	91	150	10
9.8	0.3858	95	150	10
9.9	0.3898	95	150	10
10.0	0.3937	95	150	10
10.3	0.4055	100	170	11
10.5	0.4134	100	170	11
10.8	0.4252	105	170	11
11.0	0.4331	105	170	11
11.5	0.4528	110	180	12
12.0	0.4724	114	180	12
12.5	0.4921	119	190	13
13.0	0.5118	124	190	13
13.5	0.5315	129	200	14
14.0	0.5512	133	200	14
14.5	0.5709	138	210	15
15.0	0.5906	143	210	15
15.5	0.6102	148	220	16
16.0	0.6299	152	220	16

(Unit) : mm

L9569

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
3/16	0.1875	1-7/8	3-13/16	3/16
13/64	0.2031	2-1/16	4-21/64	13/64
7/32	0.2188	2-15/64	4-21/64	7/32
15/64	0.2344	2-15/64	4-21/64	15/64
1/4	0.2500	2-7/16	4-23/32	1/4
17/64	0.2656	2-5/8	4-23/32	17/64
9/32	0.2813	2-53/64	5-7/64	9/32
19/64	0.2969	2-63/64	5-7/64	19/64
5/16	0.3125	2-63/64	5-7/64	5/16
21/64	0.3281	3-3/16	5-1/2	21/64
11/32	0.3438	3-3/8	5-1/2	11/32
23/64	0.3594	3-37/64	5-57/64	23/64
3/8	0.3750	3-37/64	5-57/64	3/8
25/64	0.3906	3-47/64	5-57/64	25/64
13/32	0.4063	3-59/64	6-11/16	13/32
27/64	0.4219	4-3/16	6-11/16	27/64
7/16	0.4375	4-21/64	7-5/64	7/16
29/64	0.4531	4-31/64	7-5/64	29/64
15/32	0.4688	4-31/64	7-5/64	15/32
31/64	0.4844	4-43/64	7-15/32	31/64
1/2	0.5000	4-7/8	7-15/32	1/2
17/32	0.5313	5-5/64	7-7/8	17/32
9/16	0.5625	5-27/64	8-17/64	9/16
19/32	0.5938	5-13/16	8-21/32	19/32
5/8	0.6250	5-63/64	8-21/32	5/8

1 per tube

1 per tube

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

AQUA DRILLS THREE FLUTES / METRIC SIZES

JAPAN
STOCK ITEM*

List No.9546 High Performance



Range 3.0 to 12.0

SOLID CARBIDE AQUA COATED



This drill having balanced 3 flutes is suitable for precision drilling without reaming.

(Unit) : mm

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
3.0	0.1181	16	48	3
3.1	0.1220	18	50	4
3.2	0.1260	18	50	4
3.3	0.1299	18	50	4
3.4	0.1339	20	52	4
3.5	0.1378	20	52	4
3.6	0.1417	20	52	4
3.7	0.1457	20	52	4
3.8	0.1496	22	54	4
3.9	0.1535	22	54	4
4.0	0.1575	22	54	4
4.1	0.1614	22	66	6
4.2	0.1654	22	66	6
4.3	0.1693	24	68	6
4.4	0.1732	24	68	6
4.5	0.1772	24	68	6
4.6	0.1811	24	68	6
4.7	0.1850	24	68	6
4.8	0.1890	26	70	6
4.9	0.1929	26	70	6
5.0	0.1969	26	70	6
5.1	0.2008	26	70	6
5.2	0.2047	26	70	6
5.3	0.2087	26	70	6
5.4	0.2126	28	72	6
5.5	0.2165	28	72	6
5.6	0.2205	28	72	6
5.7	0.2244	28	72	6
5.8	0.2283	28	72	6
5.9	0.2323	28	72	6
6.0	0.2362	28	72	6
6.1	0.2402	31	75	8
6.2	0.2441	31	75	8
6.3	0.2480	31	75	8
6.4	0.2520	31	75	8
6.5	0.2559	31	75	8
6.6	0.2598	31	75	8
6.7	0.2638	31	75	8
6.8	0.2677	34	78	8
6.9	0.2717	34	78	8
7.0	0.2756	34	78	8
7.1	0.2795	34	78	8
7.2	0.2835	34	78	8
7.3	0.2874	34	78	8
7.4	0.2913	34	78	8
7.5	0.2953	34	78	8

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
7.6	0.2992	37	81	8
7.7	0.3031	37	81	8
7.8	0.3071	37	81	8
7.9	0.3110	37	81	8
8.0	0.3150	37	81	8
8.1	0.3189	37	87	10
8.2	0.3228	37	87	10
8.3	0.3268	37	87	10
8.4	0.3307	37	87	10
8.5	0.3346	37	87	10
8.6	0.3386	40	90	10
8.7	0.3425	40	90	10
8.8	0.3465	40	90	10
8.9	0.3504	40	90	10
9.0	0.3543	40	90	10
9.1	0.3583	40	90	10
9.2	0.3622	40	90	10
9.3	0.3661	40	90	10
9.4	0.3701	40	90	10
9.5	0.3740	40	90	10
9.6	0.3780	43	93	10
9.7	0.3819	43	93	10
9.8	0.3858	43	93	10
9.9	0.3898	43	93	10
10.0	0.3937	43	93	10
10.1	0.3976	43	100	12
10.2	0.4016	43	100	12
10.3	0.4055	43	100	12
10.4	0.4094	43	100	12
10.5	0.4134	43	100	12
10.6	0.4173	43	100	12
10.7	0.4213	47	104	12
10.8	0.4252	47	104	12
10.9	0.4291	47	104	12
11.0	0.4331	47	104	12
11.1	0.4370	47	104	12
11.2	0.4409	47	104	12
11.3	0.4449	47	104	12
11.4	0.4488	47	104	12
11.5	0.4528	47	104	12
11.6	0.4567	47	104	12
11.7	0.4606	47	104	12
11.8	0.4646	47	104	12
11.9	0.4685	51	108	12
12.0	0.4724	51	108	12

Size		Tolerance (μm)
Above	Up to	
	3.0	±3
3.0	10.0	±4
10.0		±5

1 per tube

* JAPAN STOCK ITEM : Please allow 2-3 weeks delivery

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

List No.9548 High Performance



Range 2.0 to 12.0

SOLID CARBIDE AQUA COATED



This drill meets high efficiency drilling of hardened material. (50~70HRC)

(Unit) : mm

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
2.0	0.0787	12	44	3
2.1	0.0827	12	44	3
2.5	0.0984	14	46	3
2.6	0.1024	14	46	3
3.0	0.1181	16	48	3
3.4	0.1339	20	52	4
3.5	0.1378	20	52	4
4.0	0.1575	22	54	4
4.3	0.1693	24	68	6
4.5	0.1772	24	68	6
5.0	0.1969	26	70	6
5.1	0.2008	26	70	6
5.5	0.2165	28	72	6
6.0	0.2362	28	72	6
6.5	0.2559	31	75	8
6.9	0.2717	34	78	8
7.0	0.2756	34	78	8
7.5	0.2953	34	78	8
8.0	0.3150	37	81	8
8.5	0.3346	37	87	10
8.6	0.3386	40	90	10
9.0	0.3543	40	90	10
9.5	0.3740	40	90	10
10.0	0.3937	43	93	10
10.3	0.4055	43	100	12
10.5	0.4134	43	100	12
11.0	0.4331	47	104	12
11.5	0.4528	47	104	12
12.0	0.4724	51	108	12

1 per tube

* JAPAN STOCK ITEM : Please allow 2-3 weeks delivery

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others



List No.9544 High Performance



Range 0.20 to 1.99

SOLID CARBIDE AQUA COATED



This drill is suitable for stable drilling in small diameter on many kind of materials from raw material to hardened material.

(Unit) : mm

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
0.20	0.0079	2.5	38	3
0.21	0.0083	2.5	38	3
0.22	0.0087	2.5	38	3
0.23	0.0091	2.5	38	3
0.24	0.0094	2.5	38	3
0.25	0.0098	2.5	38	3
0.26	0.0102	2.5	38	3
0.27	0.0106	2.5	38	3
0.28	0.0110	2.5	38	3
0.29	0.0114	2.5	38	3
0.30	0.0118	3	38	3
0.31	0.0122	3	38	3
0.32	0.0126	3	38	3
0.33	0.0130	3	38	3
0.34	0.0134	3	38	3
0.35	0.0138	4	38	3
0.36	0.0142	4	38	3
0.37	0.0146	4	38	3
0.38	0.0150	4	38	3
0.39	0.0154	4	38	3
0.40	0.0157	5	38	3
0.41	0.0161	5	38	3
0.42	0.0165	5	38	3
0.43	0.0169	5	38	3
0.44	0.0173	5	38	3
0.45	0.0177	5	38	3
0.46	0.0181	5	38	3
0.47	0.0185	5	38	3
0.48	0.0189	5	38	3
0.49	0.0193	5	38	3
0.50	0.0197	6	38	3
0.51	0.0201	6	38	3
0.52	0.0205	6	38	3
0.53	0.0209	6	38	3
0.54	0.0213	6	38	3
0.55	0.0217	6	38	3
0.56	0.0220	6	38	3
0.57	0.0224	6	38	3
0.58	0.0228	6	38	3
0.59	0.0232	6	38	3
0.60	0.0236	7	38	3
0.61	0.0240	7	38	3
0.62	0.0244	7	38	3
0.63	0.0248	7	38	3
0.64	0.0252	7	38	3
0.65	0.0256	7	38	3
0.66	0.0260	7	38	3
0.67	0.0264	7	38	3
0.68	0.0268	7	38	3
0.69	0.0272	7	38	3
0.70	0.0276	9	38	3
0.71	0.0280	9	38	3
0.72	0.0283	9	38	3
0.73	0.0287	9	38	3
0.74	0.0291	9	38	3
0.75	0.0295	9	38	3
0.76	0.0299	9	38	3
0.77	0.0303	9	38	3
0.78	0.0307	9	38	3
0.79	0.0311	9	38	3

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
0.80	0.0315	10	38	3
0.81	0.0319	10	38	3
0.82	0.0323	10	38	3
0.83	0.0327	10	38	3
0.84	0.0331	10	38	3
0.85	0.0335	10	38	3
0.86	0.0339	10	38	3
0.87	0.0343	10	38	3
0.88	0.0346	10	38	3
0.89	0.0350	10	38	3
0.90	0.0354	11	38	3
0.91	0.0358	11	38	3
0.92	0.0362	11	38	3
0.93	0.0366	11	38	3
0.94	0.0370	11	38	3
0.95	0.0374	11	38	3
0.96	0.0378	11	38	3
0.97	0.0382	11	38	3
0.98	0.0386	11	38	3
0.99	0.0390	11	38	3
1.00	0.0394	12	38	3
1.01	0.0398	12	38	3
1.02	0.0402	12	38	3
1.03	0.0406	12	38	3
1.04	0.0409	12	38	3
1.05	0.0413	12	38	3
1.06	0.0417	12	38	3
1.07	0.0421	12	38	3
1.08	0.0425	12	38	3
1.09	0.0429	12	38	3
1.10	0.0433	14	47	3
1.11	0.0437	14	47	3
1.12	0.0441	14	47	3
1.13	0.0445	14	47	3
1.14	0.0449	14	47	3
1.15	0.0453	14	47	3
1.16	0.0457	14	47	3
1.17	0.0461	14	47	3
1.18	0.0465	14	47	3
1.19	0.0469	14	47	3
1.20	0.0472	15	47	3
1.21	0.0476	15	47	3
1.22	0.0480	15	47	3
1.23	0.0484	15	47	3
1.24	0.0488	15	47	3
1.25	0.0492	15	47	3
1.26	0.0496	15	47	3
1.27	0.0500	15	47	3
1.28	0.0504	15	47	3
1.29	0.0508	15	47	3
1.30	0.0512	15	47	3
1.31	0.0516	15	47	3
1.32	0.0520	15	47	3
1.33	0.0524	15	47	3
1.34	0.0528	15	47	3
1.35	0.0531	15	47	3
1.36	0.0535	15	47	3
1.37	0.0539	15	47	3
1.38	0.0543	15	47	3
1.39	0.0547	15	47	3

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
1.40	0.0551	15	47	3
1.41	0.0555	15	47	3
1.42	0.0559	15	47	3
1.43	0.0563	15	47	3
1.44	0.0567	15	47	3
1.45	0.0571	15	47	3
1.46	0.0575	15	47	3
1.47	0.0579	15	47	3
1.48	0.0583	15	47	3
1.49	0.0587	15	47	3
1.50	0.0591	15	47	3
1.51	0.0594	15	47	3
1.52	0.0598	15	47	3
1.53	0.0602	15	47	3
1.54	0.0606	15	47	3
1.55	0.0610	15	47	3
1.56	0.0614	15	47	3
1.57	0.0618	15	47	3
1.58	0.0622	15	47	3
1.59	0.0626	15	47	3
1.60	0.0630	15	47	3
1.61	0.0634	15	47	3
1.62	0.0638	15	47	3
1.63	0.0642	15	47	3
1.64	0.0646	15	47	3
1.65	0.0650	15	47	3
1.66	0.0654	15	47	3
1.67	0.0657	15	47	3
1.68	0.0661	15	47	3
1.69	0.0665	15	47	3
1.70	0.0669	15	47	3
1.71	0.0673	15	47	3
1.72	0.0677	15	47	3
1.73	0.0681	15	47	3
1.74	0.0685	15	47	3
1.75	0.0689	15	47	3
1.76	0.0693	15	47	3
1.77	0.0697	15	47	3
1.78	0.0701	15	47	3
1.79	0.0705	15	47	3
1.80	0.0709	15	47	3
1.81	0.0713	15	47	3
1.82	0.0717	15	47	3
1.83	0.0720	15	47	3
1.84	0.0724	15	47	3
1.85	0.0728	15	47	3
1.86	0.0732	15	47	3
1.87	0.0736	15	47	3
1.88	0.0740	15	47	3
1.89	0.0744	15	47	3
1.90	0.0748	15	47	3
1.91	0.0752	15	47	3
1.92	0.0756	15	47	3
1.93	0.0760	15	47	3
1.94	0.0764	15	47	3
1.95	0.0768	15	47	3
1.96	0.0772	15	47	3
1.97	0.0776	15	47	3
1.98	0.0780	15	47	3
1.99	0.0783	15	47	3

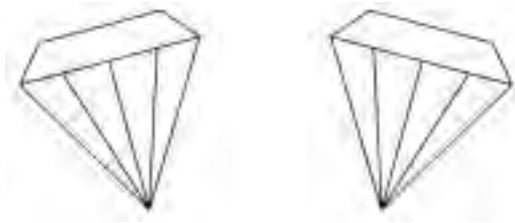
Tolerance of Drill Dia : +0.000
-0.009

1 per tube

* JAPAN STOCK ITEM : Please allow 2-3 weeks delivery

Technical Data
DRILLS
Cutting Condition
END MILLS
Cutting Condition
TAPS
Cutting Condition
Others

List No.9501D Diamond Coated



CARBIDE DIAMOND COATED



Size	Decimal Equivalent	Flute Length	Overall Length
1/16	0.0625	7/8	1 7/8
1/8	0.1250	1 5/8	2 3/4
3/16	0.1875	2 5/16	3 1/2
1/4	0.2500	2 3/4	4
5/16	0.3125	3 1/16	4 1/2
3/8	0.3750	3 5/8	5
7/16	0.4375	4 1/16	5 1/2
1/2	0.5000	4 1/2	6

1 per tube

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others



List No.544 High Performance



HSS DLC COATED



Range 1.0 to 13.0

High efficiency drilling of Aluminum Alloy is available.

(Unit) : mm

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
1.0	0.0394	12	50	3
1.1	0.0433	14	50	3
1.2	0.0472	16	50	3
1.3	0.0512	16	50	3
1.4	0.0551	18	50	3
1.5	0.0591	18	50	3
1.6	0.0630	20	56	3
1.7	0.0669	20	56	3
1.8	0.0709	22	56	3
1.9	0.0748	22	56	3
2.0	0.0787	24	56	3
2.1	0.0827	24	56	3
2.2	0.0866	25	56	3
2.3	0.0906	25	56	3
2.4	0.0945	30	64	3
2.5	0.0984	30	64	3
2.6	0.1024	30	64	3
2.7	0.1063	33	64	3
2.8	0.1102	33	64	3
2.9	0.1142	33	64	3
3.0	0.1181	33	64	3
3.1	0.1220	36	71	4
3.2	0.1260	36	71	4
3.3	0.1299	36	71	4
3.4	0.1339	39	71	4
3.5	0.1378	39	71	4
3.6	0.1417	39	71	4
3.7	0.1457	39	71	4
3.8	0.1496	43	75	4
3.9	0.1535	43	75	4
4.0	0.1575	43	75	4
4.1	0.1614	43	89	6
4.2	0.1654	43	89	6
4.3	0.1693	47	89	6
4.4	0.1732	47	89	6
4.5	0.1772	47	89	6
4.6	0.1811	47	89	6
4.7	0.1850	47	89	6
4.8	0.1890	52	94	6
4.9	0.1929	52	94	6
5.0	0.1969	52	94	6
5.1	0.2008	52	94	6
5.2	0.2047	52	94	6
5.3	0.2087	52	94	6
5.4	0.2126	57	99	6
5.5	0.2165	57	99	6
5.6	0.2205	57	99	6
5.7	0.2244	57	99	6
5.8	0.2283	57	99	6
5.9	0.2323	57	99	6
6.0	0.2362	57	99	6
6.1	0.2402	63	107	8
6.2	0.2441	63	107	8
6.3	0.2480	63	107	8
6.4	0.2520	63	107	8
6.5	0.2559	63	107	8
6.6	0.2598	63	107	8
6.7	0.2638	63	107	8
6.8	0.2677	69	113	8
6.9	0.2717	69	113	8
7.0	0.2756	69	113	8

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
7.1	0.2795	69	113	8
7.2	0.2835	69	113	8
7.3	0.2874	69	113	8
7.4	0.2913	69	113	8
7.5	0.2953	69	113	8
7.6	0.2992	75	119	8
7.7	0.3031	75	119	8
7.8	0.3071	75	119	8
7.9	0.3110	75	119	8
8.0	0.3150	75	119	8
8.1	0.3189	75	125	10
8.2	0.3228	75	125	10
8.3	0.3268	75	125	10
8.4	0.3307	75	125	10
8.5	0.3346	75	125	10
8.6	0.3386	81	131	10
8.7	0.3425	81	131	10
8.8	0.3465	81	131	10
8.9	0.3504	81	131	10
9.0	0.3543	81	131	10
9.1	0.3583	81	131	10
9.2	0.3622	81	131	10
9.3	0.3661	81	131	10
9.4	0.3701	81	131	10
9.5	0.3740	81	131	10
9.6	0.3780	87	137	10
9.7	0.3819	87	137	10
9.8	0.3858	87	137	10
9.9	0.3898	87	137	10
10.0	0.3937	87	137	10
10.1	0.3976	87	144	12
10.2	0.4016	87	144	12
10.3	0.4055	87	144	12
10.4	0.4094	87	144	12
10.5	0.4134	87	144	12
10.6	0.4173	87	144	12
10.7	0.4213	94	151	12
10.8	0.4252	94	151	12
10.9	0.4291	94	151	12
11.0	0.4331	94	151	12
11.1	0.4370	94	151	12
11.2	0.4409	94	151	12
11.3	0.4449	94	151	12
11.4	0.4488	94	151	12
11.5	0.4528	94	151	12
11.6	0.4567	94	151	12
11.7	0.4606	94	151	12
11.8	0.4646	94	151	12
11.9	0.4685	101	158	12
12.0	0.4724	101	158	12
12.1	0.4764	101	158	12
12.2	0.4803	101	158	12
12.3	0.4843	101	158	12
12.4	0.4882	101	158	12
12.5	0.4921	101	158	12
12.6	0.4961	101	158	12
12.7	0.5000	101	158	12
12.8	0.5039	101	158	12
12.9	0.5079	101	158	12
13.0	0.5118	101	158	12

1 per tube

* JAPAN STOCK ITEM : Please allow 2-3 weeks delivery

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

HIGH PERFORMANCE DRILLS

DLC MICRODRILLS / METRIC SIZES

JAPAN
STOCK ITEM*

69

List No.9524 High Performance



Range 0.5 to 1.9

SOLID CARBIDE DLC COATED



High-speed wet processing and dry processing of Aluminum Alloy are available in small diameter.

(Unit) : mm

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Diameter
0.5	0.0197	6	44	3
0.6	0.0236	7	44	3
0.7	0.0276	9	44	3
0.8	0.0315	10	44	3
0.9	0.0354	11	44	3
1.0	0.0394	12	47	3
1.1	0.0433	14	47	3
1.2	0.0472	15	47	3
1.3	0.0512	15	47	3
1.4	0.0551	15	47	3
1.5	0.0591	15	47	3
1.6	0.0630	15	47	3
1.7	0.0669	15	47	3
1.8	0.0709	15	47	3
1.9	0.0748	15	47	3

1 per tube

* JAPAN STOCK ITEM : Please allow 2-3 weeks delivery

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

List No.9520 High Performance



Range 2.0 to 12.0

SOLID CARBIDE DLC COATED



High-speed wet processing and dry processing of Aluminum Alloy are available.

(Unit) : mm

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
2.0	0.0787	15	47	3
2.1	0.0827	15	47	3
2.2	0.0866	16	48	3
2.3	0.0906	16	48	3
2.4	0.0945	17	49	3
2.5	0.0984	17	49	3
2.6	0.1024	17	49	3
2.7	0.1063	19	51	3
2.8	0.1102	19	51	3
2.9	0.1142	19	51	3
3.0	0.1181	19	51	3
3.1	0.1220	21	53	4
3.2	0.1260	21	53	4
3.3	0.1299	21	53	4
3.4	0.1339	24	56	4
3.5	0.1378	24	56	4
3.6	0.1417	24	56	4
3.7	0.1457	24	56	4
3.8	0.1496	27	59	4
3.9	0.1535	27	59	4
4.0	0.1575	27	59	4
4.1	0.1614	27	71	6
4.2	0.1654	27	71	6
4.3	0.1693	31	75	6
4.4	0.1732	31	75	6
4.5	0.1772	31	75	6
4.6	0.1811	31	75	6
4.7	0.1850	31	75	6
4.8	0.1890	33	77	6
4.9	0.1929	33	77	6
5.0	0.1969	38	82	6
5.1	0.2008	38	82	6
5.2	0.2047	38	82	6
5.3	0.2087	38	82	6

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
5.4	0.2126	38	82	6
5.5	0.2165	38	82	6
5.6	0.2205	41	85	6
5.7	0.2244	41	85	6
5.8	0.2283	41	85	6
5.9	0.2323	41	85	6
6.0	0.2362	41	85	6
6.1	0.2402	41	85	8
6.2	0.2441	41	85	8
6.3	0.2480	41	85	8
6.4	0.2520	41	85	8
6.5	0.2559	41	85	8
6.6	0.2598	43	87	8
6.7	0.2638	43	87	8
6.8	0.2677	43	87	8
6.9	0.2717	43	87	8
7.0	0.2756	43	87	8
7.1	0.2795	45	89	8
7.2	0.2835	45	89	8
7.3	0.2874	45	89	8
7.4	0.2913	45	89	8
7.5	0.2953	45	89	8
7.6	0.2992	48	92	8
7.7	0.3031	48	92	8
7.8	0.3071	48	92	8
7.9	0.3110	48	92	8
8.0	0.3150	48	92	8
8.1	0.3189	53	103	10
8.2	0.3228	53	103	10
8.3	0.3268	53	103	10
8.4	0.3307	53	103	10
8.5	0.3346	53	103	10
8.6	0.3386	55	105	10
8.7	0.3425	55	105	10

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
8.8	0.3465	55	105	10
8.9	0.3504	55	105	10
9.0	0.3543	55	105	10
9.1	0.3583	58	108	10
9.2	0.3622	58	108	10
9.3	0.3661	58	108	10
9.4	0.3701	58	108	10
9.5	0.3740	58	108	10
9.6	0.3780	60	110	10
9.7	0.3819	60	110	10
9.8	0.3858	60	110	10
9.9	0.3898	60	110	10
10.0	0.3937	60	110	10
10.1	0.3976	66	123	12
10.2	0.4016	66	123	12
10.3	0.4055	66	123	12
10.4	0.4094	66	123	12
10.5	0.4134	66	123	12
10.6	0.4173	68	125	12
10.7	0.4213	68	125	12
10.8	0.4252	68	125	12
10.9	0.4291	68	125	12
11.0	0.4331	68	125	12
11.1	0.4370	71	128	12
11.2	0.4409	71	128	12
11.3	0.4449	71	128	12
11.4	0.4488	71	128	12
11.5	0.4528	71	128	12
11.6	0.4567	73	130	12
11.7	0.4606	73	130	12
11.8	0.4646	73	130	12
11.9	0.4685	73	130	12
12.0	0.4724	73	130	12

1 per tube

* JAPAN STOCK ITEM : Please allow 2-3 weeks delivery

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

List No.500 General Purpose



Bright Finish 0.2 to 1.95 mm

Black Oxide 2.0 to 17.5 mm

HIGH SPEED STEEL



Used in wide variety of normal conditions. Will work in a broad range of materials in both machine and portable drilling.

(Unit) : mm

Size	Decimal Equivalent	Flute Length	Overall Length
0.20	0.0079	3	19
0.22	0.0087	3.5	20
0.25	0.0098	3.5	20
0.28	0.0110	3.5	20
0.30	0.0118	3.5	20
0.32	0.0126	5.5	24
0.35	0.0138	5.5	24
0.38	0.0150	5.5	24
0.40	0.0157	5.5	24
0.42	0.0165	7.5	27
0.45	0.0177	7.5	27
0.48	0.0189	7.5	27
0.50	0.0197	7.5	30
0.55	0.0217	8.5	30
0.60	0.0236	8.5	30
0.65	0.0256	10	32
0.70	0.0276	10	32
0.75	0.0295	11	34
0.80	0.0315	11	34
0.85	0.0335	13	36
0.90	0.0354	13	36
0.95	0.0374	18	40
1.00	0.0394	18	40
1.05	0.0413	20	42
1.10	0.0433	20	42
1.15	0.0453	20	42
1.20	0.0472	20	42
1.25	0.0492	22	45
1.30	0.0512	22	45
1.35	0.0531	23	48
1.40	0.0551	23	48
1.45	0.0571	23	48
1.50	0.0591	23	48
1.55	0.0610	25	50
1.60	0.0630	25	50
1.65	0.0650	25	50
1.70	0.0669	25	50
1.75	0.0689	28	52
1.80	0.0709	28	52
1.85	0.0728	28	52
1.90	0.0748	28	52
1.95	0.0768	29	55
2.00	0.0787	29	55
2.05	0.0807	29	55
2.10	0.0827	29	55
2.15	0.0846	29	55
2.20	0.0866	33	58
2.25	0.0886	33	58
2.30	0.0906	33	58
2.35	0.0925	33	58
2.40	0.0945	35	61
2.45	0.0965	35	61
2.50	0.0984	35	61
2.55	0.1004	37	64
2.60	0.1024	37	64
2.65	0.1043	37	64
2.70	0.1063	37	64
2.75	0.1083	39	67

Size	Decimal Equivalent	Flute Length	Overall Length
2.80	0.1102	39	67
2.85	0.1122	39	67
2.90	0.1142	42	71
2.95	0.1161	42	71
3.00	0.1181	42	71
3.10	0.1220	42	71
3.20	0.1260	42	71
3.25	0.1280	42	71
3.30	0.1299	45	73
3.40	0.1339	45	73
3.50	0.1378	45	73
3.60	0.1417	48	76
3.70	0.1457	48	76
3.75	0.1476	48	76
3.80	0.1496	48	76
3.90	0.1535	51	79
4.00	0.1575	54	83
4.10	0.1614	54	83
4.20	0.1654	54	83
4.25	0.1673	54	83
4.30	0.1693	54	83
4.40	0.1732	56	86
4.50	0.1772	56	86
4.60	0.1811	56	86
4.70	0.1850	59	89
4.75	0.1870	59	89
4.80	0.1890	59	89
4.90	0.1929	62	92
5.00	0.1969	62	92
5.10	0.2008	62	92
5.20	0.2047	64	92
5.25	0.2067	64	95
5.30	0.2087	64	95
5.40	0.2126	64	95
5.50	0.2165	64	95
5.60	0.2205	67	98
5.70	0.2244	67	98
5.75	0.2264	67	98
5.80	0.2283	67	98
5.90	0.2323	67	98
6.00	0.2362	70	102
6.10	0.2402	70	102
6.20	0.2441	70	102
6.25	0.2461	70	102
6.30	0.2480	70	102
6.40	0.2520	73	105
6.50	0.2559	73	105
6.60	0.2598	73	105
6.70	0.2638	73	105
6.75	0.2657	73	105
6.80	0.2677	73	105
6.90	0.2717	73	105
7.00	0.2756	73	105
7.10	0.2795	75	108
7.20	0.2835	75	108
7.25	0.2854	75	108
7.30	0.2874	75	108
7.40	0.2913	78	111

Size	Decimal Equivalent	Flute Length	Overall Length
7.50	0.2953	78	111
7.60	0.2992	78	111
7.70	0.3031	81	114
7.75	0.3051	81	114
7.80	0.3071	81	114
7.90	0.3110	81	114
8.00	0.3150	81	114
8.10	0.3189	84	117
8.20	0.3228	84	117
8.25	0.3248	84	117
8.30	0.3268	84	117
8.40	0.3307	87	121
8.50	0.3346	87	121
8.60	0.3386	87	121
8.70	0.3425	87	121
8.75	0.3445	89	124
8.80	0.3465	89	124
8.90	0.3504	89	124
9.00	0.3543	89	124
9.10	0.3583	89	124
9.20	0.3622	92	127
9.25	0.3642	92	127
9.30	0.3661	92	127
9.40	0.3701	92	127
9.50	0.3740	92	127
9.60	0.3780	95	130
9.70	0.3819	95	130
9.75	0.3839	95	130
9.80	0.3858	95	130
9.90	0.3898	95	130
10.00	0.3937	95	130
10.20	0.4016	98	133
10.25	0.4035	98	133
10.50	0.4134	100	137
10.75	0.4232	103	140
10.80	0.4252	103	140
11.00	0.4331	103	140
11.20	0.4409	106	143
11.25	0.4429	106	143
11.50	0.4528	106	143
11.75	0.4626	109	146
11.80	0.4646	109	146
12.00	0.4724	111	149
12.20	0.4803	111	149
12.25	0.4823	111	149
12.50	0.4921	114	152
12.75	0.5020	114	152
12.80	0.5039	114	152
13.00	0.5118	114	152
13.50	0.5315	122	168
14.00	0.5512	122	168
14.50	0.5709	122	168
15.00	0.5906	132	181
15.50	0.6102	132	181
16.00	0.6299	132	181
16.50	0.6496	132	181
17.00	0.6693	143	194
17.50	0.6890	143	194

0.2 to 8.0 in package of 10, 8.1 to 13.0 in package of 5, 13.5 to 17.50 in package of 2

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

STRAIGHT SHANK COBALT DRILL TYPE I / METRIC SIZES

JAPAN STOCK ITEM*

List No.6520 General Purpose



Bright Finish 0.5 to 1.9 mm

Black Oxide 2.0 to 13.0 mm

HIGH SPEED STEEL COBALT Black Oxide



This is general purpose cobalt HSS drills.

(Unit) : mm

Drill Dia.	Decimal Equivalent	Flute Length	Overall Length
0.5	0.0197	5	30
0.6	0.0236	5.5	30
0.7	0.0276	7.5	32
0.8	0.0315	8	34
0.9	0.0354	9	36
1.0	0.0394	10	40
1.1	0.0433	11	42
1.2	0.0472	13	42
1.3	0.0512	13	45
1.4	0.0551	14.5	48
1.5	0.0591	14.5	48
1.6	0.0630	16	50
1.7	0.0669	16	50
1.8	0.0709	17.5	52
1.9	0.0748	17.5	52
2.0	0.0787	20	55
2.1	0.0827	20	55
2.2	0.0866	23	58
2.3	0.0906	23	58
2.4	0.0945	24.5	61
2.5	0.0984	24.5	61
2.6	0.1024	26	64
2.7	0.1063	26	64
2.8	0.1102	27	67
2.9	0.1142	29.5	71
3.0	0.1181	29.5	71
3.1	0.1220	29.5	71
3.2	0.1260	29.5	71
3.3	0.1299	31.5	73
3.4	0.1339	31.5	73
3.5	0.1378	31.5	73
3.6	0.1417	33.5	76
3.7	0.1457	33.5	76
3.8	0.1496	33.5	76
3.9	0.1535	36	79
4.0	0.1575	38	83
4.1	0.1614	38	83
4.2	0.1654	38	83
4.3	0.1693	38	83
4.4	0.1732	39	86
4.5	0.1772	39	86
4.6	0.1811	39	86

Drill Dia.	Decimal Equivalent	Flute Length	Overall Length
4.7	0.1850	41	89
4.8	0.1890	41	89
4.9	0.1929	43	92
5.0	0.1969	43	92
5.1	0.2008	43	92
5.2	0.2047	45	95
5.3	0.2087	45	95
5.4	0.2126	45	95
5.5	0.2165	45	95
5.6	0.2205	47	98
5.7	0.2244	47	98
5.8	0.2283	47	98
5.9	0.2323	47	98
6.0	0.2362	49	102
6.1	0.2402	49	102
6.2	0.2441	49	102
6.3	0.2480	49	102
6.4	0.2520	51	105
6.5	0.2559	51	105
6.6	0.2598	51	105
6.7	0.2638	51	105
6.8	0.2677	51	105
6.9	0.2717	51	105
7.0	0.2756	51	105
7.1	0.2795	53	108
7.2	0.2835	53	108
7.3	0.2874	53	108
7.4	0.2913	55	111
7.5	0.2953	55	111
7.6	0.2992	55	111
7.7	0.3031	57	114
7.8	0.3071	57	114
7.9	0.3110	57	114
8.0	0.3150	57	114
8.1	0.3189	59	117
8.2	0.3228	59	117
8.3	0.3268	59	117
8.4	0.3307	61	121
8.5	0.3346	61	121
8.6	0.3386	61	121
8.7	0.3425	61	121
8.8	0.3465	63	124

Drill Dia.	Decimal Equivalent	Flute Length	Overall Length
8.9	0.3504	63	124
9.0	0.3543	63	124
9.1	0.3583	63	124
9.2	0.3622	65	127
9.3	0.3661	65	127
9.4	0.3701	65	127
9.5	0.3740	65	127
9.6	0.3780	67	130
9.7	0.3819	67	130
9.8	0.3858	67	130
9.9	0.3898	67	130
10.0	0.3937	67	130
10.1	0.3976	69	133
10.2	0.4016	69	133
10.3	0.4055	69	133
10.4	0.4094	69	133
10.5	0.4134	70	137
10.6	0.4173	70	137
10.7	0.4213	70	137
10.8	0.4252	72	140
10.9	0.4291	72	140
11.0	0.4331	72	140
11.1	0.4370	72	140
11.2	0.4409	75	143
11.3	0.4449	75	143
11.4	0.4488	75	143
11.5	0.4528	75	143
11.6	0.4567	77	146
11.7	0.4606	77	146
11.8	0.4646	77	146
11.9	0.4685	77	146
12.0	0.4724	78	149
12.1	0.4764	78	149
12.2	0.4803	78	149
12.3	0.4843	78	149
12.4	0.4882	80	152
12.5	0.4921	80	152
12.6	0.4961	80	152
12.7	0.5000	80	152
12.8	0.5039	80	152
12.9	0.5079	80	152
13.0	0.5118	80	152

0.5 to 7.9 in package 10, 8.0 to 13.0 in package 5

* JAPAN STOCK ITEM : Please allow 2-3 weeks delivery

Technical Data
DRILLS
Cutting Condition
END MILLS
Cutting Condition
END MILLS
Cutting Condition
TAPS
Cutting Condition
Others

List No.520P General Purpose



Range 0.5 to 13.0 mm

HIGH SPEED STEEL-TIN COATED



Used for high speed drilling. TiN coated.

(Unit) : mm

Drill Dia.	Decimal Equivalent	Flute Length	Overall Length
0.5	0.0197	6	22
0.6	0.0236	7	24
0.7	0.0276	9	28
0.8	0.0315	10	30
0.9	0.0354	11	32
1.0	0.0394	12	34
1.1	0.0433	14	36
1.2	0.0472	16	38
1.3	0.0512	16	38
1.4	0.0551	18	40
1.5	0.0591	18	40
1.6	0.0630	20	43
1.7	0.0669	20	43
1.8	0.0709	22	46
1.9	0.0748	22	46
2.0	0.0787	24	49
2.1	0.0827	24	49
2.2	0.0866	27	53
2.3	0.0906	27	53
2.4	0.0945	30	57
2.5	0.0984	30	57
2.6	0.1024	30	57
2.7	0.1063	33	61
2.8	0.1102	33	61
2.9	0.1142	33	61
3.0	0.1181	33	61
3.1	0.1220	36	65
3.2	0.1260	36	65
3.3	0.1299	36	65
3.4	0.1339	39	70
3.5	0.1378	39	70
3.6	0.1417	39	70
3.7	0.1457	39	70
3.8	0.1496	43	75
3.9	0.1535	43	75
4.0	0.1575	43	75
4.1	0.1614	43	75
4.2	0.1654	43	75
4.3	0.1693	47	80
4.4	0.1732	47	80
4.5	0.1772	47	80
4.6	0.1811	47	80

Drill Dia.	Decimal Equivalent	Flute Length	Overall Length
4.7	0.1850	47	80
4.8	0.1890	52	86
4.9	0.1929	52	86
5.0	0.1969	52	86
5.1	0.2008	52	86
5.2	0.2047	52	86
5.3	0.2087	52	86
5.4	0.2126	57	93
5.5	0.2165	57	93
5.6	0.2205	57	93
5.7	0.2244	57	93
5.8	0.2283	57	93
5.9	0.2323	57	93
6.0	0.2362	57	93
6.1	0.2402	63	101
6.2	0.2441	63	101
6.3	0.2480	63	101
6.4	0.2520	63	101
6.5	0.2559	63	101
6.6	0.2598	63	101
6.7	0.2638	63	101
6.8	0.2677	69	109
6.9	0.2717	69	109
7.0	0.2756	69	109
7.1	0.2795	69	109
7.2	0.2835	69	109
7.3	0.2874	69	109
7.4	0.2913	69	109
7.5	0.2953	69	109
7.6	0.2992	75	117
7.7	0.3031	75	117
7.8	0.3071	75	117
7.9	0.3110	75	117
8.0	0.3150	75	117
8.1	0.3189	75	117
8.2	0.3228	75	117
8.3	0.3268	75	117
8.4	0.3307	75	117
8.5	0.3346	75	117
8.6	0.3386	81	125
8.7	0.3425	81	125
8.8	0.3465	81	125

Drill Dia.	Decimal Equivalent	Flute Length	Overall Length
8.9	0.3504	81	125
9.0	0.3543	81	125
9.1	0.3583	81	125
9.2	0.3622	81	125
9.3	0.3661	81	125
9.4	0.3701	81	125
9.5	0.3740	81	125
9.6	0.3780	87	133
9.7	0.3819	87	133
9.8	0.3858	87	133
9.9	0.3898	87	133
10.0	0.3937	87	133
10.1	0.3976	87	133
10.2	0.4016	87	133
10.3	0.4055	87	133
10.4	0.4094	87	133
10.5	0.4134	87	133
10.6	0.4173	87	133
10.7	0.4213	94	142
10.8	0.4252	94	142
10.9	0.4291	94	142
11.0	0.4331	94	142
11.1	0.4370	94	142
11.2	0.4409	94	142
11.3	0.4449	94	142
11.4	0.4488	94	142
11.5	0.4528	94	142
11.6	0.4567	94	142
11.7	0.4606	94	142
11.8	0.4646	94	142
11.9	0.4685	101	151
12.0	0.4724	101	151
12.1	0.4764	101	151
12.2	0.4803	101	151
12.3	0.4843	101	151
12.4	0.4882	101	151
12.5	0.4921	101	151
12.6	0.4961	101	151
12.7	0.5000	101	151
12.8	0.5039	101	151
12.9	0.5079	101	151
13.0	0.5118	101	151

0.5 to 1.9 in package 10, 2.0 to 13.0 in package 1

* JAPAN STOCK ITEM : Please allow 2-3 weeks delivery

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

STRAIGHT SHANK JOBBERS LENGTH DRILLS / FRACTIONAL SIZES / WIRE GAUGE SIZES / LETTER SIZES

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

List No.501 General Purpose



Fractional : Range 3/64" to 11/16"
Wire : Range #1 to #60
Letter : Range A to Z

HIGH SPEED STEEL Black Oxide



Used in wide variety of normal conditions. Will work in a broad range of materials in both machine and portable drilling.

List No.501A General Purpose



Fractional : Range 1/64" to 11/16"
Wire : Range #1 to #80
Letter : Range A to Z

HIGH SPEED STEEL Bright Finish



Used in wide variety of normal conditions. Will work in a broad range of materials in both machine and portable drilling.

List No.6501 Aircraft NAS907-J



Fractional : Range 1/64" to 1/2"
Wire : Range #1 to #80
Letter : Range A to Z

HIGH SPEED STEEL COBALT Black Oxide



Manufactured with 135° Split Point.

List No.501P General Purpose



Fractional : Range 1/16" to 1/2"
Wire : Range #1 to #52

HIGH SPEED STEEL-TIN COATED



Used for high speed drilling. TiN coated.

List No.517P Parabolic



Fractional : Range 1/16" to 1/2"
Wire : Range #1 to #52

HIGH SPEED STEEL-TIN COATED



Used for drilling for 7D deep holes. Parabolic style gives maximum chip removal with no chip clogging. Suitable for hard material. TiN coated.

Fractional	Size		Decimal Equivalent	Flute Length	Overall Length
	Wire	Letter			
1/64	#80		0.0135	1/8	3/4
	#79		0.0145	1/8	3/4
	#78		0.0156	3/16	3/4
	#77		0.0160	3/16	7/8
	#76		0.0200	3/16	7/8
	#75		0.0210	1/4	1
	#74		0.0225	1/4	1
	#73		0.0240	5/16	1 1/8
	#72		0.0250	5/16	1 1/8
	#71		0.0260	3/8	1 1/4
1/32	#70		0.0280	3/8	1 1/4
	#69		0.0292	1/2	1 3/8
	#68		0.0310	1/2	1 3/8
	#67		0.0320	1/2	1 3/8
	#66		0.0330	1/2	1 3/8
	#65		0.0350	5/8	1 1/2
	#64		0.0360	5/8	1 1/2
	#63		0.0370	5/8	1 1/2
	#62		0.0380	5/8	1 1/2
	#61		0.0390	11/16	1 5/8
3/64	#60		0.0400	11/16	1 5/8
	#59		0.0410	11/16	1 5/8
	#58		0.0420	11/16	1 5/8
	#57		0.0430	3/4	1 3/4
	#56		0.0465	3/4	1 3/4
	#55		0.0520	7/8	1 7/8
	#54		0.0550	7/8	1 7/8
	#53		0.0595	7/8	1 7/8
	#52		0.0625	7/8	1 7/8
	#51		0.0670	1	2
1/16	#50		0.0700	1	2
	#49		0.0730	1	2
	#48		0.0760	1	2
	#47		0.0781	1	2
	#46		0.0785	1	2
	#45		0.0810	1 1/8	2 1/8
	#44		0.0820	1 1/8	2 1/8
	#43		0.0860	1 1/8	2 1/8
	#42		0.0890	1 1/4	2 1/4
	#41		0.0935	1 1/4	2 1/4
5/64	#40		0.0938	1 1/4	2 1/4
	#39		0.0960	1 3/8	2 3/8
	#38		0.0980	1 3/8	2 3/8
	#37		0.0995	1 3/8	2 3/8
	#36		0.1015	1 3/8	2 3/8
	#35		0.1015	1 7/16	2 1/2
	#34		0.1040	1 7/16	2 1/2
	#33		0.1040	1 7/16	2 1/2
	#32		0.1065	1 7/16	2 1/2
	#31		0.1065	1 7/16	2 1/2
3/32	#30		0.1094	1 1/2	2 5/8
	#29		0.1094	1 1/2	2 5/8
	#28		0.1100	1 1/2	2 5/8
	#27		0.1100	1 1/2	2 5/8
	#26		0.1110	1 1/2	2 5/8
	#25		0.1110	1 1/2	2 5/8
	#24		0.1110	1 1/2	2 5/8
	#23		0.1110	1 1/2	2 5/8
	#22		0.1110	1 1/2	2 5/8
	#21		0.1110	1 1/2	2 5/8
7/64	#20		0.1110	1 1/2	2 5/8
	#19		0.1110	1 1/2	2 5/8
	#18		0.1110	1 1/2	2 5/8
	#17		0.1110	1 1/2	2 5/8
	#16		0.1110	1 1/2	2 5/8
	#15		0.1110	1 1/2	2 5/8
	#14		0.1110	1 1/2	2 5/8
	#13		0.1110	1 1/2	2 5/8
	#12		0.1110	1 1/2	2 5/8
	#11		0.1110	1 1/2	2 5/8

**STRAIGHT SHANK JOBBERS LENGTH DRILLS /
List No.501, 501A, 6501, 501P, 517P**

Size			Decimal Equivalent	Flute Length	Overall Length
Fractional	Wire	Letter			
	#33		0.1130	1 1/2	2 5/8
	#32		0.1160	1 5/8	2 3/4
	#31		0.1200	1 5/8	2 3/4
1/8			0.1250	1 5/8	2 3/4
	#30		0.1285	1 5/8	2 3/4
	#29		0.1360	1 3/4	2 7/8
	#28		0.1405	1 3/4	2 7/8
9/64			0.1406	1 3/4	2 7/8
	#27		0.1440	1 7/8	3
	#26		0.1470	1 7/8	3
	#25		0.1495	1 7/8	3
	#24		0.1520	2	3 1/8
	#23		0.1540	2	3 1/8
5/32			0.1563	2	3 1/8
	#22		0.1570	2	3 1/8
	#21		0.1590	2 1/8	3 1/4
	#20		0.1610	2 1/8	3 1/4
	#19		0.1660	2 1/8	3 1/4
	#18		0.1695	2 1/8	3 1/4
	#16		0.1700	2 3/16	3 3/8
11/64			0.1719	2 1/8	3 1/4
	#17		0.1730	2 3/16	3 3/8
	#15		0.1800	2 3/16	3 3/8
	#14		0.1820	2 3/16	3 3/8
	#13		0.1850	2 5/16	3 1/2
3/16			0.1875	2 5/16	3 1/2
	#12		0.1890	2 5/16	3 1/2
	#11		0.1910	2 5/16	3 1/2
	#10		0.1935	2 7/16	3 5/8
	#9		0.1960	2 7/16	3 5/8
	#8		0.1990	2 7/16	3 5/8
	#7		0.2010	2 7/16	3 5/8
13/64			0.2031	2 7/16	3 5/8
	#6		0.2040	2 1/2	3 3/4
	#5		0.2055	2 1/2	3 3/4
	#4		0.2090	2 1/2	3 3/4
	#3		0.2130	2 1/2	3 3/4
7/32			0.2188	2 1/2	3 3/4
	#2		0.2210	2 5/8	3 7/8
	#1		0.2280	2 5/8	3 7/8
		A	0.2340	2 5/8	3 7/8
15/64			0.2344	2 5/8	3 7/8
		B	0.2380	2 3/4	4
		C	0.2420	2 3/4	4
		D	0.2460	2 3/4	4
		E	0.2500	2 3/4	4
1/4			0.2500	2 3/4	4
		F	0.2570	2 7/8	4 1/8

Size			Decimal Equivalent	Flute Length	Overall Length
Fractional	Wire	Letter			
		G	0.2610	2 7/8	4 1/8
17/64			0.2656	2 7/8	4 1/8
		H	0.2660	2 7/8	4 1/8
		I	0.2720	2 7/8	4 1/8
		J	0.2770	2 7/8	4 1/8
		K	0.2810	2 15/16	4 1/4
9/32			0.2813	2 15/16	4 1/4
		L	0.2900	2 15/16	4 1/4
		M	0.2950	3 1/16	4 3/8
19/64			0.2969	3 1/16	4 3/8
		N	0.3020	3 1/16	4 3/8
5/16			0.3125	3 3/16	4 1/2
		O	0.3160	3 3/16	4 1/2
		P	0.3230	3 5/16	4 5/8
21/64			0.3281	3 5/16	4 5/8
		Q	0.3320	3 7/16	4 3/4
		R	0.3390	3 7/16	4 3/4
11/32			0.3438	3 7/16	4 3/4
		S	0.3480	3 1/2	4 7/8
		T	0.3580	3 1/2	4 7/8
23/64			0.3594	3 1/2	4 7/8
		U	0.3680	3 5/8	5
3/8			0.3750	3 5/8	5
		V	0.3770	3 5/8	5
		W	0.3860	3 3/4	5 1/8
25/64			0.3906	3 3/4	5 1/8
		X	0.3970	3 3/4	5 1/8
		Y	0.4040	3 7/8	5 1/4
13/32			0.4063	3 7/8	5 1/4
		Z	0.4130	3 7/8	5 1/4
27/64			0.4219	3 15/16	5 3/8
7/16			0.4375	4 1/16	5 1/2
29/64			0.4531	4 3/16	5 5/8
15/32			0.4688	4 5/16	5 3/4
31/64			0.4844	4 3/8	5 7/8
1/2			0.5000	4 1/2	6
33/64			0.5156	4 13/16	6 5/8
17/32			0.5313	4 13/16	6 5/8
35/64			0.5469	4 13/16	6 5/8
9/16			0.5625	4 13/16	6 5/8
37/64			0.5781	4 13/16	6 5/8
19/32			0.5938	5 3/16	7 1/8
39/64			0.6094	5 3/16	7 1/8
5/8			0.6250	5 3/16	7 1/8
41/64			0.6406	5 3/16	7 1/8
21/32			0.6563	5 3/16	7 1/8
43/64			0.6719	5 5/8	7 5/8
11/16			0.6875	5 5/8	7 5/8

Fractional sizes : 1/64 to 5/16 in package of 10; 21/64 to 1/2 in packages of 5. 33/64 to 11/16 in package of 2.

Wire gauge sizes : All Sizes in Packages of 10

Letter sizes : A to N in package of 10, O to Z in package of 5

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

SCREW MACHINE LENGTH / FRACTIONAL SIZES / WIRE GAUGE SIZES / LETTER SIZES

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

List No.561 General Purpose



Fractional : Range 3/64" to 2"
Wire : Range #1 to #60
Letter : Range A to Z

HIGH SPEED STEEL Bright Finish



Manufactured with short overall and flute length.

List No.561P General Purpose



Fractional : Range 1/16" to 1/2"
Wire : Range #1 to #52

HIGH SPEED STEEL-TIN COATED



Manufactured with short overall and flute length with TIN coated.

List No.563 Aircraft NAS907-C



Fractional : Range 3/64" to 1/2"
Wire : Range #1 to #52
Letter : Range A to Z

HIGH SPEED STEEL Black Oxide



Standard NAS907 Type C. Manufactured with short overall and flute length.

List No.6563 Aircraft NAS907-C



Fractional : **Bright Finish** 3/64 to 7/64
Black Oxide 1/8 to 1/2
Wire : **Bright Finish** #32 to #52
Black Oxide #1 to #31
Letter : Range A to Z

HIGH SPEED STEEL COBALT



Standard NAS907 Type C. Manufactured with short overall and flute length.

Size			Decimal Equivalent	Flute Length	Overall Length	Shank Diameter
Fractional	Wire	Letter				
	#60		0.0400	1/2	1 3/8	#60
	#59		0.0410	1/2	1 3/8	#59
	#58		0.0420	1/2	1 3/8	#58
	#57		0.0430	1/2	1 3/8	#57
	#56		0.0465	1/2	1 3/8	#56
3/64			0.0469	1/2	1 3/8	3/64
	#55		0.0520	5/8	1 5/8	#55
	#54		0.0550	5/8	1 5/8	#54
	#53		0.0595	5/8	1 5/8	#53
1/16			0.0625	5/8	1 5/8	1/16
	#52		0.0635	11/16	1 11/16	#52
	#51		0.0670	11/16	1 11/16	#51
	#49		0.0730	11/16	1 11/16	#49
	#48		0.0760	11/16	1 11/16	#48
5/64			0.0781	11/16	1 11/16	5/64
	#47		0.0785	3/4	1 3/4	#47
	#46		0.0810	3/4	1 3/4	#46
	#45		0.0820	3/4	1 3/4	#45
	#44		0.0860	3/4	1 3/4	#44
	#43		0.0890	3/4	1 3/4	#43
	#42		0.0935	3/4	1 3/4	#42
3/32			0.0938	3/4	1 3/4	3/32
	#41		0.0960	13/16	1 13/16	#41
	#40		0.0980	13/16	1 13/16	#40
	#39		0.0995	13/16	1 13/16	#39
	#38		0.1015	13/16	1 13/16	#38
	#37		0.1040	13/16	1 13/16	#37
	#36		0.1065	13/16	1 13/16	#36
7/64			0.1094	13/16	1 13/16	7/64
	#35		0.1100	7/8	1 7/8	#35
	#34		0.1110	7/8	1 7/8	#34
	#33		0.1130	7/8	1 7/8	#33
	#32		0.1160	7/8	1 7/8	#32
	#31		0.1200	7/8	1 7/8	#31
1/8			0.1250	7/8	1 7/8	1/8
	#30		0.1285	15/16	1 15/16	#30
	#29		0.1360	15/16	1 15/16	#29
	#28		0.1405	15/16	1 15/16	#28
9/64			0.1406	15/16	1 15/16	9/64
	#27		0.1440	1	2 1/16	#27
	#26		0.1470	1	2 1/16	#26
	#25		0.1495	1	2 1/16	#25
	#24		0.1520	1	2 1/16	#24
	#23		0.1540	1	2 1/16	#23
5/32			0.1563	1	2 1/16	5/32
	#22		0.1570	1 1/16	2 1/8	#22
	#21		0.1590	1 1/16	2 1/8	#21
	#20		0.1610	1 1/16	2 1/8	#20
	#19		0.1660	1 1/16	2 1/8	#19
	#18		0.1695	1 1/16	2 1/8	#18
11/64			0.1719	1 1/16	2 1/8	11/64
	#17		0.1730	1 1/8	2 3/16	#17
	#16		0.1770	1 1/8	2 3/16	#16
	#15		0.1800	1 1/8	2 3/16	#15
	#14		0.1820	1 1/8	2 3/16	#14
	#13		0.1850	1 1/8	2 3/16	#13
3/16			0.1875	1 1/8	2 3/16	3/16
	#12		0.1890	1 3/16	2 1/4	#12

**SCREW MACHINE LENGTH /
List No.561, 561P, 563, 6563**

Size			Decimal Equivalent	Flute Length	Overall Length	Shank Diameter
Fractional	Wire	Letter				
	#11		0.1910	1 3/16	2 1/4	#11
	#10		0.1935	1 3/16	2 1/4	#10
	#9		0.1960	1 3/16	2 1/4	#9
	#8		0.1990	1 3/16	2 1/4	#8
	#7		0.2010	1 3/16	2 1/4	#7
13/64			0.2031	1 3/16	2 1/4	13/64
	#6		0.2040	1 1/4	2 3/8	#6
	#5		0.2055	1 1/4	2 3/8	#5
	#4		0.2090	1 1/4	2 3/8	#4
	#3		0.2130	1 1/4	2 3/8	#3
7/32			0.2188	1 1/4	2 3/8	7/32
	#2		0.2210	1 5/16	2 7/16	#2
	#1		0.2285	1 5/16	2 7/16	#1
		A	0.2340	1 5/16	2 7/16	A
15/64			0.2344	1 5/16	2 7/16	15/64
		B	0.2380	1 3/8	2 1/2	B
		C	0.2420	1 3/8	2 1/2	C
		D	0.2460	1 3/8	2 1/2	D
1/4			0.2500	1 3/8	2 1/2	1/4
		E	0.2500	1 3/8	2 1/2	E
		F	0.2570	1 7/16	2 5/8	F
		G	0.2610	1 7/16	2 5/8	G
17/64			0.2656	1 7/16	2 5/8	17/64
		H	0.2660	1 1/2	2 11/16	H
		I	0.2720	1 1/2	2 11/16	I
		J	0.2770	1 1/2	2 11/16	J
		K	0.2810	1 1/2	2 11/16	K
9/32			0.2813	1 1/2	2 11/16	9/32
		L	0.2900	1 9/16	2 3/4	L
		M	0.2950	1 9/16	2 3/4	M
19/64			0.2969	1 9/16	2 3/4	19/64
		N	0.3020	1 5/8	2 13/16	N
5/16			0.3125	1 5/8	2 13/16	5/16
		O	0.3160	1 11/16	2 15/16	O
		P	0.3230	1 11/16	2 15/16	P
21/64			0.3281	1 11/16	2 15/16	21/64
		Q	0.3320	1 11/16	3	Q
		R	0.3390	1 11/16	3	R
11/32			0.3438	1 11/16	3	11/32
		S	0.3480	1 3/4	3 1/16	S
		T	0.3580	1 3/4	3 1/16	T
23/64			0.3594	1 3/4	3 1/16	23/64
		U	0.3680	1 13/16	3 1/8	U
3/8			0.3750	1 13/16	3 1/8	3/8
		V	0.3770	1 7/8	3 1/4	V
		W	0.3860	1 7/8	3 1/4	W
25/64			0.3906	1 7/8	3 1/4	25/64
		X	0.3970	1 15/16	3 5/16	X
		Y	0.4040	1 15/16	3 5/16	Y
13/32			0.4063	1 5/16	3 5/16	13/32
		Z	0.4130	2	3 3/8	Z
27/64			0.4219	2	3 3/8	27/64
7/16			0.4375	2 1/16	3 7/16	7/16

Size			Decimal Equivalent	Flute Length	Overall Length	Shank Diameter
Fractional	Wire	Letter				
29/64			0.4531	2 1/8	3 9/16	29/64
15/32			0.4688	2 1/8	3 5/8	15/32
31/64			0.4844	2 3/16	3 11/16	31/64
1/2			0.5000	2 1/4	3 3/4	1/2
33/64			0.5156	2 3/8	3 7/8	33/64
17/32			0.5313	2 3/8	3 7/8	17/32
35/64			0.5469	2 1/2	4	35/64
9/16			0.5625	2 1/2	4	9/16
37/64			0.5781	2 5/8	4 1/8	37/64
19/32			0.5938	2 5/8	4 1/8	19/32
39/64			0.6094	2 3/4	4 1/4	39/64
5/8			0.6250	2 3/4	4 1/4	5/8
41/64			0.6406	2 7/8	4 1/2	41/64
21/32			0.6563	2 7/8	4 1/2	21/32
43/64			0.6719	2 7/8	4 5/8	43/64
11/16			0.6875	2 7/8	4 5/8	11/16
	#50		0.7000	11/16	1 11/16	#50
45/64			0.7031	3	4 3/4	45/64
23/32			0.7188	3	4 3/4	23/32
47/64			0.7344	3 1/8	5	47/64
3/4			0.7500	3 1/8	5	3/4
49/64			0.7656	3 1/4	5 1/8	49/64
25/32			0.7813	3 1/4	5 1/8	25/32
51/64			0.7969	3 3/8	5 1/4	51/64
13/16			0.8125	3 3/8	5 1/4	13/16
53/64			0.8281	3 1/2	5 3/8	53/64
27/32			0.8438	3 1/2	5 3/8	27/32
55/64			0.8594	3 1/2	5 1/2	55/64
7/8			0.8750	3 1/2	5 1/2	7/8
57/64			0.8906	3 5/8	5 5/8	57/64
29/32			0.9063	3 5/8	5 5/8	29/32
59/64			0.9219	3 3/4	5 3/4	59/64
15/16			0.9375	3 3/4	5 3/4	15/16
61/64			0.9531	3 7/8	5 7/8	61/64
31/32			0.9688	3 7/8	5 7/8	31/32
63/64			0.9844	4	6	63/64
1			1.0000	4	6	1
1 1/16			1.0625	4	6 1/4	1 1/16
1 1/8			1.1250	4	6 3/8	1 1/8
1 3/16			1.1875	4 1/4	6 5/8	1 3/16
1 1/4			1.2500	4 3/8	6 3/4	1 1/4
1 5/16			1.3125	4 3/8	7	1 5/16
1 3/8			1.3750	4 1/2	7 1/8	1 3/8
1 7/16			1.4375	4 3/4	7 3/8	1 7/16
1 1/2			1.5000	4 7/8	7 1/2	1 1/2
1 9/16			1.5625	4 7/8	7 3/4	1 9/16
1 5/8			1.6250	4 7/8	7 3/4	1 5/8
1 11/16			1.6875	5 1/8	8	1 11/16
1 3/4			1.7500	5 1/8	8	1 3/4
1 13/16			1.8125	5 3/8	8 1/4	1 13/16
1 7/8			1.8750	5 5/8	8 1/4	1 7/8
1 15/16			1.9375	5 5/8	8 1/2	1 15/16
2			2.0000	5 5/8	8 1/2	2

Fractional sizes : Sizes 3/64 to 5/16 in Package of 10; 21/64 to 1/2 in Package of 5

Wire gauge sizes : All sizes in package of 10

Letter sizes : A to N in package of 10; O to Z in package of 5

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

Technical
Data**List No.531** General Purpose

Range 1/64" to 1/2"

HIGH SPEED STEEL Black Oxide

Used in wide range of materials under normal conditions.
These drills are longer in length than jobbers drills.

DRILLS

List No.6531 General Purpose

Range 1/16" to 3/4"

HIGH SPEED STEEL COBALT Black Oxide

Used in Machining hard material, alloy steel, forgings and cast iron.

DRILLS
Cutting Condition**List No.545P** Parabolic Style

Range 1/16" to 1/2"

HIGH SPEED STEEL-TIN COATED

Used for deep hole drilling. Parabolic design gives maximum chip removal with no chip clogging. TiN coated.

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

STRAIGHT SHANK TAPER LENGTH / FRACTIONAL SIZES
List No.531, 6531, 545P

Size	Decimal Equivalent	Flute Length	Overall Length
1/64	0.0156	5/16	1 1/2
1/32	0.0313	3/4	2
3/64	0.0469	1 1/8	2 1/4
1/16	0.0625	1 3/4	3
5/64	0.0781	2	3 3/4
3/32	0.0938	2 1/4	4 1/4
7/64	0.1094	2 1/2	4 5/8
1/8	0.1250	2 3/4	5 1/8
9/64	0.1406	3	5 3/8
5/32	0.1563	3	5 3/8
11/64	0.1719	3 3/8	5 3/4
3/16	0.1875	3 3/8	5 3/4
13/64	0.2031	3 5/8	6
7/32	0.2188	3 5/8	6
15/64	0.2344	3 3/4	6 1/8
1/4	0.2500	3 3/4	6 1/8
17/64	0.2656	3 7/8	6 1/4
9/32	0.2813	3 7/8	6 1/4
19/64	0.2969	4	6 3/8
5/16	0.3125	4	6 3/8
21/64	0.3281	4 1/8	6 1/2
11/32	0.3438	4 1/8	6 1/2
23/64	0.3594	4 1/4	6 3/4
3/8	0.3750	4 1/4	6 3/4
25/64	0.3906	4 3/8	7
13/32	0.4063	4 3/8	7
27/64	0.4219	4 5/8	7 1/4
7/16	0.4375	4 5/8	7 1/4
29/64	0.4531	4 3/4	7 1/2
15/32	0.4688	4 3/4	7 1/2
31/64	0.4844	4 3/4	7 3/4
1/2	0.5000	4 3/4	7 3/4
33/64	0.5156	4 3/4	8
17/32	0.5313	4 3/4	8
35/64	0.5469	4 7/8	8 1/4
9/16	0.5625	4 7/8	8 1/4
37/64	0.5781	4 7/8	8 3/4
19/32	0.5938	4 7/8	8 3/4
39/64	0.6094	4 7/8	8 3/4
5/8	0.6250	4 7/8	8 3/4
41/64	0.6406	5 1/8	9
21/32	0.6563	5 1/8	9
43/64	0.6719	5 3/8	9 1/4
11/16	0.6875	5 3/8	9 1/4
45/64	0.7031	5 5/8	9 1/2
23/32	0.7188	5 5/8	9 1/2
47/64	0.7344	5 7/8	9 3/4
3/4	0.7500	5 7/8	9 3/4

Sizes to 1/64 to 5/16 in package of 10; 21/64 to 1/2 in package of 5

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

STRAIGHT SHANK DRILL-EXTRA LENGTH

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

List No.551



Range 1/8 to 1"
Overall Length 12" And 18"

HIGH SPEED STEEL Bright Finish



Used in general deep hole drilling.

Size	Decimal Equivalent	Overall Length	
		12"	18"
		Flute Length	Flute Length
1/8	0.1250	9	—
9/64	0.1406	9	—
5/32	0.1563	9	—
11/64	0.1719	9	—
3/16	0.1875	9	14
13/64	0.2031	9	14
7/32	0.2188	9	14
15/64	0.2344	9	14
1/4	0.2500	9	14
17/64	0.2656	9	14
9/32	0.2813	9	14
19/64	0.2969	9	14
5/16	0.3125	9	14
21/64	0.3281	9	14
11/32	0.3438	9	14
23/64	0.3594	9	14
3/8	0.3750	9	14
25/64	0.3906	9	14
13/32	0.4063	9	14
27/64	0.4219	9	14
7/16	0.4375	9	14

Size	Decimal Equivalent	Overall Length	
		12"	18"
		Flute Length	Flute Length
29/64	0.4531	9	14
15/32	0.4688	9	14
31/64	0.4844	9	14
1/2	0.5000	9	14
33/64	0.5156	9	14
17/32	0.5313	9	14
35/64	0.5469	9	14
9/16	0.5625	9	14
37/64	0.5781	9	14
19/32	0.5938	9	14
39/64	0.6094	9	14
5/8	0.6250	9	14
21/32	0.6563	9	14
11/16	0.6875	9	14
23/32	0.7188	9	14
3/4	0.7500	9	14
13/16	0.8125	9	14
7/8	0.8750	9	14
15/16	0.9375	9	14
1	1.0000	9	14

1 per box

List No.6551 Parabolic Tang Drive



Range 3/16 to 1/2
Overall Length 10"

HIGH SPEED STEEL COBALT Black Oxide



Used in deep hole drilling for tougher high tensile materials.

Size	Decimal Equivalent	Flute Length	Overall Length
3/16	0.1875	7	10
13/64	0.2031	7	10
7/32	0.2188	7	10
15/64	0.2344	7	10
1/4	0.2500	7	10
17/64	0.2656	7	10
9/32	0.2813	7	10
19/64	0.2969	7	10
5/16	0.3125	7	10
21/64	0.3281	7	10
11/32	0.3438	7	10

Size	Decimal Equivalent	Flute Length	Overall Length
23/64	0.3594	7	10
3/8	0.3750	7	10
25/64	0.3906	7	10
13/32	0.4063	7	10
27/64	0.4219	7	10
7/16	0.4375	7	10
29/64	0.4531	7	10
15/32	0.4688	7	10
31/64	0.4844	7	10
1/2	0.5000	7	10

1 per box

List No.581



Range 3/8 to 1 1/2

M35 COBALT Bright Finish



Used in heavy-duty applications. Delivers coolant to the point permit higher speeds and feeds and reduce high temperatures.

Size	Decimal Equivalent	Flute Length	Overall Length
3/8	0.3750	4 1/4	6 3/4
25/64	0.3906	4 3/8	7
13/32	0.4063	4 3/8	7
27/64	0.4219	4 5/8	7 1/4
7/16	0.4375	4 5/8	7 1/4
29/64	0.4531	4 7/8	7 1/2
15/32	0.4688	4 7/8	7 1/2
31/64	0.4844	5	7 3/4
1/2	0.5000	5	7 3/4
33/64	0.5156	5 1/4	8
17/32	0.5313	5 1/4	8
35/64	0.5469	5 3/8	8 1/4
9/16	0.5625	5 3/8	8 1/4
37/64	0.5781	5 5/8	8 1/2
19/32	0.5938	5 5/8	8 1/2
39/64	0.6094	5 3/4	8 3/4
5/8	0.6250	5 3/4	8 3/4
41/64	0.6406	5 7/8	9
21/32	0.6563	5 7/8	9
43/64	0.6719	6	9 1/4
11/16	0.6875	6	9 1/4
45/64	0.7031	6 3/16	9 1/2
23/32	0.7188	6 3/16	9 1/2
47/64	0.7344	6 3/8	9 3/4
3/4	0.7500	6 3/8	9 3/4
49/64	0.7656	6 1/2	9 7/8
25/32	0.7813	6 1/2	9 7/8
51/64	0.7969	6 5/8	10

Size	Decimal Equivalent	Flute Length	Overall Length
13/16	0.8125	6 5/8	10
53/64	0.8281	6 3/4	10 1/4
27/32	0.8438	6 3/4	10 1/4
55/64	0.8594	7	10 1/2
7/8	0.8750	7	10 1/2
57/64	0.8906	7	10 5/8
29/32	0.9063	7	10 5/8
59/64	0.9219	7	10 3/4
15/16	0.9375	7	10 3/4
61/64	0.9531	7 1/8	10 7/8
31/32	0.9688	7 1/8	10 7/8
63/64	0.9844	7 3/16	11
1	1.0000	7 3/16	11
1 1/64	1.0156	7 5/16	11 1/8
1 1/32	1.0313	7 5/16	11 1/8
1 3/64	1.0469	7 3/8	11 1/4
1 1/16	1.0625	7 3/8	11 1/4
1 3/32	1.0938	7 5/8	11 1/2
1 1/8	1.1250	7 7/8	11 3/4
1 5/32	1.1563	8	11 7/8
1 3/16	1.1875	8 1/8	12
1 7/32	1.2188	8 1/8	12 1/8
1 1/4	1.2500	8 1/2	12 1/2
1 5/16	1.3125	9 1/4	14 1/4
1 3/8	1.3750	9 1/2	14 1/2
1 7/16	1.4375	9 5/8	14 3/4
1 1/2	1.5000	9 7/8	15

1 per box

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

TAPER SHANK DRILLS / REGULAR SHANKS / FRACTIONAL

List No.601 General Purpose

HIGH SPEED STEEL Black Oxide



Range 1/8" to 3 1/2"



Used in cast iron, steel, forgings, and other materials.

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

	Size	Decimal Equivalent	Flute Length	Overall Length	Taper Shank
*	1/8	0.1250	1 7/8	5 1/8	1
*	9/64	0.1406	2 1/8	5 3/8	1
*	5/32	0.1563	2 1/8	5 3/8	1
*	11/64	0.1719	2 1/2	5 3/4	1
*	3/16	0.1875	2 1/2	5 3/4	1
*	13/64	0.2031	2 3/4	6	1
*	7/32	0.2188	2 3/4	6	1
*	15/64	0.2344	2 7/8	6 1/8	1
*	1/4	0.2500	2 7/8	6 1/8	1
*	17/64	0.2656	3	6 1/4	1
	9/32	0.2813	3	6 1/4	1
	19/64	0.2969	3 1/8	6 3/8	1
	5/16	0.3125	3 1/8	6 3/8	1
	21/64	0.3281	3 1/4	6 1/2	1
	11/32	0.3438	3 1/4	6 1/2	1
	23/64	0.3594	3 1/2	6 3/4	1
	3/8	0.3750	3 1/2	6 3/4	1
	25/64	0.3906	3 5/8	7	1
	13/32	0.4063	3 5/8	7	1
	27/64	0.4219	3 7/8	7 1/4	1
	7/16	0.4375	3 7/8	7 1/4	1
	29/64	0.4531	4 1/8	7 1/2	1
	15/32	0.4688	4 1/8	7 1/2	1
	31/64	0.4844	4 3/8	8 1/4	2
	1/2	0.5000	4 3/8	8 1/4	2
	33/64	0.5156	4 5/8	8 1/2	2
	17/32	0.5313	4 5/8	8 1/2	2
	35/64	0.5469	4 7/8	8 3/4	2
	9/16	0.5625	4 7/8	8 3/4	2
	37/64	0.5781	4 7/8	8 3/4	2
	19/32	0.5938	4 7/8	8 3/4	2
	39/64	0.6094	4 7/8	8 3/4	2
	5/8	0.6250	4 7/8	8 3/4	2
	41/64	0.6406	5 1/8	9	2
	21/32	0.6563	5 1/8	9	2
	43/64	0.6719	5 3/8	9 1/4	2
	11/16	0.6875	5 3/8	9 1/4	2
	45/64	0.7031	5 5/8	9 1/2	2
	23/32	0.7188	5 5/8	9 1/2	2
	47/64	0.7344	5 7/8	9 3/4	2
	3/4	0.7500	5 7/8	9 3/4	2
	49/64	0.7656	6	9 7/8	2
	25/32	0.7813	6	9 7/8	2
	51/64	0.7969	6 1/8	10 3/4	3
	13/16	0.8125	6 1/8	10 3/4	3
	53/64	0.8281	6 1/8	10 3/4	3
	27/32	0.8438	6 1/8	10 3/4	3
	55/64	0.8594	6 1/8	10 3/4	3

	Size	Decimal Equivalent	Flute Length	Overall Length	Taper Shank
	7/8	0.8750	6 1/8	10 3/4	3
	57/64	0.8906	6 1/8	10 3/4	3
	29/32	0.9063	6 1/8	10 3/4	3
	59/64	0.9219	6 1/8	10 3/4	3
	15/16	0.9375	6 1/8	10 3/4	3
	61/64	0.9531	6 3/8	11	3
	31/32	0.9688	6 3/8	11	3
	63/64	0.9844	6 3/8	11	3
	1	1.0000	6 3/8	11	3
	1 1/64	1.0156	6 1/2	11 1/8	3
	1 1/32	1.0313	6 1/2	11 1/8	3
	1 3/64	1.0469	6 5/8	11 1/4	3
	1 1/16	1.0625	6 5/8	11 1/4	3
	1 1/16	1.0625	6 5/8	11 1/4	4
	1 5/64	1.0781	6 7/8	12 1/2	4
	1 3/32	1.0938	6 7/8	12 1/2	4
	1 7/64	1.1094	7 1/8	12 3/4	4
	1 1/8	1.1250	7 1/8	12 3/4	4
	1 9/64	1.1406	7 1/4	12 7/8	4
	1 5/32	1.1563	7 1/4	12 7/8	4
	1 11/64	1.1719	7 3/8	13	4
	1 3/16	1.1875	7 3/8	13	4
	1 13/64	1.2031	7 1/2	13 1/8	4
	1 7/32	1.2188	7 1/2	13 1/8	4
	1 15/64	1.2344	7 7/8	13 1/2	4
	1 1/4	1.2500	7 7/8	13 1/2	4
	1 17/64	1.2656	8 1/2	14 1/8	4
	1 9/32	1.2813	8 1/2	14 1/8	4
	1 19/64	1.2969	8 5/8	14 1/4	4
	1 5/16	1.3125	8 5/8	14 1/4	4
	1 21/64	1.3281	8 3/4	14 3/8	4
	1 11/32	1.3438	8 3/4	14 3/8	4
	1 23/64	1.3594	8 7/8	14 1/2	4
	1 3/8	1.3750	8 7/8	14 1/2	4
	1 25/64	1.3906	9	14 5/8	4
	1 13/32	1.4063	9	14 5/8	4
	1 27/64	1.4219	9 1/8	14 3/4	4
	1 7/16	1.4375	9 1/8	14 3/4	4
	1 29/64	1.4531	9 1/4	14 7/8	4
	1 15/32	1.4688	9 1/4	14 7/8	4
	1 31/64	1.4844	9 3/8	15	4
	1 1/2	1.5000	9 3/8	15	4
	1 33/64	1.5156	9 3/8	16 3/8	5
	1 17/32	1.5313	9 3/8	16 3/8	5
	1 35/64	1.5469	9 5/8	16 5/8	5
	1 9/16	1.5625	9 5/8	16 5/8	5
	1 37/64	1.5781	9 7/8	16 5/8	5
	1 19/32	1.5938	9 7/8	16 7/8	5

	Size	Decimal Equivalent	Flute Length	Overall Length	Taper Shank
	1 39/64	1.6094	10	17	5
	1 5/8	1.6250	10	17	5
	1 41/64	1.6406	10 1/8	17 1/8	5
	1 21/32	1.6563	10 1/8	17 1/8	5
	1 43/64	1.6719	10 1/8	17 1/8	5
	1 11/16	1.6875	10 1/8	17 1/8	5
	1 45/64	1.7031	10 1/8	17 1/8	5
	1 23/32	1.7188	10 1/8	17 1/8	5
	1 47/64	1.7344	10 1/8	17 1/8	5
	1 3/4	1.7500	10 1/8	17 1/8	5
	1 25/32	1.7813	10 1/8	17 1/8	5
	1 13/16	1.8125	10 1/8	17 1/8	5
	1 27/32	1.8438	10 1/8	17 1/8	5
	1 7/8	1.8750	10 3/8	17 3/8	5
	1 29/32	1.9063	10 3/8	17 3/8	5
	1 15/16	1.9375	10 3/8	17 3/8	5
	1 31/32	1.9688	10 3/8	17 3/8	5
	2	2.0000	10 3/8	17 3/8	5
	2 1/32	2.0313	10 3/8	17 3/8	5
	2 1/16	2.0625	10 1/4	17 3/8	5
	2 3/32	2.0938	10 1/4	17 3/8	5
	2 1/8	2.1250	10 1/4	17 3/8	5
	2 5/32	2.1563	10 1/4	17 3/8	5
	2 3/16	2.1875	10 1/4	17 3/8	5
	2 7/32	2.2188	10 1/8	17 3/8	5
	2 1/4	2.2500	10 1/8	17 3/8	5
	2 5/16	2.3125	10 1/8	17 3/8	5
	2 3/8	2.3750	10 1/8	17 3/8	5
	2 7/16	2.4375	11 1/4	18 3/4	5
	2 1/2	2.5000	11 1/4	18 3/4	5
	2 9/16	2.5625	11 7/8	19 1/2	5
	2 5/8	2.6250	11 7/8	19 1/2	5
	2 11/16	2.6875	12 3/4	20 3/8	5
	2 3/4	2.7500	12 3/4	20 3/8	5
	2 13/16	2.8125	13 3/8	21 1/8	5
	2 7/8	2.8750	13 3/8	21 1/8	5
	2 15/16	2.9375	14	21 3/4	5
	3	3.0000	14	21 3/4	5
	3 1/16	3.0625	14 5/8	24 1/2	6
	3 1/8	3.1250	14 5/8	24 1/2	6
	3 3/16	3.1875	14 5/8	24 1/2	6
	3 1/4	3.2500	15 1/2	25 1/2	6
	3 5/16	3.3125	15 1/2	25 1/2	6
	3 3/8	3.3750	15 1/2	25 1/2	6
	3 7/16	3.4375	15 1/2	25 1/2	6
	3 1/2	3.5000	16 3/8	26 1/2	6

* item will be discontinued, after stock has depleted.

1 per box

List No.651 Taper Shank Drills

HIGH SPEED STEEL **Bright Finish**



Range 1/4 to 2 1/2
Overall Length 18" and 24"

Used for deep hole drilling with Taper Shank.

Size	Decimal Equivalent	Overall Length		Taper Shank
		18"	24"	
		Flute Length	Flute Length	
1/4	0.2500	14	—	1
17/64	0.2656	14	—	1
9/32	0.2813	14	—	1
19/64	0.2969	14	—	1
5/16	0.3125	14	20	1
21/64	0.3281	14	—	1
11/32	0.3438	14	—	1
23/64	0.3594	14	—	1
3/8	0.3750	14	20	1
25/64	0.3906	14	—	1
13/32	0.4063	14	—	1
27/64	0.4219	14	—	1
7/16	0.4375	14	20	1
29/64	0.4531	14	—	1
15/32	0.4688	14	—	1
31/64	0.4844	14	—	2
1/2	0.5000	14	20	2
33/64	0.5156	14	20	2
17/32	0.5313	14	20	2
35/64	0.5469	14	—	2
9/16	0.5625	14	20	2
37/64	0.5781	14	20	2
19/32	0.5938	14	20	2
39/64	0.6094	14	—	2
5/8	0.6250	14	20	2
41/64	0.6406	14	—	2
21/32	0.6563	14	20	2
43/64	0.6719	14	—	2
11/16	0.6875	14	20	2
45/64	0.7031	14	—	2
23/32	0.7188	14	20	2
47/64	0.7344	14	—	2
3/4	0.7500	14	20	2
49/64	0.7656	14	—	2
25/32	0.7813	14	20	2
51/64	0.7969	13	—	3
13/16	0.8125	13	19	3
53/64	0.8281	13	—	3

Size	Decimal Equivalent	Overall Length		Taper Shank
		18"	24"	
		Flute Length	Flute Length	
27/32	0.8438	13	19	3
55/64	0.8594	13	—	3
7/8	0.8750	13	19	3
57/64	0.8906	13	—	3
29/32	0.9063	13	19	3
59/64	0.9219	13	—	3
15/16	0.9375	13	19	3
61/64	0.9531	13	—	3
31/32	0.9688	13	19	3
63/64	0.9844	13	—	3
1	1.0000	13	19	3
1 1/32	1.0313	13	—	3
1 1/16	1.0625	13	19	3
1 3/32	1.0938	12	—	4
1 1/8	1.1250	12	19	4
1 5/32	1.1563	12	18	4
1 3/16	1.1875	12	18	4
1 7/32	1.2188	12	18	4
1 1/4	1.2500	12	18	4
1 9/32	1.2813	12	—	4
1 5/16	1.3125	12	18	4
1 11/32	1.3438	12	—	4
1 3/8	1.3750	12	18	4
1 13/32	1.4063	12	—	4
1 7/16	1.4375	12	18	4
1 1/2	1.5000	12	18	4
1 9/16	1.5625	10 1/2	17	5
1 5/8	1.6250	10 1/2	17	5
1 11/16	1.6875	10 1/2	17	5
1 3/4	1.7500	10 1/2	17	5
1 7/8	1.8750	10 1/2	17	5
2	2.0000	10 1/2	17	5
2 1/16	2.0625	—	17	5
2 1/8	2.1250	—	17	5
2 1/4	2.2500	—	17	5
2 3/8	2.3750	—	17	5
2 1/2	2.5000	—	17	5

1 per box

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

List No.683



Range 3/8 to 1 1/2

M35 COBALT Bright Finish



Used in heavy-duty applications. Delivers coolant to the point permit higher speeds and feeds and reduce high temperatures.

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Taper
3/8	0.3750	4 1/4	8 1/8	2
25/64	0.3906	4 3/8	8 1/4	2
13/32	0.4063	4 3/8	8 1/4	2
27/64	0.4219	4 5/8	8 1/2	2
7/16	0.4375	4 5/8	8 1/2	2
29/64	0.4531	4 7/8	8 3/4	2
15/32	0.4688	4 7/8	8 3/4	2
31/64	0.4844	5	9 5/8	3
1/2	0.5000	5	9 5/8	3
33/64	0.5156	5 1/8	9 3/4	3
17/32	0.5313	5 1/8	9 3/4	3
35/64	0.5469	5 1/4	9 7/8	3
9/16	0.5625	5 1/4	9 7/8	3
37/64	0.5781	5 1/2	10 1/8	3
19/32	0.5938	5 1/2	10 1/8	3
39/64	0.6094	5 5/8	10 1/4	3
5/8	0.6250	5 5/8	10 1/4	3
41/64	0.6406	5 3/4	10 3/8	3
21/32	0.6563	5 3/4	10 3/8	3
43/64	0.6719	5 7/8	10 1/2	3
11/16	0.6875	5 7/8	10 1/2	3
45/64	0.7031	6 1/8	10 3/4	3
23/32	0.7188	6 1/8	10 3/4	3
47/64	0.7344	6 1/4	10 7/8	3
3/4	0.7500	6 1/4	10 7/8	3

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Taper
49/64	0.7656	6 3/8	11	3
25/32	0.7813	6 3/8	11	3
51/64	0.7969	6 1/2	11 1/8	3
13/16	0.8125	6 1/2	11 1/8	3
53/64	0.8281	6 5/8	11 1/4	3
27/32	0.8438	6 5/8	11 1/4	3
55/64	0.8594	6 7/8	11 1/2	3
7/8	0.8750	6 7/8	11 1/2	3
57/64	0.8906	6 7/8	11 1/2	3
29/32	0.9063	6 7/8	11 1/2	3
59/64	0.9219	6 7/8	11 1/2	3
15/16	0.9375	6 7/8	11 1/2	3
61/64	0.9531	7	11 5/8	3
31/32	0.9688	7	11 5/8	3
63/64	0.9844	7 1/8	11 3/4	3
1	1.0000	7 1/8	11 3/4	3
1 1/16	1.0625	7 1/4	12 7/8	4
1 1/8	1.1250	7 3/4	13 3/8	4
1 3/16	1.1875	8	13 5/8	4
1 1/4	1.2500	8 1/4	13 7/8	4
1 5/16	1.3125	9 1/8	14 3/4	4
1 3/8	1.3750	9 3/8	15	4
1 7/16	1.4375	9 1/2	15 1/8	4
1 1/2	1.5000	9 3/4	15 3/8	4

1 per box

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

List No.575



Shank Diameter 1/2" by 2 1/2" long
Range 1/2" to 1 1/2"

HIGH SPEED STEEL Bright Finish



Used for general purpose drilling when 1/2" shank is required.
Used in drill presses and portable electric drills.

Size	Decimal Equivalent	Flute Length	Overall Length
1/2	.5000	3 1/8	6
33/64	.5156	3 1/8	6
17/32	.5312	3 1/8	6
35/64	.5469	3 1/8	6
9/16	.5625	3 1/8	6
37/64	.5781	3 1/8	6
19/32	.5938	3 1/8	6
39/64	.6094	3 1/8	6
5/8	.6250	3 1/8	6
41/64	.6406	3 1/8	6
21/32	.6562	3 1/8	6
43/64	.6719	3 1/8	6
11/16	.6875	3 1/8	6
45/64	.7031	3 1/8	6
23/32	.7187	3 1/8	6
47/64	.7344	3 1/8	6
3/4	.7500	3 1/8	6
49/64	.7656	3	6
25/32	.7812	3	6
51/64	.7969	3	6
13/16	.8125	3	6
53/64	.8281	3	6
27/32	.8438	3	6
55/64	.8594	3	6
7/8	.8750	6	6

Size	Decimal Equivalent	Flute Length	Overall Length
57/64	.8906	3	6
29/32	.9062	3	6
59/64	.9219	3	6
15/16	.9375	3	6
61/64	.9531	3	6
31/32	.9687	3	6
63/64	.9844	3	6
1	1.0000	3	6
1 1/32	1.0312	3	6
1 1/16	1.0625	3	6
1 3/32	1.0938	3	6
1 1/8	1.1250	3	6
1 5/32	1.1562	3	6
1 3/16	1.1875	3	6
1 7/32	1.2188	3	6
1 1/4	1.2500	3	6
1 9/32	1.2812	2 3/4	6
1 5/16	1.3125	2 3/4	6
1 11/32	1.3438	2 3/4	6
1 3/8	1.3750	2 3/4	6
1 13/32	1.4062	2 3/4	6
1 7/16	1.4375	2 3/4	6
1 15/32	1.4688	2 3/4	6
1 1/2	1.5000	2 3/4	6

1 per box

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

List No.599 General Purpose

Black Oxide or **Bright Finish***
*When ordering please specify



HIGH SPEED DRILLS SETS (L501, L501A)	SET NO.
Fractional Sizes	
1/16" To 1/4" By 64ths	S13
1/16" To 1/2" By 32nds	S15
1/16" To 3/8" By 64ths	S21
1/16" To 1/2" By 64ths	S29
Wire Gauge Sizes	
No.1 To No.60	S60
No.61 To No. 80	S20
Letter Sizes	
A To Z	S26
Combination Sizes	
S29, S60, S26	S115
COBALT DRILL SETS (L6501)	SET NO.
Fractional Sizes	
1/16" To 1/2" By 64ths	C29

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

SG-ESS Drills List No. 7572P, 7573P

Workpiece Material			Structural Steels, Carbon Steels		Alloy Steels		Mold Steels Stainless Steels 300-400 series		Nickel Alloys, Titanium Alloys		Cast Irons		Aluminum Alloys, Copper Alloys, Nonferrous Alloys	
Speed (SFM)			115 - 135 SFM		95 - 105 SFM		40 - 50 SFM		20 SFM		130 - 150 SFM		200 - 230 SFM	
Drill Diameter			RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
Fractional	Metric mm	Decimal												
—	2	0.0787	6,000	0.003	4,800	0.002	2,100	0.002	950	0.001	6,800	0.003	10,500	0.003
3/32	2.381	0.0938	5,000	0.003	4,000	0.003	1,800	0.003	800	0.001	5,700	0.004	8,700	0.004
—	3	0.1181	4,000	0.004	3,200	0.004	1,500	0.004	650	0.001	4,500	0.005	7,000	0.005
1/8	3.175	0.1250	3,800	0.005	3,000	0.004	1,400	0.004	600	0.002	4,250	0.006	6,500	0.006
5/32	3.969	0.1563	3,000	0.006	2,400	0.005	1,100	0.004	500	0.002	3,400	0.007	5,200	0.007
3/16	4.763	0.1875	2,500	0.007	2,000	0.005	900	0.004	400	0.002	2,850	0.008	4,300	0.008
—	5	0.1969	2,500	0.007	1,900	0.006	850	0.004	350	0.002	2,700	0.008	4,100	0.008
1/4	6.35	0.2500	1,900	0.008	1,500	0.007	700	0.005	300	0.003	2,100	0.010	3,200	0.009
5/16	7.938	0.3125	1,500	0.009	1,200	0.008	550	0.007	250	0.003	1,750	0.012	2,600	0.011
—	8	0.3150	1,500	0.009	1,200	0.008	550	0.007	250	0.003	1,700	0.012	2,600	0.012
3/8	9.525	0.3750	1,250	0.010	1,000	0.009	450	0.008	200	0.004	1,450	0.012	2,200	0.013
—	10	0.3937	1,200	0.010	950	0.009	450	0.008	200	0.004	1,400	0.013	2,100	0.013
—	12	0.4724	1,000	0.011	800	0.010	350	0.009	150	0.005	1,100	0.014	1,700	0.015
1/2	12.7	0.5000	950	0.011	750	0.010	350	0.009	150	0.005	1,100	0.015	1,650	0.015
—	16	0.6299	750	0.014	600	0.012	250	0.011	120	0.007	850	0.017	1,300	0.017
—	20	0.7874	600	0.016	450	0.014	200	0.012	100	0.008	680	0.020	1,050	0.020
—	25	0.9843	450	0.019	350	0.015	150	0.014	70	0.010	550	0.023	850	0.023
—	32	1.2598	350	0.018	300	0.015	150	0.016	50	0.014	450	0.022	650	0.022

- 1) The above values apply when coolant is used in vertical machine & horizontal machine. When drilling in stainless steel and hard to cut material using pecking.
- 2) Adjust drilling condition when unusual vibration or different sound occurs.
- 3) Recommended feeds and speeds are starting points only. Actual performance will be determined by specific material, the condition of equipment being used and coolant.

Formulas: $RPM = \frac{SFM \times 3.82}{\text{Drill dia.}}$, Feed Rate (in/min) = RPM x IPR

SG-ES Drills List No. 7570P, 7571P

Workpiece Material			Structural Steels, Carbon Steels		Alloy Steels		Die Steels Steels(35-45HRc) 400 Series Stainless Steel		Cast Irons		Aluminum Alloys, Copper Alloys, Nonferrous Alloys	
Speed (SFM)			115 - 135 SFM		95 - 105 SFM		40 - 50 SFM		130 - 150 SFM		200 - 230 SFM	
Drill Diameter			RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
Fractional	Metric mm	Decimal										
—	2	0.0787	6,000	0.003	4,800	0.002	2,200	0.002	6,800	0.003	10,400	0.003
3/32	2.381	0.0938	5,100	0.003	4,000	0.003	1,800	0.003	5,700	0.004	8,700	0.004
—	3	0.1181	4,100	0.004	3,200	0.004	1,450	0.004	4,500	0.005	6,900	0.005
1/8	3.175	0.1250	3,800	0.005	3,100	0.004	1,375	0.004	4,300	0.006	6,570	0.006
5/32	3.969	0.1563	3,100	0.006	2,450	0.005	1,100	0.004	3,450	0.007	5,300	0.007
3/16	4.763	0.1875	2,550	0.007	2,000	0.005	900	0.004	2,900	0.008	4,400	0.008
—	5	0.1969	2,400	0.007	1,900	0.006	870	0.004	2,700	0.008	4,200	0.008
1/4	6.35	0.2500	1,900	0.008	1,500	0.007	700	0.005	2,100	0.010	3,300	0.009
5/16	7.938	0.3125	1,500	0.009	1,200	0.008	550	0.007	1,750	0.012	2,700	0.011
—	8	0.3150	1,500	0.009	1,200	0.008	550	0.007	1,700	0.012	2,600	0.012
3/8	9.525	0.3750	1,300	0.010	1,000	0.009	500	0.008	1,500	0.012	2,200	0.013
—	10	0.3937	1,200	0.010	950	0.009	450	0.008	1,400	0.013	2,100	0.013
—	12	0.4724	1,000	0.011	800	0.010	400	0.009	1,100	0.014	1,750	0.015
1/2	12.7	0.5000	950	0.011	750	0.010	350	0.009	1,050	0.015	1,650	0.015
—	16	0.6299	750	0.014	600	0.012	300	0.011	850	0.017	1,300	0.017
—	20	0.7874	600	0.016	500	0.014	250	0.012	700	0.020	1,050	0.020
—	25	0.9843	500	0.019	400	0.015	200	0.014	550	0.023	850	0.023
—	32	1.2598	400	0.018	300	0.015	150	0.016	450	0.022	650	0.022

- 1) SG-ES is not recommended for 300-series Stainless Steels.
- 2) SG-ES is suitable for drilling into 400-series Stainless Steels.
- 3) Pilot hole required for deep hole drilling applications. It is recommended to use same diameter pilot drill. The depth of cut for pilot hole is 1 to 2 times drill diameter.
- 4) Use pecking in hard to cut materials.
- 5) Recommended feeds and speeds are starting points only. Actual performance will be determined by specific material, the condition of equipment being used and coolant.

Formulas: $RPM = \frac{SFM \times 3.82}{\text{Drill dia.}}$, Feed Rate (in/min) = RPM x IPR

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

SG Drills with Oil Hole List No. 7596P, 7591P

Workpiece Material			Structural Steels, Carbon Steels	Alloy Steels	Die Steels Hardened Steels (35-45HRc)		Stainless Steels		Cast Irons		Aluminum Alloys, Copper Alloys, Nonferrous Alloys			
Speed (SFM)					120 - 130 SFM		105 - 110 SFM		60 - 70 SFM		130 - 150 SFM		200 - 230 SFM	
Drill Diameter			RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
Fractional	Metric mm	Decimal												
—	5	0.1969	2,400	0.007	1,900	0.006	850	0.005	1,200	0.005	2,700	0.009	4,100	0.009
1/4	6.35	0.2500	1,900	0.008	1,500	0.008	650	0.006	1,000	0.006	2,100	0.011	3,300	0.011
5/16	7.938	0.3125	1,500	0.009	1,250	0.008	550	0.007	800	0.007	1,700	0.013	2,650	0.013
—	8	0.3150	1,500	0.009	1,200	0.009	550	0.009	750	0.008	1,700	0.014	2,600	0.014
3/8	9.525	0.3750	1,250	0.010	1,000	0.010	500	0.009	700	0.009	1,500	0.014	2,200	0.014
—	10	0.3937	1,200	0.010	950	0.011	450	0.010	650	0.010	1,400	0.016	2,000	0.016
—	12	0.4724	1,000	0.011	800	0.011	400	0.010	550	0.010	1,200	0.016	1,700	0.016
1/2	12.7	0.5000	950	0.011	750	0.013	350	0.012	500	0.013	1,100	0.019	1,600	0.019
—	16	0.6299	750	0.014	600	0.014	250	0.014	400	0.015	850	0.021	1,300	0.021
—	20	0.7874	600	0.016	450	0.015	200	0.014	300	0.015	650	0.022	1,000	0.021

- 1) The above values apply when coolant is used in vertical machine & horizontal machine. When drilling in stainless steel and hard to cut material using pecking.
- 2) Adjust drilling condition when unusual vibration or different sound occurs.
- 3) Recommended feeds and speeds are starting points only. Actual performance will be determined by specific material, the condition of equipment being used and coolant.

Formulas: $RPM = \frac{SFM \times 3.82}{\text{Drill dia.}}$, Feed Rate (in/min) = RPM x IPR

UG-Power Drills List No. 6528P, 6517U

Workpiece Material			Structural Steels, Carbon Steels	Alloy Steels	Die Steels Hardened Steels (-40HRc)		Cast Irons		Stainless Steels 300 - 400 Series			
Speed (SFM)					75 - 100 SFM		60 - 80 SFM		45 - 60 SFM		90 - 120 SFM	
Drill Diameter			RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
Fractional	Metric mm	Decimal										
—	1	0.0394	8,200	0.001	6,800	0.001	4,850	0.001	9,700	0.002	2,900	0.0006
3/64	1.191	0.0469	6,900	0.002	5,700	0.001	4,100	0.001	8,100	0.002	2,400	0.0008
—	2	0.0787	4,100	0.003	3,400	0.002	2,500	0.002	4,800	0.003	1,400	0.0015
3/32	2.381	0.0938	3,400	0.003	2,800	0.003	2,000	0.003	4,000	0.004	1,200	0.0017
—	3	0.1181	2,700	0.004	2,300	0.004	1,600	0.004	3,200	0.005	950	0.002
1/8	3.175	0.1250	2,500	0.005	2,100	0.004	1,500	0.004	3,000	0.006	900	0.002
5/32	3.969	0.1563	2,000	0.006	1,700	0.005	1,200	0.004	2,500	0.007	700	0.003
3/16	4.763	0.1875	1,700	0.007	1,400	0.005	1,000	0.004	2,000	0.008	600	0.003
—	5	0.1969	1,650	0.007	1,300	0.006	950	0.004	1,900	0.008	550	0.004
1/4	6.35	0.2500	1,300	0.008	1,000	0.007	750	0.005	1,500	0.010	450	0.004
5/16	7.938	0.3125	1,000	0.009	900	0.008	600	0.007	1,300	0.012	400	0.005
—	8	0.3150	1,000	0.009	850	0.008	600	0.007	1,200	0.012	400	0.005
3/8	9.525	0.3750	900	0.010	750	0.009	500	0.008	1,100	0.012	350	0.006
—	10	0.3937	850	0.010	700	0.009	450	0.008	1,000	0.013	350	0.006
13/32	10.319	0.4063	800	0.015	650	0.012	450	0.008	950	0.016	330	0.006
7/16	11.113	0.4375	750	0.015	600	0.013	400	0.009	900	0.017	300	0.007
—	12	0.4724	700	0.011	550	0.010	400	0.009	850	0.014	280	0.007
1/2	12.7	0.5000	650	0.011	550	0.010	380	0.009	800	0.015	280	0.007
—	13	0.5118	600	0.016	500	0.014	350	0.010	750	0.017	250	0.008

- 1) Pilot Hole is required. It is recommended to use same diameter or up to 0.1mm larger than diameter of the long drill. The depth of cut of the pilot hole is 1 to 2 times diameter of the drill diameter.
- 2) Use pecking in hard to cut materials like Stainless Steel & hardened Steels.
- 3) Recommended feeds and speeds are starting points only. Actual performance will be determined by specific material, the condition of equipment being used and coolant.

Formulas: $RPM = \frac{SFM \times 3.82}{\text{Drill dia.}}$, Feed Rate (in/min) = RPM x IPR

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

STANDARD DRILLING CONDITION

AG-SUS Short Drills List No. 6596P
AG-SUS Regular Drills List No. 6594P, 6595P

Workpiece Material			Austenitic Stainless Steels 304, 316		Austenitic Stainless Steels 304N		Martensitic Stainless Steels 420, 440		Ferritic Stainless Steels 405, 430		Low Carbon Steels	
Speed (SFM)			40 - 50 SFM		30 - 40 SFM		50 - 60 SFM		50 - 65 SFM		100 - 115 SFM	
Drill Diameter			40 - 50 SFM		30 - 40 SFM		50 - 60 SFM		50 - 65 SFM		100 - 115 SFM	
Fractional	Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
—	1	0.0394	4,300	0.001	3,300	0.001	5,300	0.001	5,300	0.001	10,600	0.001
—	2	0.0787	2,100	0.003	1,700	0.002	2,650	0.002	2,650	0.001	5,300	0.003
3/32	2.381	0.0938	1,800	0.003	1,400	0.003	2,240	0.003	2,240	0.001	4,450	0.004
—	3	0.1181	1,400	0.004	1,100	0.004	1,770	0.004	1,750	0.001	3,500	0.005
1/8	3.175	0.1250	1,300	0.005	1,000	0.004	1,680	0.004	1,650	0.002	3,300	0.006
5/32	3.969	0.1563	1,100	0.006	850	0.005	1,340	0.004	1,340	0.002	2,650	0.007
3/16	4.763	0.1875	900	0.007	700	0.005	1,120	0.004	1,120	0.002	2,250	0.008
—	5	0.1969	850	0.007	670	0.006	1,050	0.004	1,060	0.002	2,100	0.008
1/4	6.35	0.2500	650	0.008	530	0.007	840	0.005	840	0.003	1,680	0.010
5/16	7.938	0.3125	550	0.009	420	0.008	670	0.007	650	0.003	1,350	0.012
—	8	0.3150	550	0.009	400	0.008	650	0.007	650	0.003	1,300	0.012
3/8	9.525	0.3750	450	0.010	350	0.009	560	0.008	560	0.004	1,100	0.012
—	10	0.3937	430	0.010	340	0.009	530	0.008	500	0.004	1,000	0.013
—	12	0.4724	360	0.011	280	0.010	440	0.009	450	0.005	850	0.014
1/2	12.7	0.5000	340	0.011	260	0.010	420	0.009	420	0.005	800	0.015
—	16	0.6299	270	0.014	210	0.012	330	0.011	330	0.007	650	0.017
3/4	19.05	0.7500	220	0.016	200	0.015	280	0.016	280	0.016	550	0.015
—	20	0.7874	210	0.016	170	0.014	260	0.012	250	0.008	500	0.020

- 1) The above values apply when coolant is used in vertical machine & horizontal machine.
- 2) Adjust drilling condition when unusual vibration or different sound occurs.
- 3) Recommended feeds and speeds are starting points only. Actual performance will be determined by specific material, the condition of equipment being used and coolant.

Formulas: $RPM = \frac{SFM \times 3.82}{\text{Drill dia.}}$, Feed Rate (in/min) = RPM x IPR

AG-Power Long Drills List No. 6540P, 6541P

Workpiece Material			Structural Steels, Carbon Steels		Alloy Steels		Hardened Steels, (-40 HRc), Tool Steels		Stainless Steels 300-400 Series		Cast Irons	
Speed (SFM)			40 - 80 SFM		25 - 50 SFM		16 - 35 SFM		30 - 40 SFM		42 - 82 SFM	
Drill Diameter			40 - 80 SFM		25 - 50 SFM		16 - 35 SFM		30 - 40 SFM		42 - 82 SFM	
Fractional	Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
—	1	0.0394	5,800	0.0007	3,300	0.0007	2,400	0.0005	2,900	0.0006	6,000	0.0008
—	2	0.0787	2,900	0.002	1,600	0.002	1,200	0.002	1,400	0.0015	3,000	0.002
—	3	0.1181	1,950	0.003	1,100	0.003	800	0.002	950	0.002	2,000	0.003
1/8	3.175	0.1250	1,800	0.003	1,000	0.003	750	0.002	900	0.002	1,800	0.003
3/16	4.763	0.1875	1,200	0.005	700	0.005	500	0.004	600	0.003	1,200	0.005
—	5	0.1969	1,100	0.005	650	0.005	480	0.004	550	0.004	1,200	0.006
—	6	0.2362	970	0.006	550	0.006	400	0.005	450	0.004	1,000	0.007
1/4	6.350	0.2500	900	0.006	500	0.006	350	0.005	450	0.004	950	0.008
9/32	7.144	0.2813	800	0.007	450	0.007	350	0.005	400	0.005	850	0.009
5/16	7.938	0.3125	700	0.008	400	0.008	300	0.006	350	0.006	800	0.010
—	8	0.3150	700	0.008	400	0.008	300	0.006	350	0.006	750	0.009
23/64	9	0.3594	650	0.009	350	0.009	250	0.007	300	0.007	700	0.010
—	10	0.3937	600	0.010	350	0.009	250	0.008	300	0.007	650	0.013
—	13	0.5118	550	0.009	300	0.009	200	0.008	250	0.008	600	0.011

- 1) Pilot Hole is required. It is recommended to use same diameter or up to 0.1mm larger than diameter of the long drill. The depth of cut of the pilot hole is 1 to 2 times diameter of the drill diameter.
- 2) Above drilling table is applied to Series 1 & 2. In case of series 3 & 4, reduce the RPM and feed to 80% of table values.
- 3) Use pecking when drilling in Stainless Steel & Hardened Steels.
- 4) Recommended feeds and speeds are starting points only. Actual performance will be determined by specific material, the condition of equipment being used and coolant.

Formulas: $RPM = \frac{SFM \times 3.82}{\text{Drill dia.}}$, Feed Rate (in/min) = RPM x IPR

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

AQUA Drills STUB List No. 9550, 9551

Hi-Speed Wet Drilling

Workpiece Material			Carbon Steels Cast Irons		Alloy Steels		Die Steels Hardened Steels (30-40HRc)		Hardened Steels (40-50HRc)		DuctileCast Irons	
Speed (SFM)			330 - 495 SFM		260 - 330 SFM		165 - 230 SFM		100 - 165 SFM		260 - 330 SFM	
Drill Diameter			330 - 495 SFM		260 - 330 SFM		165 - 230 SFM		100 - 165 SFM		260 - 330 SFM	
Fractional	Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
—	3	0.1181	16,000	0.004	11,000	0.004	7,400	0.004	5,300	0.004	11,000	0.002
5/32	3.969	0.1563	12,000	0.006	8,100	0.005	5,600	0.005	4,000	0.005	8,100	0.003
3/16	4.763	0.1875	10,000	0.007	6,800	0.006	4,700	0.007	3,400	0.006	6,800	0.004
—	5	0.1969	9,600	0.007	6,400	0.007	4,500	0.007	3,200	0.006	6,400	0.004
1/4	6.35	0.2500	7,500	0.009	5,100	0.008	3,500	0.009	2,500	0.007	5,100	0.005
—	8	0.3150	6,000	0.010	4,000	0.011	2,800	0.011	2,000	0.009	4,000	0.006
3/8	9.525	0.3750	5,000	0.012	3,400	0.013	2,400	0.012	1,700	0.010	3,400	0.007
—	10	0.3937	4,800	0.012	3,200	0.012	2,200	0.013	1,600	0.011	3,200	0.008
—	12	0.4724	4,000	0.015	2,700	0.015	1,900	0.015	1,300	0.012	2,700	0.009
1/2	12.7	0.5000	3,800	0.015	2,500	0.015	1,800	0.015	1,300	0.013	2,500	0.010
—	16	0.6299	3,000	0.017	2,000	0.018	1,400	0.018	1,000	0.015	2,000	0.012

Drilling in Dry Condition

Workpiece Material			Carbon Steels Cast Irons		Alloy Steels		Die Steels Hardened Steels (30-40HRc)		Hardened Steels (40-50HRc)		DuctileCast Irons	
Speed (SFM)			215 - 260 SFM		165 - 215 SFM		82 - 112 SFM		49 - 83 SFM		165 - 215 SFM	
Drill Diameter			215 - 260 SFM		165 - 215 SFM		82 - 112 SFM		49 - 83 SFM		165 - 215 SFM	
Fractional	Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
—	3	0.1181	8,500	0.003	6,900	0.003	3,700	0.003	2,700	0.002	6,900	0.002
5/32	3.969	0.1563	6,400	0.004	5,200	0.004	2,700	0.004	2,000	0.003	5,200	0.003
3/16	4.763	0.1875	5,300	0.005	4,300	0.005	2,300	0.005	1,700	0.004	4,300	0.004
—	5	0.1969	5,100	0.005	4,100	0.005	2,200	0.005	1,600	0.004	4,100	0.004
1/4	6.35	0.2500	4,000	0.006	3,200	0.006	1,700	0.006	1,300	0.005	3,200	0.005
—	8	0.3150	3,200	0.008	2,600	0.008	1,400	0.008	1,000	0.006	2,600	0.006
3/8	9.525	0.3750	2,700	0.009	2,200	0.009	1,100	0.009	850	0.007	2,200	0.007
—	10	0.3937	2,500	0.009	2,100	0.009	1,100	0.009	800	0.007	2,100	0.007
—	12	0.4724	2,100	0.010	1,700	0.011	900	0.011	700	0.008	1,700	0.009
1/2	12.7	0.5000	2,000	0.011	1,600	0.011	850	0.011	630	0.008	1,600	0.010
—	16	0.6299	1,600	0.013	1,300	0.013	700	0.012	500	0.010	1,300	0.012

- 1) Drilling Aluminum Alloys, Light Metals, Stainless Steels are not recommended.
- 2) Use blow air for cooling and chip removal in dry processes.
- 3) Due to sparks during cutting, heat by breakage, or hot chips, there is danger of fire. Take fire prevention measures.
- 4) Adjust drilling condition when unusual vibration or different sound occurs.

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

AQUA Drills Regular List No. 9552

Hi-Speed Wet Drilling

Workpiece Material		Carbon Steels Cast Irons		Alloy Steels		Die Steels Hardened Steels (30-40HRc)		Hardened Steels (40-50HRc)		Ductile Cast Irons	
Speed (SFM)											
Drill Diameter		330 - 495 SFM		260 - 330 SFM		165 - 230 SFM		100 - 165 SFM		260 - 330 SFM	
Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
3	0.1181	16,000	0.004	11,000	0.004	7,400	0.004	5,300	0.003	11,000	0.002
5	0.1969	9,600	0.006	6,400	0.006	4,500	0.006	3,200	0.005	6,400	0.004
8	0.3150	6,000	0.010	4,000	0.010	2,800	0.010	2,000	0.008	4,000	0.006
10	0.3937	4,800	0.011	3,200	0.011	2,200	0.011	1,600	0.010	3,200	0.007
12	0.4724	4,000	0.013	2,700	0.013	1,900	0.013	1,300	0.011	2,700	0.008
16	0.6299	3,000	0.016	2,000	0.016	1,400	0.016	1,000	0.013	2,000	0.011

Drilling in Dry Condition

Workpiece Material		Carbon Steels Cast Irons		Alloy Steels		Die Steels Hardened Steels (30-40HRc)		Hardened Steels (40-50HRc)		Ductile Cast Irons	
Speed (SFM)											
Drill Diameter		215 - 260 SFM		165 - 215 SFM		82 - 112 SFM		49 - 83 SFM		165 - 215 SFM	
Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
3	0.1181	8,500	0.003	6,900	0.003	3,700	0.003	2,700	0.002	6,900	0.002
5	0.1969	5,100	0.004	4,100	0.005	2,200	0.004	1,600	0.004	4,100	0.004
8	0.3150	3,200	0.007	2,600	0.007	1,400	0.007	1,000	0.006	2,600	0.006
10	0.3937	2,500	0.008	2,100	0.008	1,100	0.009	800	0.007	2,100	0.007
12	0.4724	2,100	0.009	1,700	0.009	900	0.010	700	0.007	1,700	0.008
16	0.6299	1,600	0.011	1,300	0.012	700	0.011	500	0.009	1,300	0.011

- 1) Drilling Aluminum Alloys, Light Metals, Stainless Steels are not recommended.
- 2) Use blow air for cooling and chip removal in dry processes.
- 3) Due to sparks during cutting, heat by breakage, or hot chips, there is danger of fire. Take fire prevention measures.
- 4) Adjust drilling condition when unusual vibration or different sound occurs.

AQUA Drills 3 Flute List No. 9546

Drilling in Wet Condition

Workpiece Material		Carbon Steels Cast Irons		Alloy Steels		Die Steels Hardened Steels (30-40HRc)		Hardened Steels (40-50HRc)		Ductile Cast Irons	
Speed (SFM)											
Drill Diameter		215 - 260 SFM		160 - 195 SFM		130 - 165 SFM		98 - 130 SFM		132 - 163 SFM	
Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
3	0.1181	8,500	0.004	6,400	0.004	5,300	0.003	4,200	0.002	5,300	0.002
5	0.1969	5,100	0.006	3,800	0.006	3,200	0.005	2,500	0.004	3,200	0.004
6	0.2362	4,200	0.008	3,200	0.007	2,700	0.006	2,100	0.005	2,700	0.005
8	0.3150	3,200	0.010	2,400	0.009	2,000	0.007	1,600	0.006	2,000	0.006
10	0.3937	2,500	0.011	1,900	0.011	1,600	0.009	1,300	0.007	1,600	0.007
12	0.4724	2,100	0.013	1,600	0.012	1,300	0.010	1,100	0.008	1,300	0.008
14	0.5512	1,820	0.014	1,360	0.014	1,140	0.011	910	0.009	1,140	0.009
16	0.6299	1,600	0.016	1,190	0.015	990	0.013	800	0.009	990	0.010

- 1) For precision drilling, use in wet condition.
- 2) In case of dry condition, reduce the rotation and feed to 70% of table values.
- 3) Use blow air for cooling and chip removal in dry processes.
- 4) Due to sparks during cutting, heat by breakage, or hot chips, there is danger of fire. Take fire prevention measures.
- 5) Adjust drilling condition when unusual vibration or different sound occurs.

AQUA Drills Hard List No. 9548

Workpiece Material		Work Hardness							
Speed (SFM)		50 - 55HRc		55 - 60HRc		60 - 65HRc		65HRc -	
Drill Diameter		98 - 130 SFM		65 - 82 SFM		49 - 66 SFM		33 - 50 SFM	
Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
2	0.0787	6,400	0.0020	4,000	0.0016	3,200	0.0012	2,400	0.0011
3	0.1181	4,200	0.0026	2,700	0.0020	2,100	0.0016	1,600	0.0015
4	0.1575	3,200	0.0032	2,000	0.0024	1,600	0.0016	1,200	0.0016
6	0.2362	2,100	0.0039	1,300	0.0030	1,100	0.0020	800	0.0016
8	0.3150	1,600	0.0047	1,000	0.0039	800	0.0020	600	0.0016
10	0.3937	1,300	0.0048	800	0.0047	640	0.0020	480	0.0016
12	0.4724	1,100	0.0047	660	0.0048	530	0.0020	400	0.0016

- 1) Recommend AQUA Drills Stub, AQUA Drills Regular in drilling work material when hardness is below 50HRc.
- 2) These table values are used in dry & wet conditions, but work material having over 60HRc hardness requires in wet condition.

AQUA Micro Drills List No. 9544

Drilling in Wet Condition

Workpiece Material		Carbon Steels Cast Irons			Alloy Steels			Die Steels Hardened Steels (30-40HRc)			Hardened Steels (40-50HRc)		
Drill Diameter		RPM	Feed (IPR)	Step Feed	RPM	Feed (IPR)	Step Feed	RPM	Feed (IPR)	Step Feed	RPM	Feed (IPR)	Step Feed
Metric mm	Decimal												
0.2	0.0079	31,800	0.0001	0.1D	26,500	0.0001	0.1D	21,200	0.0001	0.1D	12,700	0.0001	0.1D
0.3	0.0118	31,800	0.0001	0.1D	26,500	0.0001	0.1D	21,200	0.0001	0.1D	12,700	0.0001	0.1D
0.4	0.0157	31,800	0.0002	0.1D	25,900	0.0002	0.1D	19,900	0.0002	0.1D	12,700	0.0002	0.1D
0.5	0.0197	31,800	0.0002	0.1D	25,900	0.0002	0.1D	19,100	0.0002	0.1D	12,700	0.0002	0.1D
1.0	0.0394	23,900	0.0006	0.2D-0.5D ^{*)}	15,900	0.0006	0.2D-0.5D ^{*)}	12,700	0.0006	0.2D-0.5D ^{*)}	8,000	0.0005	0.1D
1.5	0.0591	21,200	0.0011	0.2D-0.5D ^{*)}	13,800	0.0011	0.2D-0.5D ^{*)}	9,500	0.0011	0.2D-0.5D ^{*)}	6,400	0.0009	0.1D
1.99	0.0783	19,200	0.0019	0.2D-0.5D ^{*)}	12,800	0.0020	0.2D-0.5D ^{*)}	8,000	0.0020	0.2D-0.5D ^{*)}	5,600	0.0015	0.1D

D: Drill Diameter

Workpiece Material		Hardened Steels (50-55HRc)			Ductile Cast Irons			Stainless Steels		
Drill Diameter		RPM	Feed (IPR)	Step Feed	RPM	Feed (IPR)	Step Feed	RPM	Feed (IPR)	Step Feed
Metric mm	Decimal									
0.2	0.0079	10,600	0.0001	0.1D	31,800	0.0001	0.1D	10,600	0.0001	0.1D
0.3	0.0118	10,600	0.0001	0.1D	31,800	0.0001	0.1D	10,600	0.0001	0.1D
0.4	0.0157	9,900	0.0002	0.1D	31,800	0.0002	0.1D	9,500	0.0002	0.1D
0.5	0.0197	9,500	0.0002	0.1D	31,800	0.0002	0.1D	9,500	0.0002	0.1D
1.0	0.0394	5,600	0.0004	0.1D	19,100	0.0006	0.2D-0.5D ^{*)}	5,600	0.0006	0.1D
1.5	0.0591	4,200	0.0006	0.1D	17,000	0.0011	0.2D-0.5D ^{*)}	4,200	0.0012	0.1D
1.99	0.0783	3,600	0.0008	0.1D	16,000	0.0014	0.2D-0.5D ^{*)}	3,600	0.0015	0.1D

D: Drill Diameter

- 1) These table values are for drilling with water soluble cutting fluid.
- 2) Drill diameters under 1mm must be used in wet condition.
- 3) Adjust drilling condition when unusual vibration or different sound occurs.
- 4) When using low speed machines, use the maximum speed and adjust the feed rate.
- 5) If drilling a deep hole over 3 times drill diameter, use pecking.

* SFM vary largely according the diameter. It is decided that AQUA Micro does not have SFM information.

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

AQUA Drills with Mist Hole 3D List No. 9558

Hi-Speed Wet Drilling

Workpiece Material		Carbon Steels Cast Irons		Alloy Steels Pre-Hardened Steels		Mold Steels Hardened Steels (30-40HRc)		Hardened Steels (40-50HRc)		Ductile Cast Irons	
Speed (SFM)		330 - 495 SFM		260 - 330 SFM		165 - 230 SFM		100 - 165 SFM		260 - 330 SFM	
Drill Diameter		330 - 495 SFM		260 - 330 SFM		165 - 230 SFM		100 - 165 SFM		260 - 330 SFM	
Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
5	0.1969	9,600	0.007	6,400	0.007	4,500	0.007	3,200	0.006	6,400	0.004
8	0.3150	6,000	0.010	4,000	0.011	2,800	0.011	2,000	0.009	4,000	0.006
10	0.3937	4,800	0.012	3,200	0.012	2,200	0.013	1,600	0.011	3,200	0.008
12	0.4724	4,000	0.015	2,700	0.015	1,900	0.015	1,300	0.012	2,700	0.009
16	0.6299	3,000	0.017	2,000	0.018	1,400	0.018	1,000	0.015	2,000	0.012

Drilling in Semi-Dry (Mist Coolant) Condition

Workpiece Material		Carbon Steels Cast Irons		Alloy Steels Pre-Hardened Steels		Mold Steels Hardened Steels (30-40HRc)		Hardened Steels (40-50HRc)		Ductile Cast Irons	
Speed (SFM)		260 - 300 SFM		164 - 195 SFM		98 - 135 SFM		82 - 100 SFM		164 - 195 SFM	
Drill Diameter		260 - 300 SFM		164 - 195 SFM		98 - 135 SFM		82 - 100 SFM		164 - 195 SFM	
Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
5	0.1969	5,800	0.005	3,800	0.005	2,700	0.005	1,900	0.004	3,800	0.004
8	0.3150	3,600	0.008	2,400	0.008	1,700	0.008	1,200	0.007	2,400	0.006
10	0.3937	2,900	0.010	1,900	0.010	1,300	0.010	1,000	0.008	1,900	0.008
12	0.4724	2,400	0.011	1,600	0.011	1,100	0.012	800	0.009	1,600	0.009
16	0.6299	1,800	0.014	1,200	0.014	800	0.013	600	0.011	1,200	0.012

AQUA Drills with Mist Hole 5D List No. 9554

Hi-Speed Wet Drilling

Workpiece Material		Carbon Steels Cast Irons		Alloy Steels Pre-Hardened Steels		Mold Steels Hardened Steels (30-40HRc)		Hardened Steels (40-50HRc)		Ductile Cast Irons	
Speed (SFM)		330 - 495 SFM		260 - 330 SFM		165 - 230 SFM		100 - 165 SFM		260 - 330 SFM	
Drill Diameter		330 - 495 SFM		260 - 330 SFM		165 - 230 SFM		100 - 165 SFM		260 - 330 SFM	
Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
5	0.1969	9,600	0.006	6,400	0.006	4,500	0.006	3,200	0.005	6,400	0.004
8	0.3150	6,000	0.010	4,000	0.010	2,800	0.010	2,000	0.008	4,000	0.006
10	0.3937	4,800	0.011	3,200	0.011	2,200	0.011	1,600	0.010	3,200	0.007
12	0.4724	4,000	0.013	2,700	0.013	1,900	0.013	1,300	0.011	2,700	0.008
16	0.6299	3,000	0.016	2,000	0.016	1,400	0.016	1,000	0.013	2,000	0.011

Drilling in Semi-Dry (Mist Coolant) Condition

Workpiece Material		Carbon Steels Cast Irons		Alloy Steels Pre-Hardened Steels		Mold Steels Hardened Steels (30-40HRc)		Hardened Steels (40-50HRc)		Ductile Cast Irons	
Speed (SFM)		260 - 300 SFM		164 - 195 SFM		98 - 135 SFM		82 - 100 SFM		164 - 195 SFM	
Drill Diameter		260 - 300 SFM		164 - 195 SFM		98 - 135 SFM		82 - 100 SFM		164 - 195 SFM	
Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
5	0.1969	5,800	0.005	3,800	0.005	2,700	0.005	1,900	0.004	3,800	0.004
8	0.3150	3,600	0.007	2,400	0.008	1,700	0.007	1,200	0.006	2,400	0.006
10	0.3937	2,900	0.009	1,900	0.009	1,300	0.009	1,000	0.007	1,900	0.007
12	0.4724	2,400	0.010	1,600	0.010	1,100	0.011	800	0.008	1,600	0.008
16	0.6299	1,800	0.012	1,200	0.012	800	0.012	600	0.010	1,200	0.011

- 1) Drilling Aluminum Alloys and Light Metals are not recommended.
- 2) Use blow air for cooling and chip removal in dry processes.
- 3) Due to sparks during cutting, heat by breakage, or hot chips, there is danger of fire. Take fire prevention measures.
- 4) Adjust drilling condition when unusual vibration or different sound occurs.

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

AQUA Drills with Mist Hole 7D List No. 9556, 9569

Hi-Speed Wet Drilling

Workpiece Material			Carbon Steels Cast Irons		Alloy Steels		Die Steels Hardened Steels (30-40HRc)		Hardened Steels (40-50HRc)		Ductile Cast Irons	
Speed (SFM)												
Drill Diameter			330 - 495 SFM		260 - 330 SFM		165 - 230 SFM		100 - 165 SFM		260 - 330 SFM	
Fractional	Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
3/16	4.763	0.1875	10,000	0.005	6,700	0.005	4,700	0.005	3,400	0.004	6,700	0.002
—	5	0.1969	9,600	0.005	6,400	0.005	4,500	0.005	3,200	0.004	6,400	0.003
1/4	6.35	0.2500	7,500	0.007	5,000	0.007	3,500	0.007	2,500	0.005	5,000	0.003
—	8	0.3150	6,000	0.008	4,000	0.008	2,800	0.008	2,000	0.006	4,000	0.004
3/8	9.525	0.3750	5,000	0.009	3,400	0.009	2,300	0.009	1,700	0.007	3,400	0.005
—	10	0.3937	4,800	0.009	3,200	0.009	2,200	0.009	1,600	0.008	3,200	0.005
—	12	0.4724	4,000	0.011	2,700	0.011	1,900	0.011	1,300	0.009	2,700	0.006
1/2	12.7	0.5000	3,800	0.011	2,500	0.011	1,800	0.011	1,250	0.009	2,500	0.006
—	16	0.6299	3,000	0.013	2,000	0.013	1,400	0.013	1,000	0.010	2,000	0.008

Drilling in Semi-Dry (Mist Coolant) Condition

Workpiece Material			Carbon Steels Cast Irons		Alloy Steels		Die Steels Hardened Steels (30-40HRc)		Hardened Steels (40-50HRc)		Ductile Cast Irons	
Speed (SFM)												
Drill Diameter			260 - 300 SFM		164 - 195 SFM		98 - 135 SFM		82 - 100 SFM		164 - 195 SFM	
Fractional	Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
3/16	4.763	0.1875	6,100	0.004	4,000	0.004	2,800	0.004	2,000	0.003	4,000	0.002
—	5	0.1969	5,800	0.004	3,800	0.004	2,700	0.004	1,900	0.003	3,800	0.003
1/4	6.35	0.2500	4,500	0.005	3,000	0.005	2,100	0.005	1,500	0.004	3,000	0.003
—	8	0.3150	3,600	0.006	2,400	0.006	1,700	0.006	1,200	0.005	2,400	0.004
3/8	9.525	0.3750	3,000	0.007	2,000	0.007	1,400	0.007	1,000	0.005	2,000	0.005
—	10	0.3937	2,900	0.007	1,900	0.007	1,300	0.008	1,000	0.006	1,900	0.005
—	12	0.4724	2,400	0.008	1,600	0.008	1,100	0.008	800	0.006	1,600	0.006
1/2	12.7	0.5000	2,300	0.008	1,500	0.008	1,000	0.009	750	0.006	1,500	0.006
—	16	0.6299	1,800	0.009	1,200	0.009	800	0.009	600	0.007	1,200	0.008

- 1) Drilling Aluminum Alloys and Soft Metals are not recommended.
- 2) Use blow air for cooling and chip removal in dry processes.
- 3) Due to sparks during cutting, heat by breakage, or hot chips, there is danger of fire. Take fire prevention measures.
- 4) Adjust drilling condition when unusual vibration or different sound occurs.

DIAMOND Coated Carbide drills List No. 9501D

Work Material	Speed (SFM)	Feed Rate (IPR)
Aluminum Alloys	130 - 650	.002 - .008
Hi Si-Aluminum Alloys	130 - 300	.001 - .006
Copper Alloys	130 - 650	.002 - .008
Semi-Sinter Ceramics	60 - 250	.001 - .008
High Polymer Material	130 - 650	.001 - .006

- 1) Diamond Coated Drills are used in Nonferrous Metals such as Aluminum, Copper Alloys and FRP.
- 2) Adjust drilling condition when unusual vibration or different sound occurs.

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

DLC-HSS Drill List No. 544

Drilling in Wet Condition

Workpiece Material		Aluminum 1017		Aluminum Alloys						Aluminum Alloy Casting		Copper Alloys	
Speed (SFM)				4032, 6061		5052		7075					
Drill Diameter		330 - 390 SFM		210 - 260 SFM		280 - 330 SFM		210 - 260 SFM		210 - 260 SFM		150 - 200 SFM	
Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
1	0.0394	30,600	0.001	20,400	0.001	25,500	0.001	20,400	0.001	20,400	0.001	15,300	0.001
2	0.0787	19,100	0.002	12,700	0.002	15,900	0.002	12,700	0.002	12,700	0.002	9,600	0.002
3	0.1181	12,700	0.003	8,500	0.003	10,600	0.003	8,500	0.002	8,500	0.002	6,400	0.002
5	0.1969	7,600	0.005	5,100	0.005	6,400	0.005	5,100	0.004	5,100	0.004	3,800	0.004
8	0.3150	4,800	0.008	3,200	0.008	4,000	0.008	3,200	0.006	3,200	0.006	2,400	0.006
10	0.3937	3,800	0.010	2,500	0.010	3,200	0.010	2,500	0.008	2,500	0.008	1,900	0.008
12	0.4724	3,200	0.012	2,100	0.012	2,700	0.012	2,100	0.009	2,100	0.009	1,600	0.009
16	0.6299	2,400	0.013	1,600	0.013	2,000	0.013	1,600	0.010	1,600	0.010	1,200	0.010
20	0.7874	1,900	0.012	1,300	0.012	1,600	0.012	1,300	0.009	1,300	0.009	1,000	0.009

- 1) The table values are for drilling with water soluble cutting fluid.
- 2) DLC-HSS Drills are used in Nonferrous Metals such as Aluminum or Copper alloys.
- 3) Adjust drilling condition when unusual vibration or different sound occurs.
- 4) If drilling a deep hole over 3 times drill diameter, use pecking.

DLC Microdrills List No. 9524
DLC Drills Regular List No. 9520

Drilling in Wet & Semi Dry (Mist Coolant) Condition

Workpiece Material		Aluminum 1017		Aluminum Alloys						Aluminum Alloy Casting		Copper Alloys	
Speed (SFM)				4032, 6061		5052		7075					
Drill Diameter		650 - 820 SFM		330 - 500 SFM		500 - 650 SFM		500 - 650 SFM		430 - 590 SFM		260 - 330 SFM	
Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
0.5	0.0197	60,000	0.0002	58,000	0.0002	60,000	0.0002	60,000	0.0003	60,000	0.0003	38,000	0.0003
1	0.0394	50,000	0.0006	38,000	0.0006	50,000	0.0006	50,000	0.0007	48,000	0.0007	25,000	0.0007
2	0.0787	40,000	0.0014	24,000	0.0014	32,000	0.0015	32,000	0.0016	29,000	0.0016	16,000	0.0016
3	0.1181	26,500	0.0021	16,000	0.0021	21,000	0.0022	21,000	0.0024	19,000	0.0025	10,500	0.0024
5	0.1969	16,000	0.003	9,600	0.004	12,700	0.004	12,700	0.004	11,500	0.004	6,400	0.004
8	0.3150	10,000	0.006	6,000	0.006	8,000	0.006	8,000	0.006	7,200	0.007	4,000	0.006
10	0.3937	8,000	0.007	4,800	0.007	6,400	0.007	6,400	0.008	5,700	0.008	3,200	0.008
12	0.4724	6,600	0.008	4,000	0.008	5,300	0.009	5,300	0.010	4,800	0.010	2,650	0.010

Drilling in Dry Condition

Workpiece Material		Aluminum 1017		Aluminum Alloys						Aluminum Alloy Casting		Copper Alloys		
Speed (SFM)				4032, 6061		5052		7075						
Drill Diameter		-		210 - 260 SFM		280 - 330 SFM		330 - 390 SFM		280 - 330 SFM		164 - 196 SFM		
Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	
0.5	0.0197	Not Used		30,000	0.0002	38,000	0.0002	45,000	0.0002	38,000	0.0002	22,000	0.0002	
1	0.0394		20,000	0.0004	25,000	0.0004	30,000	0.0005	25,000	0.0005	25,000	0.0005	15,000	0.0005
2	0.0787		12,500	0.0010	16,000	0.0010	19,000	0.0012	16,000	0.0012	16,000	0.0012	9,500	0.0012
3	0.1181		8,500	0.0015	10,600	0.0016	12,700	0.0018	10,600	0.0018	10,600	0.0018	6,400	0.0017
5	0.1969		5,100	0.0025	6,400	0.0026	7,600	0.003	6,400	0.003	6,400	0.003	3,800	0.003
8	0.3150		3,200	0.004	4,000	0.004	4,800	0.005	4,000	0.005	4,000	0.005	2,400	0.005
10	0.3937		2,550	0.005	3,200	0.005	3,800	0.006	3,200	0.006	3,200	0.006	1,900	0.006
12	0.4724		2,100	0.006	2,650	0.006	3,200	0.007	2,650	0.007	2,650	0.007	1,600	0.007

- 1) DLC Drills are used in Nonferrous Metals such as Aluminum or Copper Alloys.
- 2) Adjust drilling condition when unusual vibration or different sound occurs.
- 3) When using low speed machines, use the maximum speed and adjust the feed rate.

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

Straight Shank Drills

Jobbers Length
Screw Machine Length
Taper Length

List No. 500, 501, 501A, 599
List No. 561, 563
List No. 531

Straight Shank Cobalt Drills

Jobbers Length
Screw Machine Length
Taper Length

List No. 6501, 6520, 599
List No. 6563
List No. 6531

Workpiece Material			Carbon Steels		Alloy Steels Hardened Steels		Mold Steels Stainless Steels		Titanium Alloys ¹⁾ High Temperature Alloys ¹⁾		Cast Irons		Aluminum Alloys Nonferrous Metals	
Speed (SFM)			50 - 65 SFM		40 - 52 SFM		30 - 40 SFM		10 - 20 SFM		55 - 72 SFM		83 - 115 SFM	
Drill Diameter			50 - 65 SFM		40 - 52 SFM		30 - 40 SFM		10 - 20 SFM		55 - 72 SFM		83 - 115 SFM	
Fractional	Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
—	1	0.0394	4,800	0.0008	3,800	0.0007	2,900	0.0006	1,500	0.0003	5,300	0.0010	8,100	0.0007
1/16	1.588	0.0625	3,400	0.0013	2,700	0.0011	2,100	0.0009	1,000	0.0005	3,800	0.0015	5,800	0.0011
—	2	0.0787	2,900	0.0016	2,300	0.0013	1,700	0.0012	720	0.0006	3,200	0.0020	4,900	0.0014
—	3	0.1181	2,100	0.0028	1,700	0.0023	1,300	0.0021	480	0.0009	2,300	0.0034	3,600	0.0024
1/8	3.175	0.1250	2,000	0.0029	1,700	0.0023	1,200	0.0022	460	0.0010	2,200	0.0036	3,500	0.0025
—	5	0.1969	1,300	0.0042	1,000	0.0037	760	0.0033	290	0.0015	1,400	0.0053	2,200	0.0038
1/4	6.35	0.2500	1,100	0.0047	800	0.0044	610	0.0038	230	0.0020	1,120	0.0064	1,750	0.0044
—	8	0.3150	800	0.0059	640	0.0050	480	0.0044	180	0.0025	900	0.0074	1,400	0.0051
3/8	9.525	0.3750	680	0.0065	540	0.0055	400	0.0049	160	0.0030	740	0.0082	1,200	0.0054
—	10	0.3937	640	0.0068	510	0.0057	380	0.0050	150	0.0032	700	0.0084	1,100	0.0057
—	12	0.4724	530	0.0074	420	0.0064	320	0.0057	120	0.0040	580	0.0095	900	0.0066
1/2	12.7	0.5000	510	0.0076	400	0.0066	310	0.0057	120	0.0043	550	0.0099	860	0.0069
5/8	15.875	0.6250	410	0.0089	330	0.0076	250	0.0065	100	0.0050	450	0.0115	690	0.0086
—	16	0.6299	400	0.0091	320	0.0078	240	0.0067	90	0.0050	440	0.0116	680	0.0087

- 1) The cutting condition of Titanium Alloys and Nickel Alloys are for HSS-Co drills only.
- 2) The above values apply when coolant is used in a vertical machine. In a horizontal machine or deep hole, use pecking.
- 3) Adjust drilling condition when unusual vibration or different sound occurs.

Straight Shank Drills TiN Coated

Jobbers Length List No. 501P, 520P
Screw Machine Length List No. 561P

Workpiece Material			Carbon Steels		Alloy Steels		Die Steels Hardened Steels Stainless Steels		Cast Irons		Aluminum Alloys Nonferrous Metals	
Speed (SFM)			60 - 85 SFM		47 - 65 SFM		36 - 48 SFM		66 - 90 SFM		100 - 140 SFM	
Drill Diameter			60 - 85 SFM		47 - 65 SFM		36 - 48 SFM		66 - 90 SFM		100 - 140 SFM	
Fractional	Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
—	1	0.0394	5,800	0.0008	4,600	0.0007	3,500	0.0006	6,400	0.0010	9,800	0.0007
1/16	1.588	0.0625	4,100	0.0013	3,200	0.0011	2,500	0.0009	4,400	0.0015	7,000	0.0011
—	2	0.0787	3,500	0.0016	2,800	0.0013	2,000	0.0012	3,800	0.0020	5,900	0.0014
—	3	0.1181	2,500	0.0028	2,000	0.0023	1,500	0.0021	2,800	0.0034	4,300	0.0024
1/8	3.175	0.1250	2,400	0.0029	2,000	0.0023	1,400	0.0022	2,600	0.0036	4,200	0.0025
—	5	0.1969	1,600	0.0042	1,200	0.0037	910	0.0033	1,700	0.0053	2,600	0.0038
1/4	6.35	0.2500	1,300	0.0047	1,000	0.0044	730	0.0038	1,300	0.0064	2,100	0.0044
—	8	0.3150	1,000	0.0059	770	0.0050	580	0.0044	1,100	0.0074	1,700	0.0051
3/8	9.525	0.3750	820	0.0065	650	0.0055	480	0.0049	890	0.0082	1,400	0.0054
—	10	0.3937	770	0.0068	610	0.0057	460	0.0050	840	0.0084	1,300	0.0057
—	12	0.4724	640	0.0074	500	0.0064	380	0.0057	700	0.0095	1,100	0.0066
1/2	12.7	0.5000	610	0.0076	490	0.0066	370	0.0057	670	0.0099	1,000	0.0069
5/8	15.875	0.6250	500	0.0089	400	0.0076	300	0.0065	540	0.0115	830	0.0086
—	16	0.6299	480	0.0091	380	0.0078	290	0.0067	530	0.0116	820	0.0087

- 1) The above values apply when coolant is used in a vertical machine. In a horizontal machine or deep hole, use pecking.
- 2) Adjust drilling condition when unusual vibration or different sound occurs.

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

**Straight Shank Drills Parabolic Style TiN Coated Jobbers Length List No. 517P
Taper Length List No. 545P**

Workpiece Material			Carbon Steels		Alloy Steels		Die Steels Hardened Steels Stainless Steels		Cast Irons	
Speed (SFM)			60 - 85 SFM		47 - 65 SFM		36 - 48 SFM		66 - 90 SFM	
Drill Diameter			60 - 85 SFM		47 - 65 SFM		36 - 48 SFM		66 - 90 SFM	
Fractional	Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
—	1	0.0394	5,800	0.0011	4,600	0.0009	3,500	0.0008	6,400	0.0014
1/16	1.588	0.0625	4,100	0.0018	3,200	0.0014	2,500	0.0012	4,400	0.0021
—	2	0.0787	3,500	0.0023	2,800	0.0017	2,000	0.0015	3,800	0.0028
—	3	0.1181	2,500	0.0039	2,000	0.0030	1,500	0.0027	2,800	0.0048
1/8	3.175	0.1250	2,400	0.0041	2,000	0.0030	1,400	0.0029	2,600	0.0050
—	5	0.1969	1,600	0.0059	1,200	0.0048	910	0.0042	1,700	0.0075
1/4	6.35	0.2500	1,300	0.0066	1,000	0.0057	730	0.0049	1,300	0.0089
—	8	0.3150	1,000	0.0083	770	0.0066	580	0.0058	1,100	0.0104
3/8	9.525	0.3750	820	0.0091	650	0.0072	480	0.0063	890	0.0115
—	10	0.3937	770	0.0095	610	0.0074	460	0.0065	840	0.0118
—	12	0.4724	640	0.0104	500	0.0083	380	0.0074	700	0.0133
1/2	12.7	0.5000	610	0.0107	490	0.0086	370	0.0075	670	0.0139
5/8	15.875	0.6250	500	0.0124	400	0.0099	300	0.0085	540	0.0161
—	16	0.6299	480	0.0127	380	0.0101	290	0.0087	530	0.0163

1) The above values apply when coolant is used in a vertical machine. In a horizontal machine or deep hole, use pecking.
2) Adjust drilling condition when unusual vibration or different sound occurs.

**Straight Shank Drills Extra Length List No. 551, 6551
Taper Shank Drills Extra Length List No. 651**

Workpiece Material		Carbon Steels		Alloy Steels Hardened Steels		Stainless Steels		Cast Irons		Brass Nonferrous Metals	
Speed (SFM)		44 - 55 SFM		32 - 40 SFM		32 - 40 SFM		52 - 65 SFM		48 - 60 SFM	
Drill Diameter		44 - 55 SFM		32 - 40 SFM		32 - 40 SFM		52 - 65 SFM		48 - 60 SFM	
Fractional	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
1/16	0.0625	2,700	0.0020	2,000	0.0010	2,000	0.0015	3,200	0.0015	3,000	0.0020
1/8	0.1250	1,600	0.0038	1,200	0.0018	1,200	0.0025	1,800	0.0025	1,700	0.0036
3/16	0.1875	1,200	0.0052	820	0.0025	820	0.0035	1,400	0.0035	1,300	0.0050
1/4	0.2500	850	0.0065	620	0.0030	620	0.0048	1,000	0.0048	1,000	0.0063
5/16	0.3125	680	0.0075	490	0.0035	490	0.0055	800	0.0055	740	0.0078
3/8	0.3750	570	0.0090	410	0.0040	410	0.0060	670	0.0060	620	0.0090
1/2	0.5000	430	0.0110	310	0.0052	310	0.0080	500	0.0080	460	0.0110
5/8	0.6250	340	0.0120	250	0.0060	250	0.0090	400	0.0090	370	0.0120
3/4	0.7500	290	0.0130	210	0.0070	210	0.0100	340	0.0100	310	0.0130
1	1.0000	220	0.0140	160	0.0080	160	0.0110	250	0.0110	230	0.0140

1) The above values apply when coolant is used in a vertical machine. In a horizontal machine or deep hole, use pecking.
2) Adjust drilling condition when unusual vibration or different sound occurs.

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

Straight Shank Oil Hole Drills / Cobalt List No. 581

Workpiece Material		Carbon Steels		Alloy Steels		Die Steels Hardened Steels Stainless Steels		Cast Irons		Aluminum Alloys Nonferrous Metals	
Speed (SFM)		55 - 66 SFM		44 - 52 SFM		32 - 40 SFM		61 - 73 SFM		94 - 114 SFM	
Drill Diameter		55 - 66 SFM		44 - 52 SFM		32 - 40 SFM		61 - 73 SFM		94 - 114 SFM	
Fractional	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
1/16	0.0625	3,400	0.0016	2,700	0.0013	2,100	0.0011	3,800	0.0018	5,800	0.0013
1/8	0.1250	2,000	0.0035	1,700	0.0027	1,200	0.0027	2,200	0.0043	3,500	0.0030
1/4	0.2500	1,100	0.0056	800	0.0052	610	0.0046	1,120	0.0076	1,750	0.0053
3/8	0.3750	680	0.0078	540	0.0066	400	0.0058	740	0.0099	1,200	0.0065
1/2	0.5000	510	0.0091	400	0.0079	310	0.0069	550	0.0119	860	0.0082
5/8	0.6250	410	0.0106	330	0.0091	250	0.0079	450	0.0138	690	0.0103

- 1) The above values apply when coolant is used in a vertical machine. In a horizontal machine or deep hole, use pecking.
- 2) Adjust drilling condition when unusual vibration or different sound occurs.

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

Technical Data

**Taper Shank Drills Regular Shank / Core Drills List No. 601
Silver and Deming Drills List No. 575**

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

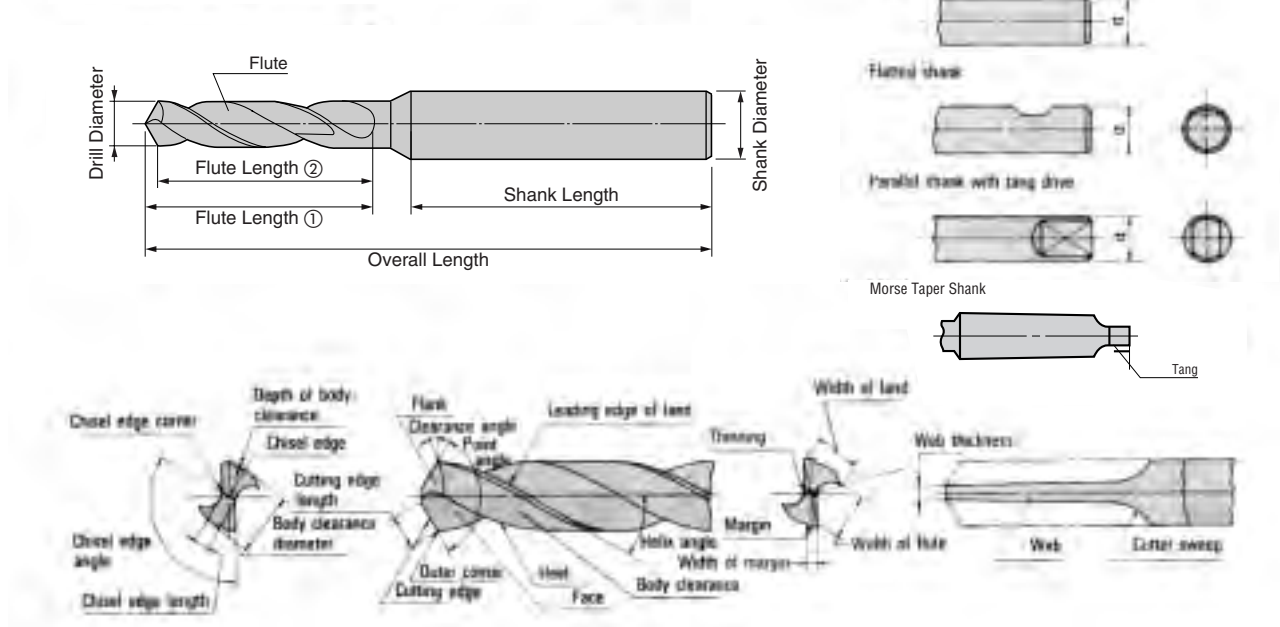
Workpiece Material		Carbon Steels		Alloy Steels		Die Steels Hardened Steels Stainless Steels		Cast Irons		Aluminum Alloys Nonferrous Metals	
Speed (SFM)		55 - 65 SFM		50 - 60 SFM		35 - 45 SFM		65 - 80 SFM		100 - 110 SFM	
Drill Diameter		55 - 65 SFM		50 - 60 SFM		35 - 45 SFM		65 - 80 SFM		100 - 110 SFM	
Fractional	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
1/8	0.1250	2,000	0.003	1,900	0.003	1,400	0.002	2,500	0.004	3,400	0.003
3/16	0.1875	1,400	0.004	1,300	0.004	920	0.003	1,700	0.005	2,300	0.005
1/4	0.2500	1,000	0.004	920	0.005	690	0.004	1,300	0.007	1,700	0.006
5/16	0.3125	800	0.004	740	0.005	560	0.005	980	0.008	1,400	0.008
3/8	0.3750	670	0.007	620	0.006	460	0.005	820	0.008	1,200	0.008
7/16	0.4375	570	0.007	530	0.006	400	0.005	700	0.009	970	0.009
1/2	0.5000	500	0.008	460	0.006	350	0.006	620	0.010	850	0.009
5/8	0.6250	400	0.009	370	0.008	280	0.007	490	0.012	680	0.012
3/4	0.7500	340	0.010	310	0.009	230	0.008	410	0.013	570	0.013
7/8	0.8750	290	0.011	270	0.009	200	0.008	350	0.014	490	0.014
1	1.0000	250	0.012	230	0.010	180	0.009	310	0.015	430	0.014
1 1/8	1.1250	230	0.012	210	0.011	160	0.010	280	0.016	380	0.015
1 1/4	1.2500	200	0.014	190	0.011	140	0.010	250	0.016	340	0.016
1 3/8	1.3750	190	0.014	170	0.012	130	0.010	230	0.017	310	0.017
1 1/2	1.5000	170	0.014	160	0.012	120	0.011	210	0.017	290	0.017
1 5/8	1.6250	160	0.015	150	0.013	110	0.011	190	0.017	260	0.017
1 3/4	1.7500	150	0.016	140	0.013	100	0.011	180	0.018	250	0.018
1 7/8	1.8750	140	0.016	130	0.014	100	0.012	170	0.019	230	0.019
2	2.0000	130	0.016	120	0.014	90	0.012	160	0.020	220	0.020

Taper Shank Oil Hole Drills / Cobalt List No. 683

Workpiece Material		Carbon Steels		Alloy Steels Hardened Steels		Mold Steels Stainless Steels		Cast Irons		Aluminum Alloys Nonferrous Metals	
Speed (SFM)		55 - 65 SFM		50 - 60 SFM		35 - 45 SFM		65 - 80 SFM		100 - 110 SFM	
Drill Diameter		55 - 65 SFM		50 - 60 SFM		35 - 45 SFM		65 - 80 SFM		100 - 110 SFM	
Fractional	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
3/8	0.3750	680	0.008	620	0.007	460	0.006	820	0.010	1,200	0.010
7/16	0.4375	580	0.009	530	0.007	400	0.006	700	0.011	970	0.011
1/2	0.5000	510	0.009	460	0.008	350	0.007	620	0.012	850	0.012
5/8	0.6250	410	0.011	370	0.010	280	0.008	490	0.014	680	0.014
23/32	0.7188	360	0.012	320	0.010	240	0.009	430	0.015	590	0.014
3/4	0.7500	340	0.013	310	0.011	230	0.009	410	0.015	570	0.015
7/8	0.8750	290	0.013	270	0.011	200	0.010	350	0.017	490	0.017
1	1.0000	260	0.014	230	0.012	180	0.011	310	0.018	430	0.018
1 1/4	1.2500	210	0.016	190	0.013	140	0.011	250	0.019	340	0.019
1 1/2	1.5000	170	0.017	160	0.014	120	0.012	210	0.021	290	0.021

1) The above values apply when coolant is used in a vertical machine. In a horizontal machine or deep hole, use pecking.
2) Adjust drilling condition when unusual vibration or different sound occurs.

TERMS FOR DRILLS



Precautions in using drills: 6-point

1. PROPER SELECTION OF DRILLS

Depending on work material and cutting conditions, standard drills can be used for drilling holes in materials. However, to ensure efficient and economical production, it is important that the proper drill is selected for each drilling operation.

3. CORRECT HOLDING OF DRILLS

Of the time spent in drilling operations, net cutting time is surprisingly short and setting up time is much longer. Consequently, improved efficiency in attaching and detaching of drill from its holder is decidedly important from the point of view of increased productivity.

5. PROPER CUTTING SPEED AND FEED RATE

Incorrect cutting speed and feed may cause the drill to wear excessively or even to break and will greatly shorten drill life. Cutting conditions are determined by the shape and machining qualities of the material, condition of the drilling machine, jigs and so forth, select proper values, referring to the cutting conditions. When deep hole drilling, reduce the cutting speed and feed in accordance with table shown in below.

Speed and feed reductions for drilling deep holes

HOLE DEPTH	CUTTING SPEED REDUCTION RATE	FEED REDUCTION RATE
3 Times Diameter	10%	10%
4 Times Diameter	20%	10%
5 Times Diameter	30%	20%
6-8 Times Diameter	35-40%	20%

2.MAINTENANCE OF DRILLING MACHINE, JIGS AND FIXTURES

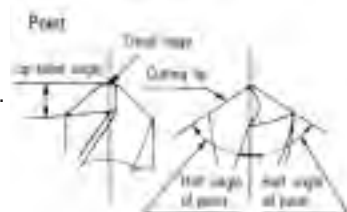
For prolonging the drill life and maintaining accurate hole production, both the drilling machine used and jigs and fixtures must preserve high rigidity.

4.CORRECT CLAMPING OF WORKPIECE

6. REGRINDING

When a drill is used until it is completely worn and does not cut, disadvantages will accumulate such as decreased production, deterioration of surface finish, reduced accuracy, drill breakage, increased amount of stock removal in regrinding and so forth. It is much better to sharpen a drill before it is worn completely. When correcting regrinding, the following five points should be carefully observed:

- Completely remove the worn part (rough grind).
- Center the chisel point.
- The lengths of each cutting edge must be equal.
- Regardless of the point angle, each cutting edge must be equally inclined to the axis of the drill.
- Make the clearance angles proper and each clearance angle identical.



Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition










Others

THE MAIN GEOMETRY FACTOR OF DRILLS AND THEIR WORK

CHARACTERISTICS	Cutting Resistance		Rigidity		Chip Removable	Guide Prfrmnc.	Amount of burr at the end	Remark
	Thrust	Torque	Body	Cutting Edge				
Helix Angle	High	Small	Small	Small	Good	Good	Small	When the helix angle is getting bigger, the cutting resistance is decreased, but the drill's rigidity down. High helix angle is adopted for soft material, and low helix angle is adopted, for brittle material.
	Low	Big	Big	Big	Big	Bad	Big	
Point Angle	Big	Big	Small				Small	When the point angle is getting small, thrust is also small, but torque the gets bigger. For general purpose, 118 point angle is adopted. For hard material, or for high-speed cutting, 135 is recommended.
	Small	Small	Big				Big	
Web Thickness	Big	Big	Big	Big		Bad		To increase the drill web thickness, the rigidity of drill should be bigger. But thrust is also increased because of long chisel edge. To decrease thrust, the thinning is treated.
	Small	Small	Small	Small		Good		
Clearance Angle	Big	Small			Small		Small	If large clearance angle is taken, thrust is decreased, and flank wear is also decreased, but cutting edge is getting brittle. For hard material, small clearance angle is taken, for soft material, large clearance angle is taken.
	Small	Big			Big		Big	
Back Taper	Big		Small				Bad	When back taper is getting bigger, torque is smaller, and worn margin length is also smaller. But too much back taper has less guide performance, and straightness of hole is decreased
	Small		Big				Good	









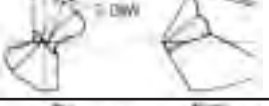

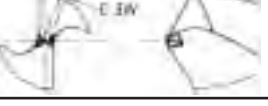
Shape of lip relief

The conical grinding method is broadly adopted as the most normal one. The other lip relieves are chosen according to the application when it is preferable to make the highly accurate holes.

Shape	Features · Effects	Application	Symbol
Conical 	<ul style="list-style-type: none"> the most normal grinding method The lip relief angle becomes greater as to it approaches to the center from corner because of grinding the lip relief conically. 	General purpose	
Flat 	<ul style="list-style-type: none"> grind the lip relief planely easy grinding 	small diameter	
Three-rake 	<ul style="list-style-type: none"> having good centripetalability because of no chisel edge less enlargement of hole need special grinder 	drilling high accurate hole and location	
Spiral point 	<ul style="list-style-type: none"> lip relief spirally ground makes an S-shaped chisel edge brings good centripetalability and high accuracy 	drilling high accurate hole	
Radial-lip 	<ul style="list-style-type: none"> making load uniformly disperse on curved-edge depending on grinding cutting edges to curved-one get good accuracy and surface roughness by this point less burr on exit side of through hole need special grinder 	cast iron, light alloy and steel plate	
Fishtail 	<ul style="list-style-type: none"> bring good centripetalability and less shock when penetrate less burr when penetrate 	thin plate	

Web Thinning

The proportion of drill resistance caused by the various drilling force concentrates on the chisel edge. The thrust force on chisel edge is in the same proportions as that on the lip. Drill-thrust force is very sensitive to variations of chisel-edge length or web thickness. Web thinning reduces drilling thrust and produces other advantages such as reduced cutting temperature, increased drill life and improved hole geometry. In order to recondition the drill properly, it is necessary to reduce this web thickness.

Type	Features · Effects	Application	Symbol
S-type 	<ul style="list-style-type: none"> very easy to make thinning 	General purpose for steel, cast iron, non-ferrous metal	
X-type (split point) 	<ul style="list-style-type: none"> reduce thrust force substantially advantage when entering This type of thinning is very effective for thick web 	<ul style="list-style-type: none"> drilling deep hole ex. oil-hole of crankshaft material of low-machinability and of machining hardenability 	 
N-type 	<ul style="list-style-type: none"> effective for thick web 	<ul style="list-style-type: none"> drilling deep hole 	
R-type 	<ul style="list-style-type: none"> reduce thrust force substantially lessen chipping on cutting edges 	<ul style="list-style-type: none"> heavy duty rail or manganese steel 	
XS-type 	<ul style="list-style-type: none"> easier grinding than x-type reduce thrust force substantially advantage when entering 	<ul style="list-style-type: none"> drilling deep hole 	
H-type 	<ul style="list-style-type: none"> lessen web thickness and strengthen chisel at same time 	<ul style="list-style-type: none"> heavy duty 	

Figures reference only

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition

TAPS

TAPS Cutting Condition

Others

Technical Data

DRILLS

DRILLS Cutting Condition

END MILLS

END MILLS Cutting Condition




TAPS

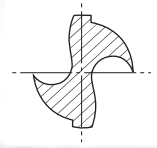
TAPS Cutting Condition

Others

Chip Breaker

Since continuous chips do not discharge easily, it is necessary to break these forcibly. Particularly, to change the shape of continuous chips generated in the deep hole processing of tough materials, it is desirable that the drill shall be provided with a chipbreaker. Examples of chipbreakers are shown below.

Type	Effect
	The rake angle is decreased by grinding the face flat along the cutting edge, preventing the wedging of chips on the drill. In this case, the breaker must not affect the margin.
	The face is ground in the same way as for a chip breaker for a bit. This form of grinding is very difficult and, since there is a danger of breaking the margin, the amount of the breaker must be kept at minimum, care must be exercised to prevent interference with the chip pocket. This chipbreaker effective especially in the processing of deep holes.
	This ricks on the flank function as chip breakers. Stagger the positions of ricks so that distances of the ricks from the drill axis are not identical. Cut chips become thin and long and they discharged smoothly



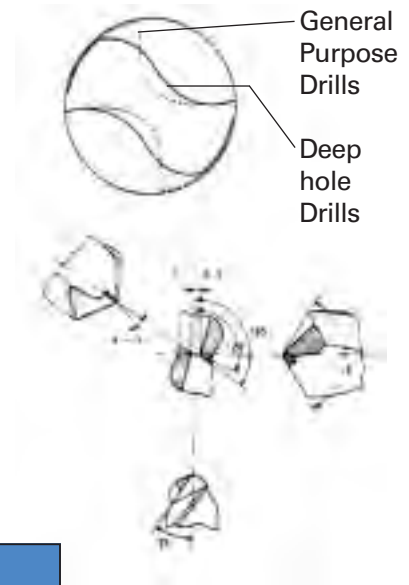
ex. Characteristics of the drills for deep hole

To drill a very deep hole, it is necessary for the drills to have the following four features:

1. Good removal of the cutting chip
2. Good penetration of the cutting coolant
3. Good heat resistance
4. High rigidity

We show the geometries for the drills as shown in the illustration.

The drill has a thick web for strength and proper thinning for less thrust force.



Drilling Terminology

Terms	Descriptions	Formulas
IPM	Inches Per Minutes	$IPR \times RPM$
IPR	Inches Per Revolution	$\frac{IPM}{RPM}$
RPM	Revolutions Per Minute	$\frac{SFM \times 3.82}{D}$
SFM	Surface Feet Per Minute	$D \times RPM \times 0.26$
D	Drill Diameter	

OPERATING INSTRUCTIONS FOR RE-SHARPENING OF SG-ES & SG-ESS DRILLS

Accurate re-sharpening is one of the most important skills that a qualified worker must have.

SG-ESS RE-SHARPENING

1. DIMENSIONS OF THREE RAKE POINTING

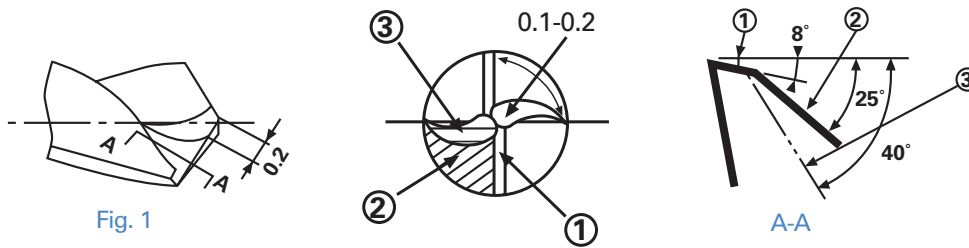


Fig. 1

2. RE-SHARPENERS

The relief flank is re-sharpened in an ordered sequence.

- (1) The cutting tools are held parallel to the table.
- (2) The drill swings from the same horizontal plane, about 20 degrees (Fig.2).
- (3) The grinding wheel swings from the same number of degrees as the relief angle.
- (4) Re-sharpening relief flank (Fig.3).

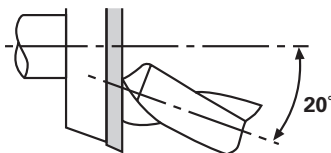


Fig. 2

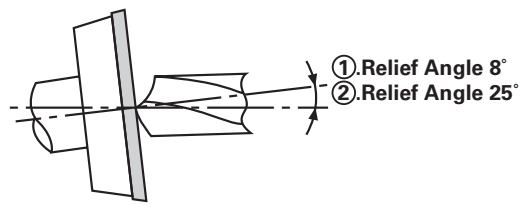


Fig. 3

3. THINNING (3RD RAKE)

The thinning is re-sharpened according to the following stipulations:

- (1) The drills rotate about 40 degrees towards the re-sharpening surface (Fig. 4).
- (2) The drills swings about 40 degrees (Fig. 5).
- (3) The thinning surface must be re-sharpened done at 0.1 to 0.2 mm (0.004-0.008") increments.

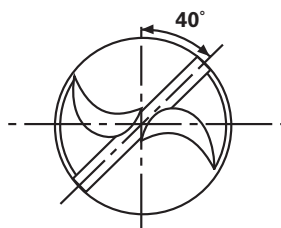


Fig. 4

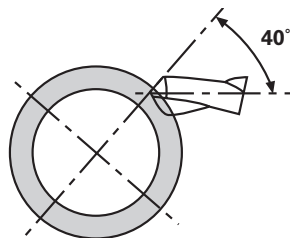
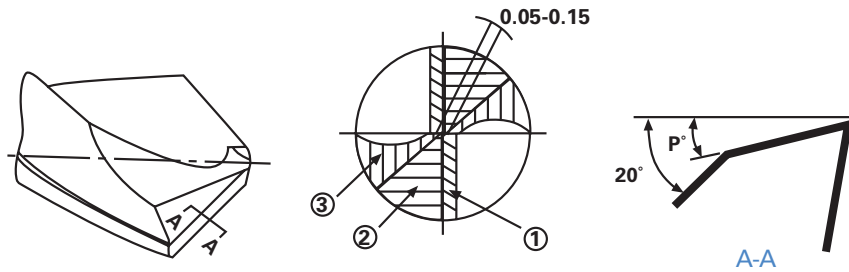


Fig. 5

SG-ES RE-SHARPENING

1. DIMENSIONS OF TWO-RAKE+X-THINNING



Diameter	P
2.0-5.0 (3/32-3/16)	12°
5.1-13.0 (13/64-1/2)	10°
13.1-20.0 (17/32-3/4)	8°

Table 1

2. GRINDING OF RELIEF FLANK

- 2-1. Utilize a drill grinder or a universal tool grinder
- 2-2. Grind relief flank as having 8 – 12 deg. as relief angle shown in Table 1. and Fig. 2.
- 2-3. Fix the drill after incline it. Then grind relief flank as having 20 deg. as secondary relief.
- 2-4. At this time, regrind it to meet the edgeline of these two relief in center line (Fig.3).

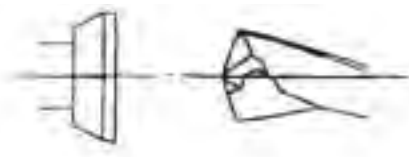


Fig. 1

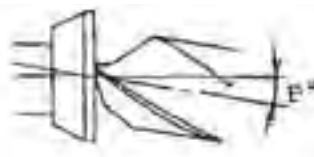


Fig. 2

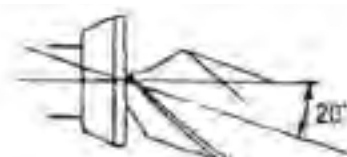


Fig. 3

3. WEB THINNING

- 3-1. As shown Fig. 4, incline drill in 50-55 deg. then grind the corner of secondary relief remaining .05-.1 mm (.002-.004 in.). At this time, give attention not to grind the center of drill, then remain approx. 0.1 mm (.004 in.).
- 3-2. Rotate drill in 10 – 15 deg., then grind it. And secure the pocket of 105 – 110 deg.

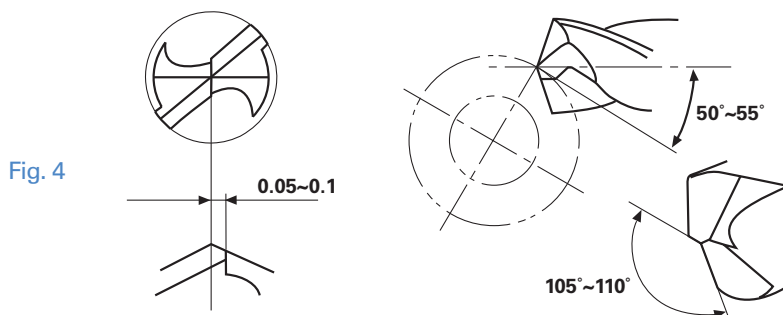


Fig. 4

4. INSPECTION

Please check the following points before using.

- 4-1. Lip height exist within 0.02 mm. (0.001 in.).
- 4-2. No remainder of damage on cutting edges after regrind.
- 4-3. Burr by regrind is removed.

GUIDELINES FOR TROUBLE SHOOTING TWIST DRILL PROBLEMS

- Remedial measure is highly effective
- Remedial measure is relatively effective

Possible Cause								
Trouble with device	Faulty jig, clamp, or fixture	Faulty tool (design)	Faulty tool (regrinding)	Faulty tool holder	Defect in workplace	Unsatisfactory cutting conditions	Faulty coolant or lubricating system	Faulty process design

Problems	Solution	Remedy								
Oversize holes	Reduce material build up on cutting lips and flutes				22		24		29 30 31 32	
	Reduce difference in cutting resistance between Right and left cutting lips.		4 5B 7	13B	19 20 21	8				
Curved hole or drilled off center	Prevent defective leading	3	3 4 5B 7		13A 21	8			26B 27	6 33
	Increase drill rigidity			10						
	Reduce difference in cutting resistance between right and left cutting lips.				17B 19					
Distorted Holes	Prevent rifling		4		18B 19					
	Reduce irregular motion and vibration		3 7	23	20 21	8		26A		33
	Eliminate clogging with chips			9A 11 14 15						34
Hole position shift		3 4		20 21	8		27		33	
Rough Finish or tearing in hole	Reduce galling (material build up on cutting lips)				22		24		29 30 31 32	
	Reduce wear				13A 19			25B		
	Reduce chatter and vibration	1	4 7	9A 23	20 21			26A		33
Breakage of drill	Eliminate clogging with chips			9A 11 14 15				26A 36		34
	Increase drill rigidity			10 23	17			26B		
	Reduce feed at breakthrough	1 2	7		20 18			28		
	Prevent drill deflection		3 4 5B 7		13A 19 21			26B		
Abnormal wear of drill corner edge	Reduce wear			12 16	18A		24	25B 26B		
	Prevent chipping	2	7					26B		
Wrapping of chip around drill	Increase or decrease helix angle and cutting speed from the recommended angle and speed	34	5A	9 14				26A		

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

GUIDELINES FOR TROUBLE SHOOTING TWIST DRILL PROBLEMS continued

No.	Remedial action and important points	No.	Remedial action and important points
1	Increase rigidity (column and spindle) of machine tool.	19	Eliminate relative lip height (difference in cutting resistance between right and left cutting edges).
2	Take steps to insure a steady feed (particularly components with pneumatic or hydraulic controls).	20	Thinning (take care to prevent excessive thinning).
3	Increase accuracy of alignment of bushing. (Increase alignment of preliminary hole and spindle for hole with large diameter.)	21	Eliminate unevenly chiseled areas.
		22	Rework worn margin completely.
4	Use bushing and reduce bushing clearance.	23	Increase web thickness.
5 5A: 5B:	Clearance between workpiece to be drilled and bushing Widen this clearance. Narrow this clearance.	24	Check workpiece to be drilled, for proper grain structure and heat treatment. (HB: 180 or more)
		25 25A: 25B:	Cutting speed Increase this speed. Decrease this speed.
6	Rotate workpiece instead of tool.	26 26A: 26B:	Feed Increase feed rate. Decrease feed rate.
7	Secure workpiece or replace fixture on the workpiece with fittings that have less clamp distortion.		27
8	Check contact of drill taper (clean) and reduce run-out of holder and spindle.	28	Decrease feed at exit from workpiece.
9 9A: 9B:	Helix angle Increase this angle. Decrease this angle.	29	Use non-water-soluble coolant.
		30	Use sulfuric or chloric extreme-pressure oils.
10	Shorten overall length and flute length to increase rigidity.	31	Increase quantity of coolant discharged.
11	Provide chipbreaker.	32	Feed oil in correct direction.
12	Use surface treatment.	33	Drill center hole in preceding process.
13A: 13B:	Increase this angle Decrease this angle.	34	Effect intermittent feed. (Narrow step for deep holes.)
		35	Select such helix angle and end angle that cutting edges will not be shaped like beak.
14	Increase flute width ratio.	36	Decrease feed rate for deep holes
15	Use oil-hole drill.		
16 17 17A: 17B:	Upgrade material of tool. Back taper Increase back taper. Decrease back taper (Check a slight decrease in diameter from point to back).		

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

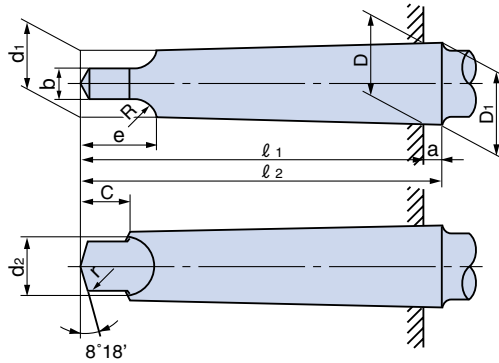
END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

TAPER SHANK WITH TENON



Morse taper	Taper		Angle on Side	Taper shank with tenon																
				D ⁽²⁾	a	D _i ⁽³⁾	d _i ⁽³⁾	d ₂		l ₁		l ₂		b		C ⁽⁴⁾	e		R	r
								Basic size	Tolerance	Basic size	Tolerance	Basic size	Tolerance	Basic size	Tolerance		Basic size	Tolerance		
0	1/19.212	0.05205	1°29'27"	9.045	3	9.201	6.104	6	0 -0.3	56.5	0 -1.2	59.5	0 -1.9	3.9	0 -0.180	6.5	10.5	0 -1.1	4	1
1	1/20.047	0.04988	1°25'43"	12.065	3.5	12.240	8.972	8.7	0 -0.3	62.0	0 -1.2	65.5	0 -1.9	5.2	0 -0.180	8.5	13.5	0 -1.1	5	1.2
2	1/20.020	0.04995	1°25'50"	17.780	5	18.030	14.034	13.5	0 -0.43	75.0	0 -1.2	80	0 -1.9	6.3	0 -0.220	10	16	0 -1.1	6	1.6
3	1/19.922	0.05020	1°26'16"	23.825	5	24.076	19.107	18.5	0 -0.52	94.0	0 -1.4	99	0 -2.2	7.9	0 -0.220	13	20	0 -1.3	7	2
4	1/19.254	0.05194	1°29'15"	31.267	6.5	31.605	25.164	24.5	0 -0.52	117.5	0 -1.4	124	0 -2.5	11.9	0 -0.270	16	24	0 -1.3	8	2.5
5	1/19.002	0.05263	1°30'26"	44.399	6.5	44.741	36.531	35.7	0 -0.62	149.5	0 -1.6	156	0 -2.5	15.9	0 -0.270	19	29	0 -1.3	10	3
6	1/19.180	0.05214	1°29'36"	63.348	8	63.765	52.399	51.0	0 -0.74	210.0	0 -1.85	218	0 -2.9	19	0 -0.330	27	40	0 -1.6	13	4

Tolerance of Drill Diameter

Unit : 0.001mm

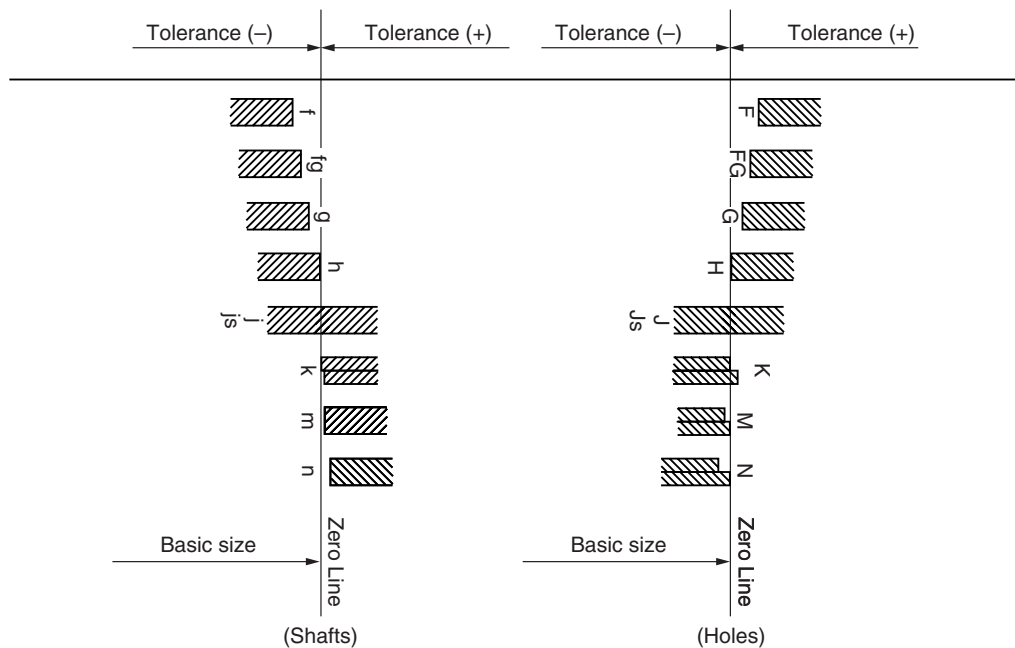
Diameter (mm)		Under 3.0 D≤3	Above 3.0 Under 6.0 3<D≤6	Above 6.0 Under 10 6<D≤10	Above 10 Under 18 10<D≤18	Above 18 Under 30 18<D≤30	Above 30 Under 50 30<D≤50	Above 50 Under 80 50<D≤80	Above 80 Under 120 80<D≤120
Tolerance	js6	±3	±4	±4.5	±5.5	±6.5	±8	±8.5	±11
	h6	0 -6	0 -8	0 -9	0 -11	0 -13	0 -16	0 -19	0 -22
	h7	0 -10	0 -12	0 -15	0 -18	0 -21	0 -25	0 -30	0 -35
	h8	0 -14	0 -18	0 -22	0 -27	0 -33	0 -39	0 -46	0 -54

NUMERICAL VALUES OF STANDARD TOLERANCE IT (JIS B 0401-1 : 1998 EXTRACT)

Unit : 0.001mm

Base size (mm)		Grades													
		IT 1	IT 2	IT 3	IT 4	IT 5	IT 6	IT 7	IT 8	IT 9	IT 10	IT 11	IT 12	IT 13	IT 14
Above	Up to and including														
—	3	0.8	1.2	2	3	4	6	10	14	25	40	60	100	140	250
3	6	1	1.5	2.5	4	5	8	12	18	30	48	75	120	180	300
6	10	1	1.5	2.5	4	6	9	15	22	36	58	90	150	220	360
10	18	1.2	2	3	5	8	11	18	27	43	70	110	180	270	430
18	30	1.5	2.5	4	6	9	13	21	33	52	84	130	210	330	520
30	50	1.5	2.5	4	7	11	16	25	39	62	100	160	250	390	620
50	80	2	3	5	8	13	19	30	46	74	120	190	300	460	740
80	120	2.5	4	6	10	15	22	35	54	87	140	220	350	540	870
120	180	3.5	5	8	12	18	25	40	63	100	160	250	400	630	1000
180	250	4.5	7	10	14	20	29	46	72	115	185	290	460	720	1150
250	315	6	8	12	16	23	32	52	81	130	210	320	520	810	1300
315	400	7	9	13	18	25	36	57	89	140	230	360	570	890	1400
400	500	8	10	15	20	27	40	63	97	155	250	400	630	970	1550

TOLERANCE GRADE (JIS B 0401-1 : 1998 EXTRACT)



Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others