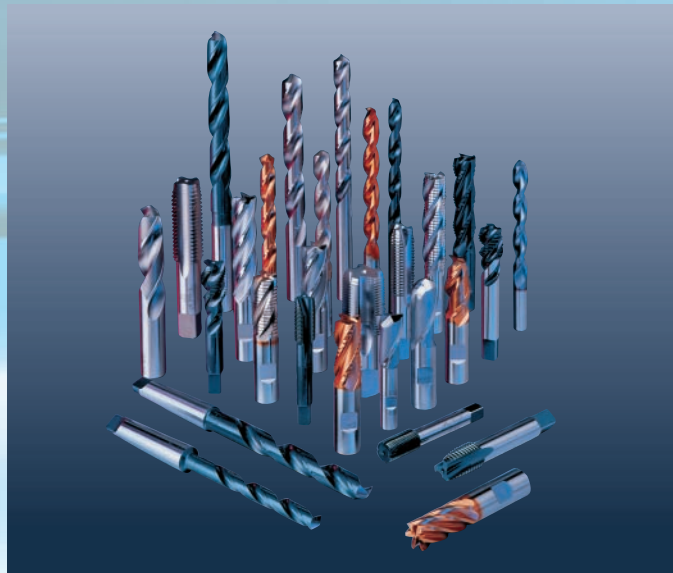


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Contributing to Progress in the World of Product Manufacture

The NACHI Difference:

NACHI-FUJIKOSHI CORP. is a pioneer of precision cutting tools in Japan and one of the leading manufacturers of tools worldwide. No manufacturer of cutting tools anywhere in the world exercises greater control over the quality of its products than NACHI. NACHI quality starts with the material itself because the High Speed Steel, premium Cobalt High Speed Steel, Powder High Speed, and Cermet we use comes from our own mills. The technology of the coating, such as Mixed Component multi-layer coating and Diamond coating (thin film diamond) has been developed specifically for our cutting tools.

Cutting tools are basic products for the machine industries. Successful performance of machine tools cannot be expected without precise cutting tools and high quality. NACHI pursues the highest quality 100% of the time. NACHI is the first Japanese cutting tool manufacturer to be awarded the prestigious honor of the Deming Award for Quality.

When You Buy From NACHI:

When you purchase cutting tools from NACHI you are using products produced by one of the largest, most innovative manufacturers of industrial equipment in the world. Established almost 75 years ago, The NACHI-FUJIKOSHI CORP. has grown into a world-class, worldwide leader in its industry. The company has approximately ten million square feet of plant area and facilities in Japan, Production plants in The U.S.A., Singapore, Brazil, Taiwan, Spain and Korea, and sales marketing subsidiaries in all major industrial nations.

NACHI-FUJIKOSHI CORP.

We have a history of Seventy five years as a world-famous integrated manufacturers with the renowned brand "NACHI". With the continuous production system, from high class special steels to finished products, our well-coordinated technics stand high in public estimation.



Head Office: Toyama Plant



Higashi - Toyama, Steel Plant



Singapore Plant



Brazil Plant



Namerikawa Plant



NACHI MACHINING TECHNOLOGY CO.



Spain Plant

JAPAN MAIN OFFICE

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Argentina C.P. 11230, Mexico D.F. MEXICO
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Phone: 6861-3944 Fax: 6861-1153

NACHI PILIPINAS INDUSTRIES, INC.

1ST Avenue, Manalac Compound, Sta. Maria
Industrial Estate, Bagumbayan, Taguig Metro Manila, PHILIPPINES
Phone: (02) 838-3620 Fax: (02) 838-3623

NACHI



CUTTING TOOL PRODUCTS

NACHI AMERICA INC.

HEADQUARTERS AND MAIN WAREHOUSE

17500 Twenty-three Mile Road, Macomb, Michigan, 48044, U.S.A

Phone: (586) 226-5288

Toll Free Phone: 1-888-340-8665

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Web Site URL: <http://www.nachi.com>

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MONTREAL BRANCH

9730 Trans-Canada Hwy., St. Laurent, Quebec H4S 1V9, CANADA

Phone: (514) 856-2200

Toll Free Phone: 1-888-622-4411

Fax: (514) 856-9144

NACHI'S OTHER QUALITY PRODUCTS

SPECIAL CUTTING TOOLS

(Broach, Forming Rack, Shave Cutter and Hob)

NACHI MACHINING TECHNOLOGY CO.

17500 Twenty-three Mile Road, Macomb, Michigan, 48044, U.S.A.

Phone: (586) 263-0100

Fax: (586) 263-4571

Web Site URL: <http://www.nachimtc.com>

MACHINE TOOLS

(Broaching, Roll Forming, Shaver and Hobbing)

Phone: (586) 226-5166

Fax: (586) 263-4571

BEARINGS

IN Phone: (317) 334-9993

Toll Free Phone: 1-888-340-2747

IN Fax: (317) 334-1206

Toll Free Fax: 1-888-734-1206

L. A., CA Phone: (562) 802-0055 Fax: (562) 802-3903 Toll Free Phone: 1-800-548-3903

HYDRAULICS

Phone: (586) 226-5280 Fax: (586) 226-5289 Toll Free Phone: 1-800-622-4410

MATERIALS

Phone: (586) 226-5299 Fax: (586) 226-5289 Toll Free Phone: 1-800-526-6281

ROBOTICS

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Fax: (248) 305-6542

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Clean Steel

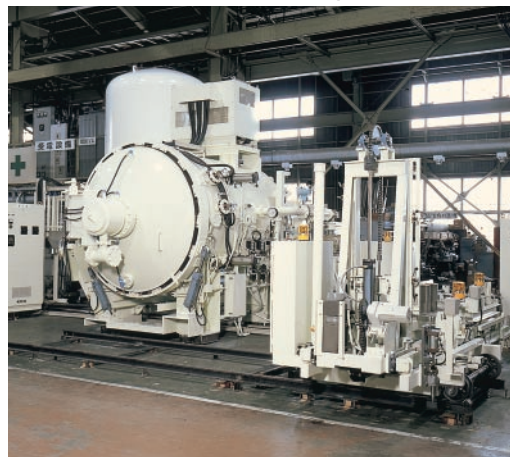
Material and heat treatment are major factors in determining the performances of the HSS tool. To provide high-quality HSS tools, NACHI-FUJIKOSHI has a steel mill to manufacture the HSS steels conforming to individual requirements for our in-house use as well as for outside sales.



Electric arc furnace

Clean Heat Treatment

In the field of heat treatment, we are producing and marketing vacuum heat treatment furnaces, which are highly evaluated among users both in Japan and abroad. Further, through technical tie-ups with Sumitomo Electric Industries Co., Ltd., we use cemented carbide materials best suited to individual requirements.



Horizontal type one chamber gas pressure quenching vacuum furnace

High-speed tool

Main high-speed tools and their applications

Classification	Steel type symbol			Chemical component						Application
	JIS	AISI	NACHI	C	Mo	W	Cr	V	Co	
High-speed steel	SKH10	T 15	HS55T	1.5		12	4	5	5	Basic steel type, cutting tool
	SKH51	M 2	SKH51	0.85	5	6	4	2		Drill, broach, others in general
	—	M33	HM33	0.9	9.5	1.5	4	1.2	8	Drill, gear cutting tool, others in general
	—	M34	HM34	0.9	8	2	4	2	8	Cutting tool, others in general
	SKH55	M35	HS53M	1.05	5.5	6	4	2.5	5	Cutting tool, others in general
	SKH57	—	HS93R	1.25	3.5	10	4	3.5	10	Tool material
	SKH59	M42	HS96H	1.1	9.5	1.5	4	1.2	8	End milling cutter and others
			HS97R	1.1	5.5	7.5	4	1.8	9	End milling cutter, tap
Powdered High-speed steel			FAX18	1.1	9.5	1.5	4	1.2	8	Saws and others
			FAX31	1.3	5.5	6	4	3		General
			FAX38	1.3	5	6	4	3	8	Gear cutting tool, tap, others in general
			FAX55	1.6		12	4	5	5	Gear cutting tool, broach, others in general
			FAX90	2.6	3.5	10	4	8.5	10	General (high alloy material)
Alloy tool steel	SKS 7		SKS 7	1.15		2.2	0.3			Hack saw, etc.
	SKD11		SKD11	1.5	1		12	0.4		]Molding tools including dies and molds
	SKD61		SKD61	0.4	1.3		5	1	Si1	

Effects of major alloy components

W : Hard double carbide is formed to ensure improved wear resistance

Mo : Fine carbide and improved toughness to ensure improved wear resistance

Cr : Tissue stabilization factor (upgraded solubility)

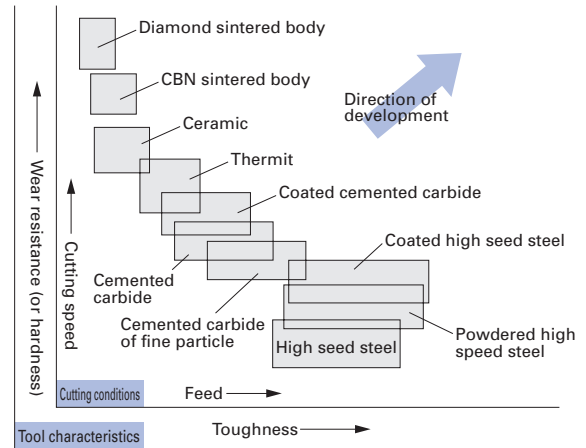
V : Extended and improved wear resistance of secondary carbon

C : Enhanced carbon formation factor and hardening properties

Co : Best suited to heavy-duty cutting due to improved heat resistance

Characteristic of various tool materials

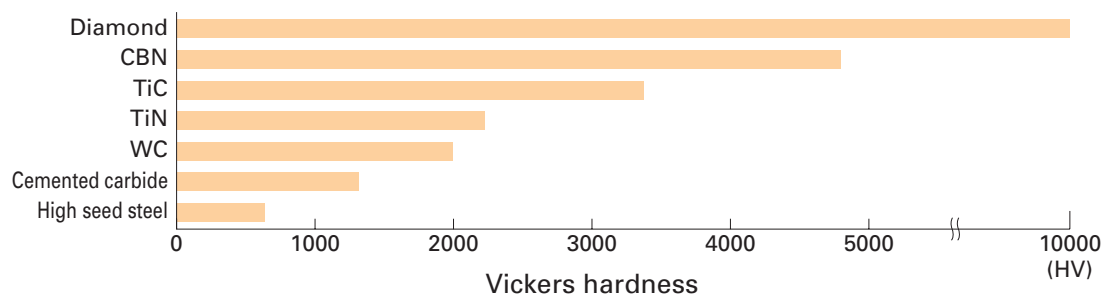
It is important that tool materials are characterized by excellent resistance to chipping or breakage. Selection is made from among various types of tool materials in conformity to the workpiece and machining method. NACHI's integrated production system covering the entire range from materials to tool produces provides tool materials meeting each of your requirements.



Characteristics of various tool materials

Type	Symbol	(Example)	Production method	Features
Carbon tool steel	SK □	SK 3	Tool steel where carbon is put into iron to enable hardening.	Less expensive, but low hardness at a high temperature.
Alloy tool steel	SKS □ SKD □	SKS 7 SKD 11	Tool steel with its wear resistance improved by alloy steel such as iron, Cr and W.	
High speed steel	SKH □	SKH 51 SKH 55	Tool steel with wear resistance and toughness improved by hard carbide created by mixing W, Mo, Cr and V with iron.	The steel type with much Co content is called cobalt high speed tool characterized by excellent heat resistance.
Powdered high speed steel	NACHI symbol FAX □	FAX 38 FAX 55	Fine powder of the high speed steel sintered by the powder metallurgy. This method can also be used to manufacture the type of steep containing such components as V and Co.	The tissue is minute, uniform and tough. Further, excellent wear resistance is provided by such components.
Cemented carbide	K □ P □	K 10 P 20	The major component is W. It is manufactured by sintering the TiC, TaC and Co (bonding agent) according to powder metallurgy method.	Very hard at a high temperature and excellent in wear resistance, but chips easily.
Ultrafine grain cemented carbide	Z □	Z 20	Cemented carbide characterized in that the particle diameter of carbide such as W, Ti and Ta does not exceed 1 micron.	The toughness is higher than that of cemented carbide, but wear resistance is lower.
Thermit	NACHI symbol NAX □	NAX T NAX LL	The main components are carbide such as Ti and Ta, nitride and carbonitride. They are sintered with Ni and Co (binder) by powder metallurgy to produce Thermit.	Excellent in resistance to wear, heat and deposition, but susceptible to chipping. Used for high-speed cutting.
Ceramic			A sintered body (porcelain). Available in two types; alumina type mainly consisting of Al ₂ O ₃ and silicon type mainly consisting of Si ₃ N ₄ .	Excellent wear resistance but poor toughness.
CBN sintered body	NACHI symbol BM □ BC □	BM 10 BC 30B	Manufactured by sintering the powder of CBN, the hardest second only to diamond, at a high temperature under super high pressure. Excellent hardness even at a high temperature.	Reaction with metal occurs very rarely. Characterized by excellent stability at a high temperature.
Diamond sintered body	NACHI symbol DM □	DM 10 DM 10F	A polycrystalline body formed by sintering powdered diamond at a high temperature under super high pressure. Characterized by excellent hardness.	Chemically stable to the workpiece made of other than iron.

Hardness of high-hardness material

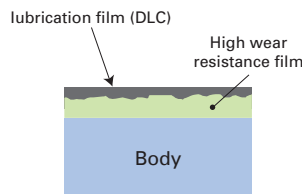


Coating Series with Excellent Characteristics

DLC Coating

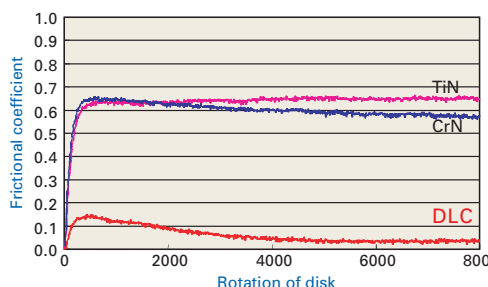
High-speed dry machining of aluminum alloy has been realized by adoption of cemented carbide alloy and coating of DLC (Diamond-Like Carbon) -- an amorphous substance having diamond-like properties characterized by a high degree of hardness, a low friction coefficient and wear resistance.

It has a low friction coefficient and resistance to deposition of aluminum alloy. Deposition is reduced even in high-speed dry machining, and excellent properties of machining surfaces are provided.



Construction of DLC

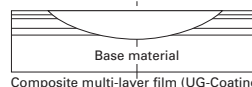
	Graphite	DLC	Diamond
Structure			
element	C	C+H	C
R/V	—	1000~8000HV	10000HV



BALL : SUJ2 Disk : Film/HSS (Ry0.2μm)
 Revolution : 500RPM Over weight : 100N Dry
 Machine : CSEM Tribometer

Composite multi-layer coating

As a cutting tool coating technique, this coating technique provides improved wear resistance and ensures protection of the base materials (through the use of a composite multi-layer configuration), centering on the general-purpose TiN G-series. We have established the manufacturing conditions of various series of our company, including the SG series of high-speed steel.

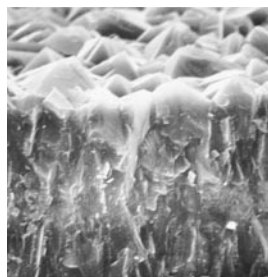


Composite multi-layer film (UG-Coating)

Diamond coating

We are the first in the world to succeed in commercial use of a diamond film (so-called a tool of dream), using our coating technique.

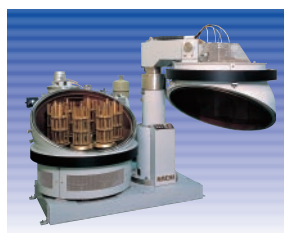
Diamond coating by vapor phase synthetic method provides the close adhesion that has been inconceivable so far. The technique ensures drastic improvement of cutting performance in the field of machining the nonferrous metal, graphite, composite material or aluminum alloy.



Diamond coated film

Coating equipment

Our R & D efforts cover the development of coating equipment indispensable to the developing of new coating technology.



Coating equipment

Comparison of characteristics of NACHI coating film

Name	Evaluation of relative characteristics	Features
G (TiN)		- The basis for PVD coating. Coating method in common use.
SG		- Composite multi-layer film coating method characterized by improved wear resistance as compared to TiN.
UG		- Coating method characterized by adoption of a TiCN based composite multi-layer film to provide improved wear resistance.
AG		- Coating method based on the TiAlN film characterized by superb resistance to heat and wear. Commercialized for use in high-speed steel.
X's		- Coating method for cemented carbide end-milling cutters, based on the TiAlN film characterized by superb resistance to heat and wear.
AQUA		- Coating method characterized by excellent heat resistance and lubricity of the workpiece. Compatible with both dry machining and wet machining.
DLC		- Coating method characterized by a film having a structural characteristic intermediate between graphite and diamond, where the surface is provided with a smooth film, thereby enhancing resistance of aluminum alloy and others to deposition.
DIA		- Coating method best suited to processing of non-ferrous metal, graphite and aluminum alloy, where NACHI is the first to realize commercialization of a diamond film.

NACHI's Efficiency Theme "Eco & Eco"

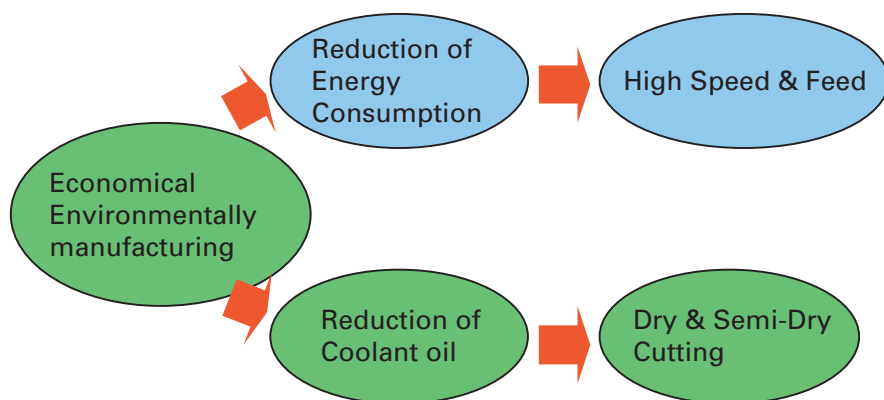
Sets The New Standard for Cutting Tools

" ECO " = Economy of Cost Reduction

" ECO " = Ecologically Friendly



Achieving The Cost Efficient Environmentally Friendly Solution



NACHI's Efficient Eco & Eco Lines Dry & Semi-Dry Cutting

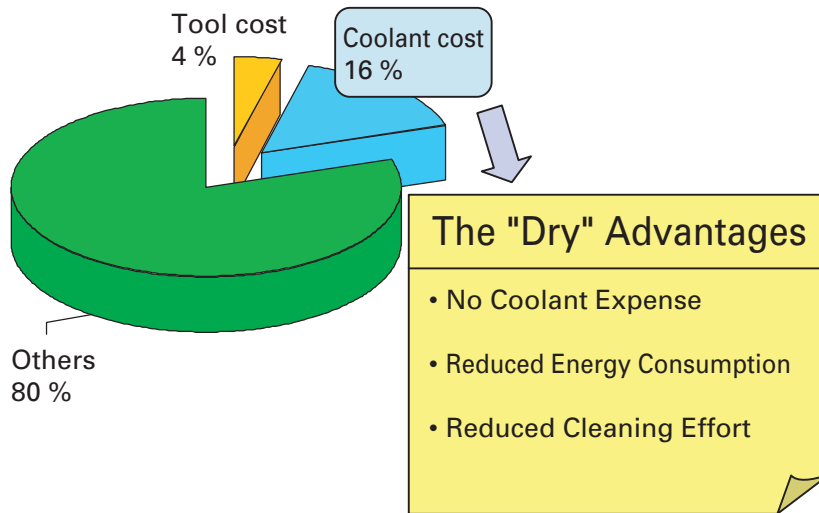
Drilling AQUA Drill Series for Steel
DLC Drill Series for Aluminum

Milling DLC Endmill Series for Aluminum
X's mill GEO Series for Steel
X's mill Series for Steel

Tapping DLC TAFLET Series for Aluminum

**If you can reduce coolant use,
you can reduce cost by more than 16%**

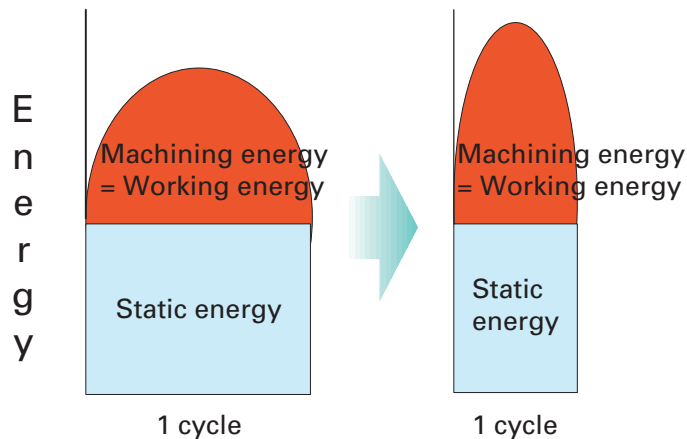
Reducing Machining Costs



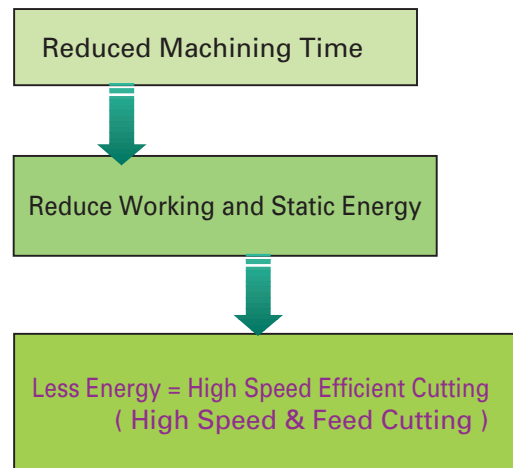
The NACHI Solution

High Speed and Feed Cutting

The Machining Energy Story



The NACHI Solution High Speed & Feed Cutting



NACHI High Speed & Feed Lines

Drilling	AQUA Drill Series	for Steel
	AG /UG Power Series	for Steel
Milling	X's mill GEO Series	
	X's mill Series	

GUIDE TO MARK (TOOL SPECIFICATION)

DRILLS

Technical
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DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

Mark	Explanation	Mark	Explanation
	G (TiN) Coating		Point Angle of Drills
	UG (TiCN multi layer) Coating		 Drill Length is from Center Point
	SG (TiCN multi layer) Coating		 Drill Length is from Corner Point
	AG (TiAlN multi layer) Coating		 Oil-hole Drills
	AQ (TiAlN multi layer) Coating		 Three Flutes Drills
	X's (TiAlN multi layer) Coating		Conical Shape of Lip Relief is Conical
	GS (TiAlN multi layer) Coating		 Shape of Lip Relief is Two Rake
	DLC Coating		 Shape of Lip Relief is Three Rake
	Diamond Coating		S-type Thinning
	High Speed Steels		 Notch Thinning
	Cobalt High Speed Steels		 X-type Thinning
	Fine Melting HSS		 XH-type Thinning
	High Grade Powder HSS		 2Rake Relief & X-type Thinning
	Vanadium HSS		 2Rake Relief & XR-type Thinning
	Vanadium HSS		 3 Flutes Drills & 3F-type Thinning
	Cobalt/Vanadium HSS		
	Tungsten Carbide		js6 Tolerance of Drills Diameter is js6
	Normal Helix Flutes		 Tolerance of Drills Diameter is h7
	High Helix Flutes		 Tolerance of Drills Diameter is h8
	Low Helix Flutes		

GUIDE TO MARK (TOOL SPECIFICATION)

END MILLS

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END MILLS

END MILLS
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TAPS

TAPS
Cutting Condition

Others

Mark	Explanation	Mark	Explanation
Coating	 G (TiN) Coating	Flutes of End Mills	 Sharp corner Type End mills
	 UG (TiCN multi layer) Coating		 2 Flutes Square End mills (Center Cut)
	 SG (TiCN multi layer) Coating		 3 Flutes Square End mills (Center Cut)
	 AG (TiAlN multi layer) Coating		 4 Flutes Square End mills (Center Cut)
	 AQ (TiAlN multi layer) Coating		 4 Flutes Square for X's-mill Hard (Center Cut)
	 X's (TiAlN multi layer) Coating		 5 Flutes Square End mills (Center Cut)
	 GS (TiAlN multi layer) Coating		 6 Flutes Square End mills (Center Cut)
	 DLC Coating		 6 Flutes Square for X's-mill Hard & X's-mill Multi Flutes (Center Cut)
	 DIA Diamond Coating		 8 Flutes Square for X's-mill Hard & X's-mill Multi Flutes (Center Cut)
Tool Materials	 HSS High Speed Steels		 4 Flutes Square End mills (with Center Hole)
	 HSS Co Cobalt High Speed Steels		 5 Flutes Square End mills (with Center Hole)
	 FMX Fine Melting HSS		 6 Flutes Square End mills (with Center Hole)
	 FAX High Grade Powder HSS		 Multiple Flutes (over 8) Square End mills (with Center Hole)
	 PREMIUM Vanadium HSS		 2 Flutes Radius End mills (Center Cut)
	 HSSE-V Vanadium HSS		 4 Flutes Radius End mills (Center Cut)
	 HSSE Cobalt/Vanadium HSS		 2 Flutes Ball Nose End mills (Center Cut)
	 Carbide Tungsten Carbide		 4 Flutes Ball Nose End mills (Center Cut)
			 6 Flutes Ball Nose End mills (Center Cut)

GUIDE TO MARK (TOOL SPECIFICATION)

TAPS

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END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

Mark	Explanation	Mark	Explanation
Coating	 G (TiN) Coating	Type of Taps	 Cutting Taps
	 UG (TiCN multi layer) Coating		 Forming Taps
	 SG (TiCN multi layer) Coating	Flutes of Taps	 ST Straight Flutes Taps
	 AG (TiAlN multi layer) Coating		 SP Spiral Pointed Taps
	 AQ (TiAlN multi layer) Coating		 NH Normal Helix Flutes Taps
	 X's (TiAlN multi layer) Coating		 HH High Helix Flutes Taps
	 GS (TiAlN multi layer) Coating		 L Low Helix Flutes Taps
	 DLC Coating	Chamfer of Taps	 MB Chamfer Length is 2.5P to 3P
	 DIA Diamond Coating		 P Chamfer Length is 4P to 5P (for through hole)
Tool Materials	 HSS High Speed Steels		 B Chamfer Length is 1.5P (for blind hole)
	 HSS Co Cobalt High Speed Steels		 2.5P Chamfer Length is 2.5P
	 FMX Fine Melting HSS		 3.5P Chamfer Length is 3.5P
	 FAX High Grade Powder HSS		 TAPER PIPE Cutting Taps for Taper Pipe
	 PREMIUM Vanadium HSS		
	 HSSE-V Vanadium HSS		
	 HSSE Cobalt/Vanadium HSS		
	 Carbide Tungsten Carbide		

HIGH PERFORMANCE DRILLS

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List 9524 DLC MICRODRILLS / METRIC SIZES


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List 9520 DLC DRILLS REGULAR / METRIC SIZES


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List 500 STRAIGHT SHANK JOBBERS LENGTH DRILL / METRIC SIZES

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List 6520 STRAIGHT SHANK COBALT DRILL TYPE I / METRIC SIZES


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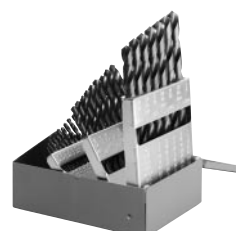
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DRILLS

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- Technical Information
- Selection Chart
- Sizes
- Cutting Condition
- Technical Reference

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

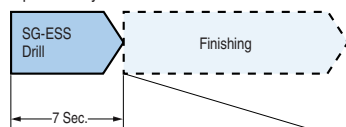
Performance

3 FUNCTIONS IN ONE DRILL

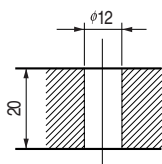
- CENTER DRILL–Precise positioning
- DRILL–Long tool life and high efficiency
- SEMI FINISH REAMER–Stable drilling and stable diameter



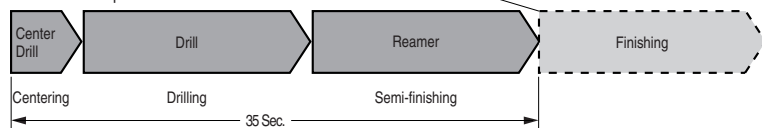
Operation by SG-ESS



Material : SCM440 (4140)



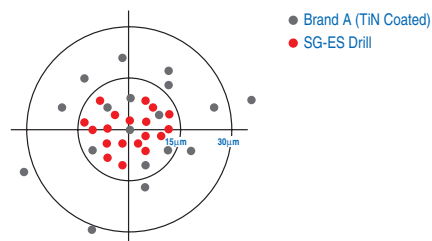
Conventional operation



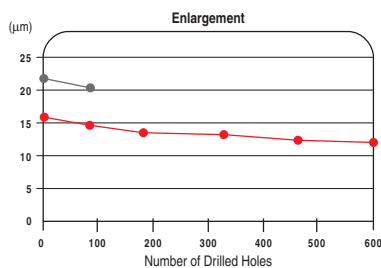
Comparison of Drilling Time

Positioning

- Stable positioning within 15μm (0.0006")



Performance and cutting data of SG drill series



● Brand A (TIN Coated)
● SG-ES Drill

CONDITION

Drill Dia. 9.0mm.

Hole depth: 32mm

Cutting speed: 20m/min. (65.6 SFM)

Feed: 142mm/min (5.6 IPM)

Work piece Material:

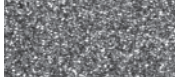
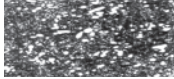
Alloy steel (300 HB)

Machine: Vertical machining center

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 Sizes	7573P	47
	SG-ESS Drill/Letter Sizes	7573P	47
	SG-ES Drill/Metric Sizes	7570P	48
	SG-ES Drill/Fractional 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

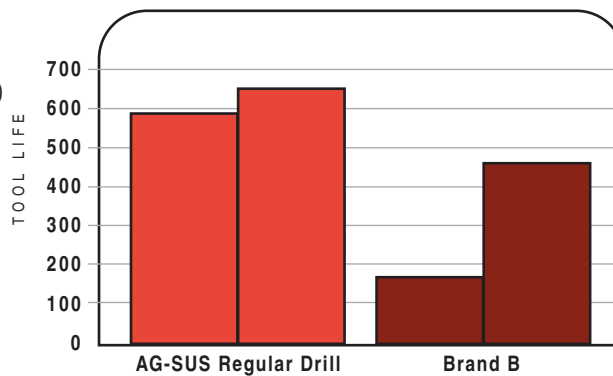
Austenitic Stainless Steels, Martensitic Stainless Steels, Ferritic Stainless Steels, Structural Steels, Low Carbon Steels



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



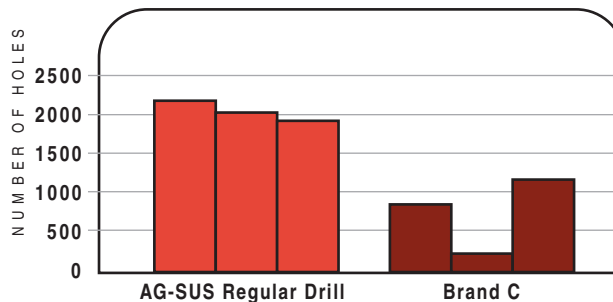
AG-SUS DRILL



COMPETITOR

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

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

Features

New style Parabolic Drills

The Nachi UG-Power drill is designed for deep hole drilling. Flute geometry allows for easy chip removal and can be drilled up to 7X diameter without pecking.

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)

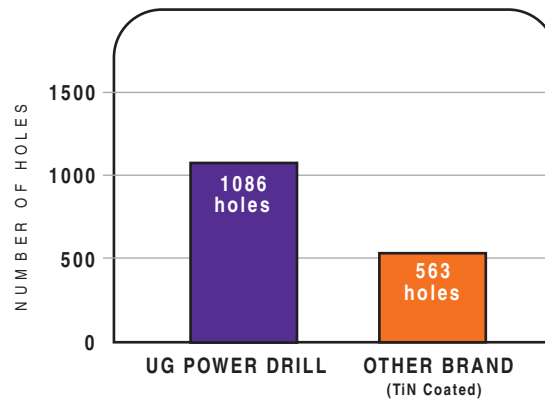
Performance

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



UG Power Drills



Competitor

Tool life is 1.5 times longer than competitor

UG Power Drills



Competitor



Cutting condition

Drill : 6mm

Speed : 33m/min

Feed : 0.18mm/rev

Depth : 48mm blind hole

Material : C45 (180HB) / S45C / 1045

Fluid : Emulsion

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 for stable drilling enables deep hole drilling with no pecking.
- AG coating (TiAlN) and high cobalt HSS increase tool life.

Work Materials

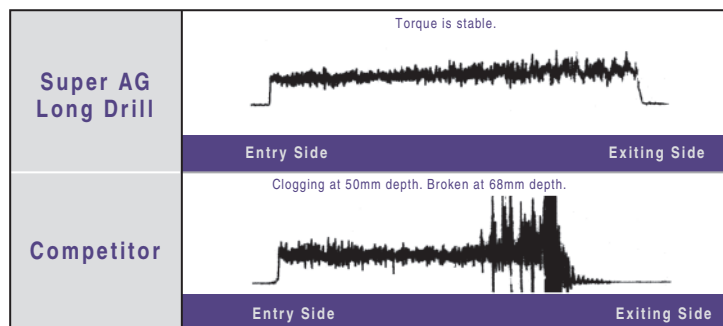
Carbon Steels, Alloy Steels, Mold Steels,
Hardened Steels (under 40HRC), Cast Irons

Performance

AG POWER LONG DRILL VS. STANDARD DRILL



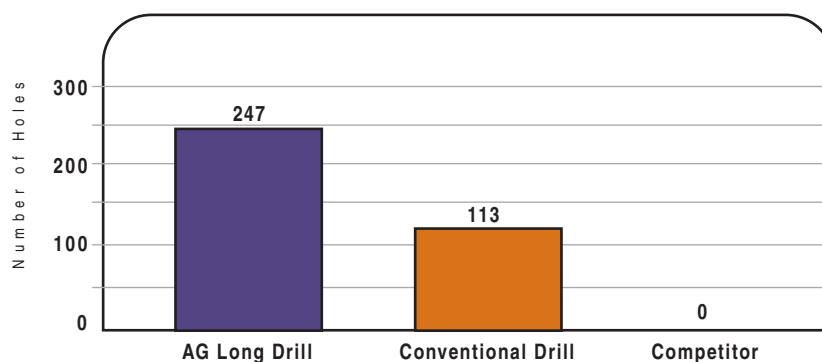
Stable torque



CUTTING CONDITION

Drill : 6mm (0.263in)
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

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

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

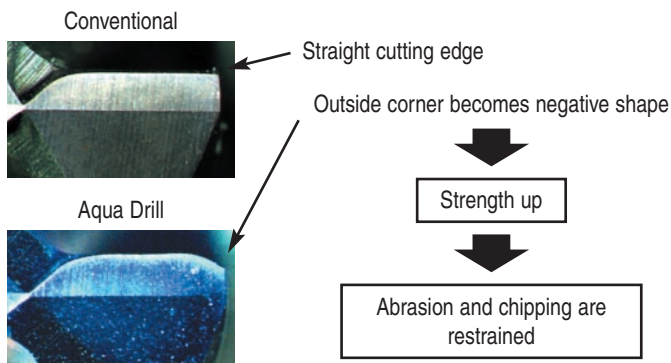
TAPS

TAPS
Cutting Condition

Others

Features

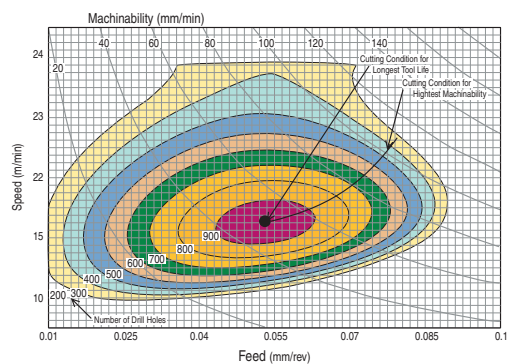
- Aqua coating has a self-lubricant and offers superior heat resistance. (Composite and multi-layered TiAlN + original lubricant film)
- Tough micro grain carbide enables a longer tool life.
- End mill type shank (List 9550, 9551, 9552, 9546, 9548, 9544)
- Cylindrical type shank (List 9556, 9569)
- Negative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



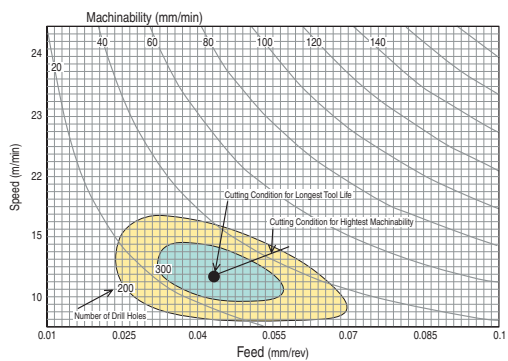
It is suitable for dry cutting and high speed cutting with fluid



• Wide range of Cutting condition



AQUA Drills Hard

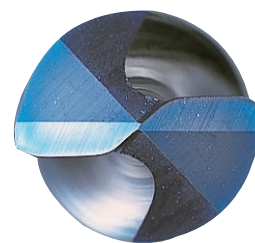


Competitor

AQUA Drills 3flutes



AQUA Drills Stub



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

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

Work Materials

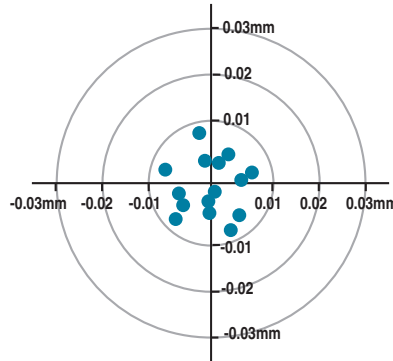
- Structural Steel
- Carbon Steel
- Alloy Steel
- Pre-Hardened Steel
- Cast Iron
- Stainless Steel (*AQUA Micro Drill)

- 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

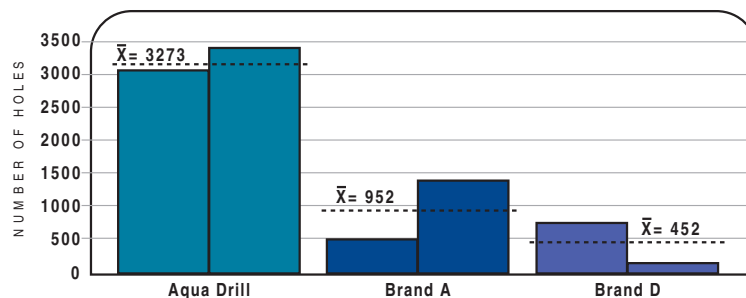


Drill Dia. : 1/4"
Material : S50C (1050), 185 HB
Hole Depth : 18mm through
Speed : 108m/min (5000 RPM)
Feed : 0.16mm/rev (800mm/min)
Coolant : Water base coolant

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

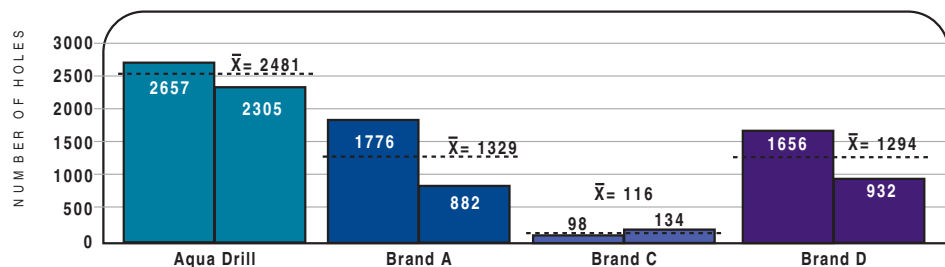
The Aqua Drill produces chips which will dissipate heat quickly.



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

CONDITION

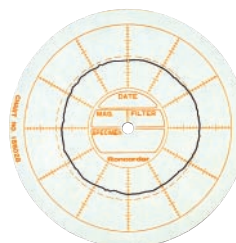
Drill : 6mm (0.2362")
Material : Alloy steel
(Hardness : 310 HB)
Hole Depth : 21mm through
Speed : 100m/min (328 SFM)
Revolution : 5305 RPM
Feed : 1061mm/min (41.7 IPM)
Water Soluble



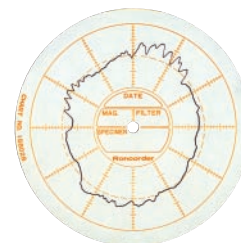
Roundness is under 3μm in pre-hardened steels

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

Features

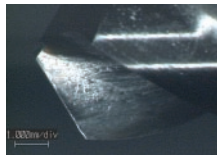
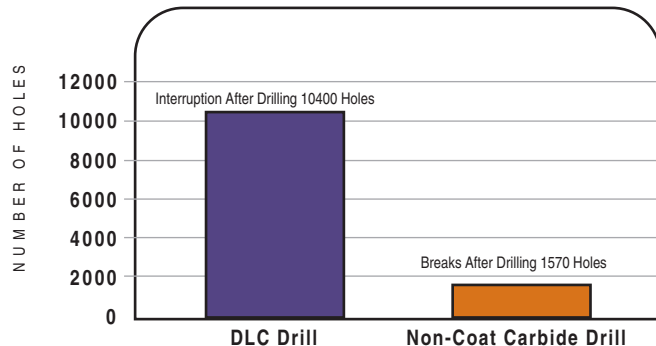
- Utilizes high accuracy shape of lip relief (2 rake thinning)
- Utilizes flute geometry resulting in excellent chip control and dry milling with no edge build-up
- End mill style shanks for highly precise and accurate drilling

Work Materials

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

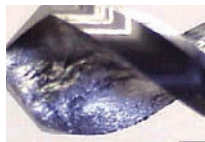
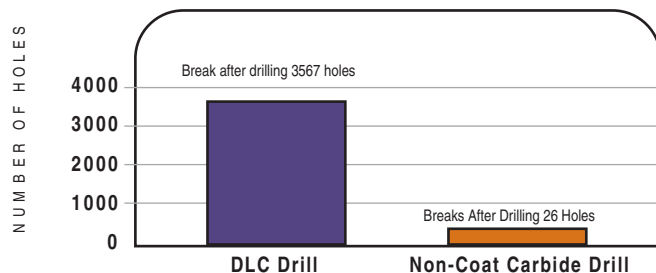
Performance

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 (1.06") 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	66
DLC Micro Drill/Metric Sizes	9524	67
DLC Drill Regular/Metric Sizes	9520	68

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

Features

- 100% pure diamond coating
- Suitable for nonferrous metals, nonmetals
- The tool life is 10 times of conventional carbide drills

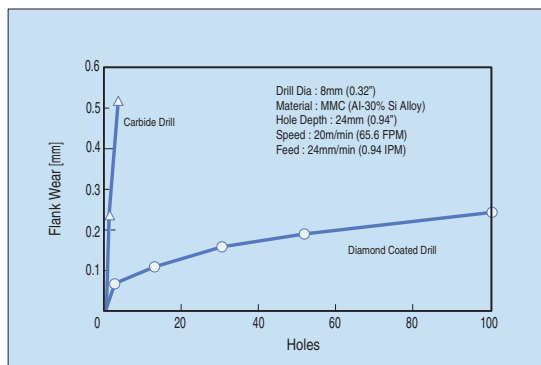
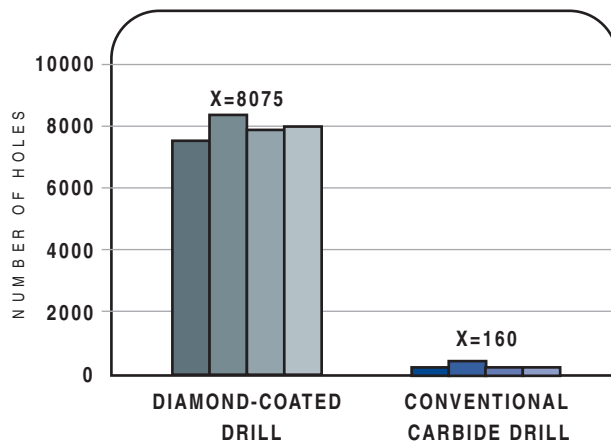
Work Materials

Aluminums, Aluminum Alloys, Graphite, FRP, Green Ceramics

Performance

CONDITION

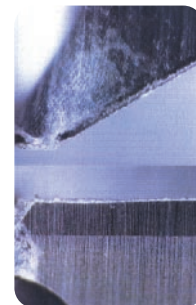
Drill Dia.: 6mm
Material: A390 (Al-17% Si Alloy)
Hole Depth: 20mm (0.79")
Speed: 80m/min (262.4 SFM)
Feed: 850mm/min (33.4 IPM)
Fluid: Water Soluble



DRILL EDGE COMPARISON



Diamond Coated Drill
(After drilling 8000 holes)



Conventional Carbide Drills
(After drilling 150 holes)



Diamond Coated Drill
100 Holes



Carbide Drill
2 Holes

Stocked Size

Drill Name	List No.	Page
Diamond Coated Drill/Fractional Sizes	9501D	58

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

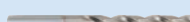
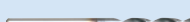
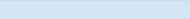
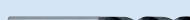
TAPS

TAPS
Cutting Condition

Others

HIGH PERFORMANCE DRILLS

●:Great ○:Good △:OK

Drill Name	Material	Coating	Stock USA ● Japan ○		Stock Size	LIST No			Drilling Depth *1				Workpiece Material																
						Page			≤3D	≤5D	≤7D	>7D	Carbon Steel		Alloy Steel	Die Steel	Hardened Steel			Stainless Steel		Titanium Alloys	Nickel Alloys	Cast Iron		Aluminum			Copper Alloys
						Size	Cutting Condition						Low Carbon	High Carbon			HRC	Austenitic 300 Series	Martensitic 400 Series	Soft < 200HB	Hard > 200HB			6061 7075	Casting Si ≤ 12%	High Si Si > 13%			
													1010,1018	1045,1065													4140,4330	D2	
SG-ESS Drills	PM-HSS	SG	●	Metric	1.0 to 20.0	7572P			●				●	●	●	●	○			○	●	●	●	○	△	○	○		○
						46	96																						
			●	Fractional	3/32 to 3/4	7573P			●				●	●	●	●	○			○	●	●	●	○	△	○	○		○
						47	96																						
●			Letter	F • U	7573P			●				●	●	●	●	○			○	●	●	●	○	△	○	○		○	
					47	96																							●
●			Wire	#40 to #6 (Limited)	7573P			●				●	●	●	●	○			○	●	●	●	○	△	○	○		○	
					47	96																							●
●	Metric	2.0 to 20.0	7570P			●	●	●		●	●	●	●	○				●			△		○	○					
			48	96																							●	●	●
●	Fractional	3/32 to 3/4	7571P			●	●	●		●	●	●	●	○					●			△		○	○				
			49	96																							●	●	●
●	Metric	5.0 to 20.0	7596P			●	●			●	●	●	●	○				○	○	○	○			○	○				
			50	97																							●	●	
●	Metric	15/64 to 3/4	7591P			●	●			●	●	●	●	○				○	○	○	○			○	○				
			50	97																							●	●	
●	Fractional	3/64 to 1/2	6517U			○	●	●		●	●	●	●	△								●	○						
			51	97																							○	●	●
○	Metric	1.0 to 13.0	6528P			○	●	●		●	●	●	●	△								●	○						
			52	97																							○	●	●
○	Metric	1.0 to 20.0	6596P			●				△	△	△	△					●	●	○	○								
			53	98																							○	●	●
●	Fractional	3/32 to 3/4	6595P			○	●	●		△	△	△	△					●	●	○	○								
			55	98																							○	●	●
●	Metric	1.0 to 20.0	6594P			○	●	●		△	△	△	△					●	●	○	○								
			54	98																							○	●	●
○	Metric	1.0 to 13.0	6540P				△	●	●		●	●	●	△							●	○							
			56	98																							○	●	●
●	Fractional	1/16 to 1/2	9501D			●	○																						
			58	98																							○	Metric	3.0 to 20.0
○	Metric	3.0 to 20.0	9550			●				●	●	●	●	○	△		○					○	△						
			59	99																							●	Fractional	1/8 to 3/4
60	99	●	Metric	2.0 to 20.0	9552			●	●			●	○	△		○						○	△						
61	100				○	Metric																					3.0 to 12.0	9546	
62	101	○	Metric	2.0 to 12.0			9548			●				●	○	●													
63	101				○	Metric	0.20 to 1.99	9544																					
64	102	●	Metric	5.0 to 16.0				9556			○	●	●		●	●	●	△	○	○				○	△				
65	103				●	Fractional	3/16 to 1/2	9569																					
65	103	○	Metric	1.0 to 13.0				544			○	●	●															●	○
66	104				○	Metric	0.5 to 1.9	9524																					
67	104	○	Metric	2.0 to 12.0				9520			●	●																●	●
68	104																												

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

STRAIGHT SHANK DRILLS

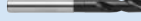
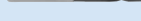
●:Great ○:Good △:OK

Drill Name		Material	Coating	Stock USA ● Japan ○		Stock Size	LIST No			Drilling Depth *1				Workpiece Material																
							Page Size Cutting Condition			≤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 1010,1018	High Carbon 1045,1065			HRC	Austenitic 300 Series	Martensitic 400 Series	Soft < 200HB	Hard > 200HB			6061 7075	Casting Si ≤ 12%	High Si Si > 13%			
																												D2	up to 35	
Jobbers Length	Standard	HSS	Black Oxide	●	Metric	0.2 to 17.5	500			●	●	●		○	○	○								△		△	△		△	
							69	105																						
				●	Fractional	3/64 to 11/16	501			●	●	●		○	○	○									△		△	△		△
							72	105																						
			●	Wire	#1 to #60	501			●	●	●		○	○	○									△		△	△		△	
						74	105																							
			●	Letter	A to Z	501			●	●	●		○	○	○									△		△	△		△	
						71	105																							
			Bright	●	Fractional	1/64 to 11/16	501A			●	●	●		○	○	○									△		△	△		△
							72	105																						
	●	Wire		#1 to #80	501A			●	●	●		○	○	○									△		△	△		△		
			74		105																									
	●	Letter	A to Z	501A			●	●	●		○	○	○									△		△	△		△			
				71	105																									
	TiN	●	Fractional	1/16 to 1/2	501P			●	●	●		○	●	●	△				△	△	△	△	○	△	△	△		△		
					72	105																								
	●	Wire	#1 to #52	501P			●	●	●		○	●	●	△				△	△	△	△	○	△	△	△		△			
				74	105																									
	High Helix	Bright	●	Fractional	1/64 to 1/2	503			●	●	●		●	△												○	△		○	
						72	105																							
Aircraft NAS 907-B	HSS-Co	Black Oxide	○	Metric	0.5 to 13.0	6520			●	●				○	○	○	△				○	○	△	△			△	△		△
						70	105																							
	HSS	Black Oxide	●	Fractional	1/16 to 1/2	515			●	●	●		○	○	○				△	△	△	△	△	△	△	△		△		
						72	105																							
	HSS-Co	Black Oxide	●	Fractional	1/64 to 1/2	6501			●	●	●		○	○	○	△				△	○	○	△	△	△	△		△		
						72	105																							
			●	Wire	#1 to #80	6501			●	●	●		○	○	○	△				△	○	○	△	△	△	△		△		
	74	105																												
	●	Letter	A to Z	6501			●	●	●		○	○	○	△				△	○	○	△	△	△	△		△				
				71	105																									
Parabolic	HSS	Black Oxide	●	Fractional	1/16 to 1/2	517			●	●	●		○	○	○									△						
						72	106																							
		●	Wire	#1 to #52	517			●	●	●		○	○	○									△							
					74	106																								
TiN	●	Fractional	1/16 to 1/2	517P			●	●	●		○	●	●	△				△			○	△	△	△		△				
				72	106																									
●	Wire	#1 to #52	517P			●	●	●		○	●	●	△				△	△		○	△	△	△		△					
			74	106																										

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

STRAIGHT SHANK DRILLS

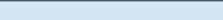
●:Great ○:Good △:OK

Drill Name		Material	Coating	Stock USA ● Japan ○		Stock Size	LIST No			Drilling Depth *1				Workpiece Material																			
							Page Size Cutting Condition			≤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 1010,1018	High Carbon 1045,1065			4140,4330	D2	up to 35	35 to 45	45 to 65			Austenitic 300 Series	Martensitic 400 Series	Soft < 200HB	Hard > 200HB	6061 7075		Casting Si ≤ 12%	High Si Si > 13%	
Screw Machine Length	Standard	HSS	Black Oxide	●	Fractional	3/64 to 2"	561			●				○	○	○												△		△			
							76 105																										
							561																										
			●	Wire	#1 to #60	78 105			●				○	○	○														△		△		
						561																											
						79 105																											
	●	Letter	A to Z	561			●				○	○	○														△		△				
				561P																													
				76 105																													
	Aircraft NAS 907-B	HSS	TiN	●	Fractional	1/16 to 1/2	561P			●				○	●	●	△				△	△	△	△	○	△	△	△	△	△			
							561P																										
							78 105																										
●			Wire	#1 to #52	78 105			●				○	○	○															△				
					563																												
					76 105																												
HSS-Co	Black Oxide	●	Fractional	3/64 to 1/2	563			●				○	○	○														△					
					563																												
					78 105																												
		●	Wire	#1 to #52	563			●				○	○	○															△				
					563																												
					79 105																												
Taper Length	Standard	HSS	Black Oxide	●	Fractional	1/64 to "2	6563			●				○	○	○	△				△	○	○	△	△	△	△		△				
							6563																										
							76 105																										
		●	Wire	#1 to #52	6563			●				○	○	○	△														△				
					6563																												
					78 105																												
Parabolic	HSS	TiN	●	Fractional	1/16 to 1/2	545P			●	●			○	●	●	△				△	△		○	△	△	△		△					
						545																											
						80 106																											
		●	Wire	#1 to #52	545			●	●			○	○	○																			
					545																												
					82 106																												
Extra Length	Aircraft Extention 6"	HSS	Bright	●	Fractional	3/64 to 1/4	555A						●	○	○	○											△		○	△			
	84 107																																
	Aircraft Extention 12"		Black Oxide	●	Fractional	3/64 to 1/2	555						●	○	○	○												△		△	△		
	84 107																																
12"	Bright	●	Fractional	1/8 to 1	551						●	○	○	○													△		○	△		△	
85 107																																	
18"	Bright	●	Fractional	1/8 to 1	551						●	○	○	○													△		○				
85 107																																	
Oil Hole Drills		HSS-Co	Bright	●	Fractional	3/8 to 1 1/2	581			●	●	○			○	○	○				△	○	○	△	○	△	△	△			△		
86 108																																	

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

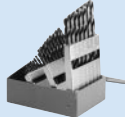
TAPER SHANK DRILLS

●:Great ○:Good △:OK

Drill Name		Material	Coating	Stock USA ● Japan ○		Stock Size	LIST No			Drilling Depth *1				Workpiece Material																			
							Page Size Cutting Condition			≤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 1010,1018	High Carbon 1045,1065			4140,4330	D2	up to 35	35 to 45	45 to 65			Austenitic 300 Series	Martensitic 400 Series	Soft <200HB	Hard >200HB	6061 7075		Casting Si ≤ 12%	High Si Si > 13%	
Regular Shank		HSS	Black Oxide	●	Fractional	1/8 to 3 1/2	601			●	○			○	○	○								△		△	△			△			
		HSS-Co		●	Fractional	1/4 to 2	6601				●	○			○	○	○	△				△	○	○	△	△	△	△			△		
		Shanks Smaller than Regular		HSS	Black Oxide	●	Fractional	31/64 to 3 1/2	603			●	○			○	○	○										△	△			△	
Extra Length				HSS	Bright	●	Fractional	1/4 to 2 1/2	651							●	○	○	○										○	△			△
		24" Overall				●	Fractional	1/4 to 2 1/2	651							●	○	○	○										○	△			△
		Oil Hole Drills				HSS-Co	Bright	●	Fractional	3/8 to 1 1/2	683			●	●	○			●	●	●					△	○	○	△	○	△	△	△
Core Drills		HSS	Black Oxide	●	Fractional	1/2 to 2 1/2	649			●	○			○	○	○								○	○								

SPECIAL

●:Great ○:Good △:OK

Drill Name	Material	Coating	Stock USA ● Japan ○		Stock Size	LIST No			Drilling Depth *1				Workpiece Material																	
						Page Size Cutting Condition			≤3D	≤5D	≤7D	>7D	Carbon Steel	Alloy	Die Steel	Hardened Steel			Stainless Steel		Titanium Alloys	Nickel Alloys	Cast Iron		Aluminum			Copper Alloys		
													Low Carbon	High Carbon		Steel	D2	up to 35	35 to 45	45 to 65			Austenitic	Martensitic	Soft < 200HB	Hard > 200HB	6061 7075		Casting Si ≤ 12%	High Si Si > 13%
													1010,1018	1045,1065									4140,4330	300 Series						
SILVER AND DEMING DRILLS	HSS	Bright	●	Fractional	1/2 to 1 1/2	575			●				○	○	○															
						93	109																							
JOBBER'S LENGTH/Set Drills	HSS, HSS-Co	Black Oxide, Bright	●	Several	Several	599			●	●	●		○	○	○	△														
						94	105																							

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

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

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 Equivalent	Flute Length	Overall Length	Shank Diameter
FRACTIONAL SIZES				
3/32	0.0938	1/2	1 3/4	1/8
7/64	0.1094	5/8	1 7/8	1/8
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	0.7031	3 7/16	6	7/8
3/4	0.7500	3 9/16	6 1/2	7/8
WIRE SIZES				
#40	0.0980	5/8	1 7/8	1/8
#36	0.1065	5/8	1 7/8	1/8
#30	0.1285	3/4	2	1/8
#29	0.1360	13/16	2 1/8	3/16
#25	0.1495	13/16	2 1/8	3/16
#21	0.1590	1	2 3/8	3/16
#8	0.1990	1	2 3/4	1/4
#7	0.2010	1 1/8	2 7/8	1/4
#6	0.2040	1 1/8	2 7/8	1/4
LETTER SIZES				
F	0.2570	1 3/8	3 3/16	3/8
U	0.3680	1 5/8	3 1/2	3/8

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

Range 2.0 to 20.0 mm

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.

(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

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	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

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.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

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	Flute 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

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

List No.6528P

High Performance

HSS-CO UG COATED



Range 1.0~13.0



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

List No.6596P

High Performance

FM HSS AG COATED



Range 1.0~20.0

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

* 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

AG-SUS DRILLS REGULAR / METRIC SIZES

List No.6594P

High Performance

FM HSS AG COATED



Range 2.0~20.0



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

List No.6595P High Performance

Range 3/32 to 3/4

FMX 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

List No.6540P

High Performance

FM HSS AG COATED



Series 1 Range 1.0~13.0

Series 2 Range 1.0~10.0

Series 3 Range 3.0~10.0



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
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
3.2	0.1260	69	106
3.3	0.1299	69	106
3.4	0.1339	73	112
3.5	0.1378	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
4.0	0.1575	78	119
4.1	0.1614	78	119
4.2	0.1654	78	119

Size	Decimal Equivalent	Flute Length	Overall Length
4.3	0.1693	82	126
4.4	0.1732	82	126
4.5	0.1772	82	126
4.6	0.1811	82	126
4.7	0.1850	82	126
4.8	0.1890	87	132
4.9	0.1929	87	132
5.0	0.1969	87	132
5.1	0.2008	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
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
6.5	0.2559	97	148
6.8	0.2677	102	156
7.0	0.2756	102	156
7.5	0.2953	102	156
8.0	0.3150	109	165
8.5	0.3346	109	165
9.0	0.3543	115	175
9.5	0.3740	115	175
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

Series 2

Size	Decimal Equivalent	Flute Length	Overall Length
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
3.2	0.1260	105	155
3.3	0.1299	105	155
3.4	0.1339	115	165
3.5	0.1378	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

(Unit) : mm

Size	Decimal Equivalent	Flute Length	Overall Length
4.0	0.1575	120	175
4.1	0.1614	120	175
4.2	0.1654	120	175
4.3	0.1693	125	185
4.4	0.1732	125	185
4.5	0.1772	125	185
4.6	0.1811	125	185
4.7	0.1850	125	185
4.8	0.1890	135	195
4.9	0.1929	135	195
5.0	0.1969	135	195
5.1	0.2008	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
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
6.5	0.2559	150	215
6.8	0.2677	155	225
7.0	0.2756	155	225
7.5	0.2953	155	225
8.0	0.3150	165	240
8.5	0.3346	165	240
9.0	0.3543	175	250
9.5	0.3740	175	250
10.0	0.3937	185	265

Series 3

(Unit) : mm

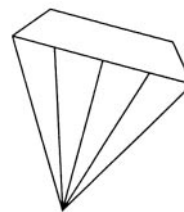
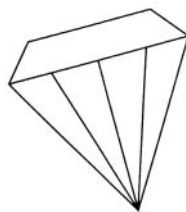
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- Other size manufactured upon request.

1 per tube

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

DIAMOND COATED CARBIDE DRILLS

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.9550 High Performance



Range 3.0~20.0

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

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

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

List No.9551

High Performance



Range 1/8~3/4

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

List No.9552 High Performance



Range 2.0~20.0

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

	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

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

AQUA DRILLS THREE FLUTES
/ METRIC SIZESJAPAN
STOCK ITEM*

List No.9546

High Performance



Range 3.0~12.0

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

List No.9548

High Performance



Range 2.0~12.0

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 0.20~1.99

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

List No.9556 Metric Sizes**List No.9569** Fractional

Range L9556 5.0~16.0
Range L9569 3/16~1/2

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

(Unit) : mm

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

1 per tube

L9569

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.
3/16	0.0074	1-7/8	3-13/16	3/16
7/32	0.0086	2-15/64	4-21/64	7/32
1/4	0.0098	2-7/16	4-23/32	1/4
9/32	0.0111	2-53/64	5-7/64	9/32
5/16	0.0123	2-63/64	5-7/64	5/16
11/32	0.0135	3-3/8	5-1/2	11/32
3/8	0.0148	3-37/64	5-57/64	3/8
13/32	0.0160	3-59/64	6-11/16	13/32
7/16	0.0172	4-21/64	7-5/64	7/16
15/32	0.0185	4-31/64	7-5/64	15/32
1/2	0.0197	4-7/8	7-15/32	1/2

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 1.0~13.0

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

HIGH PERFORMANCE DRILLS

DLC MICRODRILLS / METRIC SIZES

JAPAN
STOCK ITEM*

67

List No.9524 High Performance



Range 0.5~1.9

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 2.0~12.0

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

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	27
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

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	27
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

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

STRAIGHT SHANK JOBBERS LENGTH DRILL / LETTER SIZES

List No.501 General Purpose


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


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


Range A to Z

HIGH SPEED STEEL COBALT **Black Oxide**


Manufactured with 135° Split Point.

Size	Decimal Equivalent	Flute Length	Overall Length
A	0.2340	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
F	0.2570	2 7/8	4 1/8
G	0.2610	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
L	0.2900	2 15/16	4 1/4
M	0.2950	3 1/16	4 3/8
N	0.3020	3 1/16	4 3/8
O	0.3160	3 3/16	4 1/2
P	0.3230	3 5/16	4 5/8
Q	0.3320	3 7/16	4 3/4
R	0.3390	3 7/16	4 3/4
S	0.3480	3 1/2	4 7/8
T	0.3580	3 1/2	4 7/8
U	0.3680	3 5/8	5
V	0.3770	3 5/8	5
W	0.3860	3 3/4	5 1/8
X	0.3970	3 3/4	5 1/8
Y	0.4040	3 7/8	5 1/4
Z	0.4130	3 7/8	5 1/4

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

STRAIGHT SHANK JOBBERS LENGTH DRILLS / FRACTIONAL

List No.501, 503, 501A, 6501, 501P, 517, 517P

Size	Decimal Equivalent	Flute Length	Overall Length
1/64	0.0156	3/16	3/4
1/32	0.0313	1/2	1 3/8
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
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

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 1.

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

List No.501 General Purpose


Range 3/64" to 11/16"

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


Range 1/64" to 11/16"

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


Range 1/64" to 1/2"

HIGH SPEED STEEL COBALT **Black Oxide**


Manufactured with 135° Split Point.

List No.501P General Purpose


Range 1/16" to 1/2"

HIGH SPEED STEEL-TIN COATED


Used for high speed drilling. TiN coated.

List No.503 High Helix


Range 1/64" to 1/2"

HIGH SPEED STEEL **Bright Finish**


Manufactured with a high helix angle for better chip removal. Used in low tensile strength materials, soft steels and free machining materials, such as aluminum, copper and zinc.

List No.515 Aircraft NAS907-B


Range 1/16" to 1/2"

HIGH SPEED STEEL **Black Oxide**


Used on tough steels, stainless steels, titanium and heat treated alloy steels under 30HRc.

List No.517 Parabolic


Range 1/16" to 1/2"

HIGH SPEED STEEL **Black Oxide**


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

List No.517P Parabolic


Range 1/16" to 1/2"

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.

 Technical
Data

DRILLS

 DRILLS
Cutting Condition

END MILLS

 END MILLS
Cutting Condition

TAPS

 TAPS
Cutting Condition

Others

STRAIGHT SHANK JOBBERS LENGTH DRILLS / WIRE GAUGE SIZES

List No.501, 501A, 6501, 501P, 517, 517P

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

Size	Decimal Equivalent	Flute Length	Overall Length
1	0.2280	2 5/8	3 7/8
2	0.2210	2 5/8	3 7/8
3	0.2130	2 1/2	3 3/4
4	0.2090	2 1/2	3 3/4
5	0.2055	2 1/2	3 3/4
6	0.2040	2 1/2	3 3/4
7	0.2010	2 7/16	3 5/8
8	0.1990	2 7/16	3 5/8
9	0.1960	2 7/16	3 5/8
10	0.1935	2 7/16	3 5/8
11	0.1910	2 5/16	3 1/2
12	0.1890	2 5/16	3 1/2
13	0.1850	2 5/16	3 1/2
14	0.1820	2 3/16	3 3/8
15	0.1800	2 3/16	3 3/8
16	0.1700	2 3/16	3 3/8
17	0.1730	2 3/16	3 3/8
18	0.1695	2 1/8	3 1/4
19	0.1660	2 1/8	3 1/4
20	0.1610	2 1/8	3 1/4
21	0.1590	2 1/8	3 1/4
22	0.1570	2	3 1/8
23	0.1540	2	3 1/8
24	0.1520	2	3 1/8
25	0.1495	1 7/8	3
26	0.1470	1 7/8	3
27	0.1440	1 7/8	3
28	0.1405	1 3/4	2 7/8
29	0.1360	1 3/4	2 7/8
30	0.1285	1 5/8	2 3/4
31	0.1200	1 5/8	2 3/4
32	0.1160	1 5/8	2 3/4
33	0.1130	1 1/2	2 5/8
34	0.1110	1 1/2	2 5/8
35	0.1100	1 1/2	2 5/8
36	0.1065	1 7/16	2 1/2
37	0.1040	1 7/16	2 1/2
38	0.1015	1 7/16	2 1/2
39	0.0995	1 3/8	2 3/8
40	0.0980	1 3/8	2 3/8

Size	Decimal Equivalent	Flute Length	Overall Length
41	0.0960	1 3/8	2 3/8
42	0.0935	1 1/4	2 1/4
43	0.0890	1 1/4	2 1/4
44	0.0860	1 1/8	2 1/8
45	0.0820	1 1/8	2 1/8
46	0.0810	1 1/8	2 1/8
47	0.0785	1	2
48	0.0760	1	2
49	0.0730	1	2
50	0.0700	1	2
51	0.0670	1	2
52	0.0635	7/8	1 7/8
53	0.0595	7/8	1 7/8
54	0.0550	7/8	1 7/8
55	0.0520	7/8	1 7/8
56	0.0465	3/4	1 3/4
57	0.0430	3/4	1 3/4
58	0.0420	11/16	1 5/8
59	0.0410	11/16	1 5/8
60	0.0400	11/16	1 5/8
61	0.0390	11/16	1 5/8
62	0.0380	5/8	1 1/2
63	0.0370	5/8	1 1/2
64	0.0360	5/8	1 1/2
65	0.0350	5/8	1 1/2
66	0.0330	1/2	1 3/8
67	0.0320	1/2	1 3/8
68	0.0310	1/2	1 3/8
69	0.0292	1/2	1 3/8
70	0.0280	3/8	1 1/4
71	0.0260	3/8	1 1/4
72	0.0250	5/16	1 1/8
73	0.0240	5/16	1 1/8
74	0.0225	1/4	1
75	0.0210	1/4	1
76	0.0200	3/16	7/8
77	0.0180	3/16	7/8
78	0.0160	3/16	7/8
79	0.0145	1/8	3/4
80	0.0135	1/8	3/4

All Sizes in Packages of 10

STRAIGHT SHANK JOBBERS LENGTH DRILLS / WIRE GAUGE SIZES

List No.501 General Purpose


Range #1 to #60

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


Range #1 to #80

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


Range #1 to #80

HIGH SPEED STEEL COBALT **Black Oxide**


Manufactured with 135° Split Point.

List No.501P General Purpose


Range #1 to #52

HIGH SPEED STEEL-TIN COATED


Used for high speed drilling. TiN coated.

List No.517 Parabolic


Range #1 to #52

HIGH SPEED STEEL **Black Oxide**


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

List No.517P Parabolic


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.

 Technical
Data

DRILLS

 DRILLS
Cutting Condition

END MILLS

 END MILLS
Cutting Condition

TAPS

 TAPS
Cutting Condition

Others

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

 Technical
Data

DRILLS

 DRILLS
Cutting
Condition

END MILLS

 END MILLS
Cutting
Condition

TAPS

 TAPS
Cutting
Condition

Others

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

Size	Decimal Equivalent	Flute Length	Overall Length	Shank Diameter
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
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

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

List No.561 General Purpose



Range 3/64" to 2"

HIGH SPEED STEEL Bright Finish



Manufactured with short overall and flute length.

List No.561P General Purpose



Range 1/16" to 1/2"

HIGH SPEED STEEL-TIN COATED



Manufactured with short overall and flute length with TiN coated.

List No.563 Aircraft NAS907-C



Range 3/64" to 1/2"

HIGH SPEED STEEL Black Oxide



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

List No.6563 Aircraft NAS907-C



Bright Finish 3/64 to 7/64
Black Oxide 1/8 to 1/2
Range 3/64" to 1/2"

HIGH SPEED STEEL COBALT



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

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

List No.561 General Purpose

Range #1 To #60

HIGH SPEED STEEL **Bright Finish**

Manufactured with short overall and flute length.

List No.561P General Purpose

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

Range #1 To # 52

HIGH SPEED STEEL **Black Oxide**

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

List No.6563 Aircraft NAS907-C**Bright Finish** #32 To #52
Black Oxide #1 To #31**HIGH SPEED STEEL COBALT**

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

Size	Decimal Equivalent	Flute Length	Overall Length
1	0.2285	1 5/16	2 7/16
2	0.2210	1 5/16	2 7/16
3	0.2130	1 1/4	2 3/8
4	0.2090	1 1/4	2 3/8
5	0.2055	1 1/4	2 3/8
6	0.2040	1 1/4	2 3/8
7	0.2010	1 3/16	2 1/4
8	0.1990	1 3/16	2 1/4
9	0.1960	1 3/16	2 1/4
10	0.1935	1 3/16	2 1/4
11	0.1910	1 3/16	2 1/4
12	0.1890	1 3/16	2 1/4
13	0.1850	1 1/8	2 3/16
14	0.1820	1 1/8	2 3/16
15	0.1800	1 1/8	2 3/16
16	0.1770	1 1/8	2 3/16
17	0.1730	1 1/8	2 3/16
18	0.1695	1 1/16	2 1/8
19	0.1660	1 1/16	2 1/8
20	0.1610	1 1/16	2 1/8
21	0.1590	1 1/16	2 1/8
22	0.1570	1 1/16	2 1/8
23	0.1540	1	2 1/16
24	0.1520	1	2 1/16
25	0.1495	1	2 1/16
26	0.1470	1	2 1/16
27	0.1440	1	2 1/16
28	0.1405	15/16	1 15/16
29	0.1360	15/16	1 15/16
30	0.1285	15/16	1 15/16

Size	Decimal Equivalent	Flute Length	Overall Length
31	0.1200	7/8	1 7/8
32	0.1160	7/8	1 7/8
33	0.1130	7/8	1 7/8
34	0.1110	7/8	1 7/8
35	0.1100	7/8	1 7/8
36	0.1065	13/16	1 13/16
37	0.1040	13/16	1 13/16
38	0.1015	13/16	1 13/16
39	0.0995	13/16	1 13/16
40	0.0980	13/16	1 13/16
41	0.0960	13/16	1 13/16
42	0.0935	3/4	1 3/4
43	0.0890	3/4	1 3/4
44	0.0860	3/4	1 3/4
45	0.0820	3/4	1 3/4
46	0.0810	3/4	1 3/4
47	0.0785	3/4	1 3/4
48	0.0760	11/16	1 11/16
49	0.0730	11/16	1 11/16
50	0.7000	11/16	1 11/16
51	0.0670	11/16	1 11/16
52	0.0635	11/16	1 11/16
53	0.0595	5/8	1 5/8
54	0.0550	5/8	1 5/8
55	0.0520	5/8	1 5/8
56	0.0465	1/2	1 3/8
57	0.0430	1/2	1 3/8
58	0.0420	1/2	1 3/8
59	0.0410	1/2	1 3/8
60	0.0400	1/2	1 3/8

All sizes in package of 10

List No.561 General Purpose


Range A To Z

HIGH SPEED STEEL **Bright Finish**


Manufactured with short overall and flute length.

List No.6563 Aircraft NAS907-C


Range A To Z

HIGH SPEED STEEL COBALT **Black Oxide**


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

List No.563 Aircraft NAS907-C


Range A To Z

HIGH SPEED STEEL **Black Oxide**


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

Size	Decimal Equivalent	Flute Length	Overall Length
A	0.2340	1 5/16	2 7/16
B	0.2380	1 3/8	2 1/2
C	0.2420	1 3/8	2 1/2
D	0.2460	1 3/8	2 1/2
E	0.2500	1 3/8	2 1/2
F	0.2570	1 7/16	2 5/8
G	0.2610	1 7/16	2 5/8
H	0.2660	1 1/2	2 11/16
I	0.2720	1 1/2	2 11/16
J	0.2770	1 1/2	2 11/16
K	0.2810	1 1/2	2 11/16
L	0.2900	1 9/16	2 3/4
M	0.2950	1 9/16	2 3/4
N	0.3020	1 5/8	2 13/16
O	0.3160	1 11/16	2 15/16
P	0.3230	1 11/16	2 15/16
Q	0.3320	1 11/16	3
R	0.3390	1 11/16	3
S	0.3480	1 3/4	3 1/16
T	0.3580	1 3/4	3 1/16
U	0.3680	1 13/16	3 1/8
V	0.3770	1 7/8	3 1/4
W	0.3860	1 7/8	3 1/4
X	0.3970	1 15/16	3 5/16
Y	0.4040	1 15/16	3 5/16
Z	0.4130	2	3 3/8

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

STRAIGHT SHANK TAPER LENGTH / FRACTIONAL SIZES

List No.531, 6531, 545, 545P

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

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

Size	Decimal Equivalent	Flute Length	Overall Length
49/64	0.7656	6	9 7/8
25/32	0.7813	6	9 7/8
51/64	0.7969	6 1/8	10
13/16	0.8125	6 1/8	10
53/64	0.8281	6 1/8	10
27/32	0.8438	6 1/8	10
55/64	0.8594	6 1/8	10
7/8	0.8750	6 1/8	10
57/64	0.8906	6 1/8	10
29/32	0.9063	6 1/8	10
59/64	0.9219	6 1/8	10 3/4
15/16	0.9375	6 1/8	10 3/4
61/64	0.9531	6 3/8	11
31/32	0.9688	6 3/8	11
63/64	0.9844	6 3/8	11
1	1.0000	6 3/8	11
1 1/64	1.0156	6 1/2	11 1/8
1 1/32	1.0313	6 1/2	11 1/8
1 3/64	1.0469	6 5/8	11 1/4
1 1/16	1.0625	6 5/8	11 1/4
1 5/64	1.0781	6 7/8	11 1/2
1 3/32	1.0938	6 7/8	11 1/2
1 7/64	1.1094	7 1/8	11 3/4
1 1/8	1.1250	7 1/8	11 3/4
1 9/64	1.1406	7 1/4	11 7/8
1 5/32	1.1563	7 1/4	11 7/8
1 11/64	1.1719	7 3/8	12
1 3/16	1.1875	7 3/8	12
1 13/64	1.2031	7 1/2	12 1/8
1 7/32	1.2188	7 1/2	12 1/8
1 15/64	1.2344	7 7/8	12 1/2
1 1/4	1.2500	7 7/8	12 1/2
1 9/32	1.2813	8 1/2	14 1/8
1 5/16	1.3125	8 5/8	14 1/4
1 11/32	1.3438	8 3/4	14 3/8
1 3/8	1.3750	8 7/8	14 1/2
1 13/32	1.4063	9	14 5/8
1 7/16	1.4375	9 1/8	14 3/4
1 15/32	1.4688	9 1/4	14 7/8
1 1/2	1.5000	9 3/8	15
1 9/16	1.5625	9 5/8	15 1/4
1 5/8	1.6250	9 7/8	15 5/8
1 11/16	1.6875	10	15 3/4
1 3/4	1.7500	10 1/2	16 1/4
1 13/16	1.8125	10 1/2	16 1/4
1 7/8	1.8750	10 3/4	16 1/2
1 15/16	1.9375	10 3/4	16 5/8
2	2.0000	10 3/4	16 5/8

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

List No.531 General Purpose


Range 1/64 to 2"

HIGH SPEED STEEL Black Oxide

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

List No.545 Parabolic Style


Range 1/16" To 1/2"

HIGH SPEED STEEL Black Oxide


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

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.

 Technical
Data

DRILLS

 DRILLS
Cutting Condition

END MILLS

 END MILLS
Cutting Condition

TAPS

 TAPS
Cutting Condition

Others

STRAIGHT SHANK TAPER LENGTH DRILLS / WIRE GAUGE SIZES

List No.531 General Purpose



Range #1 To #60

HIGH SPEED STEEL Black Oxide



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

List No.545 Parabolic Style



Range #1 To #52

HIGH SPEED STEEL Black Oxide



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

Size	Decimal Equivalent	Flute Length	Overall Length
1	0.2280	3 3/4	6 1/8
2	0.2210	3 3/4	6 1/8
3	0.2130	3 5/8	6
4	0.2090	3 5/8	6
5	0.2055	3 5/8	6
6	0.2040	3 5/8	6
7	0.2010	3 5/8	6
8	0.1990	3 5/8	6
9	0.1960	3 5/8	6
10	0.1935	3 5/8	6
11	0.1910	3 5/8	6
12	0.1890	3 5/8	6
13	0.1850	3 3/8	5 3/4
14	0.1820	3 3/8	5 3/4
15	0.1800	3 3/8	5 3/4
16	0.1770	3 3/8	5 3/4
17	0.1730	3 3/8	5 3/4
18	0.1695	3 3/8	5 3/4
19	0.1660	3 3/8	5 3/4
20	0.1610	3 3/8	5 3/4
21	0.1590	3 3/8	5 3/4
22	0.1570	3 3/8	5 3/4
23	0.1540	3	5 3/8
24	0.1520	3	5 3/8
25	0.1495	3	5 3/8
26	0.1470	3	5 3/8
27	0.1440	3	5 3/8
28	0.1405	3	5 3/8
29	0.1360	3	5 3/8
30	0.1285	3	5 3/8

Size	Decimal Equivalent	Flute Length	Overall Length
31	0.1200	2 3/4	5 1/8
32	0.1160	2 3/4	5 1/8
33	0.1130	2 3/4	5 1/8
34	0.1110	2 3/4	5 1/8
35	0.1100	2 3/4	5 1/8
36	0.1065	2 1/2	4 5/8
37	0.1040	2 1/2	4 5/8
38	0.1015	2 1/2	4 5/8
39	0.0995	2 1/2	4 5/8
40	0.0980	2 1/2	4 5/8
41	0.0960	2 1/2	4 5/8
42	0.0935	2 1/4	4 1/4
43	0.0890	2 1/4	4 1/4
44	0.0860	2 1/4	4 1/4
45	0.0820	2 1/4	4 1/4
46	0.0810	2 1/4	4 1/4
47	0.0785	2 1/4	4 1/4
48	0.0760	2	3 3/4
49	0.0730	2	3 3/4
50	0.7000	2	3 3/4
51	0.0670	2	3 3/4
52	0.0635	2	3 3/4
53	0.0595	1 3/4	3
54	0.0550	1 3/4	3
55	0.0520	1 3/4	3
56	0.0465	1 1/8	2 1/4
57	0.0430	1 1/8	2 1/4
58	0.0420	1 1/8	2 1/4
59	0.0410	1 1/8	2 1/4
60	0.0400	1 1/8	2 1/4

All sizes in packages of 10

List No.531

General Purpose



Range A to Z

HIGH SPEED STEEL Black Oxide

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

Size	Decimal Equivalent	Flute Length	Overall Length
A	0.2340	3 3/4	6 1/8
B	0.2380	3 3/4	6 1/8
C	0.2420	3 3/4	6 1/8
D	0.2460	3 3/4	6 1/8
E	0.2500	3 3/4	6 1/8
F	0.2570	3 7/8	6 1/4
G	0.2610	3 7/8	6 1/4
H	0.2660	3 7/8	6 1/4
I	0.2720	3 7/8	6 1/4
J	0.2770	3 7/8	6 1/4
K	0.2810	3 7/8	6 1/4
L	0.2900	4	6 3/8
M	0.2950	4	6 3/8
N	0.3020	4	6 3/8
O	0.3160	4 1/8	6 1/2
P	0.3230	4 1/8	6 1/2
Q	0.3320	4 1/8	6 1/2
R	0.3390	4 1/8	6 1/2
S	0.3480	4 1/4	6 3/4
T	0.3580	4 1/4	6 3/4
U	0.3680	4 1/4	6 3/4
V	0.3770	4 3/8	7
W	0.3860	4 3/8	7
X	0.3970	4 3/8	7
Y	0.4040	4 3/8	7
Z	0.4130	4 5/8	7 1/4

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

AIRCRAFT EXTENSION DRILLS WITH SPRING TEMPERED SHANKS

List No.555A

Aircraft NAS907 Extension **HIGH SPEED STEEL** **Bright Finish**



Range 3/64 to 1/4
Overall Length 6"



Aerospace NAS907 118° Split Point. Used in general applications where extra length is required.

Size	Decimal Equivalent	Flute Length
3/64	0.0469	3/4
1/16	0.0625	7/8
5/64	0.0781	1
3/32	0.0938	1 1/4
7/64	0.1094	1 1/2
1/8	0.1250	1 5/8
9/64	0.1406	1 3/4

Size	Decimal Equivalent	Flute Length
5/32	0.1563	2
11/64	0.1719	2 1/8
3/16	0.1875	2 5/16
13/64	0.2031	2 7/16
7/32	0.2188	2 1/2
15/64	0.2344	2 5/8
1/4	0.2500	2 3/4

1 per box

List No.555

Aircraft NAS907 Extension **HIGH SPEED STEEL** **Black Oxide**



Range 3/64 to 1/2
Overall Length 12"



Aerospace NAS907 135° Split Point. Used in tough high tensile materials where extra length is required.

Size	Decimal Equivalent	Flute Length
3/64	0.0469	3/4
1/16	0.0625	7/8
5/64	0.0781	1
3/32	0.0938	1 1/4
7/64	0.1094	1 1/2
1/8	0.1250	1 5/8
9/64	0.1406	1 3/4
5/32	0.1563	2
11/64	0.1719	2 1/8
3/16	0.1875	2 5/16
13/64	0.2031	2 7/16
7/32	0.2188	2 1/2
15/64	0.2344	2 5/8
1/4	0.2500	2 3/4
17/64	0.2656	2 7/8

Size	Decimal Equivalent	Flute Length
9/32	0.2813	2 15/16
19/64	0.2969	3 1/16
5/16	0.3125	3 3/16
21/64	0.3281	3 5/16
11/32	0.3438	3 7/16
23/64	0.3594	3 1/2
3/8	0.3750	3 5/8
25/64	0.3906	3 3/4
13/32	0.4063	3 7/8
27/64	0.4219	3 15/16
7/16	0.4375	4 1/16
29/64	0.4531	4 3/16
15/32	0.4688	4 5/16
31/64	0.4844	4 3/8
1/2	0.5000	4 1/2

1 per box

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
3/16	0.1875	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

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

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

List No.601 General Purpose



Range 1/8" to 3 1/2"

HIGH SPEED STEEL Black Oxide



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

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

1 per box

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

List No.6601



Range 1/4 to 2

COBALT HIGH SPEED STEEL Black Oxide



Used in tough alloys steels of nickel, manganese, casting and forgings. Can be run approximately 25% faster than those of high-speed steel.

Size	Decimal Equivalent	Flute Length	Overall Length	Taper Shank
1/4	0.2500	2 7/8	6 1/8	1
9/32	0.2813	3	6 1/4	1
5/16	0.3125	3 1/8	6 3/8	1
11/32	0.3438	3 1/4	6 1/2	1
3/8	0.3750	3 1/2	7 3/8	2
13/32	0.4063	3 5/8	7 1/2	2
7/16	0.4375	3 7/8	7 3/4	2
15/32	0.4688	4 1/8	8	2
1/2	0.5000	4 3/8	8 1/4	2
17/32	0.5313	4 5/8	8 1/2	2
9/16	0.5625	4 7/8	8 3/4	2
19/32	0.5938	4 7/8	8 3/4	2
5/8	0.6250	4 7/8	8 3/4	2
21/32	0.6563	5 1/8	9 3/4	3
11/16	0.6875	5 3/8	10	3
23/32	0.7188	5 5/8	10 1/4	3
3/4	0.7500	5 7/8	10 1/2	3
25/32	0.7813	6	10 5/8	3
13/16	0.8125	6 1/8	10 3/4	3
27/32	0.8438	6 1/8	10 3/4	3
7/8	0.8750	6 1/8	10 3/4	3

Size	Decimal Equivalent	Flute Length	Overall Length	Taper Shank
29/32	0.9063	6 1/8	10 3/4	3
15/16	0.9375	6 1/8	10 3/4	3
31/32	0.9688	6 3/8	11	3
1	1.0000	6 3/8	11	3
1 1/32	1.0313	6 1/2	12 1/8	4
1 1/16	1.0625	6 5/8	12 1/4	4
1 3/32	1.0938	6 7/8	12 1/2	4
1 1/8	1.1250	7 1/8	12 3/4	4
1 5/32	1.1563	7 1/4	12 7/8	4
1 3/16	1.1875	7 3/8	13	4
1 7/32	1.2188	7 1/2	13 1/8	4
1 1/4	1.2500	7 7/8	13 1/2	4
1 5/16	1.3125	8 5/8	15 5/8	5
1 3/8	1.3750	8 7/8	15 7/8	5
1 7/16	1.4375	9 1/8	16 1/8	5
1 1/2	1.5000	9 3/8	16 3/8	5
1 5/8	1.6250	10	17	5
1 3/4	1.7500	10 1/8	17 1/8	5
1 7/8	1.8750	10 3/8	17 3/8	5
2	2.0000	10 3/8	17 3/8	5

1 per box

List No.603 General Purpose

Range 31/64 to 3 1/2

HIGH SPEED STEEL **Black Oxide**

Smaller Morse Taper Shank than regular.

Size	Decimal Equivalent	Flute Length	Overall Length	Taper Shank
31/64	0.4844	4 3/8	7 3/4	1
1/2	0.5000	4 3/8	7 3/4	1
33/64	0.5156	4 5/8	8	1
17/32	0.5313	4 5/8	8	1
35/64	0.5469	4 7/8	8 1/4	1
9/16	0.5625	4 7/8	8 1/4	1
51/64	0.7969	6 1/8	10	2
13/16	0.8125	6 1/8	10	2
53/64	0.8281	6 1/8	10	2
27/32	0.8438	6 1/8	10	2
55/64	0.8594	6 1/8	10	2
7/8	0.8750	6 1/8	10	2
57/64	0.8906	6 1/8	10	2
29/32	0.9063	6 1/8	10	2
1 5/64	1.0781	6 7/8	11 1/2	3
1 3/32	1.0938	6 7/8	11 1/2	3
1 7/64	1.1094	7 1/8	11 3/4	3
1 1/8	1.1250	7 1/8	11 3/4	3
1 9/64	1.1406	7 1/4	11 7/8	3
1 5/32	1.1563	7 1/4	11 7/8	3
1 11/64	1.1719	7 3/8	12	3
1 3/16	1.1875	7 3/8	12	3
1 13/64	1.2031	7 1/2	12 1/8	3
1 7/32	1.2188	7 1/2	12 1/8	3
1 15/64	1.2344	7 7/8	12 1/2	3
1 1/4	1.2500	7 7/8	12 1/2	3
1 33/64	1.5156	9 3/8	15	4

Size	Decimal Equivalent	Flute Length	Overall Length	Taper Shank
1 17/32	1.5313	9 3/8	15	4
1 35/64	1.5469	9 5/8	15 1/4	4
1 9/16	1.5625	9 5/8	15 1/4	4
1 37/64	1.5781	9 7/8	15 1/2	4
1 19/32	1.5938	9 7/8	15 1/2	4
1 39/64	1.6094	10	15 5/8	4
1 5/8	1.6250	10	15 5/8	4
1 41/64	1.6406	10 1/8	15 3/4	4
1 21/32	1.6563	10 1/8	15 3/4	4
1 43/64	1.6719	10 1/8	15 3/4	4
1 11/16	1.6875	10 1/8	15 3/4	4
1 45/64	1.7031	10 1/8	15 3/4	4
1 23/32	1.7188	10 1/8	15 3/4	4
1 47/64	1.7344	10 3/8	16 1/4	4
1 3/4	1.7500	10 3/8	16 1/4	4
1 25/32	1.7813	10 3/8	16 1/4	4
1 13/16	1.8125	10 3/8	16 1/4	4
1 27/32	1.8438	10 3/8	16 1/4	4
1 7/8	1.8750	10 1/2	16 1/2	4
1 29/32	1.9063	10 1/2	16 1/2	4
1 15/16	1.9375	10 5/8	16 5/8	4
1 31/32	1.9688	10 5/8	16 5/8	4
2	2.0000	10 5/8	16 5/8	4
3 1/8	3.1250	14 1/4	22	5
3 1/4	3.2500	15 1/4	23	5
3 1/2	3.5000	16 1/4	24	5

1 per box

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

EXTRA LENGTH DRILLS / TAPER SHANK DRILLS

List No.651 Taper Shank Drills



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

HIGH SPEED STEEL Bright Finish



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

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

TAPER SHANK CORE DRILLS

List No.649 Four Flute Core Drills**HIGH SPEED STEEL** **Bright Finish**

Range 1/2 to 2 1/2



Used to size or enlarge cored, punched, or other pre-formed holes ; not designed to drill from solid.

Size	Decimal Equivalent	Flute Length	Overall Length	Taper Shank
1/2	0.5000	4 3/8	8 1/4	2
17/32	0.5313	4 5/8	8 1/2	2
9/16	0.5625	4 7/8	8 3/4	2
19/32	0.5938	4 7/8	8 3/4	2
5/8	0.6250	4 7/8	8 3/4	2
21/32	0.6563	5 1/8	9	2
11/16	0.6875	5 3/8	9 1/4	2
23/32	0.7188	5 5/8	9 1/2	2
3/4	0.7500	5 7/8	9 3/4	2
25/32	0.7813	6	9 7/8	2
13/16	0.8125	6 1/8	10 3/4	3
27/32	0.8438	6 1/8	10 3/4	3
7/8	0.8750	6 1/8	10 3/4	3
29/32	0.9063	6 1/8	10 3/4	3
15/16	0.9375	6 1/8	10 3/4	3
31/32	0.9688	6 3/8	11	3
1	1.0000	6 3/8	11	3
1 1/32	1.0313	6 1/2	11 1/8	3
1 1/16	1.0625	6 5/8	11 1/4	3
1 3/32	1.0938	6 7/8	12 1/2	4
1 1/8	1.1250	7 1/8	12 3/4	4
1 5/32	1.1563	7 1/4	12 7/8	4
1 3/16	1.1875	7 3/8	13	4
1 7/32	1.2188	7 1/2	13 1/8	4
1 1/4	1.2500	7 7/8	13 1/2	4
1 9/32	1.2813	8 1/2	14 1/8	4
1 5/16	1.3125	8 5/8	14 1/4	4

Size	Decimal Equivalent	Flute Length	Overall Length	Taper Shank
1 11/32	1.3438	8 3/4	14 3/8	4
1 3/8	1.3750	8 7/8	14 1/2	4
1 13/32	1.4063	9	14 5/8	4
1 7/16	1.4375	9 1/8	14 3/4	4
1 15/32	1.4688	9 1/4	14 7/8	4
1 1/2	1.5000	9 3/8	15	4
1 17/32	1.5313	9 3/8	16 3/8	5
1 9/16	1.5625	9 5/8	16 5/8	5
1 19/32	1.5938	9 7/8	16 7/8	5
1 5/8	1.6250	10	17	5
1 21/32	1.6563	10 1/8	17 1/8	5
1 11/16	1.6875	10 1/8	17 1/8	5
1 23/32	1.7188	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 1/8	2.1250	10 1/4	17 3/8	5
2 1/4	2.2500	10 1/8	17 3/8	5
2 3/8	2.3750	10 1/8	17 3/8	5
2 1/2	2.5000	11 1/4	18 3/4	5

1 per box

List No.575

h8



HSS

N



118

S-type

Conical

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

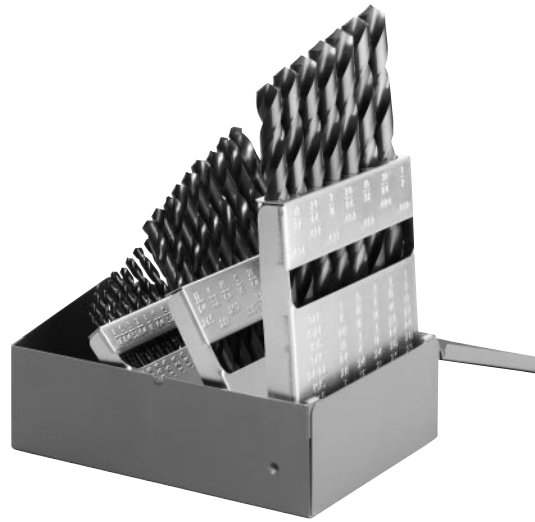
TAPS

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

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

Workpiece Material Drill Diameter			Carbon Steels		Alloy Steels		Die Steels Hardened Steels (35-45HRC) Stainless Steels		Cast Irons		Aluminum Alloys Nonferrous Metals	
Fractional	Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
—	2	0.0787	5,700	0.002	4,600	0.002	2,400	0.002	6,300	0.003	9,700	0.003
3/32	2.381	0.0938	4,800	0.003	3,900	0.003	2,000	0.003	5,300	0.004	8,100	0.004
—	3	0.1181	4,200	0.004	3,400	0.004	1,600	0.004	4,700	0.005	7,200	0.005
1/8	3.175	0.1250	4,000	0.005	3,200	0.004	1,500	0.004	4,400	0.006	6,800	0.006
5/32	3.969	0.1563	3,200	0.006	2,500	0.005	1,200	0.004	3,500	0.007	5,400	0.007
3/16	4.763	0.1875	2,600	0.007	2,100	0.005	1,000	0.004	2,900	0.008	4,500	0.008
—	5	0.1969	2,500	0.007	2,000	0.006	960	0.004	2,800	0.008	4,300	0.008
1/4	6.35	0.2500	2,000	0.008	1,600	0.007	750	0.005	2,200	0.009	3,400	0.009
5/16	7.938	0.3125	1,600	0.009	1,300	0.008	600	0.007	1,800	0.012	2,700	0.011
—	8	0.3150	1,600	0.009	1,300	0.008	600	0.007	1,800	0.012	2,700	0.012
3/8	9.525	0.3750	1,300	0.010	1,100	0.009	500	0.008	1,500	0.012	2,300	0.013
—	10	0.3937	1,300	0.010	1,000	0.009	480	0.008	1,400	0.013	2,200	0.013
—	12	0.4724	1,100	0.011	850	0.010	400	0.009	1,200	0.014	1,800	0.015
1/2	12.7	0.5000	1,000	0.011	800	0.010	380	0.009	1,100	0.015	1,700	0.015
—	16	0.6299	800	0.014	640	0.012	300	0.010	880	0.017	1,400	0.017
—	20	0.7874	640	0.016	510	0.014	240	0.012	700	0.020	1,100	0.020
—	25	0.9843	510	0.019	410	0.015	200	0.014	560	0.023	870	0.023
—	32	1.2598	400	0.018	320	0.015	150	0.016	440	0.022	680	0.022

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.

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

Workpiece Material Drill Diameter			Carbon Steels		Alloy Steels		Die Steels Hardened Steels (35-45HRC) Stainless Steels		Cast Irons		Aluminum Alloys Nonferrous Metals	
Fractional	Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
—	2	0.0787	5,700	0.002	4,600	0.002	2,400	0.002	6,300	0.003	9,700	0.003
3/32	2.381	0.0938	5,100	0.003	3,800	0.002	2,000	0.003	5,500	0.003	8,200	0.003
—	3	0.1181	4,200	0.004	3,400	0.003	1,600	0.004	4,700	0.004	7,200	0.004
1/8	3.175	0.1250	4,000	0.004	3,200	0.003	1,500	0.004	4,400	0.005	6,800	0.005
5/32	3.969	0.1563	3,200	0.005	2,500	0.004	1,200	0.004	3,500	0.006	5,400	0.006
3/16	4.763	0.1875	2,600	0.006	2,100	0.005	1,000	0.004	2,900	0.007	4,500	0.007
—	5	0.1969	2,500	0.006	2,000	0.005	960	0.004	2,800	0.007	4,300	0.007
1/4	6.35	0.2500	2,000	0.007	1,600	0.005	750	0.005	2,200	0.008	3,400	0.008
5/16	7.938	0.3125	1,600	0.008	1,200	0.006	600	0.006	1,800	0.010	2,700	0.009
—	8	0.3150	1,600	0.008	1,300	0.006	600	0.006	1,800	0.010	2,700	0.010
3/8	9.525	0.3750	1,300	0.009	1,000	0.007	500	0.007	1,500	0.010	2,300	0.011
—	10	0.3937	1,300	0.008	1,000	0.007	480	0.007	1,400	0.011	2,200	0.011
—	12	0.4724	1,100	0.009	850	0.008	400	0.008	1,200	0.012	1,800	0.012
1/2	12.7	0.5000	1,000	0.010	800	0.009	380	0.008	1,100	0.013	1,700	0.013
—	16	0.6299	800	0.012	640	0.010	300	0.010	880	0.015	1,400	0.014
3/4	19.05	0.7500	660	0.014	530	0.011	250	0.011	700	0.016	1,100	0.016
—	20	0.7874	640	0.014	510	0.012	240	0.011	700	0.017	1,100	0.016
—	25	0.9843	510	0.015	410	0.013	190	0.013	560	0.019	870	0.019
—	32	1.2598	400	0.015	320	0.012	150	0.014	440	0.019	680	0.019

1) SG-ES is not applied to Austenitic Stainless Steels such as 304 or 316.

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.

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

Workpiece Material			Carbon Steels		Alloy Steels		Die Steels Hardened Steels (35-45HRc)		Stainless Steels		Cast Irons		Aluminum Alloys Nonferrous Metals	
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	2,500	0.007	2,000	0.006	960	0.005	1,300	0.005	2,800	0.009	4,300	0.009
1/4	6.35	0.2500	2,000	0.009	1,600	0.008	750	0.006	1,000	0.006	2,200	0.011	3,400	0.011
—	8	0.3150	1,600	0.010	1,300	0.008	600	0.007	800	0.007	1,800	0.013	2,700	0.013
3/8	9.525	0.3750	1,400	0.011	1,100	0.009	500	0.009	670	0.008	1,500	0.014	2,300	0.014
—	10	0.3937	1,300	0.011	1,000	0.010	480	0.009	640	0.009	1,400	0.014	2,200	0.014
—	12	0.4724	1,100	0.013	850	0.011	400	0.010	530	0.010	1,200	0.016	1,800	0.016
1/2	12.7	0.5000	1,000	0.013	800	0.011	380	0.010	500	0.010	1,100	0.016	1,700	0.016
—	16	0.6299	800	0.016	640	0.013	300	0.012	400	0.013	880	0.019	1,400	0.019
3/4	19.05	0.7500	680	0.017	550	0.014	250	0.014	340	0.015	740	0.021	1,150	0.021
—	20	0.7874	640	0.018	510	0.015	240	0.014	320	0.015	700	0.022	1,100	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.

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

Workpiece Material			Carbon Steels		Alloy Steels		Die Steels Hardened Steels (-40HRc)		Cast Irons	
Drill Diameter			RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
Fractional	Metric mm	Decimal								
—	1	0.0394	7,200	0.001	5,700	0.001	4,300	0.001	8,600	0.002
3/64	1.191	0.0469	6,600	0.002	5,200	0.001	4,000	0.001	8,600	0.002
—	2	0.0787	4,300	0.003	3,400	0.002	2,600	0.002	5,200	0.003
—	3	0.1181	3,200	0.004	2,500	0.004	1,900	0.002	3,800	0.005
1/8	3.175	0.1250	3,100	0.004	2,400	0.004	1,800	0.002	3,800	0.005
5/32	3.969	0.1563	2,400	0.005	1,900	0.005	1,400	0.003	2,900	0.006
3/16	4.763	0.1875	2,000	0.007	1,600	0.006	1,200	0.004	2,300	0.008
—	5	0.1969	1,900	0.007	1,500	0.006	1,100	0.004	2,300	0.008
1/4	6.35	0.2500	1,500	0.009	1,200	0.008	900	0.005	1,900	0.010
9/32	7.144	0.2813	1,300	0.010	1,100	0.008	800	0.005	1,600	0.011
—	8	0.3150	1,200	0.011	960	0.009	720	0.006	1,400	0.013
11/32	8.731	0.3438	1,100	0.012	850	0.011	640	0.007	1,300	0.014
—	10	0.3937	960	0.014	760	0.012	570	0.008	1,100	0.016
13/32	10.319	0.4063	920	0.015	740	0.012	550	0.008	1,100	0.016
7/16	11.113	0.4375	870	0.015	690	0.013	500	0.009	1,000	0.017
15/32	11.906	0.4688	800	0.016	640	0.014	480	0.009	960	0.017
1/2	12.7	0.5000	750	0.016	600	0.014	450	0.010	880	0.018
—	13	0.5118	730	0.016	590	0.014	440	0.010	880	0.017

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.

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	
Drill Diameter			RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
Fractional	Metric mm	Decimal										
—	1	0.0394	4,800	0.001	3,800	0.001	5,700	0.001	6,400	0.001	11,000	0.001
—	2	0.0787	2,400	0.002	1,900	0.002	2,900	0.002	3,200	0.002	5,600	0.002
3/32	2.381	0.0938	2,000	0.002	1,600	0.002	2,400	0.002	2,700	0.054	4,700	0.002
—	3	0.1181	1,600	0.003	1,300	0.003	1,900	0.003	2,100	0.003	3,700	0.003
1/8	3.175	0.1250	1,500	0.003	1,200	0.003	1,800	0.003	2,000	0.080	3,500	0.003
5/32	3.969	0.1563	1,200	0.004	960	0.003	1,400	0.004	1,600	0.100	2,800	0.004
3/16	4.763	0.1875	1,000	0.005	800	0.004	1,200	0.005	1,300	0.123	2,300	0.005
—	5	0.1969	960	0.005	760	0.004	1,100	0.005	1,300	0.005	2,200	0.005
1/4	6.35	0.2500	750	0.006	600	0.005	900	0.006	1,000	0.160	1,800	0.006
5/16	7.938	0.3125	600	0.008	480	0.007	720	0.008	800	0.200	1,400	0.008
—	8	0.3150	600	0.008	480	0.007	720	0.008	800	0.008	1,400	0.008
3/8	9.525	0.3750	500	0.009	400	0.008	600	0.009	670	0.239	1,200	0.009
—	10	0.3937	480	0.010	380	0.008	570	0.010	640	0.010	1,100	0.010
—	12	0.4724	400	0.012	320	0.010	480	0.011	530	0.012	930	0.012
1/2	12.7	0.5000	400	0.011	300	0.010	450	0.012	500	0.316	880	0.012
—	16	0.6299	300	0.014	240	0.013	360	0.014	400	0.014	700	0.014
3/4	19.05	0.7500	250	0.016	200	0.015	300	0.016	330	0.400	590	0.015
—	20	0.7874	240	0.016	190	0.015	290	0.016	320	0.016	560	0.015

- 1) The table values are for drilling with water soluble cutting fluid.
- 2) In horizontal machine or in drilling of deep hole which depth is over 3 times of drill diameter, use step feed.
- 3) Reduce rotation and feed by 20% of table values in drilling rolled surface or forged surface.
- 4) Adjust drilling condition when unusual vibration or different sound occurs.

AG-Power Long Drills List No. 6540P

Workpiece Material		Carbon Steels		Alloy Steels Tool Steels		Hardened Steels (-40HRc)		Cast Irons	
Drill Diameter		RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
Metric mm	Decimal								
1	0.0394	4,000	0.001	2,400	0.001	1,600	0.000	4,000	0.001
2	0.0787	2,400	0.002	1,400	0.002	1,000	0.001	2,400	0.002
3	0.1181	2,000	0.003	1,200	0.003	800	0.002	2,000	0.003
5	0.1969	1,400	0.005	860	0.005	570	0.004	1,400	0.006
6	0.2362	1,300	0.006	800	0.006	530	0.004	1,300	0.007
8	0.3150	1,000	0.008	600	0.008	400	0.006	1,000	0.009
10	0.3937	800	0.009	480	0.009	320	0.007	800	0.011
13	0.5118	610	0.011	370	0.011	240	0.008	610	0.013

- 1) Above drilling table is applied to series 1 & 2. In case of series 3 & 4, reduce the rotation and feed to 80% of the table values.
- 2) Use pecking in cases when drilling depth exceeds 20D (D:drill diameter). Even when drilling depth is under 20D, use pecking in case when chips are jammed.
- 3) Adjust drilling condition when unusual vibration or different sound occurs. 4) Pre-hole should be drilled.

DIAMOND Coated Carbide drills List No. 9501D

Work Material	Speed (ft/min)	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 Ceremics	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.

AQUA Drills STUB List No. 9550, 9551
Hi-Speed Wet Drilling

Workpiece Material Drill Diameter			Carbon Steels Cast Irons		Alloy Steels		Die Steels Hardened Steels (30-40HRc)		Hardened Steels (40-50HRc)		DuctileCast Irons	
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 Drill Diameter			Carbon Steels Cast Irons		Alloy Steels		Die Steels Hardened Steels (30-40HRc)		Hardened Steels (40-50HRc)		DuctileCast Irons	
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	
Drill Diameter											
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	
Drill Diameter											
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	
Drill Diameter											
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							
Drill Diameter		50 - 55HRc		55 - 60HRc		60 - 65HRc		65HRc -	
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.

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

AQUA Drills Micro 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													
Metric mm	Decimal	RPM	Feed (IPR)	Step Feed	RPM	Feed (IPR)	Step Feed	RPM	Feed (IPR)	Step Feed	RPM	Feed (IPR)	Step Feed
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 ^{*5)}	15,900	0.0006	0.2D-0.5D ^{*5)}	12,700	0.0006	0.2D-0.5D ^{*5)}	8,000	0.0005	0.1D
1.5	0.0591	21,200	0.0011	0.2D-0.5D ^{*5)}	13,800	0.0011	0.2D-0.5D ^{*5)}	9,500	0.0011	0.2D-0.5D ^{*5)}	6,400	0.0009	0.1D
1.99	0.0783	19,200	0.0019	0.2D-0.5D ^{*5)}	12,800	0.0020	0.2D-0.5D ^{*5)}	8,000	0.0020	0.2D-0.5D ^{*5)}	5,600	0.0015	0.1D

D: Drill Diameter

Workpiece Material		Hardened Steels (50-55HRc)			Ductile Cast Irons			Stainless Steels		
Drill Diameter										
Metric mm	Decimal	RPM	Feed (IPR)	Step Feed	RPM	Feed (IPR)	Step Feed	RPM	Feed (IPR)	Step Feed
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)}	5,600	0.0006	0.1D
1.5	0.0591	4,200	0.0006	0.1D	17,000	0.0011	0.2D-0.5D ^{*5)}	4,200	0.0012	0.1D
1.99	0.0783	3,600	0.0008	0.1D	16,000	0.0014	0.2D-0.5D ^{*5)}	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.

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

Hi-Speed Wet Drilling

Workpiece Material Drill Diameter			Carbon Steels Cast Irons		Alloy Steels		Die Steels Hardened Steels (30-40HRc)		Hardened Steels (40-50HRc)		DuctileCast Irons	
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 Drill Diameter			Carbon Steels Cast Irons		Alloy Steels		Die Steels Hardened Steels (30-40HRc)		Hardened Steels (40-50HRc)		DuctileCast Irons	
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.

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		Alluminum Alloys						Aluminum Alloy Casting		Copper Alloys	
Drill Diameter				4032, 6061		5052		7075					
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 Drills Micro List No. 9524
DLC Drills Regular List No. 9520

Drilling in Wet & Semi Dry (Mist Coolant) Condition

Workpiece Material		Aluminum 1017		Alluminum Alloys						Aluminum Alloy Casting		Copper Alloys	
Drill Diameter				4032, 6061		5052		7075					
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		Alluminum Alloys						Aluminum Alloy Casting		Copper Alloys	
Drill Diameter				4032, 6061		5052		7075					
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	15,000	0.0005
2	0.0787			12,500	0.0010	16,000	0.0010	19,000	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	6,400	0.0017
5	0.1969			5,100	0.0025	6,400	0.0026	7,600	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	2,400	0.005
10	0.3937			2,550	0.005	3,200	0.005	3,800	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	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.

Straight Shank Drills

Jobbers Length
Screw Machine Length
Taper Length

List No. 500, 501, 501A, 503, 515, 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		Die Steels Hardened Steels Stainless Steels		Cast Irons		Aluminum Alloys Nonferrous Metals	
Drill Diameter			RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
Fractional	Metric mm	Decimal										
—	1	0.0394	4,800	0.0008	3,800	0.0007	2,900	0.0006	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	3,800	0.0015	5,800	0.0011
—	2	0.0787	2,900	0.0016	2,300	0.0013	1,700	0.0012	3,200	0.0020	4,900	0.0014
—	3	0.1181	2,100	0.0028	1,700	0.0023	1,300	0.0021	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	2,200	0.0036	3,500	0.0025
—	5	0.1969	1,300	0.0042	1,000	0.0037	760	0.0033	1,400	0.0053	2,200	0.0038
1/4	6.35	0.2500	1,100	0.0047	800	0.0044	610	0.0038	1,120	0.0064	1,750	0.0044
—	8	0.3150	800	0.0059	640	0.0050	480	0.0044	900	0.0074	1,400	0.0051
3/8	9.525	0.3750	680	0.0065	540	0.0055	400	0.0049	740	0.0082	1,200	0.0054
—	10	0.3937	640	0.0068	510	0.0057	380	0.0050	700	0.0084	1,100	0.0057
—	12	0.4724	530	0.0074	420	0.0064	320	0.0057	580	0.0095	900	0.0066
1/2	12.7	0.5000	510	0.0076	400	0.0066	310	0.0057	550	0.0099	860	0.0069
5/8	15.875	0.6250	410	0.0089	330	0.0076	250	0.0065	450	0.0115	690	0.0086
—	16	0.6299	400	0.0091	320	0.0078	240	0.0067	440	0.0116	680	0.0087

Straight Shank Drills TiN Coated

Jobbers Length

List No. 501P

Screw Machine Length

List No. 561P

Workpiece Material			Carbon Steels		Alloy Steels		Die Steels Hardened Steels Stainless Steels		Cast Irons		Aluminum Alloys Nonferrous Metals	
Drill Diameter			RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
Fractional	Metric mm	Decimal										
—	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

Jobbers Length
Taper LengthList No. 517
List No. 545

Workpiece Material			Carbon Steels		Alloy Steels		Die Steels Hardened Steels Stainless Steels		Cast Irons	
Drill Diameter										
Fractional	Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
—	1	0.0394	4,800	0.0011	3,800	0.0009	2,900	0.0008	5,300	0.0014
1/16	1.588	0.0625	3,400	0.0018	2,700	0.0014	2,100	0.0012	3,800	0.0021
—	2	0.0787	2,900	0.0023	2,300	0.0017	1,700	0.0015	3,200	0.0028
—	3	0.1181	2,100	0.0039	1,700	0.0030	1,300	0.0027	2,300	0.0048
1/8	3.175	0.1250	2,000	0.0041	1,700	0.0030	1,200	0.0029	2,200	0.0050
—	5	0.1969	1,300	0.0059	1,000	0.0048	760	0.0042	1,400	0.0075
1/4	6.35	0.2500	1,100	0.0066	800	0.0057	610	0.0049	1,120	0.0089
—	8	0.3150	800	0.0083	640	0.0066	480	0.0058	900	0.0104
3/8	9.525	0.3750	680	0.0091	540	0.0072	400	0.0063	740	0.0115
—	10	0.3937	640	0.0095	510	0.0074	380	0.0065	700	0.0118
—	12	0.4724	530	0.0104	420	0.0083	320	0.0074	580	0.0133
1/2	12.7	0.5000	510	0.0107	400	0.0086	310	0.0075	550	0.0139
5/8	15.875	0.6250	410	0.0124	330	0.0099	250	0.0085	450	0.0161
—	16	0.6299	400	0.0127	320	0.0101	240	0.0087	440	0.0163

Straight Shank Drills Parabolic Style TiN Coated

Jobbers Length
Taper LengthList No. 517P
List No. 545P

Workpiece Material			Carbon Steels		Alloy Steels		Die Steels Hardened Steels Stainless Steels		Cast Irons	
Drill Diameter										
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. 555A, 555, 551
Taper Shank Drills Extra Length List No. 651

Workpiece Material		Carbon Steels		Alloy Steels Hardened Steels		Stainless Steels		Cast Irons		Brass Nonferrous Metals	
Drill Diameter											
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	
Drill Diameter											
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.

Taper Shank Drills Regular Shank / CORE Drills List No. 601, 6601, 649
Shanks Smaller than Regular List No. 603
Silver and Deming Drills List No. 575

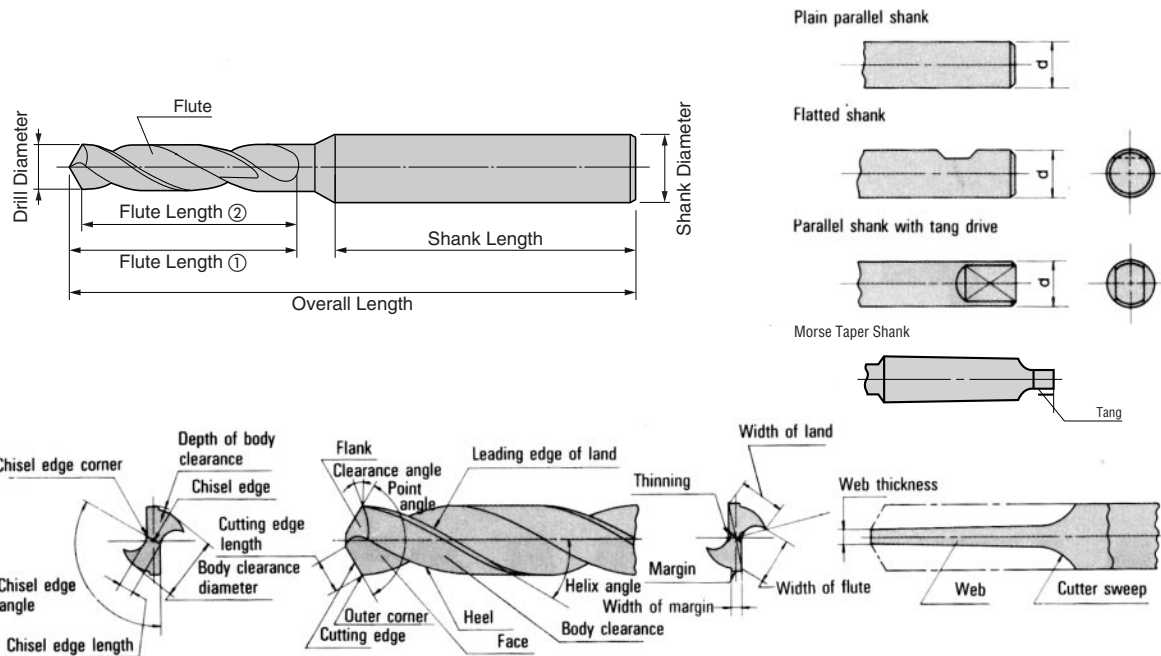
Workpiece Material		Carbon Steels		Alloy Steels		Die Steels Hardened Steels Stainless Steels		Cast Irons		Aluminum Alloys Nonferrous Metals	
Drill Diameter											
Fractional	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
1/8	0.1250	2,000	0.003	1,900	0.003	1,400	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	
Drill Diameter											
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

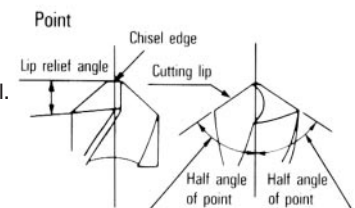
For prolonging the drill life and maintaining accurate hole production, both the drilling machine used and jigs and fixtures must preserve high rigidity.

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.

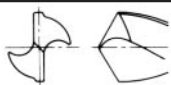
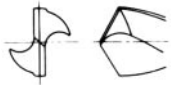
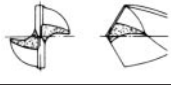
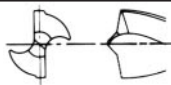


THE MAIN GEOMETRY FACTOR OF DRILLS AND THEIR WORK

CHARACTERISTICS GEOMETRY FACTORS OF DRILLS	Cutting Resistance		Rigidity		Chip Removable	Guide Prfrmnc.	Amount of burr at the end	Remark
	Thrust	Torque	Body	Cutting Edge				
Helix Angle High ↑ ↓ Low	Small ↑ ↓ Big	Small ↑ ↓ Big	Small ↑ ↓ Big	Good ↑ ↓ Big	Good ↑ ↓ Bad		Small ↑ ↓ Big	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.
Point Angle Big ↑ ↓ Small	Big ↑ ↓ Small	Small ↑ ↓ Big					Small ↑ ↓ Big	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.
Web Thickness Big ↑ ↓ Small	Big ↑ ↓ Small	Big ↑ ↓ Small	Big ↑ ↓ Small		Bad ↑ ↓ Good			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.
Clearance Angle Big ↑ ↓ Small	Small ↑ ↓ Big			Small ↑ ↓ Big			Small ↑ ↓ Big	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.
Back Taper Big ↑ ↓ Small		Small ↑ ↓ Big				Bad ↑ ↓ Good		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

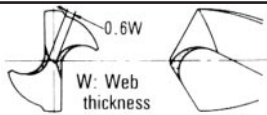
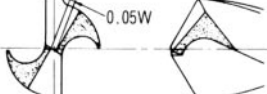
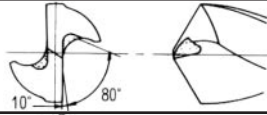
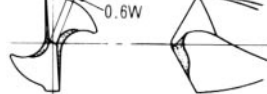
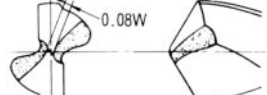
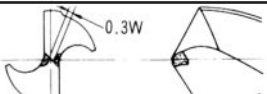
Shape of lip relief

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 	- 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 	- grind the lip relief planely - easy grinding	small diameter	
Three-rake 	- having good centripetalability because of no chisel edge - less enlargement of hole - need special grinder	drilling high accurate hole and location	
Spiral point 	- lip relief spirally ground makes an S-shaped chisel edge - brings good centripetalability and high accuracy	drilling high accurate hole	
Radial-lip 	- 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 	- 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 	very easy to make thinning	General purpose for steel, cast iron, non-ferrous metal	
X-type (split point) 	- reduce thrust force substantially - advantage when entering - This type of thinning is very effective for thick web	- drilling deep hole ex. oil-hole of crankshaft - material of low-machinability and of machining hardenability	 
N-type 	effective for thick web	drilling deep hole	
R-type 	- reduce thrust force substantially - lessen chipping on cutting edges	- heavy duty - rail or manganese steel	
XS-type 	- easier grinding than x-type - reduce thrust force substantially - advantage when entering	drilling deep hole	
H-type 	lessen web thickness and strengthen chisel at same time	heavy duty	

Figures reference only

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 winding 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 nicks on the flank function as chip breakers. Stagger the positions of nicks so that distances of the nicks from the drill axis are not identical. Cut chips become thin and long and they discharged smoothly.

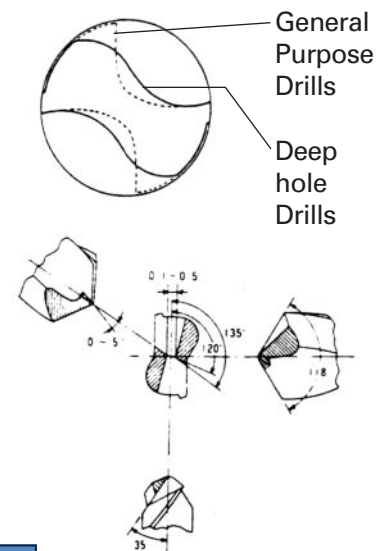
ex. Characteristics of the drills for deep hole

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	$\frac{SFM \times 3.82}{RPM}$
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

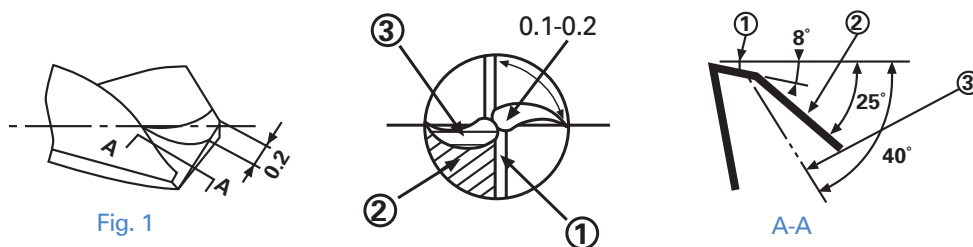


Fig. 1

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).

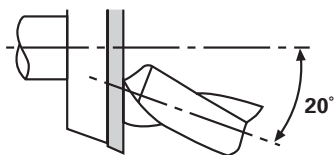


Fig. 2

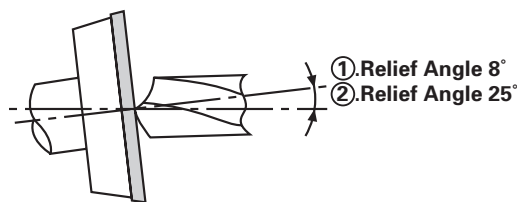


Fig. 3

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.

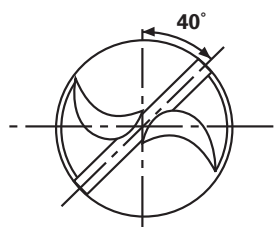


Fig. 4

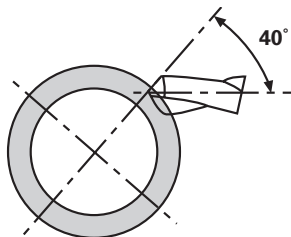
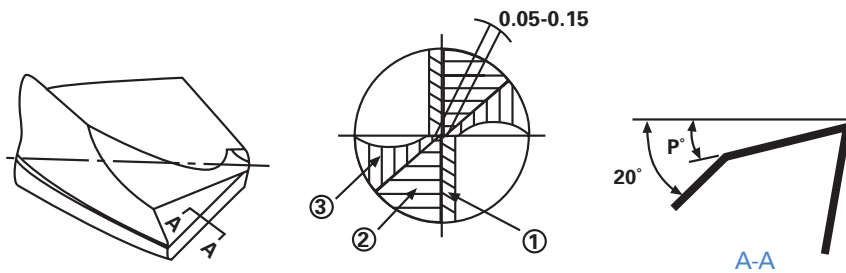


Fig. 5

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).

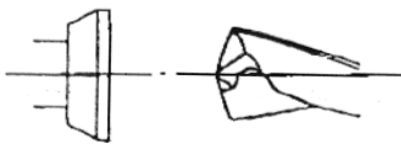


Fig. 1

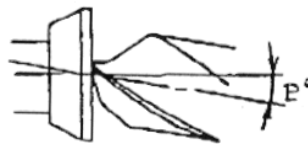


Fig. 2

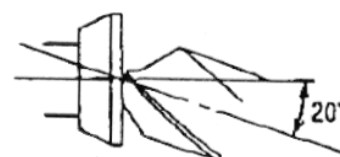


Fig. 3

3. WEB THINNING

- 3-1. As shown Fig. 4, incline drill in 40 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.

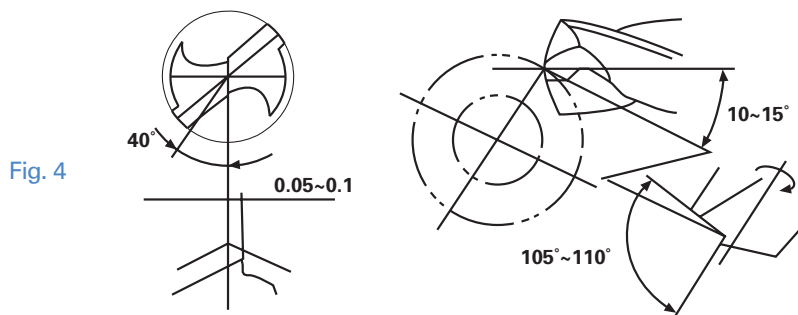


Fig. 4

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

Problems	Solution	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	
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 11 14				26A			

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.
4	Use bushing and reduce bushing clearance.	22	Rework worn margin completely.
5	Clearance between workpiece to be drilled and bushing	23	Increase web thickness.
5A:	Widen this clearance.	24	Check workpiece to be drilled, for proper grain structure and heat treatment. (HB: 180 or more)
5B:	Narrow this clearance.	25	Cutting speed
6	Rotate workpiece instead of tool.	25A:	Increase this speed.
7	Secure workpiece or replace fixture on the workpiece with fittings that have less clamp distortion.	25B:	Decrease this speed.
8	Check contact of drill taper (clean) and reduce run-out of holder and spindle.	26	Feed
9	Helix angle	26A:	Increase feed rate.
9A:	Increase this angle.	26B:	Decrease feed rate.
9B:	Decrease this angle.	27	Decrease feed at entrance to workpiece.
10	Shorten overall length and flute length to increase rigidity.	28	Decrease feed at exit from workpiece.
11	Provide chipbreaker.	29	Use non-water-soluble coolant.
12	Use surface treatment.	30	Use sulfuric or chloric extreme-pressure oils.
13	Point angle	31	Increase quantity of coolant discharged.
13A:	Increase this angle	32	Feed oil in correct direction.
13B:	Decrease this angle.	33	Drill center hole in preceding process.
14	Increase flute width ratio.	34	Effect intermittent feed. (Narrow step for deep holes.)
15	Use oil-hole drill.	35	Select such helix angle and end angle that cutting edges will not be shaped like beak.
16	Upgrade material of tool.	36	Decrease feed rate for deep holes
17	Back taper		
17A:	Increase back taper.		
17B:	Decrease back taper (Check a slight decrease in diameter from point to back).		
18	Lip relief angle		
18A:	Increase this angle.		
18B:	Decrease this angle.		

 Technical
Data

DRILLS

 DRILLS
Cutting Condition

END MILLS

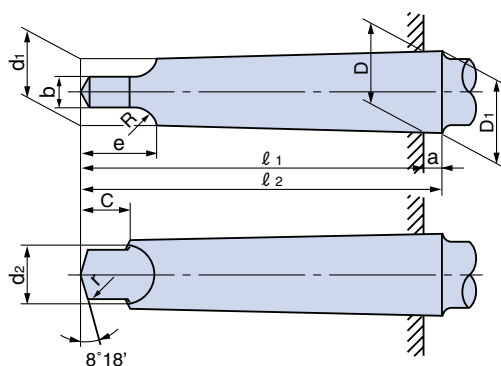
 END MILLS
Cutting Condition

TAPS

 TAPS
Cutting Condition

Others

TAPER SHANK WITH TENON



Morse taper	Taper		Angle on Side	Taper shank with tenon																
				D ⁽²⁾	a	D ₁ ⁽³⁾	d ₁ ⁽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	Basic size	
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

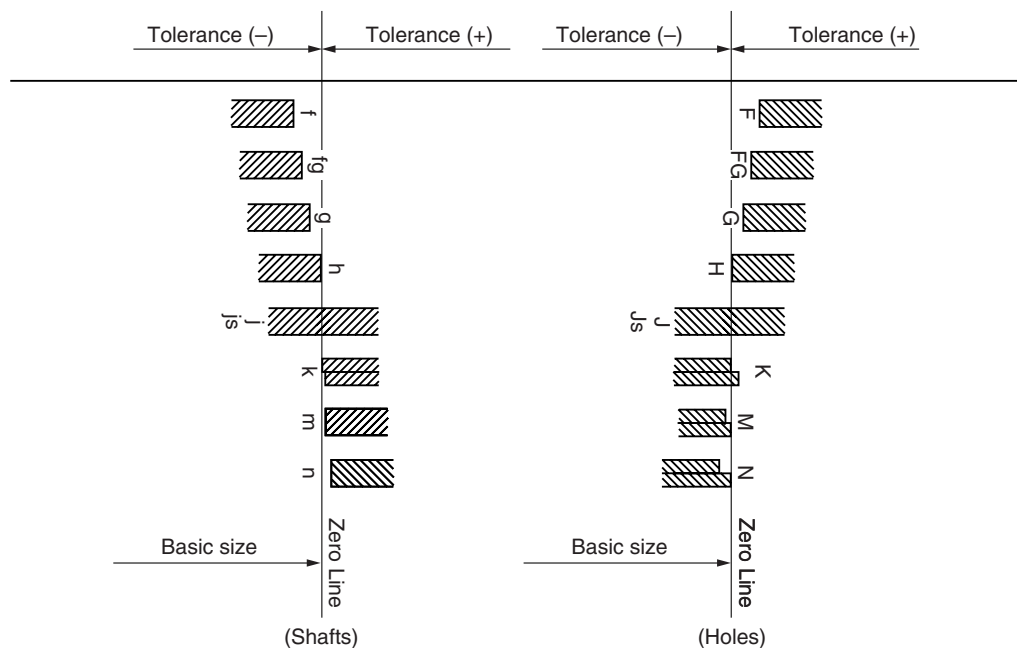
Diameter (mm)		Under 3.0 D≤3	Above 3.0 Under 6.0 3<D≤6	Above 6.0 Under 10 6<D≤10	Above 10 Under 18 10<D≤18	Above 18 Under 30 18<D≤30	Above 30 Under 50 30<D≤50	Above 50 Under 80 50<D≤80	Above 80 Under 120 80<D≤120
Tolerance	js6	±3	±4	±4.5	±5.5	±6.5	±8	±8.5	±11
	h6	0 -6	0 -8	0 -9	0 -11	0 -13	0 -16	0 -19	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

Grades 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)



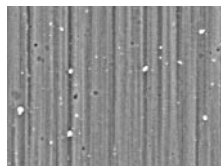
ENDMILLS

Visual Index

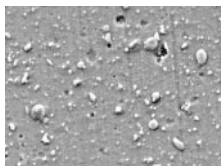
- Guide to Mark
- Technical Information
- Selection Chart
- Sizes
- Cutting Condition
- Technical Reference

Features

- Sharp corner type solid carbide end mill.
- Smooth chip flow by GS coat, (New TiAlN coating).
- Multi purpose use and long tool life.



Ra=0.078μm
GS-mill
(Smooth surface !)



Ra=0.171μm
Competitor



Work Materials

Structural Steels, Carbon Steels, Alloy Steels, Pre-hardened Steels, Hardened Steels, Stainless Steels, Nickel Alloys, Titanium Alloys, Cast Irons

Performance

GS-mill Two Flute

Milling Condition

Dia. of Mill : $\phi 8\text{mm}$

Speed : $2,400\text{min}^{-1}$

(198 SFM)

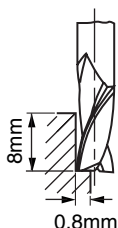
Feed : 190mm/min

(7.5 IPM)

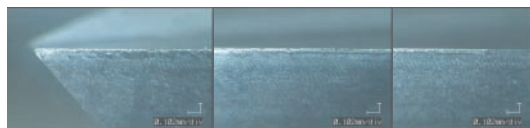
Material : Pre-hardened Steels

Coolant : air blow

Milling Length : 30m



GS-mill Two Flute



Competitor



GS-mill ball

Milling Condition

Size of Mill : R4

Speed : $12,000\text{min}^{-1}$

(990 SFM)

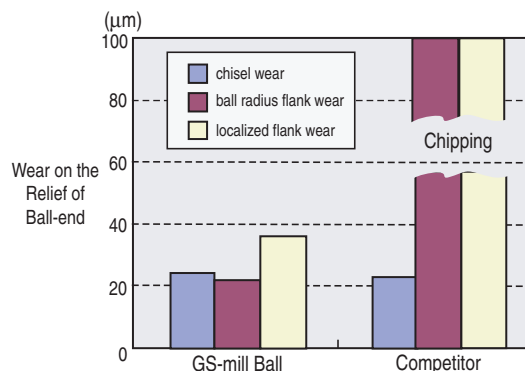
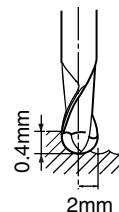
Feed : $1,910\text{mm/min}$

(75.2 IPM)

Material : SCM440 (30HRC)

Coolant : air blow

Milling Length : 7m



Stocked Size

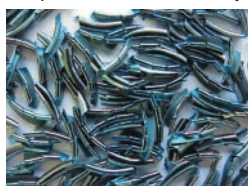
End mills Name	List No.	Page
GS-mills 2-Flute	9382	136 NEW
GS-mills 4-Flute	9384	136 NEW
GS-mills Ball	9386	137 NEW

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

Features

- Utilizes flute geometry resulting in fast groove milling and excellent chip ejection.
- Tough micro grain carbide enables a longer tool life.
- TiAlN coating has high heat resistance that enhances a longer tool life.
- Multi-functional end mill that allows high speed grooving and highly precise side milling.

Chip form to flow smoothly



Cross section of geo mill



Geo Mill



Current 4 Flute
End Mill



Work Materials

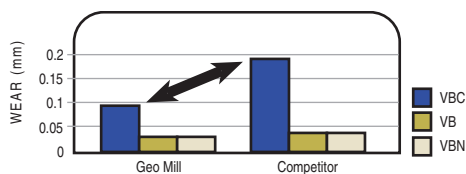
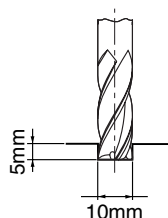
Carbon Steels, Alloy Steels, Pre-Hardened Steels, Hardened Steels, Stainless Steels, Nickel Alloys, Titanium Alloys, Cast Irons

Performance

CUTTING ABILITY- NACHI'S GEO MILL VS. OTHER BRAND

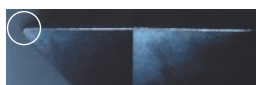
Milling Condition

Dia. of Mill : 10mm 4flute
Speed : 1,600min⁻¹ (165 SFM)
Feed : 256mm/min (10 IPM)
Material : SKD61 (40HRC)
Coolant : DRY
Cutting Length : 7.5m (25feet)

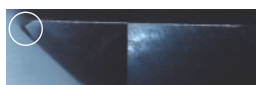


Corner Wear is Reduced by 50%

Geo Mill



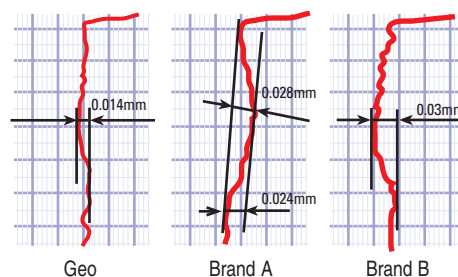
Competitor



SURFACE ROUGHNESS (UNDULATION & INCLINATION)-NACHI GEO MILL VS. OTHER BRANDS

Milling Condition

Dia. of Mill : 3/8 4flute
Speed : 2,800min⁻¹ (275 SFM)
Feed : 1,000mm/min (39.4 IPM)
Material : Carbon (28HRC)
Coolant : DRY
Cutting Length : 27m (90feet)



Stocked Size	End mills Name	List No.	Page
*	X's-mill Geo / METRIC	9322	138
*	X's-mill Geo / Fractional	9321	139
*	X's-mill Geo Radius	9324	140

Stocked Size	End mills Name	List No.	Page
*	X's-mill Geo SLOT	9338	141
*	X's-mill Geo KOVAR	9366	142
		9368	142 NEW

* 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

Features

- Efficient milling in stainless steels, Nickel Alloys and Titanium Alloys.
- Process Superior finishes on machined surfaces.
- Solid Carbide End Mill. TiAlN Coating.

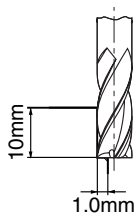
Work Materials

Stainless Steels, Nickel Alloys, Titanium Alloys

Performance

Milling Condition

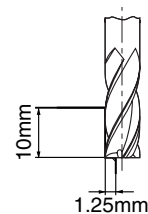
Dia. of Mill : 12mm
Speed : 1,000min⁻¹ (124 SFM)
Feed : 320mm/min (12.6 IPM)
Material : Inconel 718 (40HRC)
Coolant : Water-Soluble Fluid



Wear on the relief for cutting SUS304

Milling Condition

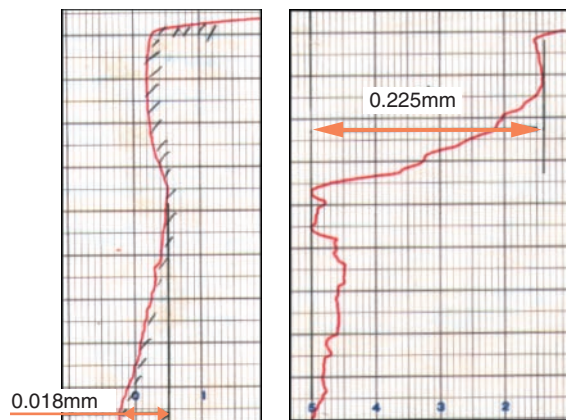
Dia. of Mill : 10mm
Speed : 2,650min⁻¹ (273 SFM)
Feed : 560mm/min (22 IPM)
Material : SUS304
Coolant : Wet



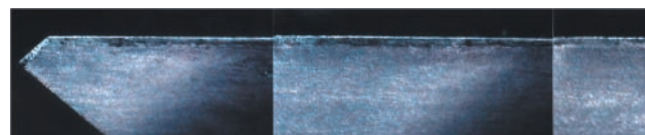
Surface inclination

X's-mill for Stainless Steels

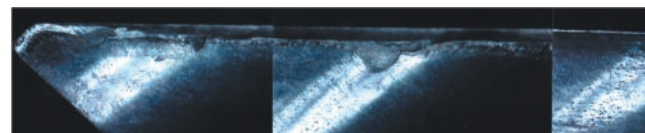
Competitor



X's-mill for Stainless Steels



Competitor



Stocked Size	End mill Name	List No.	Page
	X's-mill for Stainless Steels	9314	147

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

Features

- Provides high accuracy and long life in RIB processing.
- Superior accuracy and surface finish.
- Wide variation of End Mills for RIB processing.
- Solid Carbide End Mills, TiAlN Coating.

Work Materials

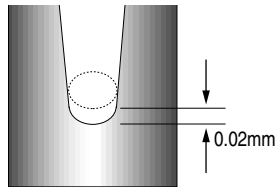
Pre-Hardened Steels, Alloy Steels, Carbon Steels

Performance

X's-mill Taper Ball

Milling Condition

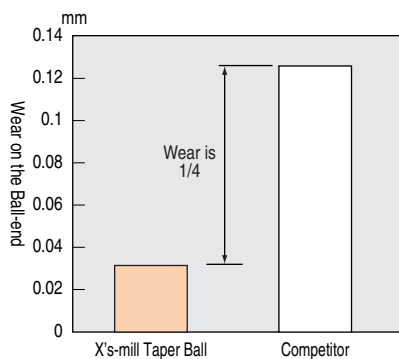
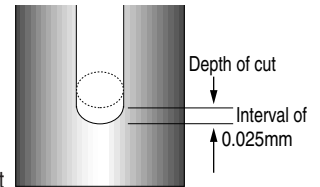
Size of Mill : R0.5×1°×8×45×4
 Speed : 17,500min⁻¹ (180 SFM)
 Feed : 440mm/min (17.3 IPM)
 Material : NAK80 (40HRC)
 Coolant : Non-Water-Soluble Fluid Wet
 Cutting Length : 80m



X's-mill Ball for Rib

Milling Condition

Size of Mill : R0.5×1.5×12×45×4
 Speed : 17,500min⁻¹ (180 SFM)
 Feed : 220mm/min (8.7 IPM)
 Material : NAK80 (40HRC)
 Coolant : Non-Water-Soluble Fluid Wet
 Cutting Length : 160m



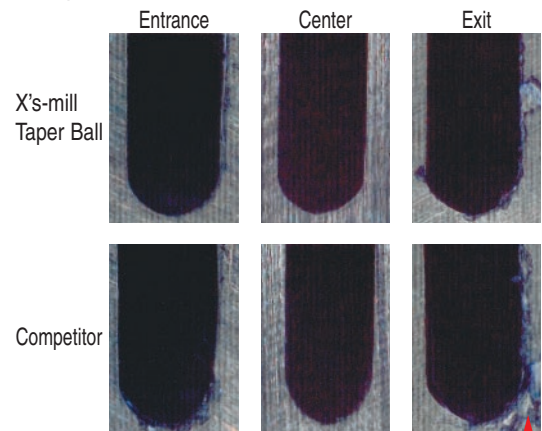
X's-mill Taper Ball



Competitor



Comparison of Precision



Burr

Stocked Size	End mills Name	List No.	Page
	X's-mill for Rib Processing	9496	148
	X's-mill Ball for Rib Processing	9498	149

* 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

Features

- It is possible to mill work material up to 65HRC.
- Useful in dry milling.
- Solid Carbide End Mill. TiAlN Coating.

Work Materials

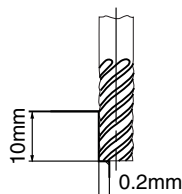
Hardened Steels (45~65HRC), Die Steels

Performance

X's-mill HARD Regular

Milling Condition

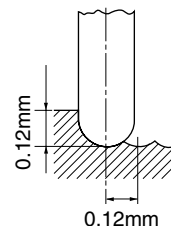
Dia. of Mill : 10mm
Speed : 2,400min⁻¹ (247 SFM)
Feed : 1,400mm/min (55 IPM)
Material : SKD11 (60HRC)
Coolant : air blow



X's-mill HARD Ball

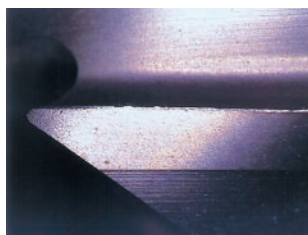
Milling Condition

Dia. of Mill : 2mm
Speed : 17,500min⁻¹ (360 SFM)
Feed : 1,400mm/min (55 IPM)
Material : SKD11 (60HRC)
Coolant : air blow



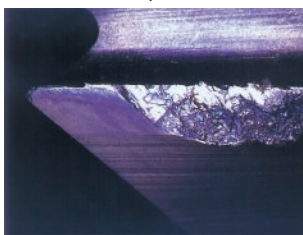
Wear on the relief

X's-mill HARD



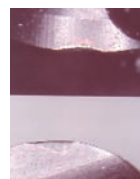
Wear of after 18m cutting

Competitor

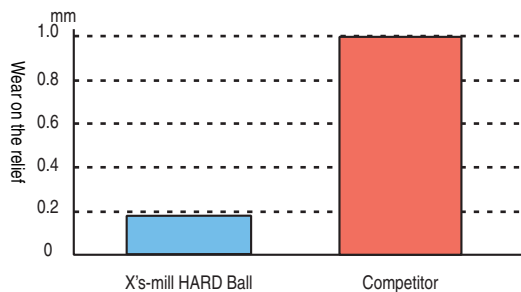
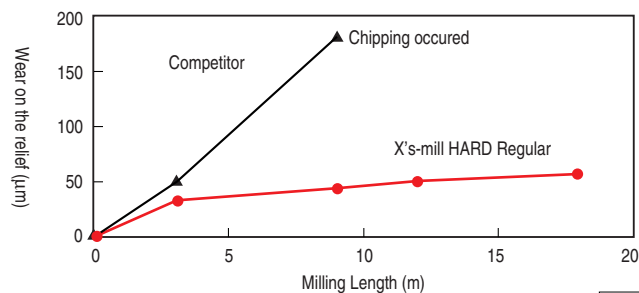
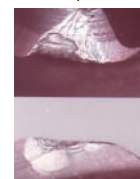


Wear of after 9m cutting

X's-mill HARD Ball



Competitor



Stocked Size	End mills Name	List No.	Page
	X's-mill HARD Regular	9286	145
	X's-mill HARD Ball	9284	146

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

Features

- Excellent surface finish.
- "DLC" (Diamond like carbon) coating has low friction.
- Designed for dry-milling.
- Excellent chip control due to special flute geometry.

Work Materials

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

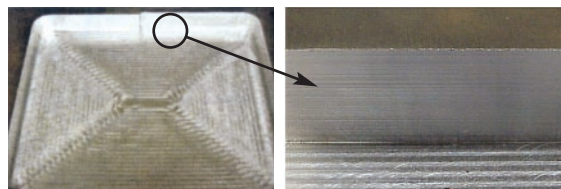
Performance

Milling Condition

Dia. of Mill : 10mm
Speed : 10,000min⁻¹ (1,030 SFM)
Feed : 1,000mm/min (39.4 IPM)
Material : AA5052
Coolant : Dry



Milled with DLC coated endmill



Excellent surface finish without burr



Condition of tool after operation

Breakage



Milling with un-coated carbide end mill

AA5052	DLC mill	Non-coated carbide
Surface Finish		
Surface Roughness	 Ry=4.550 μm	 Ry=31.50 μm

**DLC mill maintains
very good surface finish!!**

Stocked Size	End mills Name	List No.	Page
*	DLC-mill for Aluminum	9330	150
*	DLC-mill Sharp Corner Two Flute	9378	151
*	DLC-mill Radius	9302	152
*	DLC-mill Slot Long Shank	9390	153
*	DLC-mill Ball	9360	154
*	DLC-HSS mill / Metric Sizes	6450	155
*	DLC-HSS mill / Inch Sizes	6231HD	156

* 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

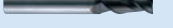
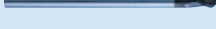
TAPS

TAPS
Cutting Condition

Others

HIGH PERFORMANCE END-MILLS

●:Great ○:Good △:OK

Endmills Name	Material	Coating	Stock USA ● Japan ○		Stock Size	LIST No			Side Milling		Grooving			Profile Milling	Rib Process	Workpiece Material																			
						Page Size	Cutting Condition		Rough	Semi- Finish	Finish	Rough	Semi- Finish			Finish	Structural Steel	Carbon Steel		Alloy Steel	Pre- hardened Steel	Die Steel	Hardend Steel				Stainless Steel		Titanium Alloys	Nickel Alloys	Cast Iron	Aluminum		Copper Alloys	Graphite
																		Low Carbon 1010,1018	High Carbon 1045,1065			HRc	HRc			Austenitic 300 Series	Martensitic 400 Series	Cast Si ≤ 12%				High Si Si >13%			
																		30 to 45	45 to 55			55 to 60	60 to 65												
GS-mill 2-Flute	Solid carbide	GS	○	Metric	0.5 to 12.0	9382				●	●		●	●		●	●	●	●	●	●	○		●	●	○	○	○							
GS-mill 4-Flute			○	Metric	1.0 to 12.0	9384				●	●		●	●		●	●	●	●	●	●	○		●	●	○	○	○							
GS-mill Ball			○	Metric	R0.5 to R6	9386								●		●	●	●	●	●	○		●	●	○	○	○								
X's-mill Geo		X's	●	Inch	1/8 to 1	9321				●	●		●	●			●	●	●	●	●	○		●	●	○	○	○							
			○	Metric	2.0 to 32.0	9322				●	●		●	●			●	●	●	●	●	○		●	●	○	○	○							
X's-mill Geo Radius			○	Metric	3.0 to 20.0	9324				●	●		●	●	●		●	●	●	●	○		●	●	○	○	○								
						9338				●	●		●	●			●	●	●	●	○	○		●	●	○	○	○							
X's-mill Geo SLOT			○	Metric	1.0 to 16.0	9366				●	●		●	●			△								●	●	●	●	○						
						9368				●	●		○	○			△					●	●	●	●	○									
X's-mill Geo KV 2-Flute			○	Metric	0.5 to 3.0	9340									●		●	●	●	●	○		●	●	○	○	○								
						9332										●	●	●	●	○		●	●	○	○	○									
X's-mill Geo KV 4-Flute			○	Metric	1.0 to 3.0	9316					●			○				●	●	●	●	○		○	○	●	●	○							
						9286					●			○				△	△	●	●	●													
X's-mill Geo Ball			○	Metric	R0.5 to R15	9284									●					△	△	●	●	●											
						9314																													
X's-mill Geo Microball			○	Metric	R0.1 to R2	9496																													
						9498																													
X's-mill Multi-Flute			○	Metric	3.0 to 20.0	9330					●	●		●	●																				
						9378					●	●		●	●																				
X's-mill Hard Regular			○	Metric	1.0 to 20.0	9302									●																				
						9390			○	●	●	●	●	●																					
X's-mill Hard Ball			○	Metric	R1 to R10	9360									●																				
						154 194																													
X's-mill for Stainless Steels			○	Metric	3.0 to 20.0	6231HD					●	●		●	●																				
						156 195																													
X's-mill for Rib Processing			○	Metric	0.5 to 3.0	6450					●	●		●	●																				
						155 195																													
X's-mill Ball for Rib Processing			○	Metric	R0.3 to R1.5	9211D					●			△																					
						157 196																													
DLC-mill		HSS-Co	DIAMOND	●	Inch	1/4 to 3/4	9211D				●			△																					
DLC-mill Sharp Corner				○	Metric	1.0 to 20.0	9211D				●			△																					
DLC-mill Radius				○	Metric	2.0 to 20.0	9211D				●			△																					
DLC-mill Slot Long Shank				○	Metric	2.0 to 20.0	9211D				●			△																					
DLC-mill Ball				○	Metric	R0.5 to R10	9211D				●			△																					
DLC-HSS mill				●	Inch	1/8 to 1	9211D				●			△																					
DLC-mill				○	Metric	1.0 to 20.0	9211D				●			△																					
DLC-mill Sharp Corner				○	Metric	1.0 to 20.0	9211D				●			△																					
DLC-mill Radius				○	Metric	2.0 to 20.0	9211D				●			△																					
DLC-mill Slot Long Shank				○	Metric	2.0 to 20.0	9211D				●			△																					
DLC-mill Ball	○			Metric	R0.5 to R10	9211D				●			△																						
DLC-HSS mill	●			Inch	1/8 to 1	9211D				●			△																						
DLC-mill	○	Metric	1.0 to 20.0	9211D				●			△																								
DLC-mill Sharp Corner	○	Metric	1.0 to 20.0	9211D				●			△																								
DLC-mill Radius	○	Metric	2.0 to 20.0	9211D				●			△																								
DLC-mill Slot Long Shank	○	Metric	2.0 to 20.0	9211D				●			△																								
DLC-mill Ball	○	Metric	R0.5 to R10	9211D				●			△																								
DLC-HSS mill	●	Inch	1/8 to 1	9211D				●			△																								
DLC-mill	○	Metric	1.0 to 20.0	9211D				●			△																								
DLC-mill Sharp Corner	○	Metric	1.0 to 20.0	9211D				●			△																								
DLC-mill Radius	○	Metric	2.0 to 20.0	9211D				●			△																								
DLC-mill Slot Long Shank	○	Metric	2.0 to 20.0	9211D				●			△																								
DLC-mill Ball	○	Metric	R0.5 to R10	9211D				●			△																								
DLC-HSS mill	●	Inch	1/8 to 1	9211D				●			△																								
DLC-mill	○	Metric	1.0 to 20.0	9211D				●			△																								
DLC-mill Sharp Corner	○	Metric	1.0 to 20.0	9211D				●			△																								
DLC-mill Radius	○	Metric	2.0 to 20.0	9211D				●			△																								
DLC-mill Slot Long Shank	○																																		

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

COATED END-MILLS

●:Great ○:Good △:OK

Endmills Name		Material	Coating	Stock USA ● Japan ○		Stock Size	LIST No			Side Milling			Grooving			Profile Milling	Rib Process	Workpiece Material																		
							Page											Structural Steel	Carbon Steel		Alloy Steel	Pre- hardened Steel	Die Steel	Hardend Steel				Stainless Steel		Titanium Alloys	Nickel Alloys	Cast Iron	Aluminum		Copper Alloys	Graphite
							Size	Cutting Condition		Rough	Semi- Finish	Finish	Rough	Semi- Finish	Finish				Low Carbon 1010,1018	High Carbon 1045,1065				HRC 30 to 45	45 to 55	55 to 60	60 to 65	Austenitic 300 Series	Martensitic 400 Series				Casting Si ≤ 12%	High Si Si >13%		
GENAC-mills	2-Flute / Regular	Solid carbide	SG	●	Inch	1/8 to 1	9261X						○	●			○	●	●	●	○	●	△			△	△	△	△	○				△		
	2-Flute / Long			●	Inch	1/8 to 1	9265X						○	●			○	●	●	●	○	●	△			△	△	△	△	○				△		
	2-Flute / Regular - Ball End			●	Inch	1/8 to 1	9271X							●		○	●	●	●	○	●	△			△	△	△	△	○				△			
	2-Flute / Long-Ball End			●	Inch	1/8 to 1	9275X							●		○	●	●	●	○	●	△			△	△	△	△	○				△			
	4-Flute / Regular			●	Inch	1/8 to 1	9263X			○	●			△		○	●	●	●	○	●	△			△	△	△	△	○				△			
	4-Flute / Long			●	Inch	1/8 to 1	9267X			○	●			△		○	●	●	●	○	●	△			△	△	△	△	○				△			
	4-Flute / Regular - Ball End			●	Inch	1/8 to 1	9273X								●		○	●	●	●	○	●	△			△	△	△	△	○				△		
	4-Flute / Long - Ball End			●	Inch	1/8 to 1	9277X								●		○	●	●	●	○	●	△			△	△	△	△	○				△		
	Roughing, Regular, Center Cutting			●	Inch	1/4 to 1-1/4	9251X		●	●		●	●				○	●	●	●	○	●	△			△	△	△	△	○				△		
	High Helix, 3-Flute			●	Inch	1/8 to 1	9221X							○	●			○	●	●	●	○	●	△			△	△	△	△	○				△	
	SG 2-Flute / Regular			HSS-Co	SG	●	Inch	1/8 to 1-1/2	6231X						○	●			●	●	●	○	○										△	△	△	△
SG Multi-Flute / Regular, Center Cutting		●	Inch			1/8 to 1-1/2	6211X			○	●						●	●	●	○	○										△	△	△	△		
SG Roughing & Finishing (Heavy Duty)		●	Inch			1/4 to 2	6367X		●	●		●	●				●	●	●	○	○											△	△	△	△	
SG Roughing (Hog)		●	Inch			1/4 to 2	6303X		●			●					●	●	●	○	○											△	△	△	△	
G Powder Metal / High Helix		PM-HSS	G	●	Inch	1/4 to 1-1/2	7221P						○	●			○	○	○	○	○										△	△	△	△		
G Roughing & Finishing(Heavy Duty)		HSS-Co		●	Inch	1/4 to 2	6367P		●	●							○	○	○	○	○										△	△	△	△		
G Roughing (Hog)				●	Inch	1/4 to 2	6303P		●			●						○	○	○	○	○									△	△	△	△		

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

NON COATED END-MILLS

●:Great ○:Good △:OK

Endmills Name		Material	Coating	Stock USA ● Japan ○		Stock Size	LIST No			Side Milling			Grooving			Profile Milling	Rib Process	Workpiece Material																		
							Page Size	Cutting Condition		Rough	Semi- Finish	Finish	Rough	Semi- Finish	Finish			Structural Steel	Carbon Steel		Alloy Steel	Pre- hardened Steel	Die Steel	Hardend Steel				Stainless Steel		Titanium Alloys	Nickel Alloys	Cast Iron	Aluminum		Copper Alloys	Graphite
																			Low Carbon 1010,1018	High Carbon 1045,1065				Hrc 30 to 45	45 to 55	55 to 60	60 to 65	Austenitic 300 Series	Martensitic 400 Series				Si ≤ 12%	High Si Si >13%		
2-Flute Single End	Regular	HSS		●	Inch	1/8 to 2-1/2	231							○	○			△	△	△	△	△								△	△	△	△			
					●	Inch	1/8 to 2	6231							○	○			○	○	○	○	○								○	△	△	○		
	Regular - High Helix	HSS-CO		●	Inch	1/4 to 2	6231H							○	○			○	○	○	○	○									○	△	△	○		
				●	Inch	1/4 to 2	6233							○	○			○	○	○	○	○									○	△	△	○		
	Ball End	HSS		●	Inch	1/8 to 2	291								○			○	○	○	○	○									○	△	△	○		
				●	Inch	1/8 to 1-1/2	6291								○			○	○	○	○	○									○	△	△	○		
	Ball Nose Extra Long	HSS-CO		●	Inch	1/4 to 1-1/4	6293								○	○			○	○	○	○	○									○	△	△	○	
					●	Metric	1.0 to 50.0	6230								○	○			○	○	○	○	○								○	△	△	○	
	Metric - Ball End				●	Metric	1.5 to 40.0	6290								○			○	○	○	○	○									○	△	△	○	
2-Flute Double End	Regular	HSS		●	Inch	1/8 to 1	261								○	○			△	△	△	△	△								△	△	△	△		
					●	Inch	1/8 to 1	6261								○	○			○	○	○	○	○								○	△	△	○	
	Ball End	HSS		●	Inch	1/8 to 1	295									○			△	△	△	△	△								△	△	△	△		
				●	Inch	1/8 to 1	6295									○			○	○	○	○	○									○	△	△	○	
4-Flute Single End	Regular - Center Cutting	HSS		●	Inch	1/8 to 2	211					○	○				△			△	△	△	△	△								△	△	△	△	
	Long - Center Cutting			●	Inch	1/4 to 2	213					○	○				△			△	△	△	△	△								△	△	△	△	
				●	Inch	1/4 to 1-1/4	6213						○	○				△			○	○	○	○	○							○	△	△	○	
	Extra Long - Center Cutting	HSS		●	Inch	1/4 to 1-1/4	215					○	○				△			△	△	△	△	△								△	△	△	△	
	Regular - Ball End	HSS-CO	●	Inch	1/4 to 1-1/2	6281									○			○	○	○	○	○									○	△	△	○		
				●	Metric	2.5 to 50.0	6210					○	○				△			○	○	○	○	○							○	△	△	○		
	Metric - Center Cutting			●	Inch	1/8 to 1	6241					○	○				△			○	○	○	○	○							○	△	△	○		
				●	Inch	1/8 to 1	271					○	○				△			△	△	△	△	△							△	△	△	△		
4-Flute Double End	Regular - Center Cutting	HSS	●	Inch	1/8 to 1	6271					○	○				△			○	○	○	○	○								○	△	△	○		
			●	Inch	1/8 to 1	6201					○	○				△			○	○	○	○	○								○	△	△	○		
	Regular - Center Cutting		●	Inch	1/8 to 2	6211M					○	○				△			○	○	○	○	○								○	△	△	○		

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

NON COATED END-MILLS

●:Great ○ :Good △:OK

[illegible]

GS-MILL TWO FLUTE

GS-MILL FOUR FLUTE

JAPAN
STOCK ITEM*

List No.9382 Two Flute



This end mill having sharp edge corner is suitable for high-speed and long life milling of workpiece materials from raw materials to hardened materials, and is used in grooving.

(Unit) : mm

Dia. of Mill	Shank Dia.	Length of Cut	Overall Length
0.5	3	1.25	38
1	3	2.5	38
1.5	3	3.75	38
2	3	5	38
2.5	3	6.25	38
3	3	7.5	38
4	4	11	45
5	6	13	50
6	6	13	50
8	8	19	60
10	10	22	70
12	12	26	75

Dia. of Mill (mm)		Tolerance (mm)
Above	Up to	
	3	0~-0.015
3		0~-0.030

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

List No.9384 Four Flute



This end mill having sharp edge corner is suitable for high-speed and long life milling of workpiece materials from raw materials to hardened materials, and is used in side milling.

(Unit) : mm

Dia. of Mill	Shank Dia.	Length of Cut	Overall Length
1	3	2.5	38
2	3	5	38
3	3	7.5	38
4	4	11	45
5	6	13	50
6	6	13	50
8	8	19	60
10	10	22	70
12	12	26	75

Dia. of Mill (mm)		Tolerance (mm)
Above	Up to	
	3	0~-0.015
3		0~-0.030

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.9386



This end mill is suitable for high-speed and long life milling, and is used in profile milling.

(Unit) : mm

Ball Radius	Dia. of Mill	Shank Dia.	Length of Cut	Overall Length
0.5	1	4	1.5	50
0.75	1.5	4	2.5	50
1	2	6	3	60
1.25	2.5	6	4	60
1.5	3	6	4.5	60
2	4	6	6	70
2.5	5	6	7.5	80
3	6	6	9	80
4	8	8	12	90
5	10	10	15	100
6	12	12	21	110

Tolerance (mm)	
Dia. of Mill	Ball Radius
0~ -0.03	±0.01

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.9322



This end mill realizes feed speed of 80 IPM, and is adaptable in workpiece material from Carbon Steels and Mold Steels to Hard-to-cut materials.

(Unit) : mm

Dia. of Mill	Shank Dia.	Length of Cut	Overall Length
2	4	6	50
2.1	4	6	50
2.2	4	6	50
2.3	4	6	50
2.4	4	8	50
2.5	4	8	50
2.6	4	8	50
2.7	4	8	50
2.8	4	8	50
2.9	4	8	50
3	6	8	50
3.1	6	8	50
3.2	6	8	50
3.3	6	8	50
3.4	6	10	50
3.5	6	10	50
3.6	6	10	50
3.7	6	10	50
3.8	6	11	50
3.9	6	11	50
4	6	11	50
4.1	6	11	50
4.2	6	11	50
4.3	6	11	50
4.4	6	11	50
4.5	6	11	50
4.6	6	11	50
4.7	6	11	50
4.8	6	13	60
4.9	6	13	60
5	6	13	60
5.1	6	13	60
5.2	6	13	60
5.3	6	13	60
5.4	6	13	60
5.5	6	13	60
5.6	6	13	60

Dia. of Mill	Shank Dia.	Length of Cut	Overall Length
5.7	6	13	60
5.8	6	13	60
5.9	6	13	60
6	6	13	60
6.1	8	16	70
6.2	8	16	70
6.3	8	16	70
6.4	8	16	70
6.5	8	16	70
6.6	8	16	70
6.7	8	16	70
6.8	8	16	70
6.9	8	16	70
7	8	16	70
7.1	8	16	70
7.2	8	16	70
7.3	8	16	70
7.4	8	16	70
7.5	8	16	70
7.6	8	19	80
7.7	8	19	80
7.8	8	19	80
7.9	8	19	80
8	8	19	80
8.1	10	19	90
8.2	10	19	90
8.3	10	19	90
8.4	10	19	90
8.5	10	19	90
8.6	10	19	90
8.7	10	19	90
8.8	10	19	90
8.9	10	19	90
9	10	19	90
9.1	10	19	90
9.2	10	19	90
9.3	10	19	90

Dia. of Mill	Shank Dia.	Length of Cut	Overall Length
9.4	10	19	90
9.5	10	19	90
9.6	10	22	90
9.7	10	22	90
9.8	10	22	90
9.9	10	22	90
10	10	22	90
10.1	12	22	90
10.2	12	22	90
10.3	12	22	90
10.4	12	22	90
10.5	12	22	90
10.6	12	22	90
10.7	12	22	90
10.8	12	22	90
10.9	12	22	90
11	12	22	90
11.1	12	22	90
11.2	12	22	90
11.3	12	22	90
11.4	12	22	90
11.5	12	22	90
11.6	12	26	90
11.7	12	26	90
11.8	12	26	90
11.9	12	26	90
12	12	26	90
14	16	26	110
15	16	26	110
16	16	32	115
18	20	32	120
20	20	38	125
22	20	50	140
25	25	50	140
28	25	60	165
30	25	60	165
32	32	70	175

Dia. of Mill (mm)		Tolerance of Dia. (mm)
Above	Up to	
	3	-0.014~-0.028
3	6	-0.020~-0.038
6	10	-0.025~-0.047
10		-0.032~-0.059

1 per tube

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

List No.9321



This end mill realizes feed speed of 80 IPM, and is adaptable in workpiece material from Carbon Steels and Mold Steels to Hard-to-cut materials.

L9321	Dia. of Mill	Shank Diameter	Length of Cut	No. of Flutes	Overall Length
GMS04	1/8	1/8	3/8	4	1-1/2
GMS06	3/16	3/16	5/8	4	2
GMS08	1/4	1/4	1/2	4	2-1/2
GMS10	5/16	5/16	13/16	4	2-1/2
GMS12	3/8	3/8	7/8	4	2-1/2
GMS14	7/16	7/16	1	4	2-3/4
GMS16	1/2	1/2	1	4	3
GMS20	5/8	5/8	1-1/4	4	3-1/2
GMS24	3/4	3/4	1-1/2	4	4
GMS32	1	1	1-1/2	4	4

1 per tube

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

List No.9324



This end mill realizes feed speed of 80 IPM. This end mill having corner radius is used for corner radius milling.

(Unit) : mm

Dia. of Mill	Corner Radius	Shank Dia.	Length of Cut	Overall Length
3	0.2	6	8	50
3	0.5	6	8	50
4	0.2	6	11	50
4	0.5	6	11	50
4	1.0	6	11	50
5	0.2	6	13	60
5	0.5	6	13	60
5	1.0	6	13	60
6	0.3	6	13	60
6	0.5	6	13	60
6	1.0	6	13	60
6	1.5	6	13	60
8	0.3	8	19	80
8	0.5	8	19	80
8	1.0	8	19	80
8	1.5	8	19	80
8	2.0	8	19	80
10	0.3	10	22	90
10	0.5	10	22	90
10	1.0	10	22	90
10	1.5	10	22	90
10	2.0	10	22	90
12	0.5	12	26	90
12	1.0	12	26	90
12	1.5	12	26	90
12	2.0	12	26	90
12	3.0	12	26	90
16	1.0	16	32	115
16	1.5	16	32	115
16	2.0	16	32	115
16	3.0	16	32	115
20	1.0	20	38	125
20	1.5	20	38	125
20	2.0	20	38	125
20	3.0	20	38	125

Dia. of Mill (mm)		Tolerance (mm)	
Above	Up to	Dia. of Mill	Corner Radius
	3	-0.014~-0.028	+0.02~-0.01
3	6	-0.020~-0.038	
6	10	-0.025~-0.047	
10		-0.032~-0.059	

1 per tube

* JAPAN STOCK ITEM :

Please allow 2-3 weeks delivery

List No.9338



This end mill is available from plunging to slotting continuously and is used for workpiece materials from raw materials to hardened materials.

(Unit) : mm

Dia. of Mill	Shank Dia.	Length of Cut	Overall Length
1	4	3	50
1.5	4	4	50
2	4	6	50
2.5	4	8	50
3	6	8	50
3.5	6	10	50
4	6	11	50
4.5	6	11	50
5	6	13	60
5.5	6	13	60
6	6	13	60
6.5	8	16	70
7	8	16	70
7.5	8	16	70
8	8	19	80
8.5	10	19	90
9	10	19	90
9.5	10	19	90
10	10	22	90
11	12	22	90
12	12	26	90
13	12	26	100
14	16	26	110
15	16	26	110
16	16	32	115

Dia. of Mill (mm)		Tolerance of Dia. (mm)
Above	Up to	
	3	-0.014~-0.028
3	6	-0.020~-0.038
6	10	-0.025~-0.047
10		-0.032~-0.059

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.9366 Two Flute

This end mill is the best in grooving of Fiber optics component,
and controls less burr.

Length of Cut : 1.5xD

(Unit) : mm

Dia. of Mill D	Shank Dia.	Length of Cut	L1	Overall Length
0.5	3	0.75	1.2	38
1	3	1.5	2.5	38
1.2	3	1.8	2.8	38
1.5	3	2.25	3.2	38
2	3	3	4	38
2.5	3	3.75	4.7	38
3	3	4.5	—	38

1 per tube

Length of Cut : 2.5xD

(Unit) : mm

Dia. of Mill D	Shank Dia.	Length of Cut	L1	Overall Length
0.5	3	1.25	1.7	38
1	3	2.5	3.5	38
1.2	3	3	4	38
1.5	3	3.75	4.7	38
2	3	5	6	38
2.5	3	6.25	7.2	38
3	3	7.5	—	38

Tolerance of Diameter : 0~ -0.015mm

1 per tube

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

List No.9368 Four Flute

This end mill the best in side milling of Fiber optics component,
and controls less burr.

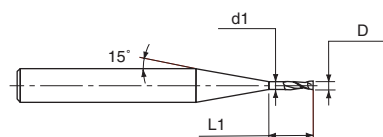
Length of Cut : 1.5xD

(Unit) : mm

Dia. of Mill D	Shank Dia.	Length of Cut	L1	Overall Length
1	3	1.5	2.5	38
1.2	3	1.8	2.8	38
1.5	3	2.25	3.2	38
2	3	3	4	38
2.5	3	3.75	4.7	38
3	3	4.5	—	38

1 per tube

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



$$D < d1$$

$$d1 = D + 0.05 \text{ mm}$$

List No.9340



This end mill is suitable for high efficiency and high precision finishing of molding dies, and is adaptable in workpiece material from Carbon Steels and Mold Die Steels to hardened materials.

(Unit) : mm

Ball Radius	Dia. of Mill	Shank Dia.	Length of Cut	L1	α	Overall Length
0.5	1	4	1.5	3	10°	50
0.75	1.5	4	2.5	4	10°	50
1	2	6	3	5	15°	60
1.25	2.5	6	4	6	15°	60
1.5	3	6	4.5	8	15°	80
2	4	6	6	12	15°	80
2.5	5	6	7.5	14	15°	90
3	6	6	9	—	—	100
3.5	7	8	11	20	20°	100
4	8	8	12	—	—	100
4.5	9	10	14	25	20°	120
5	10	10	15	—	—	120
5.5	11	12	17	30	20°	120
6	12	12	18	—	—	120
6.5	13	16	20	35	20°	160
7	14	16	21	38	—	160
7.5	15	16	23	40	20°	160
8	16	16	24	—	—	160
9	18	20	27	50	20°	180
10	20	20	30	—	—	180
12.5	25	25	38	—	—	200
15	30	32	45	80	20°	200

1 per tube

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

Ball Radius (mm)		Tolerance (mm)	
Above	Up to	Dia. of Mill	Ball Radius
	8	0~-0.030	±0.01
8		0~-0.040	

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

List No.9332



This end mill is suitable for high precision and fine milling, and is adaptable in workpiece material from Carbon Steels and Mold Die Steels to hardened materials.

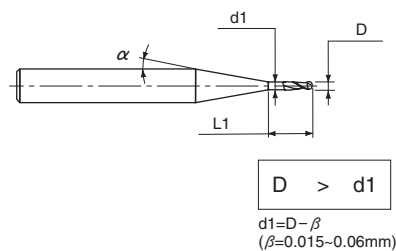
(Unit) : mm

Ball Radius	Dia. of Mill D	Shank Dia.	Length of Cut	L1	α	Overall Length
0.1	0.2	6	0.2	—	13.5°	50
0.15	0.3	6	0.3	—	13.5°	50
0.2	0.4	6	0.4	—	13.5°	50
0.25	0.5	6	0.5	1.5	15°	50
0.3	0.6	6	0.6	1.8	15°	50
0.4	0.8	6	0.8	2.4	15°	50
0.5	1.0	6	1	2.5	15°	50
0.6	1.2	6	1.2	3	15°	50
0.7	1.4	6	1.4	3.5	15°	50
0.75	1.5	6	1.5	3.8	15°	50
0.8	1.6	6	1.6	4	15°	50
0.9	1.8	6	1.8	4.5	15°	50
1	2.0	6	2	5	15°	50
1.25	2.5	6	2.5	5	13°	50
1.5	3.0	6	3	6	13°	50
1.75	3.5	6	3.5	6	10°	50
2	4.0	6	4	6	10°	50

1 per tube

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

Ball Radius (mm)		Tolerance (mm)	
Above	Up to	Dia. of Mill	Ball Radius
	0.2	0~-0.015	0~+0.005
0.2	2.0		±0.010



X'S-MILL MULTI FLUTE

X'S-MILL HARD REGULAR

JAPAN
STOCK ITEM*

List No.9316 Multi Flute



This provides ultra high-speed milling and ultra excellent surface of workpiece materials from raw materials to hardened materials.

(Unit) : mm

Dia. of Mill	Shank Dia.	Length of Cut	Overall Length	Number of Flutes
3	6	10	50	6
4	6	13	50	6
5	6	16	50	6
6	6	16	50	6
8	8	22	60	6
10	10	26	70	6
12	12	32	75	8
16	16	40	90	8
20	20	46	100	8

Dia. of Mill (mm)		Tolerance of Dia. (mm)
Above	Up to	
	3	-0.014~-0.028
3	6	-0.020~-0.038
6	10	-0.025~-0.047
10		-0.032~-0.059

1 per tube

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

List No.9286 Hard Regular



This end mill is suitable for high efficiency milling of hardened material of 60HRC.

(Unit) : mm

Dia. of Mill	Shank Dia.	Length of Cut	Overall Length	Number of Flutes
1	6	3	50	4
1.5	6	4	50	4
2	6	6	50	4
3	6	8	50	6
4	6	11	50	6
5	6	13	50	6
6	6	13	50	6
8	8	19	60	6
10	10	22	70	6
12	12	26	75	8
16	16	32	90	8
20	20	38	100	8

Dia. of Mill (mm)		Tolerance of Dia. (mm)
Above	Up to	
	3	-0.014~-0.028
3	6	-0.020~-0.038
6	10	-0.025~-0.047
10		-0.032~-0.059

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

Technical
Data

List No.9284



This end mill is suitable for direct profile milling of hardened
molds steels of 60HRC.

(Unit) : mm

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

Ball Radius	Dia. of Mill	Shank Dia.	Length of Cut	Overall Length
1	2	6	1	60
1.5	3	6	1.5	70
2	4	6	2	80
2.5	5	6	2.5	80
3	6	6	3	90
4	8	8	4	100
5	10	10	5	110
6	12	12	6	120
8	16	16	8	150
10	20	20	10	160

Tolerance of Ball Radius : $\pm 0.01\text{mm}$

1 per tube

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

HIGH PERFORMANCE END MILLS

X'S-MILL FOR STAINLESS STEELS

JAPAN
STOCK ITEM*

147

List No.9314



This end mill is designed for Stainless Steels milling and provides high-speed & super excellent surface of workpiece.

(Unit) : mm

Dia. of Mill	Shank Dia.	Length of Cut	Overall Length
3	6	8	45
4	6	11	45
5	6	13	50
6	6	13	50
7	8	16	60
8	8	19	60
9	10	19	70
10	10	22	70
12	12	26	75
16	16	32	90
18	20	32	100
20	20	38	100

Dia. of Mill (mm)		Tolerance of Dia. (mm)
Above	Up to	
	3	-0.014~-0.028
3	6	-0.020~-0.038
6	10	-0.025~-0.047
10		-0.032~-0.059

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.9496


This end mill is used for deep rib grooving.

(Unit) : mm

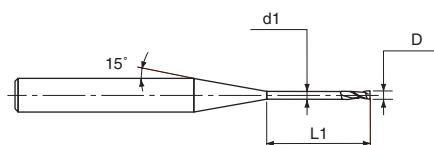
Dia. of Mill D	Shank Dia.	Length of Cut	Overall Length	L1
0.5	3	0.7	35	2
0.5	3	0.7	35	4
0.5	3	0.7	35	6
0.6	3	0.9	35	2
0.6	3	0.9	35	4
0.6	3	0.9	35	6
0.7	4	1.0	45	2
0.7	4	1.0	45	4
0.7	4	1.0	45	6
0.8	4	1.2	45	4
0.8	4	1.2	45	6
0.8	4	1.2	45	8
0.9	4	1.35	45	6
0.9	4	1.35	45	8
0.9	4	1.35	45	10
1	4	1.5	45	6
1	4	1.5	45	8
1	4	1.5	45	10
1	4	1.5	45	12
1.2	4	1.8	45	6
1.2	4	1.8	45	8
1.2	4	1.8	45	10
1.2	4	1.8	45	12
1.4	4	2.1	45	6
1.4	4	2.1	45	8
1.4	4	2.1	45	10
1.4	4	2.1	45	12
1.4	4	2.1	50	14
1.4	4	2.1	50	16
1.5	4	2.3	45	6
1.5	4	2.3	45	8
1.5	4	2.3	45	10
1.5	4	2.3	50	14
1.5	4	2.3	50	16
1.5	4	2.3	55	18
1.5	4	2.3	55	20
1.6	4	2.4	45	6
1.6	4	2.4	45	8
1.6	4	2.4	45	10
1.6	4	2.4	45	12
1.6	4	2.4	50	14
1.6	4	2.4	50	16
1.6	4	2.4	55	18
1.6	4	2.4	55	20
1.7	4	2.6	45	6

Dia. of Mill D	Shank Dia.	Length of Cut	Overall Length	L1
1.7	4	2.6	45	8
1.7	4	2.6	45	10
1.7	4	2.6	45	12
1.7	4	2.6	50	14
1.7	4	2.6	50	16
1.7	4	2.6	55	18
1.7	4	2.6	55	20
1.8	4	2.7	45	6
1.8	4	2.7	45	8
1.8	4	2.7	45	10
1.8	4	2.7	45	12
1.8	4	2.7	50	14
1.8	4	2.7	50	16
1.8	4	2.7	55	18
1.8	4	2.7	55	20
1.9	4	2.8	45	6
1.9	4	2.8	45	8
1.9	4	2.8	45	10
1.9	4	2.8	45	12
1.9	4	2.8	50	14
1.9	4	2.8	50	16
1.9	4	2.8	55	18
1.9	4	2.8	55	20
2	4	3.0	45	6
2	4	3.0	45	8
2	4	3.0	45	10
2	4	3.0	45	12
2	4	3.0	50	14
2	4	3.0	50	16
2	4	3.0	55	18
2	4	3.0	55	20
2.5	4	3.7	45	8
2.5	4	3.7	45	10
2.5	4	3.7	45	12
2.5	4	3.7	50	14
2.5	4	3.7	55	16
2.5	4	3.7	55	18
2.5	4	3.7	60	20
3	6	4.5	45	8
3	6	4.5	45	10
3	6	4.5	45	12
3	6	4.5	50	14
3	6	4.5	55	16
3	6	4.5	55	18
3	6	4.5	60	20
3	6	4.5	65	25

Tolerance of Diameter : 0~-0.02mm

1 per tube

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



$$D > d1$$

$$d1 = D - \beta$$

$$(\beta = 0.01 \sim 0.06 \text{ mm})$$

List No.9498



This end mill is used for deep rib groove radius.

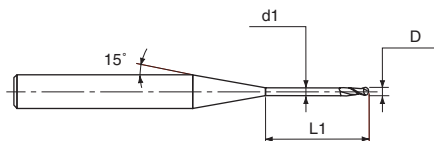
(Unit) : mm

Ball Radius	Dia. of Mill D	Shank Dia.	Length of Cut	Overall Length	L1
0.3	0.6	3	0.9	35	6
0.4	0.8	4	1.2	45	6
0.4	0.8	4	1.2	45	8
0.5	1	4	1.5	45	6
0.5	1	4	1.5	45	8
0.5	1	4	1.5	45	10
0.5	1	4	1.5	45	12
0.6	1.2	4	1.8	45	8
0.6	1.2	4	1.8	45	12
0.7	1.4	4	2.1	45	8
0.7	1.4	4	2.1	45	12
0.7	1.4	4	2.1	50	16
0.75	1.5	4	2.3	45	8
0.75	1.5	4	2.3	45	12
0.75	1.5	4	2.3	50	16
0.75	1.5	4	2.3	55	20
0.8	1.6	4	2.4	45	8
0.8	1.6	4	2.4	45	12
0.8	1.6	4	2.4	50	16
0.8	1.6	4	2.4	55	20
0.9	1.8	4	2.7	45	8
0.9	1.8	4	2.7	45	12
0.9	1.8	4	2.7	50	16
0.9	1.8	4	2.7	55	20
1	2	4	3.0	45	8
1	2	4	3.0	45	12
1	2	4	3.0	50	16
1	2	4	3.0	55	20
1.5	3	6	4.5	45	10
1.5	3	6	4.5	55	16
1.5	3	6	4.5	60	20
1.5	3	6	4.5	65	25

1 per tube

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

Tolerance (mm)	
Dia. of Mill	Ball Radius
0~0.02	±0.02



$$D > d1$$

$$d1 = D - \beta$$

($\beta = 0.01 \sim 0.06 \text{ mm}$)

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

List No.9330



This is suitable for Dry-milling of Aluminum with DLC coat.

(Unit) : mm

Dia. of Mill	Shank Dia.	Length of Cut	Overall Length
1	4	3	40
1.5	4	4	40
2	4	6	40
2.5	4	8	40
3	6	8	45
3.5	6	10	45
4	6	11	45
4.5	6	11	50
5	6	13	50
5.5	6	13	50
6	6	13	50
7	8	16	60
8	8	19	60
9	10	19	70
10	10	22	70
11	12	22	75
12	12	26	75
16	16	32	90
20	20	38	100

Dia. of Mill (mm)		Tolerance of Dia. (mm)
Above	Up to	
	3	-0.014~-0.028
3	6	-0.020~-0.038
6	10	-0.025~-0.047
10		-0.032~-0.059

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.9378



This end mill having sharp edge corner is suitable for excellent cutting surface of Aluminum.

(Unit) : mm

Dia. of Mill	Shank Dia.	Length of Cut	Overall Length
1	4	3	40
1.5	4	4	40
2	4	6	40
2.5	4	8	40
3	6	8	45
3.5	6	10	45
4	6	11	45
4.5	6	11	50
5	6	13	50
6	6	13	50
7	8	16	60
8	8	19	60
9	10	19	70
10	10	22	70
11	12	22	75
12	12	26	75
16	16	32	90
20	20	38	100

Dia. of Mill (mm)		Tolerance of Dia. (mm)
Above	Up to	
	3	-0.014~-0.028
3	6	-0.020~-0.038
6	10	-0.025~-0.047
10		-0.032~-0.059

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.9302



This end mill is suitable for used for corner radius milling or copying of Aluminum.

(Unit) : mm

Dia. of Mill	Conner Radius	Shank Dia.	Length of Cut	Overall Length
2	0.2	4	6	40
3	0.2	6	8	45
3	0.5	6	8	45
4	0.2	6	11	45
4	0.5	6	11	45
5	0.2	6	13	50
5	0.5	6	13	50
6	0.3	6	13	50
6	0.5	6	13	50
6	1.0	6	13	50
7	0.3	8	16	60
7	0.5	8	16	60
7	1.0	8	16	60
8	0.3	8	19	60
8	0.5	8	19	60
8	1.0	8	19	60
10	0.3	10	22	70
10	0.5	10	22	70
10	1.0	10	22	70
12	0.5	12	26	75
12	1.0	12	26	75
12	2.0	12	26	75
16	0.5	16	32	90
16	1.0	16	32	90
16	2.0	16	32	90
16	3.0	16	32	90
20	0.5	20	38	100
20	1.0	20	38	100
20	2.0	20	38	100
20	3.0	20	38	100

Dia. of Mill (mm)		Tolerance of Dia. (mm)
Above	Up to	
	3	-0.014~-0.028
3	6	-0.020~-0.038
6	10	-0.025~-0.047
10		-0.032~-0.059

Corner radius	Tolerance (mm)
0.2	+0.015~0
0.3	
0.5	+0.020~0
1.0	+0.030~0
2.0	+0.050~0
3.0	

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 END MILLS

DLC-MILL SLOT LONG SHANK

JAPAN
STOCK ITEM*

153

List No.9390



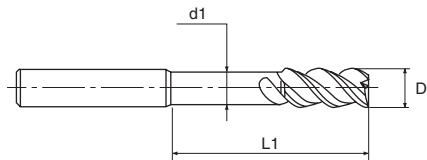
This end mill is for slotting and deep pocket milling in Aluminum Alloys.

(Unit) : mm

Dia. of Mill D	Shank Dia.	Length of Cut	L1	d1	Overall Length
2	4	3	8	1.9	50
3	6	4.5	12	2.9	60
4	6	6	16	3.8	60
5	6	7.5	20	4.8	60
6	6	9	24	5.8	60
7	6	10.5	—	—	80
8	8	12	34	7.7	80
9	8	13.5	—	—	90
10	10	15	42	9.7	100
11	10	16.5	—	—	120
12	12	18	50	11.7	120
13	12	19.5	—	—	130
16	16	24	66	15.5	160
17	16	25.5	—	—	170
20	20	30	82	19.5	200

Dia. of Mill (mm)		Tolerance of Dia. (mm)
Above	Up to	
	3	-0.014~-0.028
3	6	-0.020~-0.038
6	10	-0.025~-0.047
10		-0.032~-0.059

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.9360



This end mill is used in profile milling of Aluminum.

(Unit) : mm

Ball Radius	Dia. of Mill	Shank Dia.	Length of Cut	Overall Length
0.5	1	4	1.5	50
0.75	1.5	4	2.5	50
1	2	6	3	60
1.25	2.5	6	4	60
1.5	3	6	4.5	80
2	4	6	6	80
2.5	5	6	7.5	90
3	6	6	9	100
3.5	7	8	11	100
4	8	8	12	100
4.5	9	10	14	120
5	10	10	15	120
5.5	11	12	17	120
6	12	12	18	120
6.5	13	16	20	160
7	14	16	21	160
7.5	15	16	23	160
8	16	16	24	160
9	18	20	27	180
10	20	20	30	180

Ball Radius (mm)		Tolerance (mm)	
Above	Up to	Dia. of Mill	Ball Radius
	8	0~-0.030	+0.010
8		0~-0.040	

1 per tube

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

List No.6450



This end mill is suitable for grooving of Aluminums.

(Unit) : mm

Dia. of Mill	Shank Dia.	Length of Cut	Overall Length
1	6	2	50
1.5	6	3	50
2	6	4	50
2.5	6	5	50
3	6	6	50
3.5	8	8	60
4	8	8	60
4.5	8	10	60
5	8	10	60
5.5	8	12	60
6	8	12	60
6.5	10	14	65
7	10	14	65
7.5	10	14	65
8	10	14	65
8.5	10	18	70
9	10	18	70
9.5	10	18	70
10	10	18	70
11	12	22	80
12	12	22	80
13	16	26	90
14	16	26	90
15	16	30	95
16	16	30	95
17	20	35	105
18	20	35	105
19	20	40	110
20	20	40	110

Dia. of Mill (mm)		Tolerance of Dia. (mm)
Above	Up to	
	10	0~-0.020
10		0~-0.025

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.6231HD

This end mill is suitable for grooving of Aluminums.

L6231HD	Dia. of Mill	Shank Diameter	Length of Cut	No. of Flutes	Overall Length
PGHDL4	1/8	3/8	3/8	2	2-5/16
PGHDL6	3/16	3/8	7/16	2	2-5/16
PGHDL8	1/4	3/8	5/8	2	2-7/16
PGHDL10	5/16	3/8	3/4	2	2-1/2
PGHDL12	3/8	3/8	3/4	2	2-1/2
PGHDL14	7/16	3/8	1	2	2-11/16
PGHDL16	1/2	1/2	1-1/4	2	3-1/4
PGHDL20	5/8	5/8	1-5/8	2	3-3/4
PGHDL24	3/4	3/4	1-5/8	2	4-1/8
PGHDL32	1	1	2	2	4-1/2

1 per tube

HIGH PERFORMANCE END MILLS

DIAMOND COATED END MILL

157

List No.9211D

DIA

Carbide

HEX

N

Four Flute, Center Cutting
Regular, Single End



L9211D	Diameter Of Mill	Shank Diameter	Length Of Cut	Overall Length
DPFC8	1/4	3/8	5/8	2 1/2
DPFC10	5/16	3/8	3/4	2 1/2
DPFC12	3/8	3/8	3/4	2 1/2
DPFC16	1/2	1/2	1	3 1/4
DPFC24	3/4	3/4	1 5/8	3 7/8

1 per tube

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

GENAC END MILLS "SG" COATED CARBIDE

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

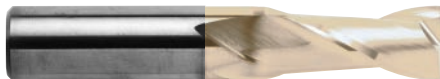
TAPS

TAPS
Cutting Condition

Others

List No.9261X Regular

Two Flute, Single End

SG COATED CARBIDE**List No.9271X** Ball Nose

Two Flute, Ball Nose

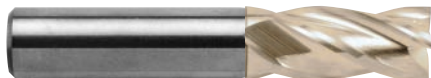
SG COATED CARBIDE

L9261X	L9271X	Diameter of Mill	Shank Diameter	Length of Cut	Number of Flutes	Overall Length
CGX4	CRGX4	1/8	1/8	1/2	2	1 1/2
CGX6	CRGX6	3/16	3/16	5/8	2	2
CGX8	CRGX8	1/4	1/4	3/4	2	2 1/2
CGX10	CRGX10	5/16	5/16	13/16	2	2 1/2
CGX12	CRGX12	3/8	3/8	1	2	2 1/2
CGX14	CRGX14	7/16	7/16	1	2	2 3/4
CGX16	CRGX16	1/2	1/2	1	2	3
CGX20	CRGX20	5/8	5/8	1 1/4	2	3 1/2
CGX24	CRGX24	3/4	3/4	1 1/2	2	4
CGX32	CRGX32	1	1	1 1/2	2	4

1 per tube

List No.9263X Regular

Four Flute, Single End

SG COATED CARBIDE**List No.9273X** Ball Nose

Four Flute, Ball Nose

SG COATED CARBIDE

L9263X	L9273X	Diameter of Mill	Shank Diameter	Length of Cut	Number of Flutes	Overall Length
CFX4	CRFX4	1/8	1/8	1/2	4	1 1/2
CFX6	CRFX6	3/16	3/16	5/8	4	2
CFX8	CRFX8	1/4	1/4	3/4	4	2 1/2
CFX10	CRFX10	5/16	5/16	13/16	4	2 1/2
CFX12	CRFX12	3/8	3/8	1	4	2 1/2
CFX14	CRFX14	7/16	7/16	1	4	2 3/4
CFX16	CRFX16	1/2	1/2	1	4	3
CFX20	CRFX20	5/8	5/8	1 1/4	4	3 1/2
CFX24	CRFX24	3/4	3/4	1 1/2	4	4
CFX32	CRFX32	1	1	1 1/2	4	4

1 per tube

List No.9221X

High Helix 3 Flute 60 Degree

SG COATED CARBIDE

L9221X	Dia. of Mill	Shank Dia.	Length of Cut	Number of Flutes	Overall Length
CHHX4	1/8	1/8	3/8	3	1 1/2
CHHX6	3/16	3/16	5/8	3	2
CHHX8	1/4	1/4	3/4	3	2 1/2
CHHX10	5/16	5/16	13/16	3	2 1/2
CHHX12	3/8	3/8	7/8	3	2 1/2
CHHX14	7/16	7/16	7/8	3	2 1/2
CHHX16	1/2	1/2	1	3	3
CHHX20	5/8	5/8	1 1/4	3	3 1/2
CHHX24	3/4	3/4	1 1/2	3	4
CHHX32	1	1	1 1/2	3	4

1 per tube

List No.9251X

Roughing Center Cutting

SG COATED CARBIDE

L9251X	Dia. of Mill	Shank Dia.	Length of Cut	Number of Flutes	Overall Length
CQX8	1/4	1/4	3/4	4	2 1/2
CQX12	3/8	3/8	7/8	4	2 1/2
CQX16	1/2	1/2	1	4	3
CQX16-1	1/2	1/2	2	4	4
CQX20	5/8	5/8	1 1/4	5	3 1/2
CQX20-1	5/8	5/8	2 1/2	5	5
CQX24	3/4	3/4	1 1/2	6	4
CQX24-1	3/4	3/4	3	6	6
CQX32	1	1	2	6	4
CQX32-1	1	1	3	6	6
CQX40	1 1/4	1 1/4	3	6	6

1 per tube

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

GENAC END MILLS "SG" COATED CARBIDE LONG SERIES

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

List No.9265X

Two Flute
Long, Single End

SG COATED CARBIDE



List No.9267X

Four Flute
Long, Single End

SG COATED CARBIDE



L9265X	L9267X	Dia. of Mill	Shank Dia.	Length of Cut	Overall Length
CGLX4	CFLX4	1/8	1/8	3/4	2 1/4
CGLX6	CFLX6	3/16	3/16	3/4	2 1/2
CGLX8	CFLX8	1/4	1/4	1 1/8	3
CGLX10	CFLX10	5/16	5/16	1 1/8	3
CGLX12	CFLX12	3/8	3/8	1 1/8	3
CGLX14	CFLX14	7/16	7/16	2	4 1/2
CGLX16	CFLX16	1/2	1/2	2	4 1/2
CGLX20	CFLX20	5/8	5/8	2 1/4	5
CGLX24	CFLX24	3/4	3/4	2 1/4	5
CGLX32	CFLX32	1	1	2 1/4	5

1 per tube

List No.9275X

Two Flute, Ball Nose
Long, Single End

SG COATED CARBIDE



List No.9277X

Four Flute, Ball Nose
Long, Single End

SG COATED CARBIDE



L9275X	L9277X	Dia. of Mill	Shank Dia.	Length of Cut	Overall Length
CRGLX4	CRFLX4	1/8	1/8	3/4	2 1/4
CRGLX6	CRFLX6	3/16	3/16	3/4	2 1/2
CRGLX8	CRFLX8	1/4	1/4	1 1/8	3
CRGLX10	CRFLX10	5/16	5/16	1 1/8	3
CRGLX12	CRFLX12	3/8	3/8	1 1/8	3
CRGLX14	CRFLX14	7/16	7/16	2	4 1/2
CRGLX16	CRFLX16	1/2	1/2	2	4 1/2
CRGLX20	CRFLX20	5/8	5/8	2 1/4	5
CRGLX24	CRFLX24	3/4	3/4	2 1/4	5
CRGLX32	CRFLX32	1	1	2 1/4	5

1 per tube

List No.6367



Surface Treat

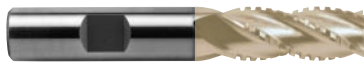
8% COBALT HSS



List No.6367X



8% COBALT "SG" COATED



List No.6367P



8% COBALT TIN COATED



L6367	L6367X	L6367P	Diameter of Mill	Shank Diameter	Length of Cut	Number of Flutes	Overall Length
PK8-2	PKX8-2	PKP8-2	1/4	3/8	5/8	4	2 7/16
PK10-2	PKX10-2		5/16	3/8	3/4	4	2 1/2
PK12-2	PKX12-2	PKP12-2	3/8	3/8	3/4	4	2 1/2
PK16-3	PKX16-3	PKP16-3	1/2	1/2	1 1/4	4	3 1/4
PK16-3A			1/2	1/2	2	4	4
PK20-4	PKX20-4	PKP20-4	5/8	5/8	1 5/8	4	3 3/4
PK20-4A			5/8	5/8	2 1/2	4	4 5/8
PK24-4			3/4	5/8	1 5/8	4	3 3/4
PK24-5	PKX24-5	PKP24-5	3/4	3/4	1 5/8	4	3 7/8
PK24-5A			3/4	3/4	3	4	5 1/4
PK28-5			7/8	3/4	1 7/8	4	4 1/8
PK28-6	PKX28-6		7/8	7/8	1 7/8	4	4 1/8
PK28-6A			7/8	7/8	3 1/2	4	5 3/4
PK32-5	PKX32-5	PKP32-5	1	3/4	2	6	4 1/2
PK32-7	PKX32-7	PKP32-7	1	1	2	6	4 1/2
PK32-7A	PKX32-7A		1	1	4	6	6 1/2
PK36-7			1 1/8	1	2	6	4 1/2
PK40-5			1 1/4	3/4	2	6	4 1/2
PK40-5A			1 1/4	3/4	4	6	6 1/2
PK40-8	PKX40-8	PKP40-8	1 1/4	1 1/4	2	6	4 1/2
PK40-8A	PKX40-8A	PKP40-8A	1 1/4	1 1/4	4	6	6 1/2
PK48-5			1 1/2	3/4	2	6	4 1/2
PK48-5A			1 1/2	3/4	4	6	6 1/2
PK48-8	PKX48-8	PKP48-8	1 1/2	1 1/4	2	6	4 1/2
PK48-8A	PKX48-8A	PKP48-8A	1 1/2	1 1/4	4	6	6 1/2
PK56-8	PKX56-8	PKP56-8	1 3/4	1 1/4	2	6	4 1/2
PK56-8A			1 3/4	1 1/4	4	6	6 1/2
PK64-8	PKX64-8	PKP64-8	2	1 1/4	2	8	4 1/2
PK64-8A			2	1 1/4	4	8	6 1/2
PK64-11	PKX64-11		2	2	4	8	7 3/4
PK64-11A			2	2	6	8	9 3/4
PK64-11B			2	2	8	8	11 3/4
PK80-11			2 1/2	2	4	8	7 3/4
PK80-11A			2 1/2	2	6	8	9 3/4
PK80-11B			2 1/2	2	8	8	11 3/4
PK80-11C			2 1/2	2	10	8	13 3/4
PK96-12			3	2 1/2	4	10	7 3/4
PK96-12A			3	2 1/2	6	10	9 3/4
PK96-12B			3	2 1/2	8	10	11 3/4
PK96-12C			3	2 1/2	10	10	13 3/4
PK96-12D			3	2 1/2	12	10	15 3/4

Shanks 2" And Larger Have Combination Drive
8 And 10 Flutes Are Not Center Cutting

1 per tube

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

ROUGHING (HOG) END MILLS

List No.6303



Bright Finish

8% COBALT HSS



List No.6303X



8% COBALT "SG" COATED



List No.6303P



8% COBALT TIN COATED



L6303	L6303X	L6303P	Diameter of Mill	Shank Diameter	Length of Cut	Number of Flutes	Overall Length
PQ8-2	PQX8-2	PQP8-2	1/4	3/8	5/8	4	2 7/16
PQ8-2A			1/4	3/8	1 1/4	4	3 1/16
PQ10-2	PQX10-2	PQP10-2	5/16	3/8	3/4	4	2 1/2
PQ10-2A			5/16	3/8	1 3/8	4	3 1/8
PQ12-2	PQX12-2	PQP12-2	3/8	3/8	3/4	4	2 1/2
PQ12-2A			3/8	3/8	1 1/2	4	3 1/4
PQ16-3	PQX16-3	PQP16-3	1/2	1/2	1 1/4	4	3 1/4
PQ16-3A	PQX16-3A	PQP16-3A	1/2	1/2	2	4	4
PQ20-4	PQX20-4	PQP20-4	5/8	5/8	1 5/8	4	3 3/4
PQ20-4A	PQX20-4A	PQP20-4A	5/8	5/8	2 1/2	4	4 5/8
PQ24-4			3/4	5/8	1 5/8	4	3 7/8
PQ24-4A			3/4	5/8	3	4	5 1/4
PQ24-5	PQX24-5	PQP24-5	3/4	3/4	1 5/8	4	3 7/8
PQ24-5A	PQX24-5A	PQP24-5A	3/4	3/4	3	4	5 1/4
PQ28-5	PQX28-5	PQP28-5	7/8	3/4	1 7/8	5	4 1/8
PQ28-5A			7/8	3/4	3 1/2	5	5 3/4
PQ28-6	PQX28-6	PQP28-6	7/8	7/8	1 7/8	5	4 1/8
PQ28-6A			7/8	7/8	3 1/2	5	5 3/4
PQ32-5	PQX32-5	PQP32-5	1	3/4	2	5	4 1/4
PQ32-5A			1	3/4	1	5	3 1/4
PQ32-7	PQX32-7	PQP32-7	1	1	2	5	4 1/2
PQ32-7A	PQX32-7A	PQP32-7A	1	1	4	5	6 1/2
PQ32-7B	PQX32-7B	PQP32-7B	1	1	3	5	5 1/2
PQ36-7			1 1/8	1	2	5	4 1/2
PQ40-5			1 1/4	3/4	2	6	4 1/2
PQ40-5A			1 1/4	3/4	4	6	6 1/2
PQ40-8	PQX40-8	PQP40-8	1 1/4	1 1/4	2	6	4 1/2
PQ40-8A	PQX40-8A	PQP40-8A	1 1/4	1 1/4	4	6	6 1/2
PQ40-8B	PQX40-8B	PQP40-8B	1 1/4	1 1/4	3	6	5 1/2
PQ48-5			1 1/2	3/4	2	6	4 1/2
PQ48-5A			1 1/2	3/4	4	6	6 1/2
PQ48-8	PQX48-8	PQP48-8	1 1/2	1 1/4	2	6	4 1/2
PQ48-8A	PQX48-8A	PQP48-8A	1 1/2	1 1/4	4	6	6 1/2
PQ48-8B	PQX48-8B	PQP48-8B	1 1/2	1 1/4	3	6	5 1/2
PQ56-5			1 3/4	3/4	2	6	4 1/2
PQ56-5A			1 3/4	3/4	4	6	6 1/2
PQ56-8	PQX56-8	PQP56-8	1 3/4	1 1/4	2	6	4 1/2
PQ56-8A	PQX56-8A	PQP56-8A	1 3/4	1 1/4	4	6	6 1/2
PQ56-8B	PQX56-8B	PQP56-8B	1 3/4	1 1/4	3	6	5 1/2
PQ64-8	PQX64-8	PQP64-8	2	1 1/4	2	8	4 1/2
PQ64-8A			2	1 1/4	4	8	6 1/2
PQ64-8B			2	1 1/4	3	8	5 1/2
PQ64-11	PQX64-11	PQP64-11	2	2	4	8	7 3/4
PQ64-11A	PQX64-11A	PQP64-11A	2	2	6	8	9 3/4
PQ64-11B			2	2	8	8	11 3/4
PQ64-11C	PQX64-11C	PQP64-11C	2	2	3	8	6 3/4

Shanks 2" And Larger Have Combination Drive

All Sizes Are Not Center Cutting

1 per tube

ROUGHING (HOG) END MILLS

List No.6305



Three Flute Center
Cutting For Aluminum

8% COBALT HIGH SPEED STEEL



L.6305	Dia. of Mill	Shank Diameter	Length of Cut	Number of Flutes	Overall Length
PQA8-2	1/4	3/8	5/8	3	2 7/16
PQA10-2	5/16	3/8	3/4	3	2 1/2
PQA12-2	3/8	3/8	3/4	3	2 1/2
PQA16-3	1/2	1/2	1 1/4	3	3 1/4
PQA20-4	5/8	5/8	1 5/8	3	3 3/4
PQA24-5	3/4	3/4	1 5/8	3	3 7/8
PQA28-6	7/8	7/8	1 7/8	3	4 1/8
PQA32-5	1	3/4	2	3	4 1/4
PQA32-7	1	1	2	3	4 1/2
PQA32-7A	1	1	4	3	6 1/2
PQA40-8	1 1/4	1 1/4	2	3	4 1/2
PQA48-8	1 1/2	1 1/4	2	3	4 1/2
PQA64-8	2	1 1/4	2	3	4 1/2
PQA64-11	2	2	4	3	7 3/4

Shanks 2" And Larger Have Combination Drive

1 per tube

List No.6307



Fine Pitch Multi Flute
Non-Center Cutting

8% COBALT HIGH SPEED STEEL



L.6307	Dia. of Mill	Shank Diameter	Length of Cut	Number of Flutes	Overall Length
PQF8-2	1/4	3/8	5/8	3	2 7/16
PQF8-2A	1/4	3/8	1 1/4	3	3 1/16
PQF10-2	5/16	3/8	3/4	3	2 1/2
PQF10-2A	5/16	3/8	1 3/8	3	3 1/8
PQF12-2	3/8	3/8	3/4	3	2 1/2
PQF12-2A	3/8	3/8	1 1/2	3	3 1/4
PQF16-3	1/2	1/2	1 1/4	4	3 1/4
PQF16-3A	1/2	1/2	2	4	4
PQF20-4	5/8	5/8	1 5/8	4	3 3/4
PQF20-4A	5/8	5/8	2 1/2	4	4 5/8
PQF24-4	3/4	5/8	1 5/8	4	3 7/8
PQF24-5	3/4	3/4	1 5/8	4	3 7/8
PQF28-5	7/8	3/4	1 7/8	5	4 1/8
PQF28-6	7/8	7/8	1 7/8	5	4 1/8
PQF32-5	1	3/4	2	5	4 1/4
PQF32-7	1	1	2	5	4 1/2
PQF32-7A	1	1	4	5	6 1/2
PQF32-7B	1	1	3	5	5 1/2
PQF36-7	1 1/8	1	2	5	4 1/2
PQF40-8	1 1/4	1 1/4	2	6	4 1/2
PQF40-8A	1 1/4	1 1/4	4	6	6 1/2
PQF40-8B	1 1/4	1 1/4	3	6	5 1/2
PQF48-8	1 1/2	1 1/4	2	6	4 1/2
PQF48-8A	1 1/2	1 1/4	4	6	6 1/2
PQF48-8B	1 1/2	1 1/4	3	6	5 1/2
PQF56-8	1 3/4	1 1/4	2	6	4 1/2
PQF64-8	2	1 1/4	2	6	4 1/2
PQF64-8A	2	1 1/4	4	6	6 1/2
PQF64-11	2	2	4	6	7 3/4
PQF64-11A	2	2	6	6	9 3/4

Shanks 2" And Larger Have Combination Drive

1 per tube

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

List No.6304



Metric Sizes
Non-Center Cutting

8% COBALT HIGH SPEED STEEL



(Unit) : mm

L.6304	Diameter of Mill	Shank Diameter	Length of Cut	Number of Flutes	Overall Length
MPQ12	12	12	40	4	90
MPQ14	14	16	45	4	100
MPQ15	15	16	45	4	100
MPQ16	16	16	50	4	105
MPQ18	18	20	50	4	115
MPQ20	20	20	55	4	120
MPQ22	22	20	60	4	120
MPQ24	24	25	70	4	140
MPQ25	25	25	70	4	140
MPQ28	28	25	70	4	140
MPQ30	30	32	80	4	165
MPQ32	32	32	80	5	165
MPQ35	35	32	90	5	175
MPQ40	40	32	100	5	185
MPQ45	45	42	110	6	195
MPQ50	50	42	120	6	205

No Set Screw Flats

1 per tube

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

PM-PREMIUM POWERED METAL END MILLS (FAX 38) 50 DEGREE

List No.7221P



High Helix End Mills

FAX 38 TIN COATED



L7221P	Dia. of Mill	Shank Diameter	Length of Cut	Number of Flutes	Overall Length
PHP8	1/4	3/8	5/8	3	2 7/16
PHP10	5/16	3/8	3/4	3	2 1/2
PHP12	3/8	3/8	3/4	3	2 1/2
PHP14	7/16	3/8	1	3	2 11/16
PHP16	1/2	1/2	1 1/4	3	3 1/4
PHP20	5/8	5/8	1 5/8	3	3 3/4
PHP24	3/4	3/4	1 5/8	3	3 7/8
PHP28	7/8	7/8	1 7/8	4	4 1/8
PHP32	1	1	2	4	4 1/2
PHP40	1 1/4	1 1/4	2	4	4 1/2
PHP48	1 1/2	1 1/4	2	4	4 1/2

1 per tube

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

TWO FLUTE END MILLS / REGULAR-SINGLE END

List No.231



HIGH SPEED STEEL



List No.6231



8% COBALT HIGH SPEED STEEL



List No.6231X

8% COBALT HIGH SPEED STEEL
SG COATED

L231	L6231	L6231X	Dia. of Mill	Shank Diameter	Length of Cut	Overall Length
G4	PG4	PGX4	1/8	3/8	3/8	2 5/16
G5	PG5		5/32	3/8	3/8	2 5/16
G6	PG6	PGX6	3/16	3/8	7/16	2 5/16
G7	PG7		7/32	3/8	7/16	2 5/16
G8	PG8	PGX8	1/4	3/8	1/2	2 5/16
G9	PG9		9/32	3/8	1/2	2 5/16
G10	PG10	PGX10	5/16	3/8	9/16	2 5/16
G11	PG11		11/32	3/8	9/16	2 5/16
G12	PG12	PGX12	3/8	3/8	9/16	2 5/16
G13	PG13		13/32	3/8	13/16	2 1/2
G14	PG14	PGX14	7/16	3/8	13/16	2 1/2
G15	PG15		15/32	3/8	13/16	2 1/2
G16	PG16	PGX16	1/2	1/2	1	3
G16X	PG16X		1/2	3/8	13/16	2 1/2
G17	PG17		17/32	1/2	1 1/8	3 1/8
G18	PG18	PGX18	9/16	1/2	1 1/8	3 1/8
G20	PG20	PGX20	5/8	5/8	1 5/16	3 7/16
G20X	PG20X		5/8	1/2	1 1/8	3 1/8
G22	PG22	PGX22	11/16	5/8	1 5/16	3 7/16
G22X	PG22X		11/16	1/2	1 5/16	3 5/16
G24	PG24	PGX24	3/4	5/8	1 5/16	3 7/16
G24X	PG24X		3/4	1/2	1 5/16	3 5/16
G24Y	PG24Y	PGX24Y	3/4	3/4	1 5/16	3 9/16
G26	PG26		13/16	5/8	1 1/2	3 5/8
G26Y			13/16	3/4	1 1/2	3 3/4
G28	PG28	PGX28	7/8	7/8	1 1/2	3 3/4
G28A			7/8	1/2	1 1/2	3 1/2
G28X	PG28X		7/8	5/8	1 1/2	3 5/8
G28Y	PG28Y	PGX28Y	7/8	3/4	1 1/2	3 3/4
G30	PG30		15/16	5/8	1 1/2	3 5/8
G30X			15/16	7/8	1 1/2	3 3/4
G30Y			15/16	3/4	1 1/2	3 3/4
G32	PG32	PGX32	1	1	1 5/8	4 1/8
G32A			1	1/2	1 1/2	3 1/2
G32W	PG32W	PGX32W	1	3/4	1 1/2	3 3/4
G32X	PG32X		1	5/8	1 1/2	3 5/8
G32Y	PG32Y		1	7/8	1 1/2	3 3/4
G36	PG36	PGX36	1 1/8	1	1 5/8	4 1/8
G36W	PG36W		1 1/8	3/4	1 5/8	3 7/8
G36X	PG36X		1 1/8	7/8	1 5/8	3 7/8
G40	PG40		1 1/4	1	1 5/8	4 1/8
G40W	PG40W		1 1/4	3/4	1 5/8	3 7/8
G40X	PG40X		1 1/4	7/8	1 5/8	3 7/8
G40Y	PG40Y	PGX40Y	1 1/4	1 1/4	1 5/8	4 1/8
G44	PG44		1 3/8	1	1 5/8	4 1/8
G44W	PG44W		1 3/8	3/4	1 5/8	3 7/8
G48	PG48		1 1/2	1	1 5/8	4 1/8
G48W	PG48W		1 1/2	3/4	1 5/8	3 7/8
G48X	PG48X	PGX48X	1 1/2	1 1/4	1 5/8	4 1/8
G52			1 5/8	1 1/4	1 5/8	4 1/8
G52W			1 5/8	3/4	1 1/2	3 7/8
G56	PG56		1 3/4	1 1/4	1 5/8	4 1/8
G56W			1 3/4	3/4	1 1/2	3 7/8
G60			1 7/8	1 1/4	1 5/8	4 1/8
G64	PG64		2	1 1/4	1 5/8	4 1/8
G64A			2	1 1/4	2 1/2	5
G64W			2	3/4	1 1/2	3 7/8
G64X			2	2	4	7 3/4
G80-4			2 1/2	2	4	7 5/8
G80-6			2 1/2	2	6	9 5/8

Shanks 2" And Larger Have Combination Drive

1 per tube

List No.6231H



8% COBALT HIGH SPEED STEEL



L6231H	Diameter of Mill	Shank Diameter	Length of Cut	Overall Length
PGH8	1/4	3/8	5/8	2 7/16
PGH10	5/16	3/8	3/4	2 1/2
PGH12	3/8	3/8	3/4	2 1/2
PGH14	7/16	3/8	1	2 11/16
PGH16	1/2	1/2	1 1/4	3 1/4
PGH20	5/8	5/8	1 5/8	3 3/4
PGH24	3/4	3/4	1 5/8	3 7/8
PGH28	7/8	7/8	1 7/8	4 1/8
PGH28Y	7/8	3/4	1 7/8	4 1/8
PGH32	1	1	2	4 1/2
PGH32W	1	3/4	1 7/8	4 1/8
PGH40	1 1/4	1 1/4	2	4 1/2
PGH48	1 1/2	1 1/4	2	4 1/2
PGH56	1 3/4	1 1/4	2	4 1/2
PGH64	2	1 1/4	2	4 1/2

1 per tube

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

List No.6233



8% COBALT HIGH SPEED STEEL



L6233	Diameter of Mill	Shank Diameter	Length of Cut	Overall Length
PGE8	1/4	3/8	1	3 1/16
PGE10	5/16	3/8	1 1/4	3 5/16
PGE12	3/8	3/8	1 1/2	3 1/4
PGE12A	3/8	3/8	1	2 3/4
PGE16	1/2	1/2	2	4
PGE16A	1/2	1/2	1 1/2	3 1/2
PGE16C	1/2	1/2	3	5
PGE20A	5/8	5/8	2	4 1/8
PGE24C	3/4	3/4	2 1/4	4 1/2
PGE28B	7/8	7/8	2 1/2	4 3/4
PGE32C	1	1	3	5 1/2
PGE36C	1 1/8	1	3	5 1/2
PGE40A	1 1/4	1 1/4	3	5 1/2
PGE48	1 1/2	1 1/4	3	5 1/2
PGE56	1 3/4	1 1/4	3	5 1/2
PGE64	2	1 1/4	3	5 1/2

1 per tube

TWO FLUTE BALL END / REGULAR, SINGLE END TWO FLUTE BALL NOSE EXTRA LONG, SINGLE END

List No.291



HIGH SPEED STEEL



List No.6291



8% COBALT HIGH SPEED STEEL



L291	L6291	Dia. of Mill	Shank Diameter	Length of Cut	Overall Length
R4	PR4	1/8	3/8	3/8	2 5/16
R6	PR6	3/16	3/8	1/2	2 3/8
R8	PR8	1/4	3/8	5/8	2 7/16
R10	PR10	5/16	3/8	3/4	2 1/2
R12	PR12	3/8	3/8	3/4	2 1/2
R14	PR14	7/16	1/2	1	3
R16	PR16	1/2	1/2	1	3
R18	PR18	9/16	1/2	1 1/8	3 1/8
R20	PR20	5/8	5/8	1 3/8	3 1/2
R20X	PR20X	5/8	1/2	1 1/8	3 1/8
R24	PR24	3/4	3/4	1 5/8	3 7/8
R24X	PR24X	3/4	1/2	1 5/16	3 5/16
R26		13/16	3/4	2	4 1/4
R28	PR28	7/8	7/8	2	4 1/4
R28Y	PR28Y	7/8	3/4	2	4 1/4
R30		15/16	3/4	2 1/4	4 1/2
R32	PR32	1	1	2 1/4	4 3/4
R32Y	PR32Y	1	3/4	2 1/4	4 9/16
R36	PR36	1 1/8	1	2 1/4	4 3/4
R40	PR40	1 1/4	1 1/4	2 1/2	5
R44	PR44	1 3/8	1 1/4	2 1/2	5
R48	PR48	1 1/2	1 1/4	2 1/2	5
R64		2	1 1/4	2 1/2	5

1 per tube

List No.6293



8% COBALT HIGH SPEED STEEL



L6293	Diameter of Mill	Length of Cut	Overall Length	Shank Diameter
PRL8	1/4	5/8	3 1/16	3/8
PRL10	5/16	3/4	3 5/16	3/8
PRL12	3/8	3/4	3 5/16	3/8
PRL14	7/16	1	3 11/16	1/2
PRL16	1/2	1	4	1/2
PRL20	5/8	1 3/8	4 5/8	5/8
PRL24	3/4	1 5/8	5 3/8	3/4
PRL28	7/8	2	6	7/8
PRL32	1	2 1/2	7 1/4	1
PRL40	1 1/4	3	7 1/4	1 1/4

1 per tube

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

List No.6290



8% COBALT HIGH SPEED STEEL



(Unit) : mm

L6290	Diameter of Mill	Shank Diameter	Length of Cut	Overall Length
MPR0.75	1.5	6	3	55
MPR1.0	2	6	4	55
MPR1.25	2.5	6	5	60
MPR1.5	3	6	6	60
MPR2.0	4	6	8	70
MPR2.5	5	6	10	80
MPR3.0	6	6	12	90
MPR3.5	7	6	14	90
MPR4.0	8	8	16	100
MPR4.5	9	8	18	100
MPR5.0	10	10	20	100
MPR5.5	11	10	22	100
MPR6.0	12	12	24	110
MPR6.5	13	12	26	110
MPR7.0	14	12	28	110
MPR7.5	15	12	30	110
MPR8.0	16	16	32	140
MPR10.0	20	20	40	160
MPR12.5	25	25	50	180
MPR16.0	32	32	60	200
MPR20.0	40	32	65	220

1 per tube

TWO FLUTE DOUBLE END MILLS

TWO FLUTE DOUBLE, BALL NOSE

List No.261



HIGH SPEED STEEL



List No.6261



8% COBALT HIGH SPEED STEEL



L261	L6261	Diameter of Mill	Shank Diameter	Length of Cut	Overall Length
C4	PC4	1/8	3/8	3/8	3 1/16
C5	PC5	5/32	3/8	7/16	3 1/8
C6	PC6	3/16	3/8	7/16	3 1/8
C7	PC7	7/32	3/8	1/2	3 1/8
C8	PC8	1/4	3/8	1/2	3 1/8
C9	PC9	9/32	3/8	9/16	3 1/8
C10	PC10	5/16	3/8	9/16	3 1/8
C11	PC11	11/32	3/8	9/16	3 1/8
C12	PC12	3/8	3/8	9/16	3 1/8
C13	PC13	13/32	1/2	13/16	3 3/4
C14	PC14	7/16	1/2	13/16	3 3/4
C15	PC15	15/32	1/2	13/16	3 3/4
C16	PC16	1/2	1/2	13/16	3 3/4
C18	PC18	9/16	5/8	1 1/8	4 1/2
C20	PC20	5/8	5/8	1 1/8	4 1/2
C22	PC22	11/16	3/4	1 5/16	5
C24	PC24	3/4	3/4	1 5/16	5
C26	PC26	13/16	7/8	1 9/16	5 1/2
C28	PC28	7/8	7/8	1 9/16	5 1/2
C30	PC30	15/16	1	1 5/8	5 7/8
C32	PC32	1	1	1 5/8	5 7/8

1 per tube

List No.295



HIGH SPEED STEEL



List No.6295



8% COBALT HIGH SPEED STEEL



L295	L6295	Diameter of Mill	Shank Diameter	Length of Cut	Overall Length
RR4	PRR4	1/8	3/8	3/8	3 1/16
RR5		5/32	3/8	7/16	3 1/8
RR6	PRR6	3/16	3/8	7/16	3 1/8
RR7		7/32	3/8	1/2	3 1/8
RR8	PRR8	1/4	3/8	1/2	3 1/8
RR9		9/32	3/8	9/16	3 1/8
RR10	PRR10	5/16	3/8	9/16	3 1/8
RR11		11/32	3/8	9/16	3 1/8
RR12	PRR12	3/8	3/8	9/16	3 1/8
RR14	PRR14	7/16	1/2	13/16	3 3/4
RR16	PRR16	1/2	1/2	13/16	3 3/4
RR20	PRR20	5/8	5/8	1 1/8	4 1/2
RR24	PRR24	3/4	3/4	1 5/16	5
RR28	PRR28	7/8	7/8	1 9/16	5 1/2
RR32	PRR32	1	1	1 5/8	5 7/8

1 per tube

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

List No.6230



Two Flute End Mill

8% COBALT HIGH SPEED STEEL



List No.6210



Four Flute Center Cutting

8% COBALT HIGH SPEED STEEL



(Unit) : mm

L6230	L6210	Diameter of Mill	Shank Diameter	Length of Cut	Overall Length
MPG1.0		1.0	6.0	2.0	50.0
MPG1.5		1.5	6.0	3.0	50.0
MPG2.0		2.0	6.0	7.0	50.0
MPG2.5	MPF2.5	2.5	6.0	7.0	50.0
MPG3.0	MPF3.0	3.0	6.0	9.0	50.0
MPG3.5	MPF3.5	3.5	8.0	12.0	60.0
MPG4.0	MPF4.0	4.0	8.0	12.0	60.0
MPG4.5	MPF4.5	4.5	8.0	15.0	60.0
MPG5.0	MPF5.0	5.0	8.0	15.0	60.0
MPG5.5	MPF5.5	5.5	8.0	15.0	60.0
MPG6.0	MPF6.0	6.0	8.0	15.0	60.0
MPG6.5	MPF6.5	6.5	10.0	20.0	65.0
MPG7.0	MPF7.0	7.0	10.0	20.0	65.0
MPG7.5	MPF7.5	7.5	10.0	20.0	65.0
MPG8.0	MPF8.0	8.0	10.0	20.0	65.0
MPG8.5	MPF8.5	8.5	10.0	25.0	75.0
MPG9.0	MPF9.0	9.0	10.0	25.0	75.0
MPG9.5	MPF9.5	9.5	10.0	25.0	75.0
MPG10	MPF10	10.0	10.0	25.0	75.0
MPG11	MPF11	11.0	12.0	30.0	80.0
MPG12	MPF12	12.0	12.0	30.0	80.0
MPG13	MPF13	13.0	16.0	35.0	90.0
MPG14	MPF14	14.0	16.0	35.0	90.0
MPG15	MPF15	15.0	16.0	40.0	95.0
MPG16	MPF16	16.0	16.0	40.0	95.0
MPG17	MPF17	17.0	20.0	40.0	105.0
MPG18	MPF18	18.0	20.0	40.0	105.0
MPG19	MPF19	19.0	20.0	45.0	110.0
MPG20	MPF20	20.0	20.0	45.0	110.0
MPG21	MPF21	21.0	20.0	45.0	110.0
MPG22	MPF22	22.0	20.0	45.0	110.0
MPG23	MPF23	23.0	25.0	50.0	120.0
MPG24	MPF24	24.0	25.0	50.0	120.0
MPG25	MPF25	25.0	25.0	50.0	120.0
MPG26	MPF26	26.0	25.0	50.0	120.0
MPG27	MPF27	27.0	25.0	55.0	125.0
MPG28	MPF28	28.0	25.0	55.0	125.0
MPG29	MPF29	29.0	25.0	55.0	125.0
MPG30	MPF30	30.0	25.0	55.0	125.0
MPG31	MPF31	31.0	32.0	60.0	145.0
MPG32	MPF32	32.0	32.0	60.0	145.0
MPG33	MPF33	33.0	32.0	60.0	145.0
MPG34	MPF34	34.0	32.0	60.0	145.0
MPG35	MPF35	35.0	32.0	60.0	145.0
MPG36	MPF36	36.0	32.0	60.0	145.0
MPG37	MPF37	37.0	32.0	65.0	150.0
MPG38	MPF38	38.0	32.0	65.0	150.0
MPG39	MPF39	39.0	32.0	65.0	150.0
MPG40	MPF40	40.0	32.0	65.0	150.0
MPG42	MPF42	42.0	32.0	65.0	150.0
MPG45	MPF45	45.0	32.0	70.0	155.0
MPG48	MPF48	48.0	32.0	70.0	155.0
MPG50	MPF50	50.0	32.0	70.0	155.0

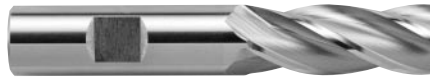
1 per tube

List No.6201



Non-Center Cutting

8% COBALT HIGH SPEED STEEL



L6201	Dia. of Mill	Shank Dia.	Length of Cut	No. of Flutes	Overall Length
PF4	1/8	3/8	3/8	4	2 5/16
PF5	5/32	3/8	3/8	4	2 3/8
PF6	3/16	3/8	1/2	4	2 3/8
PF7	7/32	3/8	1/2	4	2 3/8
PF8	1/4	3/8	5/8	4	2 7/16
PF9	9/32	3/8	5/8	4	2 1/2
PF10	5/16	3/8	3/4	4	2 1/2
PF11	11/32	3/8	3/4	4	2 1/2
PF12	3/8	3/8	3/4	4	2 1/2
PF13	13/32	3/8	1	4	2 11/16
PF14	7/16	3/8	1	4	2 11/16
PF15	15/32	3/8	1	4	2 11/16
PF16	1/2	1/2	1 1/4	4	3 1/4
PF16X	1/2	3/8	1	4	2 11/16
PF17	17/32	1/2	1 3/8	4	3 3/8
PF18	9/16	1/2	1 3/8	4	3 3/8
PF20	5/8	5/8	1 5/8	4	3 3/4
PF20X	5/8	1/2	1 3/8	4	3 3/8
PF22	11/16	5/8	1 5/8	4	3 3/4
PF22X	11/16	1/2	1 5/8	4	3 5/8
PF24	3/4	5/8	1 5/8	4	3 3/4
PF24X	3/4	1/2	1 5/8	4	3 5/8
PF24Y	3/4	3/4	1 5/8	4	3 7/8
PF26	13/16	5/8	1 7/8	6	4
PF26Y	13/16	3/4	1 7/8	4	4 1/8
PF28	7/8	7/8	1 7/8	4	4 1/8
PF28W	7/8	3/4	1 7/8	4	4 1/8
PF28X	7/8	5/8	1 7/8	6	4
PF28Y	7/8	1/2	1 5/8	4	3 5/8
PF30	15/16	7/8	1 7/8	4	4 1/8
PF30X	15/16	5/8	1 7/8	6	4
PF30Y	15/16	3/4	1 7/8	4	4 1/8
PF32	1	7/8	1 7/8	4	4 1/8
PF32A	1	1/2	1 7/8	4	3 7/8
PF32W	1	3/4	1 7/8	4	4 1/8
PF32X	1	5/8	1 7/8	6	4
PF32Y	1	1	2	4	4 1/2
PF36	1 1/8	1	2	6	4 1/2
PF36W	1 1/8	3/4	2	6	4 1/4
PF36X	1 1/8	7/8	2	6	4 1/4
PF40	1 1/4	1	2	6	4 1/2
PF40A	1 1/4	1 1/4	2	4	4 1/2
PF40W	1 1/4	3/4	2	6	4 1/4
PF40X	1 1/4	7/8	2	6	4 1/4
PF40Y	1 1/4	1 1/4	2	6	4 1/2
PF44	1 3/8	1	2	6	4 1/2
PF44W	1 3/8	3/4	2	6	4 1/4
PF48	1 1/2	1	2	6	4 1/2
PF48A	1 1/2	1 1/4	2	4	4 1/2
PF48W	1 1/2	3/4	2	6	4 1/4
PF48X	1 1/2	1 1/4	2	6	4 1/2
PF52	1 5/8	1 1/4	2	6	4 1/2
PF56	1 3/4	1 1/4	2	6	4 1/2
PF56A	1 3/4	1 1/4	2	4	4 1/2
PF60	1 7/8	1 1/4	2	8	4 1/2
PF64	2	1 1/4	2	8	4 1/2
PF64A	2	1 1/4	2	4	4 1/2
PF64B	2	1 1/4	2	6	4 1/2

1 per tube

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

List No.6203

Non-Center Cutting
Long, Single End

8% COBALT HIGH SPEED STEEL



L6203	Diameter of Mill	Shank Diameter	Length of Cut	No. of Flutes	Overall Length
PFL8	1/4	3/8	1 1/4	4	3 1/16
PFL10	5/16	3/8	1 3/8	4	3 1/8
PFL12	3/8	3/8	1 1/2	4	3 1/4
PFL14	7/16	1/2	1 3/4	4	3 3/4
PFL16	1/2	1/2	2	4	4
PFL20	5/8	5/8	2 1/2	4	4 5/8
PFL24	3/4	3/4	3	4	5 1/4
PFL28	7/8	7/8	3 1/2	4	5 3/4
PFL32	1	1	4	4	6 1/2
PFL36	1 1/8	1	4	6	6 1/2
PFL40	1 1/4	1	4	6	6 1/2
PFL40X	1 1/4	1 1/4	4	6	6 1/2
PFL48	1 1/2	1 1/4	4	6	6 1/2
PFL48X	1 1/2	1	4	6	6 1/2
PFL56	1 3/4	1 1/4	4	6	6 1/2
PFL64B	2	1 1/4	4	6	6 1/2
PFL64E	2	2	4	6	7 3/4
PFL64Y	2	2	4	4	7 3/4

1 per tube

List No.6207



Non-Center Cutting

8% COBALT HIGH SPEED STEEL



L6207	Diameter of Mill	Shank Diameter	Length of Cut	No. of Flutes	Overall Length
PFX8	1/4	3/8	1 3/4	4	3 9/16
PFX10	5/16	3/8	2	4	3 3/4
PFX12	3/8	3/8	2 1/2	4	4 1/4
PFX16	1/2	1/2	3	4	5
PFX20	5/8	5/8	4	4	6 1/8
PFX24	3/4	3/4	4	4	6 1/4
PFX28	7/8	7/8	5	4	7 1/4
PFX32	1	1	6	4	8 1/2
PFX40	1 1/4	1 1/4	6	6	8 1/2
PFX48	1 1/2	1 1/4	8	6	10 1/2
PFX64-8	2	2	8	6	11 3/4

1 per tube

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

List No.211**HIGH SPEED STEEL****List No.6211X****8% COBALT "SG" COATED****List No.6211M****8% COBALT HIGH SPEED STEEL**

L211	L6211M	L6211X	Diameter of Mill	Shank Diameter	Length of Cut	Number of Flutes	Overall Length
FC4	PFC4	PFCX4	1/8	3/8	3/8	4	2 5/16
FC6	PFC6	PFCX6	3/16	3/8	1/2	4	2 3/8
FC8	PFC8	PFCX8	1/4	3/8	5/8	4	2 7/16
FC10	PFC10	PFCX10	5/16	3/8	3/4	4	2 1/2
FC12	PFC12	PFCX12	3/8	3/8	3/4	4	2 1/2
FC16	PFC16	PFCX16	1/2	1/2	1 1/4	4	3 1/4
	PFC16A	PFCX16A	1/2	1/2	1 1/4	6	3 1/4
FC20	PFC20	PFCX20	5/8	5/8	1 5/8	4	3 3/4
	PFC20A	PFCX20A	5/8	5/8	1 5/8	6	3 3/4
FC22			11/16	5/8	1 5/8	4	3 3/4
FC24	PFC24	PFCX24	3/4	3/4	1 5/8	4	3 7/8
	PFC24A	PFCX24A	3/4	3/4	1 5/8	6	3 7/8
FC28	PFC28	PFCX28	7/8	7/8	1 7/8	4	4 1/8
	PFC28A	PFCX28A	7/8	7/8	1 7/8	6	4 1/8
FC32	PFC32	PFCX32	1	1	2	4	4 1/2
	PFC32A	PFCX32A	1	1	2	6	4 1/2
FC36	PFC36	PFCX36	1 1/8	1	2	4	4 1/2
	PFC36A	PFCX36A	1 1/8	1	2	6	4 1/2
FC40	PFC40	PFCX40	1 1/4	1 1/4	2	4	4 1/2
	PFC40A	PFCX40A	1 1/4	1 1/4	2	6	4 1/2
FC48	PFC48	PFCX48	1 1/2	1 1/4	2	4	4 1/2
	PFC48A	PFCX48A	1 1/2	1 1/4	2	6	4 1/2
FC56			1 3/4	1 1/4	2	4	4 1/2
FC64			2	1 1/4	2	4	4 1/2
	PFC64		2	1 1/4	2	6	4 1/2
	PFC64A		2	1 1/4	4	6	6 1/2

1 per tube

MULTI FLUTE END MILLS / LONG SINGLE END, CENTER CUTTING

List No.213



Long, Single End

HIGH SPEED STEEL

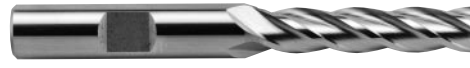


List No.6213



Long, Single End

8% COBALT HIGH SPEED STEEL



L213	L6213	Diameter of Mill	Shank Diameter	Length of Cut	No. of Flutes	Overall Length
FLC8	PFLC8	1/4	3/8	1 1/4	4	3 1/16
FLC10	PFLC10	5/16	3/8	1 3/8	4	3 1/8
FLC12	PFLC12	3/8	3/8	1 1/2	4	3 1/4
FLC16	PFLC16	1/2	1/2	2	4	4
FLC20	PFLC20	5/8	5/8	2 1/2	4	4 5/8
FLC24	PFLC24	3/4	3/4	3	4	5 1/4
FLC28	PFLC28	7/8	7/8	3 1/2	4	5 3/4
FLC32	PFLC32	1	1	4	4	6 1/2
FLC40	PFLC40	1 1/4	1 1/4	4	4	6 1/2
FLC48		1 1/2	1 1/4	4	4	6 1/2
FLC56		1 3/4	1 1/4	4	4	6 1/2
FLC64		2	1 1/4	4	4	6 1/2

1 per tube

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

FOUR FLUTE END MILLS / EXTRA LONG SINGLE END, CENTER CUTTING FOUR FLUTE BALL END / REGULAR, SINGLE END

List No.215



Extra Long, Single End

HIGH SPEED STEEL



L215	Diameter of Mill	Shank Diameter	Length of Cut	Number of Flutes	Overall Length
FXC8	1/4	3/8	1 3/4	4	3 9/16
FXC10	5/16	3/8	2	4	3 3/4
FXC12	3/8	3/8	2 1/2	4	4 1/4
FXC16	1/2	1/2	3	4	5
FXC20	5/8	5/8	4	4	6 1/8
FXC24	3/4	3/4	4	4	6 1/4
FXC28	7/8	7/8	5	4	7 1/4
FXC32	1	1	6	4	8 1/2
FXC40	1 1/4	1 1/4	6	4	8 1/2

1 per tube

List No.6281



8% COBALT HIGH SPEED STEEL



L6281	Diameter of Mill	Shank Diameter	Length of Cut	Number of Flutes	Overall Length
PRC8	1/4	3/8	5/8	4	2 7/16
PRC10	5/16	3/8	3/4	4	2 1/2
PRC12	3/8	3/8	3/4	4	2 1/2
PRC14	7/16	1/2	1 1/4	4	3 1/4
PRC16	1/2	1/2	1 1/4	4	3 1/4
PRC20	5/8	5/8	1 5/8	4	3 3/4
PRC24	3/4	3/4	1 5/8	4	3 7/8
PRC28	7/8	7/8	1 7/8	4	4 1/8
PRC32	1	1	2	4	4 1/2
PRC40	1 1/4	1 1/4	2	4	4 1/2
PRC48	1 1/2	1 1/4	2	4	4 1/2

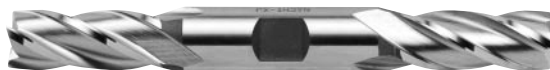
1 per tube

List No.6241



Non-Center Cutting
Four Flute/Double End

8% COBALT HIGH SPEED STEEL



L6241	Diameter of Mill	Shank Mill	Length of Cut	Number of Flutes	Overall Length
PB4	1/8	3/8	3/8	4	3 1/16
PB5	5/32	3/8	7/16	4	3 1/8
PB6	3/16	3/8	1/2	4	3 1/4
PB7	7/32	3/8	9/16	4	3 1/4
PB8	1/4	3/8	5/8	4	3 3/8
PB9	9/32	3/8	11/16	4	3 3/8
PB10	5/16	3/8	3/4	4	3 1/2
PB11	11/32	3/8	3/4	4	3 1/2
PB12	3/8	3/8	3/4	4	3 1/2
PB13	13/32	1/2	1	4	4 1/8
PB14	7/16	1/2	1	4	4 1/8
PB15	15/32	1/2	1	4	4 1/8
PB16	1/2	1/2	1	4	4 1/8
PB18	9/16	5/8	1 3/8	4	5
PB20	5/8	5/8	1 3/8	4	5
PB22	11/16	3/4	1 5/8	4	5 5/8
PB24	3/4	3/4	1 5/8	4	5 5/8
PB26	13/16	7/8	1 7/8	4	6 1/8
PB28	7/8	7/8	1 7/8	4	6 1/8
PB30	15/16	1	1 7/8	4	6 3/8
PB32	1	1	1 7/8	4	6 3/8

1 per tube

List No.271



Center Cutting
Four Flute/Double End

HIGH SPEED STEEL



List No.6271



Center Cutting
Four Flute/Double End

8% COBALT HIGH SPEED STEEL



L271	L6271	Diameter of Mill	Shank Mill	Length of Cut	Number of Flutes	Overall Length
BC4	PBC4	1/8	3/8	3/8	4	3 1/16
BC6	PBC6	3/16	3/8	1/2	4	3 1/4
BC8	PBC8	1/4	3/8	5/8	4	3 3/8
BC10	PBC10	5/16	3/8	3/4	4	3 1/2
BC12	PBC12	3/8	3/8	3/4	4	3 1/2
BC16	PBC16	1/2	1/2	1	4	4 1/8
BC20	PBC20	5/8	5/8	1 3/8	4	5
BC24	PBC24	3/4	3/4	1 5/8	4	5 5/8
BC28	PBC28	7/8	7/8	1 7/8	4	6 1/8
BC32	PBC32	1	1	1 7/8	4	6 3/8

1 per tube

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

GS-Mill 2 Flute List No. 9382

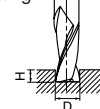
Work Material	Structural Steels Carbon Steels Cast Irons 150~250HB		Alloy Steels Hardened Steels 25~35HRC		Hardened Steels 35~45HRC		Hardened Steels 45~55HRC		Stainless Steels		Titanium Alloys Ti-6Al-4V		Nickel Alloys Inconel718	
	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
Dia. of Mill (mm)														
2	11,200	13.4	10,500	9.4	7,300	5.1	5,300	3.1	5,300	3.5	4,100	2.8	3,300	2.0
4	6,400	18.1	6,000	12.6	4,200	7.1	3,000	4.3	3,000	5.1	2,300	3.5	1,900	2.8
6	4,600	21.7	4,300	15.4	3,000	8.3	2,200	5.1	2,200	5.9	1,600	3.9	1,400	3.1
8	3,400	21.7	3,200	15.4	2,200	8.3	1,600	5.1	1,600	5.9	1,200	3.9	1,000	3.1
10	2,800	22.0	2,600	15.4	1,800	8.3	1,300	5.1	1,300	5.9	960	3.9	800	3.1
12	2,300	22.0	2,200	15.7	1,500	8.3	1,100	5.1	1,100	5.9	800	3.9	700	3.1
Depth of Cut	a _a	1.5D				1.0D		1.5D		1.0D				
	a _r	0.1D				0.05D		0.02D		0.1D				
	H	0.5D				0.3D		0.05D		0.5D				

- 1) When slotting in Stainless Steels, reduce the RPM 40%, and the feed rate 60% of table values.
- 2) Use coolant when machining Stainless Steels, Nickel Alloys and Titanium Alloys.
- 3) Adjust milling condition when unusual vibration or sound occurs.

D: Dia. of Mill

Slotting

Side Milling



GS-Mill 4 Flute List No. 9384

Conventional Condition

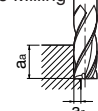
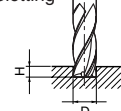
Work Material	Carbon Steels Cast Irons 150~250HB		Alloy Steels Hardened Steels 25~35HRC		Hardened Steels 35~45HRC		Hardened Steels 45~55HRC		Stainless Steels		Titanium Alloys Ti-6Al-4V		Nickel Alloys Inconel718	
	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
Dia. of Mill (mm)														
2	12,800	22.4	12,000	15.0	8,300	9.1	6,000	5.9	6,000	5.1	4,100	3.1	3,700	2.8
4	6,800	28.7	6,400	19.3	4,400	11.8	3,200	7.9	3,200	6.7	2,100	3.9	2,000	3.5
6	4,600	30.3	4,300	20.5	3,000	12.6	2,200	8.3	2,200	7.1	1,400	3.9	1,400	3.9
8	3,400	30.3	3,200	20.5	2,200	12.6	1,600	8.3	1,600	7.1	1,100	4.3	1,000	3.9
10	2,800	30.7	2,600	20.5	1,800	12.6	1,300	8.3	1,300	7.1	900	4.7	800	3.9
12	2,300	30.7	2,200	20.9	1,500	12.6	1,100	8.3	1,100	7.1	700	3.9	700	3.9
Depth of Cut	a _a	1.5D				1.0D		1.5D		1.0D				
	a _r	0.1D				0.05D		0.02D		0.1D				
	H	0.5D				0.2D		0.05D		0.3D				

- 1) When slotting in Stainless Steels, reduce the RPM 40%, and the feed rate 60% of table values.
- 2) Use coolant when machining Stainless Steels, Nickel Alloys and Titanium Alloys.
- 3) Adjust milling condition when unusual vibration or sound occurs.

D: Dia. of Mill

Slotting

Side Milling

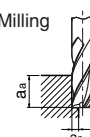


High Speed Condition

Work Material		Carbon Steels Cast Irons 150~250HB		Alloy Steels Hardened Steels 25~35HRC		Hardened Steels 35~45HRC		Hardened Steels 45~55HRC		Stainless Steels	
Milling Conditions											
Dia. of Mill (mm)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
2		47,800	86.6	47,800	63.0	39,800	47.2	31,800	35.4	15,900	15.7
4		23,900	102.4	23,900	74.8	19,900	55.1	15,900	43.3	8,000	19.3
6		16,000	106.3	16,000	78.7	13,300	59.1	10,600	47.2	5,300	20.1
8		12,000	106.3	12,000	78.7	10,000	59.1	8,000	47.2	4,000	20.5
10		9,600	106.3	9,600	78.7	8,000	59.1	6,400	47.2	3,200	20.5
12		8,000	106.3	8,000	78.7	6,700	59.1	5,300	47.2	2,700	20.5
Depth of Cut	a _a	1.5D						1.0D		1.5D	
	a _r	0.05D						0.02D		0.05D	

- 1) When slotting in Stainless Steels, reduce the RPM 40%, and the feed rate 60% of table values.
- 2) Use coolant when machining Stainless Steels, Nickel Alloys and Titanium Alloys.
- 3) Adjust milling condition when unusual vibration or sound occurs.

Side Milling

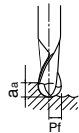


GS-Mill Ball List No. 9386

Conventional Condition

Work Material		Carbon Steels Cast Irons 150~250HB		Alloy Steels Hardened Steels 25~35HRC		Hardened Steels 35~45HRC		Hardened Steels 45~55HRC		Stainless Steels		Titanium Alloys Ti-6Al-4V		Nickel Alloys Inconel718	
Milling Conditions															
Ball Radius (mm)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
R1		19,100	30.3	12,800	14.6	10,200	10.6	8,900	7.5	8,900	8.3	6,400	6.3	6,400	4.7
R2		10,800	43.3	7,200	21.7	5,700	15.7	5,000	11.0	5,000	12.2	3,600	8.3	3,600	7.1
R3		7,700	51.2	5,200	26.0	4,100	18.9	3,600	13.0	3,600	15.0	2,600	9.1	2,600	8.3
R4		6,000	55.1	4,000	27.6	3,200	20.1	2,800	14.2	2,800	15.7	2,000	9.8	2,000	9.1
R5		4,800	55.1	3,200	27.6	2,600	20.5	2,300	14.6	2,300	16.1	1,600	9.8	1,600	9.1
R6		4,000	55.1	2,700	28.0	2,200	20.9	1,900	14.6	1,900	16.1	1,400	9.4	1,400	9.4
Depth of Cut	a _a	0.1D				0.05D				0.1D		0.05D		0.05D	
	Pf	0.2D				0.1D				0.2D		0.1D		0.1D	

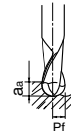
- 1) Use coolant when machining Stainless Steels, Nickel Alloys and Titanium Alloys.
 2) Adjust milling condition when unusual vibration or sound occurs.



High Speed Condition

Work Material		Carbon Steels Cast Irons 150~250HB		Alloy Steels Hardened Steels 25~35HRC		Hardened Steels 35~45HRC		Hardened Steels 45~55HRC		Stainless Steels	
Milling Conditions											
Ball Radius (mm)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
R1		51,000	82.7	39,800	51.2	35,700	37.8	23,700	25.2	35,700	37.8
R2		25,500	106.3	19,900	66.9	17,900	51.2	11,900	32.7	17,900	51.2
R3		17,000	118.1	13,300	74.8	11,900	55.1	7,900	36.2	11,900	55.1
R4		12,800	122.0	10,000	78.7	9,000	59.1	6,000	37.8	9,000	59.1
R5		10,200	122.0	8,000	78.7	7,200	59.1	4,800	37.8	7,200	59.1
R6		8,500	122.0	6,700	78.7	6,000	59.1	4,000	37.8	6,000	59.1
Depth of Cut	a _a	0.05D				0.02D				0.05D	
	Pf	0.1D				0.05D				0.1D	

- 1) When using low RPM machines, use the maximum RPM and adjust the feed rate.
 2) Use coolant when machining Stainless Steels, Nickel Alloys and Titanium Alloys.
 3) Adjust milling condition when unusual vibration or sound occurs.

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

X's-mill Geo List No. 9321

Fractional

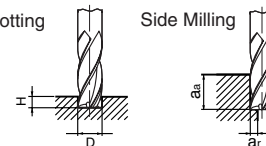
Work Material	Structural Steels Carbon Steels Cast Irons 150 - 250HB		Alloy Steels Hardened Steels 25 - 35HRC		Hardened Steels 40 - 50HRC		Stainless Steels		Titanium Alloys Ti-6Al-4V		Nickel Alloys Inconel718	
Milling Conditions												
Dia. of Mill (mm)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
1/8	9,000	31.5	5,500	17.5	4,500	13.5	5,000	12.5	3,500	6.3	2,500	4.5
3/16	6,000	35.0	3,600	18.0	3,000	14.5	3,200	14.5	2,240	6.3	1,600	4.5
1/4	4,500	37.0	2,700	19.5	2,200	15.0	2,500	19.0	1,750	6.7	1,250	4.8
5/16	3,600	39.0	2,200	24.0	1,800	15.5	2,000	20.0	1,400	7.7	1,000	5.5
3/8	3,000	39.0	1,800	24.0	1,500	15.5	1,600	21.0	1,120	8.7	800	6.2
7/16	2,500	38.0	1,500	22.0	1,200	15.0	1,400	20.5	980	8.4	700	6.0
1/2	2,200	35.0	1,300	20.0	1,100	14.5	1,200	17.5	840	7.7	600	5.5
5/8	1,800	25.0	1,100	17.5	900	11.5	1,000	15.5	700	6.3	500	4.5
3/4	1,500	20.0	900	13.0	750	10.5	800	11.5	560	5.5	400	3.9
1	1,100	19.0	650	11.5	550	9.5	600	11.0	420	5.2	300	3.7
Depth of Cut	a _a	1.5D										
	a _r	0.1D			0.05D		0.1D		0.05D			
	H	1D			0.2D		0.3D		0.2D			

- 1) When slotting in Stainless Steels, reduce the RPM 40%, and the feed rate 60% of table values.
- 2) Use coolant when machining Stainless Steels, Nickel Alloys and Titanium Alloys.
- 3) Adjust milling condition when unusual vibration or sound occurs.

D: Dia. of Mill

Slotting

Side Milling



X's-mill Geo, X's-mill Geo Radius List No. 9322, 9324

Metric

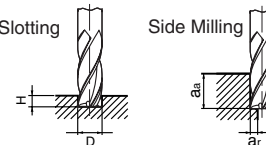
Work Material	Structural Steels Carbon Steels Cast Irons 150 - 250HB		Alloy Steels Hardened Steels 25 - 35HR		Hardened Steels 40 - 50HRC		Stainless Steels		Titanium Alloys Ti-6Al-4V		Nickel Alloys Inconel718	
Milling Conditions												
Dia. of Mill (mm)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
2	9,900	28.3	6,000	16.9	4,000	12.6	5,500	12.6	3,900	7.1	2,600	4.7
4	6,600	31.5	4,500	17.7	3,000	15.0	4,000	15.0	2,500	5.9	2,000	4.7
6	4,800	37.8	3,000	18.9	2,500	15.0	3,000	15.0	1,800	7.1	1,200	4.7
8	3,600	39.4	2,200	24.0	2,000	15.7	2,000	15.7	1,200	6.7	1,000	5.5
10	2,800	39.4	1,800	24.0	1,500	15.7	1,700	15.7	1,100	8.7	800	6.3
12	2,400	37.4	1,500	21.7	1,200	15.0	1,500	15.0	930	7.5	700	5.5
14	2,200	34.6	1,300	19.3	1,000	14.2	1,200	14.2	800	7.1	600	5.1
16	1,800	25.6	1,100	16.5	800	11.8	1,000	11.8	700	6.7	500	4.7
18	1,600	22.8	1,000	14.2	750	10.6	900	10.6	620	6.3	450	4.3
20	1,400	19.7	900	13.0	700	9.8	820	9.8	560	5.5	400	3.9
Depth of Cut	a _a	1.5D										
	a _r	0.1D			0.05D		0.1D		0.05D			
	H	1D			0.2D		0.3D		0.2D			

- 1) When slotting in Stainless Steels, reduce the RPM 40%, and the feed rate 60% of table values.
- 2) Use coolant when machining Stainless Steels, Nickel Alloys and Titanium Alloys.
- 3) Adjust milling condition when unusual vibration or sound occurs.

D: Dia. of Mill

Slotting

Side Milling



X's-mill Geo Slot List No. 9338

Side Milling & Slotting Condition

Work Material		Carbon Steels Cast Irons 150 - 250HB		Alloy Steels Hardened Steels 25 - 35HRC		Hardened Steels 35 - 45HRC		Stainless Steels 304, 316		Titanium Alloys Ti-6Al-4V		Nickel Alloys Inconel718	
Milling Conditions													
Dia. of Mill (mm)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
2		9,000	21.3	6,000	12.6	4,000	9.4	5,500	9.4	3,900	5.5	2,600	3.5
4		6,600	23.6	4,500	13.4	3,000	11.0	4,000	9.4	2,500	4.7	2,000	3.5
6		4,800	28.3	3,000	14.2	2,500	11.0	3,000	14.2	1,800	5.5	1,200	3.5
8		3,600	29.5	2,200	18.1	2,000	11.8	2,000	15.4	1,200	4.7	1,000	3.9
10		2,800	29.5	1,800	18.1	1,500	11.8	1,700	16.1	1,100	6.7	800	4.7
12		2,400	28.0	1,500	16.1	1,200	11.0	1,500	15.0	930	5.5	700	3.9
14		2,200	26.0	1,300	14.6	1,000	10.6	1,200	12.6	800	5.1	600	3.7
16		1,800	19.3	1,100	12.6	800	9.1	1,000	10.6	700	5.1	500	3.5
Depth of Cut	a _a	1.5D											
	a _r	0.1D				0.05D		0.1D		0.05D		0.05D	
	H	1D				0.2D		0.3D		0.2D		0.2D	

1) When slotting in Stainless Steels, reduce the RPM 40%, and the feed rate 60% of table values.

2) Use coolant when machining Stainless Steels, Nickel Alloys and Titanium Alloys.

3) Adjust milling condition when unusual vibration or sound occurs.

D: Dia. of Mill

Slotting

Side Milling



Plunging Condition

Work Material		Carbon Steels Cast Irons 150 - 250HB		Alloy Steels Hardened Steels 25 - 35HRC		Hardened Steels 40 - 50HRC		Stainless Steels		Titanium Alloys Ti-6Al-4V		Nickel Alloys Inconel718	
Milling Conditions													
Dia. of Mill (mm)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
2		9,000	5.9	6,000	3.9	4,000	2.4	5,500	2.4	5,000	1.6	2,600	0.8
4		6,600	9.8	4,500	6.7	3,000	3.1	4,000	4.3	2,600	2.4	2,000	1.6
6		4,800	11.8	3,000	7.9	2,500	4.3	3,000	4.7	1,600	2.4	1,200	1.6
8		3,600	11.8	2,200	7.9	2,000	4.7	2,000	4.7	1,400	2.8	1,000	2.0
10		2,800	11.8	1,800	7.9	1,500	4.7	1,700	5.1	1,110	2.8	800	2.0
12		2,400	11.8	1,500	7.9	1,200	4.7	1,500	5.1	930	2.8	700	2.0
14		2,200	9.8	1,300	5.9	1,000	3.1	1,200	3.9	800	2.4	600	1.6
16		1,800	7.9	1,100	4.7	800	2.4	1,000	3.1	500	1.2	500	1.2

1) When slotting in Stainless Steels, reduce the RPM 40%, and the feed rate 60% of table values.

2) Use coolant when machining Stainless Steels, Nickel Alloys and Titanium Alloys.

3) Adjust milling condition when unusual vibration or sound occurs.

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

X's-mill Geo Ball List No. 9340

Conventional Condition

Work Material	Carbon Steels Cast Irons		Alloy Steels Die Steels		Hardened Steels Pre-Hardened Steels 30 - 38 HRC		Stainless Steels Hardened Steels 38 - 45HRC		Hardened Steels 45 - 55HRC	
	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
Milling Conditions										
Ball Radius (mm)										
R 0.5	32,000	32.3	31,000	24.4	25,000	17.3	22,000	13.0	19,000	9.4
R 1	16,000	36.2	15,000	26.8	13,000	20.1	11,000	15.0	9,600	11.0
R 2	8,000	39.4	7,600	29.9	6,400	22.0	5,600	16.9	4,800	12.2
R 3	5,300	39.4	5,100	30.3	4,200	21.7	3,700	16.5	3,200	12.2
R 5	3,200	39.4	3,100	30.7	2,500	21.7	2,200	16.5	1,900	11.8
R 8	2,000	36.2	1,900	26.8	1,600	20.1	1,400	15.0	1,200	11.0
R 10	1,600	32.3	1,500	23.6	1,300	18.1	1,100	13.0	960	9.8
R 15	1,100	29.1	1,000	20.9	850	15.4	700	11.0	640	8.7
Depth of Cut	0.05D (R<0.5mm)				0.1D (R≥0.5mm)				0.05D	
	Pf				0.2D				0.1D	

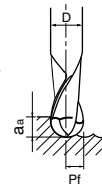
- 1) Use coolant when machining Stainless Steels, Nickel Alloys and Titanium Alloys.
- 2) When using low RPM machines, use the maximum RPM and adjust the feed rate.
- 3) Adjust milling condition when unusual vibration or sound occurs.

High Speed Condition

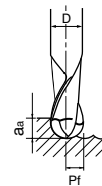
Work Material	Carbon Steels Cast Irons		Alloy Steels Die Steels		Hardened Steels Pre-Hardened Steels 30 - 38 HRC		Stainless Steels Hardened Steels 38 - 45HRC		Hardened Steels 45 - 55HRC	
	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
Milling Conditions										
Ball Radius (mm)										
R 0.5	60,000	141.7	60,000	141.7	60,000	118.1	60,000	118.1	60,000	94.5
R 1	51,000	200.8	48,000	189.0	40,000	126.0	37,000	118.1	35,000	82.7
R 2	25,000	196.9	24,000	189.0	20,000	126.0	18,000	98.4	18,000	86.6
R 3	17,000	161.4	16,000	149.6	13,000	114.2	12,000	86.6	12,000	74.8
R 5	10,200	122.0	9,600	98.4	8,000	74.8	7,300	59.1	7,000	55.1
R 8	6,400	74.8	6,000	70.9	5,000	47.2	4,600	39.4	4,400	35.4
R 10	5,100	63.0	4,800	55.1	4,000	39.4	3,700	35.0	3,500	27.6
R 15	3,400	43.3	3,200	37.8	2,700	25.6	2,400	23.6	2,300	18.1
Depth of Cut	0.05D (R<0.5mm)				0.5mm (R≥0.5mm)					
	Pf				0.1D				0.05D	

- 1) Use coolant when machining Stainless Steels, Nickel Alloys and Titanium Alloys.
- 2) When using low RPM machines, use the maximum RPM and adjust the feed rate.
- 3) Adjust milling condition when unusual vibration or sound occurs.

D: Dia. of Mill
R: Ball Radius



D: Dia. of Mill
R: Ball Radius



X's-mill Geo Micro Ball List No. 9332

Conventional Condition

Work Material		Carbon Steels Cast Irons		Alloy Steels Die Steels		Hardened Steels Pre-Hardened Steels 30 - 38 HRC		Stainless Steels Hardened Steels 38 - 45HRC		Hardened Steels 45 - 55HRC	
Milling Conditions		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
Ball Radius (mm)											
R 0.1		32,000	12.6	32,000	12.6	32,000	11.8	32,000	9.8	32,000	6.3
R 0.15		32,000	18.9	32,000	18.9	32,000	17.7	32,000	14.8	32,000	9.4
R 0.2		32,000	23.6	32,000	23.6	32,000	20.5	32,000	19.7	32,000	12.6
R 0.25		32,000	29.5	32,000	25.6	32,000	24.4	32,000	23.6	32,000	15.7
R 0.3		32,000	35.4	32,000	29.5	32,000	27.6	32,000	25.2	32,000	18.9
R 0.4		32,000	47.2	32,000	39.4	32,000	36.2	32,000	33.5	32,000	25.2
R 0.5		32,000	59.1	32,000	49.2	32,000	45.3	32,000	39.4	32,000	31.5
R 0.75		32,000	86.6	32,000	63.0	32,000	66.9	29,500	55.1	25,500	37.4
R 1		32,000	114.2	28,500	82.7	25,000	70.9	22,000	55.1	19,000	37.4
R 1.5		21,000	114.2	19,000	82.7	17,000	70.9	14,500	55.1	12,500	37.4
R 2		16,000	114.2	14,000	82.7	12,500	70.9	11,000	55.1	9,500	37.4
Depth of Cut	a_a	0.05D (R<0.5mm) 0.1D (R>=0.5)								0.05D	
	Pf	0.2D								0.1D	

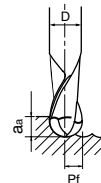
- 1) Use coolant when machining Stainless Steels, Nickel Alloys and Titanium Alloys.
- 2) When using low RPM machines, use the maximum RPM and adjust the feed rate.
- 3) Adjust milling condition when unusual vibration or sound occurs.

High Speed Condition

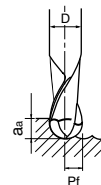
Work Material		Carbon Steels Cast Irons		Alloy Steels Die Steels		Hardened Steels Pre-Hardened Steels 30 - 38 HRC		Stainless Steels Hardened Steels 38 - 45HRC		Hardened Steels 45 - 55HRC	
Milling Conditions		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
Ball Radius (mm)											
R 0.1		60,000	23.6	60,000	23.6	60,000	22.0	60,000	18.9	48,000	9.4
R 0.15		60,000	35.4	60,000	35.4	60,000	33.1	60,000	27.6	48,000	14.2
R 0.2		60,000	43.3	60,000	43.3	60,000	39.4	60,000	37.0	48,000	18.9
R 0.25		60,000	47.2	60,000	47.2	60,000	45.3	60,000	43.3	48,000	23.6
R 0.3		60,000	55.1	60,000	55.1	60,000	51.2	60,000	47.2	48,000	28.3
R 0.4		60,000	74.8	60,000	74.8	60,000	66.9	60,000	63.0	48,000	37.8
R 0.5		60,000	92.5	60,000	92.5	60,000	84.6	60,000	74.8	48,000	47.2
R 0.75		60,000	118.1	60,000	118.1	55,000	114.2	51,000	94.5	42,500	63.0
R 1		48,000	171.3	45,000	129.9	41,500	114.2	38,000	94.5	32,000	63.0
R 1.5		32,000	171.3	30,000	129.9	27,500	114.2	25,000	94.5	21,000	63.0
R 2		24,000	171.3	22,000	129.9	20,500	114.2	19,000	94.5	16,000	63.0
Depth of Cut	a_a	0.05D								0.05D	
	Pf	0.1D								0.1D	

- 1) Use coolant when machining Stainless Steels, Nickel Alloys and Titanium Alloys.
- 2) When using low RPM machines, use the maximum RPM and adjust the feed rate.
- 3) Adjust milling condition when unusual vibration or sound occurs.

D: Dia. of Mill
R: Ball Radius



D: Dia. of Mill
R: Ball Radius

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

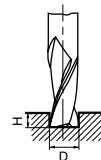
X's-mill Geo Koval / 2 Flute, 4 Flute List No. 9366, 9368

Slotting

Milling Conditions		RPM	Feed (IPM)
Dia. of Mill (mm)			
0.5		44,000	9.8
1.0		22,000	11.8
1.5		19,000	13.8
2.0		15,000	15.7
2.5		9,000	15.7
3.0		7,500	15.7
Depth of cut	H	Max 0.5D	

- 1) Mill using coolants.
- 2) When using low RPM machines, use the maximum RPM and adjust the feed rate.
- 3) Adjust milling condition when unusual vibration or sound occurs.

D: Dia. of Mill

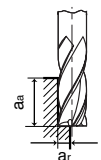


Side Milling

Milling Conditions		RPM	Feed (IPM)
Dia. of Mill (mm)			
0.5		44,000	14.8
1.0		22,000	17.7
1.5		19,000	20.7
2.0		15,000	23.6
2.5		9,000	23.6
3.0		7,500	23.6
Depth of cut	a _a	1D	
	a _r	Max 0.02D	

- 1) Mill using coolants.
- 2) When using low RPM machines, use the maximum RPM and adjust the feed rate.
- 3) Adjust milling condition when unusual vibration or sound occurs.

D: Dia. of Mill



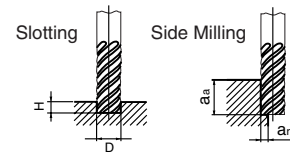
X's-mill Multi Flute List No. 9316

Conventional Condition

Work Material		Hardened Steels 55~60HRC		Hardened Steels 45~55HRC		Pre-hardened Steels Mold Steels 35~45HRC		Carbon Steels Cast Irons ~35HRC		Stainless Steels 304, 316		Cast Irons	
Milling Conditions													
Dia. of Mill (mm)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
2		Recommended X's-mill Hard		3,200	7.1	5,300	15.7	10,000	59.1	3,700	7.1	10,000	59.1
4				2,400	7.1	4,000	15.7	8,000	63.0	2,800	7.1	8,000	63.0
5				1,900	8.7	3,200	19.3	6,200	78.7	2,200	9.1	6,200	78.7
6				1,600	9.8	2,700	19.3	5,300	78.7	1,900	9.1	5,300	94.5
8				1,200	11.0	2,000	19.3	4,000	78.7	1,400	9.1	4,000	94.5
10				1,000	11.8	1,600	19.3	3,200	78.7	1,100	9.1	3,200	94.5
12				800	13.8	1,300	24.8	2,700	82.7	930	11.8	2,700	94.5
16				640	8.7	1,100	22.4	2,000	74.8	700	10.6	2,000	78.7
20				480	7.1	800	14.2	1,600	63.0	560	9.4	1,600	63.0
Depth of Cut	a _a	1.5D		1.5D		1.5D		1.5D		1.5D		1.5D	
	a _r	0.05D		0.1D		0.1D		0.1D		0.1D		0.1D	
	H	Max 0.05D		0.1D		0.1D		0.1D		0.1D		0.2D	

- 1) Use coolant when machining Stainless Steels.
- 2) Recommend dry machining when high speed milling.
- 3) Adjust milling condition when unusual vibration or sound occurs.

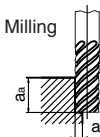
D: Dia. of Mill



High Speed Condition

Work Material		Hardened Steels 45~55HRC		Pre-hardened Steels Mold Steels 35~45HRC		Carbon Steels Cast Irons ~35HRC	
Milling Conditions							
Dia. of Mill (mm)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
2		32,000	126.0	32,000	181.1	32,000	189.0
4		24,000	126.0	24,000	181.1	24,000	189.0
6		19,200	157.5	19,200	228.3	19,200	236.2
8		16,000	157.5	16,000	228.3	16,000	236.2
10		12,000	157.5	12,000	228.3	12,000	236.2
12		9,500	165.4	9,500	224.4	9,500	236.2
14		8,000	181.1	8,000	208.7	8,000	299.2
16		6,000	157.5	6,000	208.7	6,000	299.2
20		4,800	118.1	5,000	196.9	5,000	275.6
Depth of Cut	a _a	1~1.5D		1~1.5D		1~1.5D	
	a _r	0.02~0.05D		0.05D		0.1D	

Side Milling



- 1) Recommend dry machining when high speed milling.
- 2) Adjust milling condition when unusual vibration or sound occurs.

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

X's-mill Hard List No. 9286

Conventional Condition

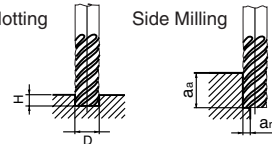
Work Material		Hardened Steels 65HRC~		Hardened Steels 60~65HRC		Hardened Steels 55~60HRC		Hardened Steels 45~55HRC			Hardened Steels 35~45HRC		Hardened Steels ~35HRC		
Milling Conditions		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Side Milling	slotting	RPM	Feed (IPM)	RPM	Feed (IPM)	
Dia. of Mill (mm)									Feed (IPM)	Feed (IPM)					
1		2,400	1.0	3,200	1.0	4,000	1.2	6,400	3.9	1.6	Recommended X's-mill GEO, X's-mill Multi-Flutes				
2		2,000	2.0	2,500	2.0	3,200	2.4	5,000	7.9	3.1					
3		1,600	3.5	2,200	3.9	2,700	4.7	4,200	15.7	6.3					
4		1,200	3.5	1,600	3.9	2,000	4.7	3,200	15.7	6.3					
5		960	4.3	1,280	4.7	1,600	5.9	2,600	19.7	7.9					
6		800	4.3	1,100	4.7	1,350	5.9	2,100	19.7	7.9					
8		600	4.3	800	4.7	1,000	6.7	1,600	19.7	7.9					
10		480	4.3	640	4.7	800	7.5	1,300	20.1	8.3					
12		400	4.7	530	5.1	650	9.8	1,100	24.8	9.8					
16		300	3.9	400	3.9	500	8.7	800	19.7	7.9					
20		240	3.5	320	3.9	400	7.5	640	17.7	7.1					
Depth of Cut		a _a	1D		1D		1.5D		1~1.5D						
		a _r	0.02D(Max 0.2mm)		0.02D(Max 0.2mm)		0.05D		0.05D						
		H	~0.05D (Max 0.5mm)		~0.05D (Max 0.5mm)		0.05D		0.05D						

Adjust milling condition when unusual vibration or sound occurs.

D: Dia. of Mill

Slotting

Side Milling

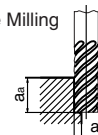


High Speed Condition

Work Material		Hardened Steels 60~65HRC		Hardened Steels 55~60HRC		Hardened Steels 45~55HRC		Hardened Steels 35~45HRC		Hardened Steels ~35HRC	
Milling Conditions		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
Dia. of Mill (mm)											
1		12,000	9.8	24,000	23.6	48,000	47.2	Recommended X's-mill GEO, X's-mill Multi-Flutes			
2		10,000	23.6	20,000	49.2	40,000	98.4				
3		8,000	43.3	16,000	90.6	32,000	181.1				
4		6,000	43.3	12,000	90.6	24,000	181.1				
5		4,800	55.1	9,600	114.2	19,200	228.3				
6		4,000	55.1	8,000	114.2	16,000	228.3				
8		3,000	55.1	6,000	114.2	12,000	228.3				
10		2,400	55.1	4,800	114.2	9,500	224.4				
12		2,000	47.2	4,000	94.5	8,000	189.0				
16		1,500	47.2	3,000	82.7	6,000	169.3				
20		1,200	37.8	2,400	66.9	4,800	133.9				
Depth of Cut	a _a	1D		1D		1~1.5D					
	a _r	0.01D		0.05D		0.05D					

D: Dia. of Mill

Side Milling

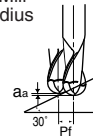


- 1) When using low RPM machines, use the maximum RPM and adjust the feed rate.
- 2) Recommend dry machining when high speed milling.
- 3) Adjust milling condition when unusual vibration or sound occurs.

X's-mill Hard Ball List No. 9284

Ball Radius (mm)	Work Material		Hardened Steels 50~55HRC		Hardened Steels 55~60HRC		Hardened Steels 60~65HRC	
	Milling Conditions		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
	Depth of Cut a_a	P_f						
R 1.0	0.06	0.06	30,000	47.2	30,000	47.2	24,000	33.9
R 1.5	0.09	0.09	28,000	63.0	23,300	55.1	18,640	39.4
R 2	0.12	0.12	21,000	63.0	17,500	55.1	14,000	39.4
R 2.5	0.15	0.15	16,800	63.0	14,000	55.1	11,200	39.4
R 3	0.18	0.18	14,000	63.0	11,700	55.1	9,360	39.4
R 4	0.24	0.24	10,600	63.0	8,800	55.1	7,040	39.4
R 5	0.3	0.3	8,400	63.0	7,000	55.1	5,600	39.4
R 6	0.36	0.36	7,000	63.0	5,800	55.1	4,640	39.4
R 8	0.48	0.48	5,300	63.0	4,400	55.1	3,520	39.4
R 10	0.6	0.6	4,200	63.0	3,500	55.1	2,800	39.4

D: Dia. of Mill
R: Ball Radius

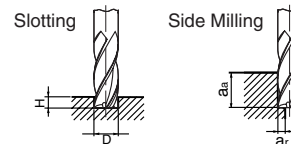


- 1) Recommended a down-cut milling.
- 2) This table is the milling condition of a processing side angle of inclination 30 deg..
- 3) Recommend dry machining
- 4) When using low speed machines, use the maximum speed and adjust the feed rate.
- 5) Adjust milling condition when unusual vibration or sound occurs.

X's-mill for Stainless Steels List No. 9314

Work Material		Stainless Steels 304, 316		Nickel Alloys Inconel 718		Titanium Alloys Ti-6Al-4V	
Milling Conditions							
Dia. of Mill (mm)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
3		8,500	20.1	4,000	8.7	5,300	12.6
5		5,100	20.9	2,400	9.1	3,180	13.0
6		4,200	21.3	2,000	9.8	2,650	13.4
8		3,200	23.2	1,500	9.8	2,000	14.6
10		2,500	23.6	1,200	11.0	1,600	15.0
12		2,100	23.6	1,000	11.0	1,330	15.0
16		1,600	22.0	750	9.8	1,000	13.8
20		1,300	19.3	600	8.7	800	11.8
Depth of Cut	a _a	1.5D		1.5D		1.5D	
	a _r	0.12D		0.08D		0.08D	
	H	0.3D		0.2D		0.2D	

D: Dia. of Mill



- 1) Mill using coolants.
- 2) When slotting, reduce RPM more than 60%, and the feed rate more than 70% of table values.
- 3) Adjust milling condition when unusual vibration or sound occurs.

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

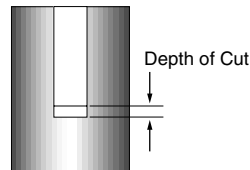
TAPS
Cutting Condition

Others

X's-mill for Rib Processing List No. 9496

Milling Conditions for Pre-hardened Steels

Work Material	Carbon Steels Alloy Steels Pre-Hardened Steels		
Milling Conditions			
Ball Radius (mm)	RPM	Feed (IPM)	Depth of Cut (inch)
0.5	32,000	11.0	0.0002
0.6	26,000	12.6	0.0004
0.7	23,000	15.7	0.0004
0.8	20,000	15.7	0.0004
0.9	18,000	15.7	0.0006
1	16,000	15.7	0.0008
1.2	13,300	15.7	0.0008
1.4	11,400	15.7	0.0008
1.5	10,600	15.7	0.0010
1.6	10,000	15.7	0.0010
1.7	9,400	15.7	0.0010
1.8	8,900	15.7	0.0012
1.9	8,400	15.7	0.0012
2	8,000	15.7	0.0012
2.5	6,400	15.7	0.0020
3	5,300	15.7	0.0031

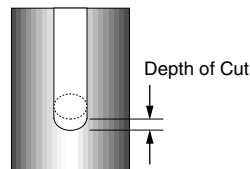


- 1) In case of high speed machine, increase 1.5 times of rotation, and 1.3 to 1.7 times of feed
- 2) When corner processing, reduce the feed rate by approximately half
- 3) Recommend non water soluble cutting fluid
- 4) To achieve the final depth of rib, recommended to use the neck length from shorter to longer sequentially.
- 5) The run out of the end mill should be in 10 microns after chucking.

X's-mill Ball for Rib Processing List No. 9498

Milling Conditions for Pre-hardened Steels

Work Material	Carbon Steels Alloy Steels Pre-Hardened Steels		
Milling Conditions			
Ball Radius (mm)	RPM	Feed (IPM)	Depth of Cut (inch)
R 0.3	26,000	11.0	0.0004
R 0.4	20,000	13.8	0.0008
R 0.5	16,000	15.7	0.0012
R 0.6	13,300	15.7	0.0020
R 0.7	11,400	15.7	0.0024
R 0.75	10,600	15.7	0.0028
R 0.8	10,000	15.7	0.0031
R 0.9	8,900	15.7	0.0035
R 1	8,000	15.7	0.0039
R 1.25	6,400	15.7	0.0059
R 1.5	5,300	15.7	0.0079



- 1) When using high speed machine, increase RPM 1.5 times, and increase feed rate 1.3 to 1.7 times of tables above.
- 2) When corner processing, reduce the feed rate by approximately half
- 3) Recommend non water soluble cutting fluid
- 4) To achieve the final depth of rib, recommended to use the neck length from shorter to longer sequentially.
- 5) The run out of the end mill should be in 10 microns after chucking.

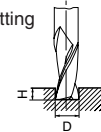
DLC-mill for Aluminum List No. 9330
DLC-mill Radius List No. 9302
DLC-mill Sharp Corner List No. 9378

Work Material		Aluminum 1070		Aluminum Alloys						Aluminum Alloy Casting		Copper Alloys	
Milling Conditions				4032, 6061		5052		7075					
Dia. of Mill (mm)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
2		50,000	39.4	32,000	25.2	38,000	29.9	38,000	33.1	34,000	29.5	15,300	9.4
3		41,000	47.2	30,000	35.4	32,000	39.4	32,000	43.3	29,000	37.8	12,700	11.8
5		25,000	51.2	18,000	35.4	19,000	39.4	19,000	43.3	17,000	37.8	7,600	12.2
6		21,000	51.2	15,000	35.4	16,000	39.4	16,000	43.3	14,000	37.8	6,400	12.2
8		16,000	51.2	12,000	37.8	12,000	39.4	12,000	43.3	10,700	37.8	4,800	12.2
10		12,000	51.2	9,000	35.4	9,600	39.4	10,000	43.3	8,600	37.8	3,800	12.2
12		10,000	51.2	7,500	35.4	8,000	39.4	8,000	43.3	7,200	37.8	3,200	12.2
16		7,800	51.2	5,600	35.4	6,000	39.4	6,000	43.3	5,400	37.8	2,400	12.2
20		6,200	51.2	4,500	35.4	4,800	39.4	4,800	43.3	4,300	37.8	1,900	12.2
Depth of Cut	a _a	1.5D											
	a _r	0.2D										0.1D	
	H	0.5D (In dry-milling)						1D (In wet-milling)					

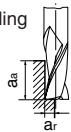
- 1) In case of using DLC Sharp Corner, use in Minimum Quantity of Lubrication (MQL) condition or with coolants.
- 2) When using low RPM machines, use the maximum RPM and adjust the feed rate.
- 3) When slotting, reduce the RPM 30%, and the Feed 75% of table values.
- 4) Adjust milling condition when unusual vibration or sound occurs.

D: Dia. of Mill

Slotting



Side Milling



DLC-mill Slot Long Shank List No. 9390

Conventional Condition : Side Milling

Work Material		Aluminum Alloys								Aluminum Alloy Casting				Copper Alloys	
Milling Conditions		Aluminum 1070		4032		5052		6061		7075		Si -12%		Si 12%	
Dia. of Mill (mm)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
3		34,500	94.5	21,300	51.2	26,600	66.9	23,900	56.7	23,400	52.4	23,900	56.7	22,600	50.8
4		25,900	122.0	16,000	63.0	19,900	86.6	18,000	74.8	17,600	67.7	18,000	74.8	17,000	65.4
6		17,300	129.9	10,700	66.9	13,300	90.6	12,000	78.7	11,700	71.3	12,000	78.7	11,300	68.5
8		13,000	137.8	8,000	70.9	10,000	94.5	9,000	82.7	8,800	75.2	9,000	82.7	8,500	72.4
10		10,400	137.8	6,400	70.9	8,000	94.5	7,200	82.7	7,100	75.6	7,200	82.7	6,800	72.4
12		8,700	137.8	5,400	70.9	6,700	98.4	6,000	82.7	5,900	75.6	6,000	82.7	5,700	72.8
14		7,400	133.9	4,500	66.9	5,700	94.5	5,100	78.7	5,000	74.8	5,100	78.7	4,800	70.9
16		6,500	129.9	4,000	63.0	5,000	90.6	4,500	74.8	4,400	70.9	4,500	74.8	4,200	66.9
18		5,700	118.1	3,500	59.1	4,400	82.7	4,000	70.9	3,900	66.9	4,000	70.9	3,800	66.9
20		5,200	106.3	3,200	55.1	4,000	74.8	3,600	63.0	3,500	59.1	3,600	63.0	3,400	59.1
Depth of Cut	a_a	1.2D													
	a_r	0.2D													

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

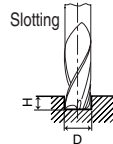
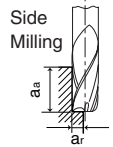
Others

STANDARD MILLING CONDITION

Conventional Condition: Slotting

Work Material		Aluminum Alloys										Aluminum Alloy Casting			
Milling Conditions		Aluminum 1070		4032		5052		6061		7075		Si -12%		Si 12%	
Dia. of Mill (mm)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
3		34,500	82.7	21,300	43.3	26,600	59.1	23,900	48.4	23,400	44.9	23,900	48.4	22,600	43.3
4		25,900	90.6	16,000	47.2	19,900	63.0	18,000	55.1	17,600	48.8	18,000	55.1	17,000	47.2
6		17,300	94.5	10,700	47.2	13,300	66.9	12,000	55.1	11,700	50.8	12,000	55.1	11,300	49.2
8		13,000	98.4	8,000	51.2	10,000	66.9	9,000	59.1	8,800	52.8	9,000	59.1	8,500	50.8
10		10,400	98.4	6,400	51.2	8,000	66.9	7,200	59.1	7,100	53.1	7,200	59.1	6,800	50.8
12		8,700	98.4	5,400	51.2	6,700	66.9	6,000	59.1	5,900	52.8	6,000	59.1	5,700	51.2
14		7,400	94.5	4,500	47.2	5,700	66.9	5,100	55.1	5,000	51.2	5,100	55.1	4,800	51.2
16		6,500	90.6	4,000	47.2	5,000	63.0	4,500	55.1	4,400	51.2	4,500	55.1	4,200	47.2
18		5,700	86.6	3,500	43.3	4,400	59.1	4,000	51.2	3,900	47.2	4,000	51.2	3,800	47.2
20		5,200	82.7	3,200	39.4	4,000	55.1	3,600	47.2	3,500	43.3	3,600	47.2	3,400	43.3
Depth of Cut H		1D													

D: Dia. of Mill



- 1) When using low RPM machines, use the maximum RPM and adjust the feed rate.
- 2) When dry milling, reduce the RPM and the Feed 30% of table values.
- 3) Adjust milling condition when unusual vibration or sound occurs.

High Speed Condition: Side Milling

Work Material		Aluminum Alloys										Aluminum Alloy Casting				Copper Alloys	
Milling Conditions		Aluminum 1070		4032		5052		6061		7075		Si -12%		Si 12%			
Dia. of Mill (mm)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
3		62,100	204.7	38,200	102.4	47,800	145.7	43,000	121.7	42,100	113.0	43,000	121.7	33,500	89.8	19,100	40.2
4		51,800	291.3	31,900	149.6	39,800	204.7	35,900	177.2	35,100	161.4	35,900	177.2	27,900	128.3	16,000	59.1
6		38,000	338.6	23,400	173.2	29,200	236.2	26,300	204.7	25,700	187.0	26,300	204.7	20,500	149.2	11,700	66.9
8		31,100	389.8	19,100	196.9	23,900	271.7	21,500	232.3	21,100	215.4	21,500	232.3	16,800	171.7	9,600	78.7
10		24,900	389.8	15,300	196.9	19,100	271.7	17,200	232.3	16,900	215.7	17,200	232.3	13,400	171.3	7,700	78.7
12		20,700	389.8	12,800	196.9	16,000	275.6	14,400	236.2	14,100	216.1	14,400	236.2	11,200	171.7	6,400	78.7
14		17,700	385.8	10,900	192.9	13,600	271.7	12,300	232.3	12,000	212.6	12,300	232.3	9,500	169.3	5,500	74.8
16		15,500	366.1	9,500	185.0	11,900	255.9	10,700	220.5	10,500	204.7	10,700	220.5	8,400	161.4	4,800	70.9
18		12,600	318.9	7,800	161.4	9,700	224.4	8,800	192.9	8,600	177.2	8,800	192.9	6,800	141.7	3,900	63.0
20		10,300	255.9	6,400	129.9	8,000	181.1	7,200	153.5	7,000	141.7	7,200	153.5	5,600	114.2	3,200	51.2
Depth of Cut		1.2D															
		0.2D															

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

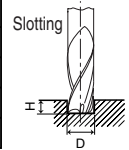
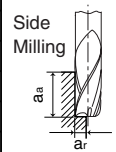
TAPS
Cutting Condition

Others

High Speed Condition: Slotting

Work Material		Aluminum 1070		Aluminum Alloys						Aluminum Alloy Casting				Copper Alloys	
Milling Conditions				4032, 6061		5052		7075		Si -12%		Si 12%			
Dia. of Mill (mm)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
3		62,100	145.7	38,200	74.8	47,800	102.4	43,000	87.0	42,100	80.7	43,000	87.0	33,500	64.2
4		51,800	177.2	31,900	90.6	39,800	126.0	35,900	106.3	35,100	97.2	35,900	106.3	27,900	77.2
6		38,000	204.7	23,400	102.4	29,200	141.7	26,300	122.0	25,700	111.8	26,300	122.0	20,500	89.0
8		31,100	228.3	19,100	114.2	23,900	161.4	21,500	137.8	21,100	126.0	21,500	137.8	16,800	100.4
10		24,900	228.3	15,300	114.2	19,100	161.4	17,200	137.8	16,900	126.0	17,200	137.8	13,400	100.0
12		20,700	228.3	12,800	118.1	16,000	161.4	14,400	137.8	14,100	126.0	14,400	137.8	11,200	100.4
14		17,700	224.4	10,900	114.2	13,600	157.5	12,300	133.9	12,000	126.0	12,300	133.9	9,500	98.4
16		15,500	220.5	9,500	110.2	11,900	153.5	10,700	129.9	10,500	122.0	10,700	129.9	8,400	98.4
18		12,600	192.9	7,800	98.4	9,700	133.9	8,800	114.2	8,600	106.3	8,800	114.2	6,800	82.7
20		10,300	161.4	6,400	82.7	8,000	114.2	7,200	98.4	7,000	90.6	7,200	98.4	5,600	70.9
Depth of Cut H		1D													

D: Dia. of Mill



- 1) When using low RPM machines, use the maximum RPM and adjust the feed rate.
- 2) When dry milling, reduce the RPM and the Feed 30% of table values.
- 3) Adjust milling condition when unusual vibration or sound occurs.

Plunging

Work Material		Aluminum 1070		Aluminum Alloys						Aluminum Alloy Casting				Copper Alloys	
Milling Conditions				4032, 6061		5052		7075		Si -12%		Si 12%			
Dia. of Mill (mm)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
3		34,500	39.4	21,300	19.7	26,600	27.6	23,900	21.7	23,400	20.1	23,900	21.7	18,600	16.1
4		25,900	43.3	16,000	23.6	19,900	31.5	18,000	27.6	17,600	22.8	18,000	27.6	14,000	18.1
6		17,300	43.3	10,700	23.6	13,300	31.5	12,000	27.6	11,700	24.0	12,000	27.6	9,300	18.9
8		13,000	47.2	8,000	23.6	10,000	31.5	9,000	27.6	8,800	25.2	9,000	27.6	7,000	20.1
10		10,400	47.2	6,400	23.6	8,000	31.5	7,200	27.6	7,100	25.2	7,200	27.6	5,600	20.1
12		8,700	47.2	5,400	23.6	6,700	35.4	6,000	27.6	5,900	25.2	6,000	27.6	4,700	20.1
14		7,400	43.3	4,500	23.6	5,700	31.5	5,100	27.6	5,000	23.6	5,100	27.6	4,000	19.7
16		6,500	43.3	4,000	19.7	5,000	31.5	4,500	23.6	4,400	23.6	4,500	23.6	3,500	19.7
18		5,700	39.4	3,500	19.7	4,400	27.6	4,000	23.6	3,900	23.6	4,000	23.6	3,100	19.7
20		5,200	35.4	3,200	19.7	4,000	23.6	3,600	19.7	3,500	19.7	3,600	19.7	2,800	15.7

- 1) When using low RPM machines, use the maximum RPM and adjust the feed rate.
- 2) When dry milling, reduce the RPM and feed rate by 30%. In dry plunging, reduce RPM 30% and Feed 80% of values on table above.
- 3) Adjust milling condition when unusual vibration or sound occurs.

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

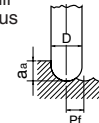
DLC-mill Ball List No. 9360

Conventional Condition

Work Material			Aluminum Alloys						Aluminum Alloy Casting		Copper Alloys		
Milling Conditions		Aluminum 1070		4032, 6061		5052		7075					
Ball Radius (mm)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
R 0.5		41,000	31.5	10,000	7.9	32,000	23.6	32,000	27.6	29,000	23.6	13,000	7.9
R 1		31,000	47.2	7,000	11.8	24,000	39.4	24,000	43.3	21,000	35.4	10,000	11.8
R 2		21,000	66.9	5,000	15.7	16,000	51.2	16,000	55.1	14,000	47.2	6,000	15.7
R 3		14,000	66.9	3,200	15.7	11,000	51.2	11,000	59.1	10,000	51.2	4,000	15.7
R 5		8,000	63.0	1,900	15.7	6,000	47.2	6,000	51.2	6,000	51.2	2,500	15.7
R 8		5,000	63.0	1,200	15.7	4,000	51.2	4,000	55.1	3,600	51.2	1,600	15.7
R 10		4,000	63.0	1,000	15.7	3,200	51.2	3,200	55.1	2,900	51.2	1,300	15.7
Depth of Cut	a _s	0.1D											
	P _f	0.2D											

- 1) When using low RPM machines, use the maximum RPM and adjust the feed rate.
 2) In dry milling (recommended air blow), reduce the rotation and feed 30% of table values.
 3) Adjust milling condition when unusual vibration or sound occurs.

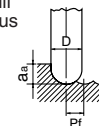
D: Dia. of Mill
 R: Ball Radius



High Speed Condition

Work Material		Aluminum 1070		Aluminum Alloys						Aluminum Alloy Casting		Copper Alloys	
Milling Conditions				4032, 6061		5052		7075					
Ball Radius (mm)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
R 0.5		62,000	47.2	19,000	15.7	60,000	47.2	60,000	51.2	57,000	51.2	25,000	15.7
R 1		54,000	86.6	14,000	23.6	48,000	74.8	48,000	82.7	43,000	74.8	19,000	23.6
R 2		47,000	149.6	11,000	35.4	36,000	114.2	36,000	126.0	32,000	110.2	14,000	35.4
R 3		34,000	161.4	8,000	39.4	27,000	126.0	27,000	141.7	24,000	126.0	11,000	39.4
R 5		21,000	165.4	4,800	39.4	16,000	126.0	16,000	137.8	14,000	122.0	6,400	39.4
R 8		13,000	165.4	3,000	39.4	9,900	126.0	9,900	137.8	9,000	126.0	4,000	39.4
R 10		10,000	157.5	2,400	39.4	8,000	126.0	8,000	137.8	7,200	126.0	3,200	39.4
Depth of Cut	a _a	0.05D											
	Pf	0.1D											

D: Dia. of Mill
 R: Ball Radius



DLC-HSS mill / Fractional List No. 6231HD

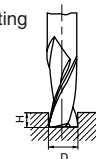
Work Material		Aluminum 1070		Aluminum Alloys					
Milling Conditions				4032, 6061		5052		7075	
Dia. of Mill (inch)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
1/8		30,000	31.5	19,900	14.9	25,100	22.6	19,900	11.9
3/16		20,000	38.0	13,300	17.5	16,800	26.5	13,300	14.0
1/4		15,000	39.4	10,000	17.5	12,600	26.5	9,940	13.9
5/16		12,000	39.4	8,000	21.5	10,030	32.0	7,950	16.9
3/8		10,000	45.0	6,700	22.6	8,360	33.9	6,630	17.9
7/16		8,500	47.2	5,700	23.9	7,160	37.6	5,680	19.9
1/2		7,500	47.2	5,000	25.0	6,270	37.6	4,970	19.9
5/8		6,000	47.2	4,000	25.0	5,020	37.7	3,980	19.9
3/4		5,000	47.2	3,400	25.5	4,180	37.6	3,320	19.9
1		3,700	47.2	2,500	25.0	3,140	37.7	2,490	19.9
Depth of Cut	a _a	1.5D							
	a _r	0.2D							
	H	1D							

DLC-HSS mill / Metric List No. 6450

Work Material		Aluminum 1070		Aluminum Alloys					
Milling Conditions				4032, 6061		5052		7075	
Dia. of Mill (mm)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
3		32,000	31.5	21,100	15.0	26,600	22.6	21,100	12.0
5		19,200	39.4	12,700	17.5	16,000	26.5	12,700	14.0
6		16,000	39.4	10,600	17.5	13,300	26.4	10,600	14.0
8		12,000	39.4	7,900	21.1	10,000	32.1	7,900	16.9
10		9,600	47.2	6,400	22.7	8,000	34.0	6,400	18.1
12		8,000	47.2	5,300	0.0	6,700	0.0	5,300	20.0
16		6,000	47.2	4,000	0.0	5,000	0.0	4,000	0.0
20		4,800	47.2	3,200	0.0	4,000	0.0	3,200	0.0
Depth of Cut	a _a	1.5D							
	a _r	0.2D							
	H	1D							

D: Dia. of Mill

Slotting



Side Milling



- 1) Mill using coolants.
- 2) Recommend to use List No. 9330 in milling of Aluminum Alloy Casting (A380, A390).
- 3) When slotting, reduce the RPM 40% and the Feed 60% of table values.
- 4) When using low RPM machines, use the maximum RPM and adjust the feed rate.
- 5) Adjust milling condition when unusual vibration or sound occurs.

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

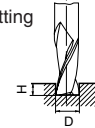
DIAMOND Coated End Mill List No. 9211D

Work Material		Aluminum Alloys		High Silicon Aluminum Alloys	
Milling Conditions	Dia. of Mill (inch)				
		RPM	Feed (IPM)	RPM	Feed (IPM)
	1/4	8000 - 16000	40.0 - 80.0	8000 - 12000	40.0 - 60.0
	5/16	6500 - 12000	40.0 - 80.0	6500 - 9600	40.0 - 60.0
	3/8	5000 - 9500	40.0 - 80.0	5000 - 7500	40.0 - 60.0
	1/2	4000 - 8000	40.0 - 80.0	4000 - 6000	40.0 - 60.0
	3/4	2500 - 4800	30.0 - 60.0	2500 - 3800	30.0 - 45.0
Depth of Cut	a _a	Max 1.5D		Max 1.5D	
	a _r	Max 0.2D		Max 0.1D	
	H	Max 0.2D		Max 0.2D	

D: Dia. of Mill

Slotting

Side Milling



- 1) Mill using coolants.
- 2) When using low RPM machines, use the maximum RPM and adjust the feed rate.
- 3) Adjust milling condition when unusual vibration or sound occurs.

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

Genac Endmills 2 Flute Single End Regular List No. 9261X Long List No. 9265X

Work Material		Carbon Steels (up to 30HRc)		Alloy Steels 30~45HRc		Tool Steels 45~55HRC		Cast Iron (up to 200HB)		Cast Iron (200HB -)		Stainless Steels		Titanium Alloys		Aluminum, Nonferrous Metals	
Milling Conditions																	
Dia. of Mill (inch)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
1/8		6,110	9.8	4,580	4.6	3,060	3.1	6,720	16.1	4,890	4.9	4,280	5.1	4,280	4.3	18,300	25.6
3/16		4,070	8.1	3,060	3.7	2,040	2.4	4,480	13.4	3,260	3.9	2,850	4.0	2,850	3.4	12,200	19.5
1/4		3,060	7.3	2,290	3.2	1,530	2.1	3,360	12.1	2,450	3.4	2,140	3.4	2,140	3.0	9,100	16.4
5/16		2,440	6.3	1,820	2.9	1,220	2.0	2,690	11.8	1,960	3.1	1,700	3.1	1,700	2.7	7,300	14.6
3/8		2,030	6.1	1,540	2.8	1,020	1.8	2,240	11.2	1,620	2.9	1,420	2.8	1,420	2.6	6,100	13.4
7/16		1,740	6.3	1,300	2.6	870	1.7	1,920	10.8	1,400	2.8	1,220	2.7	1,220	2.4	5,200	12.5
1/2		1,530	6.1	1,150	2.3	760	1.5	1,680	10.1	1,220	2.7	1,070	2.6	1,070	2.4	4,500	11.7
5/8		1,220	5.9	910	2.0	610	1.3	1,350	9.5	980	2.4	850	2.4	850	2.0	3,600	10.8
3/4		1,010	5.3	770	1.8	510	1.2	1,120	9.0	810	2.1	710	2.1	710	2.0	3,000	9.6
1		760	4.6	650	2.0	380	1.1	840	7.6	610	1.8	530	1.6	530	1.6	2,200	8.8
Depth of Cut	a _a	1.5D (Long 2.0D)												1.0D (Long 2.0D)		1.5D (Long 2.0D)	
	a _r	0.1D (Long 0.05D)				0.05D (Long 0.02D)		0.1D (Long 0.05D)				0.1D (Long 0.05D)		0.05D (Long 0.2D)		0.2D (Long 0.1D)	
	H	0.5D				0.3D		0.5D				0.3D		0.1D		0.5D	

Genac Endmills 4 Flute Single End Regular List No. 9263X Long List No. 9267X

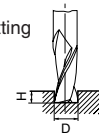
Work Material		Carbon Steels (up to 30HRc)		Alloy Steels 30~45HRc		Tool Steels 45~55HRC		Cast Iron (up to 200HB)		Cast Iron (200HB -)		Stainless Steels		Titanium Alloys		Aluminum, Nonferrous Metals	
Milling Conditions																	
Dia. of Mill (inch)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
1/8		6,110	19.6	4,580	9.2	3,060	6.1	6,720	32.3	4,890	9.8	4,280	10.3	4,280	8.6	18,300	51.2
3/16		4,070	16.3	3,060	7.3	2,040	4.9	4,480	26.9	3,260	7.8	2,850	8.0	2,850	6.8	12,200	39.0
1/4		3,060	14.7	2,290	6.4	1,530	4.3	3,360	24.2	2,450	6.9	2,140	6.8	2,140	6.0	9,100	32.8
5/16		2,440	12.7	1,820	5.8	1,220	3.9	2,690	23.7	1,960	6.3	1,700	6.1	1,700	5.4	7,300	29.2
3/8		2,030	12.2	1,540	5.5	1,020	3.7	2,240	22.4	1,620	5.8	1,420	5.7	1,420	5.1	6,100	26.8
7/16		1,740	12.5	1,300	5.2	870	3.5	1,920	21.5	1,400	5.6	1,220	5.4	1,220	4.9	5,200	25.0
1/2		1,530	12.2	1,150	4.6	760	3.0	1,680	20.2	1,220	5.4	1,070	5.1	1,070	4.7	4,500	23.4
5/8		1,220	11.7	910	4.0	610	2.7	1,350	18.9	980	4.7	850	4.8	850	4.1	3,600	21.6
3/4		1,010	10.5	770	3.7	510	2.4	1,120	17.9	810	4.2	710	4.3	710	4.0	3,000	19.2
1		760	9.1	650	3.9	380	2.3	840	15.1	610	3.7	530	3.2	530	3.2	2,200	17.6
Depth of Cut	a _a	1.5D (Long 2.0D)												1.0D (Long 2.0D)		1.5D (Long 2.0D)	
	a _r	0.1D (Long 0.05D)				0.05D (Long 0.02D)		0.1D (Long 0.05D)				0.1D (Long 0.05D)		0.05D (Long 0.2D)		0.2D (Long 0.1D)	
	H	0.25D				0.15D		0.25D				0.15D		0.05D		0.25D	

1) Mill using coolants.

2) Adjust milling condition when unusual vibration or sound occurs.

D: Dia. of Mill

Slotting



Side Milling

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

Genac Endmills 2 Flute Ball Nose Regular Long

List No. 9271X
List No. 9275X

Work Material		Carbon Steels (up to 30HRc)		Alloy Steels 30~45HRc		Tool Steels 45~55HRC		Cast Iron (up to 200HB)		Cast Iron (200HB -)		Stainless Steels		Titanium Alloys		Aluminum, Nonferrous Metals	
Milling Conditions	Dia. of Mill (inch)																
		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
	1/8	6,110	11.7	4,580	5.5	3,060	3.7	6,720	19.4	4,890	5.9	4,280	6.2	4,280	5.1	18,300	30.7
	3/16	4,070	9.8	3,060	4.4	2,040	2.9	4,480	16.1	3,260	4.7	2,850	4.8	2,850	4.1	12,200	23.4
	1/4	3,060	8.8	2,290	3.8	1,530	2.6	3,360	14.5	2,450	4.1	2,140	4.1	2,140	3.6	9,100	19.7
	5/16	2,440	7.6	1,820	3.5	1,220	2.3	2,690	14.2	1,960	3.8	1,700	3.7	1,700	3.3	7,300	17.5
	3/8	2,030	7.3	1,540	3.3	1,020	2.2	2,240	13.4	1,620	3.5	1,420	3.4	1,420	3.1	6,100	16.1
	7/16	1,740	7.5	1,300	3.1	870	2.1	1,920	12.9	1,400	3.4	1,220	3.2	1,220	2.9	5,200	15.0
	1/2	1,530	7.3	1,150	2.8	760	1.8	1,680	12.1	1,220	3.2	1,070	3.1	1,070	2.8	4,500	14.0
	5/8	1,220	7.0	910	2.4	610	1.6	1,350	11.3	980	2.8	850	2.9	850	2.4	3,600	13.0
	3/4	1,010	6.3	770	2.2	510	1.5	1,120	10.8	810	2.5	710	2.6	710	2.4	3,000	11.5
	1	760	5.5	650	2.3	380	1.4	840	9.1	610	2.2	530	1.9	530	1.9	2,200	10.6
Depth of Cut	a _a	0.1D				0.05D		0.1D						0.05D		0.1D	
	Pf	0.2D				0.1D		0.2D				0.2D		0.1D		0.2D	

Genac Endmills 4 Flute Ball Nose Regular Long

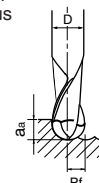
List No. 9273X
List No. 9277X

Work Material		Carbon Steels (up to 30HRc)		Alloy Steels 30~45HRc		Tool Steels 45~55HRC		Cast Iron (up to 200HB)		Cast Iron (200HB -)		Stainless Steels		Titanium Alloys		Aluminum, Nonferrous Metals	
Milling Conditions	Dia. of Mill (inch)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
	1/8	6,110	19.6	4,580	9.2	3,060	6.1	6,720	32.3	4,890	9.8	4,280	10.3	4,280	8.6	18,300	51.2
	3/16	4,070	16.3	3,060	7.3	2,040	4.9	4,480	26.9	3,260	7.8	2,850	8.0	2,850	6.8	12,200	39.0
	1/4	3,060	14.7	2,290	6.4	1,530	4.3	3,360	24.2	2,450	6.9	2,140	6.8	2,140	6.0	9,100	32.8
	5/16	2,440	12.7	1,820	5.8	1,220	3.9	2,690	23.7	1,960	6.3	1,700	6.1	1,700	5.4	7,300	29.2
	3/8	2,030	12.2	1,540	5.5	1,020	3.7	2,240	22.4	1,620	5.8	1,420	5.7	1,420	5.1	6,100	26.8
	7/16	1,740	12.5	1,300	5.2	870	3.5	1,920	21.5	1,400	5.6	1,220	5.4	1,220	4.9	5,200	25.0
	1/2	1,530	12.2	1,150	4.6	760	3.0	1,680	20.2	1,220	5.4	1,070	5.1	1,070	4.7	4,500	23.4
	5/8	1,220	11.7	910	4.0	610	2.7	1,350	18.9	980	4.7	850	4.8	850	4.1	3,600	21.6
	3/4	1,010	10.5	770	3.7	510	2.4	1,120	17.9	810	4.2	710	4.3	710	4.0	3,000	19.2
	1	760	9.1	650	3.9	380	2.3	840	15.1	610	3.7	530	3.2	530	3.2	2,200	17.6
Depth of Cut	a _a	0.1D				0.05D		0.1D						0.05D		0.1D	
	P _f	0.2D				0.1D		0.2D				0.2D		0.1D		0.2D	

1) Mill using coolants.

2) Adjust milling condition when unusual vibration or sound occurs.

D: Dia. of Mill
R: Ball Radius

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

Genac Endmills High Helix 3 Flute 60 Degrees List No. 9221X

Work Material		Carbon Steels (up to 30HRc)		Alloy Steels 30~45HRc		Tool Steels 45~55HRC		Cast Iron (up to 200HB)		Cast Iron (200HB -)		Stainless Steels		Titanium Alloys		Nonferrous Metals	
Milling Conditions		RPM		Feed (IPM)		RPM		Feed (IPM)		RPM		Feed (IPM)		RPM		Feed (IPM)	
Dia. of Mill (inch)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
1/8		6,110	19.1	4,580	8.9	3,060	6.0	6,720	31.4	4,890	9.5	4,280	10.0	4,280	8.3	18,300	50.0
3/16		4,070	15.9	3,060	7.2	2,040	4.8	4,480	26.2	3,260	7.6	2,850	7.8	2,850	6.7	12,200	38.1
1/4		3,060	14.3	2,290	6.3	1,530	4.2	3,360	23.6	2,450	6.7	2,140	6.7	2,140	5.8	9,100	31.9
5/16		2,440	12.4	1,820	5.7	1,220	3.8	2,690	23.1	1,960	6.1	1,700	6.0	1,700	5.3	7,300	28.5
3/8		2,030	11.9	1,540	5.4	1,020	3.6	2,240	21.8	1,620	5.7	1,420	5.5	1,420	5.0	6,100	26.2
7/16		1,740	12.2	1,300	5.1	870	3.4	1,920	21.0	1,400	5.5	1,220	5.2	1,220	4.8	5,200	24.3
1/2		1,530	11.9	1,150	4.5	760	3.0	1,680	19.7	1,220	5.2	1,070	5.0	1,070	4.6	4,500	22.8
5/8		1,220	11.4	910	3.9	610	2.6	1,350	18.4	980	4.6	850	4.6	850	4.0	3,600	21.1
3/4		1,010	10.2	770	3.6	510	2.4	1,120	17.5	810	4.1	710	4.2	710	3.9	3,000	18.7
1		760	8.9	650	3.8	380	2.2	840	14.7	610	3.6	530	3.1	530	3.1	2,200	17.2
Depth of Cut	a _a	1.5D												1.0D		1.5D	
	a _r	0.1D				0.05D		0.1D				0.1D		0.05D		0.2D	
	H	0				0.15D		0.25D				0.15D		0.05D		0.25D	

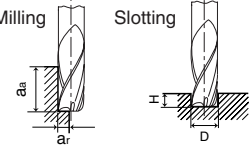
1) Mill using coolants.

2) Adjust milling condition when unusual vibration or sound occurs.

D: Dia. of Mill

Side Milling

Slotting



Genac Endmills Roughing Center Cutting List No. 9251X

Work Material		Carbon Steels (up to 30HRc)		Alloy Steels 30~45HRc		Tool Steels 45~55HRC		Cast Iron (up to 200HB)		Cast Iron (200HB -)		Stainless Steels		Titanium Alloys		Aluminum, Nonferrous Metals	
Milling Conditions		RPM		Feed (IPM)		RPM		Feed (IPM)		RPM		Feed (IPM)		RPM		Feed (IPM)	
Dia. of Mill (inch)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
1/4		3,060	22.0	2,290	9.6	1,530	6.4	3,360	36.3	2,450	10.3	2,140	10.3	2,140	9.0	9,100	49.1
3/8		2,030	18.3	1,540	8.3	1,020	5.5	2,240	33.6	1,620	8.7	1,420	8.5	1,420	7.7	6,100	40.3
1/2		1,530	18.4	1,150	6.9	760	4.6	1,680	30.2	1,220	8.1	1,070	7.7	1,070	7.1	4,500	35.1
5/8		1,220	22.0	910	7.5	610	5.0	1,350	35.4	980	8.8	850	8.9	850	7.7	3,600	40.5
3/4		1,010	23.6	770	8.3	510	5.5	1,120	40.3	810	9.5	710	9.6	710	8.9	3,000	43.2
1		760	20.5	650	8.8	380	5.1	840	34.0	610	8.2	530	7.2	530	7.2	2,200	39.6
Depth of Cut	a _a	1.5D												1.0D		1.5D	
	a _r	0.5D				0.2D		0.5D				0.25D		0.2D		0.5D	
	H	0.5D				0.2D		0.5D				0.5D		0.2D		0.5D	

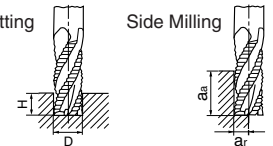
1) Mill using coolants.

2) Adjust milling condition when unusual vibration or sound occurs.

D: Dia. of Mill

Slotting

Side Milling

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

SG Multi-Flute End mills List No. 6211X

Work Material		Carbon Steels		Alloy Steels		Die Steels Stainless Steels		Nickel Alloys Titanium Alloys		Cast Iron		Aluminum Alloys Copper Alloys Nonferrous Alloys	
Milling Conditions	Dia. of Mill (inch)												
		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
	1/8	3,600	8.6	2,600	5.2	2,100	2.5	1,800	2.5	4,000	20.8	8,000	38.4
	3/16	2,400	6.7	1,700	4.1	1,400	2.2	1,200	1.9	2,700	17.3	5,300	31.8
	1/4	1,800	7.9	1,300	4.7	1,100	3.1	900	2.5	2,000	22.4	4,000	36.8
	3/8	1,200	6.7	900	4.7	700	2.8	600	2.0	1,400	19.6	2,700	33.5
	1/2	880	7.4	630	4.8	510	3.1	450	2.3	1,000	20.0	1,990	37.4
	5/8	710	7.4	510	4.5	410	3.0	360	2.2	800	20.8	1,590	34.3
	3/4	590	6.6	420	4.4	340	2.7	300	2.0	670	18.5	1,330	31.9
	1	440	4.8	320	3.1	260	2.0	230	1.5	500	13.4	1,000	24.8
	1 1/4	360	3.8	260	2.5	210	1.6	180	1.2	400	10.2	800	18.9
	1 1/2	300	3.1	210	1.9	170	1.2	150	0.9	340	8.2	670	15.0
Depth of Cut	a _s	1.5D											
	a _r	0.25D											

6 Flute

Work Material	Carbon Steels		Alloy Steels		Die Steels Stainless Steels		Nickel Alloys Titanium Alloys		Cast Iron		Aluminum Alloys Copper Alloys Nonferrous Alloys	
Milling Conditions												
Dia. of Mill (inch)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
1/2	880	11.1	630	7.2	510	4.6	450	3.4	1,000	30.0	2,700	56.1
5/8	710	11.1	510	6.7	410	4.4	360	3.2	800	31.2	1,990	51.5
3/4	590	9.9	420	6.6	340	4.1	300	3.1	670	27.7	1,590	47.9
1	440	7.3	320	4.7	260	3.0	230	2.3	500	20.1	1,330	37.2
1 1/4	360	5.7	260	3.7	210	2.3	180	1.7	400	15.4	1,000	28.3
1 1/2	300	4.6	210	2.9	170	1.8	150	1.4	340	12.2	800	22.5
Depth of Cut	a _a	1.5D										
	a _r	0.25D										

1) The above cutting speeds and feeds apply to regular end mill flute length.

For long fluted end mills please use the following factors below:

Cutting Length	Reduce Feed by
2.5 × Diameter	15%
3 × Diameter	25%
4 × Diameter	55%

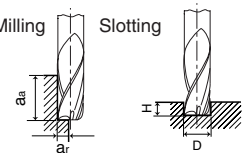
2) In dry milling, reduce the RPM and Feed 30% of values on table above. (recommended air blow)

3) Adjust drilling condition when unusual vibration or different sound occurs.

D: Dia. of Mill

Side Milling

Slotting



G POWDER METAL END MILLS / High-Helix List No. 7221P

Work Material	Carbon Steels		Alloy Steels		Die Steels Stainless Steels		Nickel Alloys Titanium Alloys		Cast Iron		Aluminum Alloys Copper Alloys Nonferrous Alloys	
Milling Conditions												
Dia. of Mill (inch)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
1/4	1,800	9.4	1,300	6.8	1,100	4.8	890	2.8	2,000	24.0	4,000	48.0
3/8	1,200	8.6	840	5.4	680	3.5	600	2.4	1,400	22.4	2,700	43.2
1/2	880	8.4	630	5.8	510	3.7	450	2.7	1,000	22.4	2,000	46.4
5/8	710	8.5	510	5.7	410	3.4	360	2.6	800	22.4	1,600	44.8
3/4	590	8.0	420	5.2	340	3.3	300	2.4	670	21.4	1,400	41.4
1	440	8.4	320	6.0	260	3.6	230	2.8	500	24.0	1,000	45.0
1 1/4	360	5.8	260	4.1	210	2.5	180	1.9	400	16.3	800	29.8
1 1/2	300	4.7	210	3.2	170	1.9	150	1.5	340	13.5	700	25.2
Depth of Cut	a _a	1.5D										
	a _r	0.25D										
	H	0.5D										

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

SG ROUGHING AND FINISHING (HEAVY DUTY) END MILLS ¹⁾ List No. 6367X ¹⁾ G ROUGHING AND FINISHING (HEAVY DUTY) END MILLS List No. 6367P

Work Material		Carbon Steels		Alloy Steels		Die Steels Stainless Steels		Nickel Alloys Titanium Alloys		Cast Iron		Aluminum Alloys Copper Alloys Nonferrous Alloys	
Milling Conditions		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
Dia. of Mill (inch)													
1/4		1,800	9.4	1,300	6.8	1,100	4.8	890	2.8	2,000	24.0	4,000	48.0
3/8		1,200	8.6	840	5.4	680	3.5	600	2.4	1,400	22.4	2,700	43.2
1/2		880	8.4	630	5.8	510	3.7	450	2.7	1,000	22.4	2,000	46.4
5/8		710	8.5	510	5.7	410	3.4	360	2.6	800	22.4	1,600	44.8
3/4		590	8.0	420	5.2	340	3.3	300	2.4	670	21.4	1,400	41.4
1		440	8.4	320	6.0	260	3.6	230	2.8	500	24.0	1,000	45.0
1 1/4		360	5.8	260	4.1	210	2.5	180	1.9	400	16.3	800	29.8
1 1/2		300	4.7	210	3.2	170	1.9	150	1.5	340	13.5	700	25.2
1 3/4		260	3.4	180	2.2	150	1.4	130	1.1	290	11.3	600	18.0
Depth of Cut	a _a	1.5D											
	a _r	0.25D											
	H	0.5D											

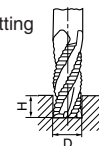
SG ROUGHING(HOG) END MILLS ¹⁾ List No. 6303X ¹⁾ G ROUGHING(HOG) END MILLS List No. 6303P

Work Material		Carbon Steels		Alloy Steels		Die Steels Stainless Steels		Nickel Alloys Titanium Alloys		Cast Iron		Aluminum Alloys Copper Alloys Nonferrous Alloys	
Milling Conditions		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
Dia. of Mill (inch)													
1/4		1,800	7.2	1,300	4.7	1,100	3.5	890	2.1	2,000	9.6	4,000	36.8
3/8		1,200	7.2	840	5.0	680	2.7	600	1.9	1,400	9.0	2,700	33.5
1/2		880	7.0	630	4.8	510	2.9	450	2.0	1,000	8.8	2,000	36.0
5/8		710	7.1	510	4.5	410	3.0	360	2.1	800	8.6	1,600	35.2
3/4		590	6.8	420	4.4	340	2.7	300	2.0	670	8.6	1,400	34.7
1		440	7.8	320	5.0	260	3.4	230	2.5	500	11.3	1,000	42.5
1 1/4		360	7.6	260	5.0	210	3.3	180	2.3	400	11.0	800	40.8
1 1/2		300	5.2	210	3.2	170	2.0	150	1.5	340	7.3	700	28.6
1 3/4		260	3.6	180	2.2	150	1.4	130	1.1	290	4.9	600	19.8
—		1,900	7.1	1,300	4.3	1,100	2.8	930	2.1	2,100	8.7	4,200	35.0
Depth of Cut	a _a	1.5D											
	a _r	0.25D											
	H	0.5D											

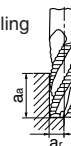
- 1) When using "SG" coated End mill, increase the RPM and feed rate 10% of values on table above.
 2) In dry milling, reduce the RPM and feed rate 30% of values on table above. (recommended air blow)
 3) Adjust milling condition when unusual vibration or sound occurs.

D: Dia. of Mill

Slotting



Side Milling



2-Flute End mills

Single End / Regular
 Single End / Regular, HSS-Co
 Single End / Regular, High-Helix
 Single End / Long
 Single End / Metric Regular, HSS-Co
 Double End / Regular
 Double End / Regular, HSS-Co

List No. 231
 List No. 6231
 List No. 6231H
 List No. 6233
 List No. 6230
 List No. 261
 List No. 6261

Work Material		Carbon Steels		Alloy Steels		Die Steels Stainless Steels		Nickel Alloys Titanium Alloys		Cast Iron		Aluminum Alloys Copper Alloys Nonferrous Alloys	
Milling Conditions													
Dia. of Mill (inch) (mm)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
—	2	4,000	3.1	2,800	2.0	2,000	1.1	1,600	0.7	4,800	9.1	9,600	16.5
—	3	2,700	3.3	1,900	2.1	1,300	1.2	1,100	0.8	3,200	9.4	6,400	17.7
1/8	3.175	2,600	3.3	1,800	2.1	1,300	1.2	1,100	0.8	3,100	9.4	6,100	17.7
3/16	4.7625	1,700	3.3	1,200	2.1	840	1.2	680	0.8	2,100	9.4	4,100	17.7
—	5	1,600	3.3	1,100	2.1	800	1.2	640	0.8	1,900	9.4	3,800	17.7
—	6	1,300	3.3	930	2.1	660	1.2	530	0.8	1,600	9.4	3,200	17.7
1/4	6.35	1,300	3.3	890	2.1	630	1.2	510	0.8	1,600	9.4	3,100	17.7
—	8	1,000	3.3	700	2.1	500	1.2	400	0.8	1,200	9.4	2,400	17.7
3/8	9.525	850	3.3	600	2.1	420	1.2	340	0.8	1,100	9.4	2,100	17.7
—	10	800	3.4	560	2.1	400	1.2	320	0.8	960	9.4	1,900	17.7
—	12	660	3.3	460	2.1	330	1.2	270	0.8	800	9.4	1,600	17.7
1/2	12.7	640	3.3	450	2.1	320	1.2	260	0.8	800	9.4	1,600	17.7
—	15	530	3.3	370	2.1	270	1.2	210	0.8	640	9.4	1,300	17.7
5/8	15.875	510	3.3	360	2.1	260	1.2	210	0.8	610	9.4	1,300	17.7
3/4	19.05	430	3.2	300	2.0	210	1.1	170	0.7	510	9.1	1,100	16.9
—	20	400	3.1	280	2.0	200	1.1	160	0.7	480	9.1	960	16.5
—	25	320	2.4	220	1.5	160	0.8	130	0.6	380	7.1	760	12.6
1	25.4	320	2.4	230	1.5	160	0.8	130	0.6	380	7.0	770	12.4
—	30	270	1.9	190	1.2	130	0.7	110	0.5	320	5.5	640	10.2
1 1/4	31.75	260	1.8	180	1.1	130	0.6	110	0.5	310	5.1	610	9.8
1 1/2	38.1	220	1.5	150	0.9	110	0.5	90	0.4	260	4.1	510	7.9
—	40	200	1.3	140	0.8	100	0.5	80	0.3	240	3.8	480	7.1
1 3/4	44.45	190	1.1	130	0.6	90	0.4	80	0.3	220	3.0	440	5.9
—	50	160	0.7	110	0.4	80	0.2	60	0.2	190	2.0	380	3.5
2	50.8	160	0.6	120	0.4	80	0.2	70	0.2	190	1.9	390	3.4
Depth of Cut		a _a	1.5D										
		a _r	0.25D										
		H	0.5D										

1) The above cutting speeds and feeds apply to regular end mill flute length.

For long fluted end mills please use the following factors below:

Cutting Length	Reduce Feed by
2.5 × Diameter	15%
3 × Diameter	25%
4 × Diameter	55%
5 × Diameter	65%
6 × Diameter	75%

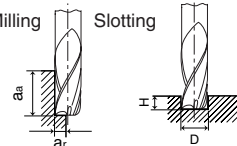
2) In dry milling, reduce the RPM and Feed 30% of values on table above. (recommended air blow)

3) Adjust drilling condition when unusual vibration or different sound occurs.

D: Dia. of Mill

Side Milling

Slotting



Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

Long, Center Cutting, HSS-Co

List No. 6213

Extra Long, HSS-Co

List No. 6207

Regular, Center Cutting, HSS-Co

List No. 6271

Work Material		Carbon Steels		Alloy Steels		Die Steels Stainless Steels		Nickel Alloys Titanium Alloys		Cast Iron		Aluminum Alloys Copper Alloys Nonferrous Alloys	
Milling Conditions													
Dia. of Mill (inch) (mm)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
—	3	2,700	5.1	1,900	3.1	1,300	1.8	1,100	1.2	3,200	14.2	6,400	26.4
1/8	3.175	2,600	5.1	1,800	3.1	1,300	1.8	1,100	1.2	3,100	14.2	6,100	26.4
3/16	4.7625	1,700	5.1	1,200	3.1	840	1.7	680	1.2	2,100	14.2	4,100	26.4
—	5	1,600	5.1	1,100	3.1	800	1.7	640	1.2	1,900	14.2	3,800	25.6
—	6	1,300	5.1	930	3.1	660	1.7	530	1.2	1,600	14.2	3,200	26.4
1/4	6.35	1,300	5.1	890	3.1	630	1.7	510	1.2	1,600	14.2	3,100	26.4
—	8	1,000	5.1	700	3.1	500	1.7	400	1.2	1,200	14.2	2,400	26.4
3/8	9.525	850	5.1	600	3.1	420	1.8	340	1.2	1,100	14.4	2,100	26.6
—	10	800	5.1	560	3.2	400	1.8	320	1.2	960	14.6	1,900	26.8
—	12	660	5.1	460	3.2	330	1.8	270	1.2	800	14.6	1,600	26.4
1/2	12.7	640	5.1	450	3.2	320	1.8	260	1.2	800	14.6	1,600	26.4
—	15	530	5.1	370	3.1	270	1.8	210	1.2	640	14.6	1,300	26.4
5/8	15.875	510	5.1	360	3.1	260	1.7	210	1.2	610	14.4	1,300	25.6
3/4	19.05	430	4.9	300	3.0	210	1.7	170	1.1	510	13.6	1,100	25.2
—	20	400	4.7	280	3.0	200	1.7	160	1.1	480	13.4	960	24.8
—	25	320	3.6	220	2.3	160	1.3	130	0.9	380	10.2	760	18.9
1	25.4	320	3.5	230	2.3	160	1.3	130	0.9	380	10.0	770	18.7
—	30	270	2.9	190	1.8	130	1.0	110	0.7	320	8.3	640	15.4
1 1/4	31.75	260	2.7	180	1.7	130	1.0	110	0.7	310	7.9	610	14.2
1 1/2	38.1	220	2.2	150	1.4	110	0.8	90	0.5	260	6.1	510	11.4
—	40	200	2.0	140	1.3	100	0.7	80	0.5	240	5.5	480	10.6
1 3/4	44.45	190	1.6	130	1.0	90	0.6	80	0.4	220	4.1	440	8.7
—	50	160	1.0	110	0.6	80	0.4	60	0.2	190	2.9	380	5.5
2	50.8	160	1.0	120	0.6	80	0.3	70	0.2	190	2.8	390	5.3
Depth of Cut		a _s	1.5D										
		a _r	0.25D										

6-Flute

Work Material		Carbon Steels		Alloy Steels		Die Steels Stainless Steels		Nickel Alloys Titanium Alloys		Cast Iron		Aluminum Alloys Copper Alloys Nonferrous Alloys	
Milling Conditions													
Dia. of Mill (inch)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
1/2		640	7.7	450	4.8	320	2.7	260	1.8	800	21.9	1,600	39.6
5/8		510	7.7	360	4.6	260	2.6	210	1.8	610	21.6	1,300	38.4
3/4		430	7.4	300	4.5	210	2.5	170	1.7	510	20.4	1,100	37.8
7/8		370	6.5	260	4.0	180	2.2	150	1.5	440	17.7	900	33.1
1		320	5.3	230	3.4	160	1.9	130	1.3	380	15.1	770	28.1
1 1/4		260	4.1	180	2.6	130	1.5	110	1.0	310	11.8	610	21.3
1 1/2		220	3.2	150	2.1	110	1.2	90	0.8	260	9.2	510	17.1
2		160	1.5	120	0.9	80	0.5	70	0.3	190	4.1	390	8.0
Depth of Cut	a _a	1.5D											
	a _r	0.25D											

1) The above cutting speeds and feeds apply to regular end mill flute length.

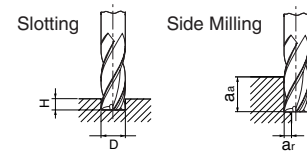
For long fluted end mills please use the following factors below:

Cutting Length	Reduce Feed by
2.5 × Diameter	15%
3 × Diameter	25%
4 × Diameter	55%
5 × Diameter	65%
6 × Diameter	75%

2) In dry milling, reduce the RPM and Feed 30% of values on table above. (recommended air blow)

3) Adjust drilling condition when unusual vibration or different sound occurs.

D: Dia. of Mill



Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

2 Flute Ball End mills

Single End / Regular
Single End / Regular, HSS-Co
Single End / Extra Long ¹⁾

List No. 291
List No. 6291
List No. 6293 ¹⁾

Single End / Metric Regular, HSS-Co
Double End / Regular
Double End / Regular, HSS-Co

List No. 6290
List No. 295
List No. 6295

Roughing Condition

Work Material				Carbon Steels		Alloy Steels		Die Steels Stainless Steels		Nickel Alloys Titanium Alloys		Cast Iron		Aluminum Alloys Copper Alloys Nonferrous Alloys	
Milling Conditions															
Dia. of Mill		Depth of Cut (inch)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
(inch)	(mm)	a _s	Pf												
—	2	0.0315	0.0315	4,000	2.2	2,800	1.4	2,000	1.1	1,600	0.7	4,400	2.8	9,600	9.4
1/8	3.175	0.0500	0.0500	2,600	2.4	1,800	1.5	1,300	1.1	1,100	0.7	2,800	2.9	6,100	10.2
—	4	0.0630	0.0630	2,000	2.5	1,700	1.6	1,000	1.2	800	0.7	2,200	3.1	4,800	10.6
3/16	4.7625	0.0750	0.0750	1,700	2.6	1,200	1.6	840	1.3	680	0.8	1,900	3.1	4,100	10.8
—	6	0.0945	0.0945	1,300	2.7	930	1.7	660	1.3	530	0.8	1,500	3.2	3,200	11.0
1/4	6.35	0.1000	0.1000	1,300	2.7	890	1.7	630	1.3	510	0.8	1,400	3.3	3,100	11.4
3/8	9.525	0.1500	0.1500	850	2.8	600	1.8	420	1.4	340	0.8	920	3.3	2,100	11.6
—	10	0.1575	0.1575	800	2.8	560	1.8	400	1.4	320	0.8	880	3.4	1,900	11.8
1/2	12.7	0.2000	0.2000	640	2.8	450	1.8	320	1.4	260	0.8	690	3.4	1,600	11.8
5/8	15.875	0.2500	0.2500	510	2.8	360	1.8	260	1.4	210	0.8	560	3.4	1,300	11.8
—	16	0.2520	0.2520	500	2.8	350	1.8	250	1.4	200	0.8	550	3.4	1,200	11.8
3/4	19.05	0.3000	0.3000	430	2.8	300	1.8	210	1.4	170	0.8	460	3.4	1,100	11.8
—	20	0.3150	0.3150	400	2.8	280	1.7	200	1.4	160	0.8	440	3.4	960	11.8
—	25	0.3937	0.3937	320	2.5	220	1.5	160	1.3	130	0.7	350	3.3	760	11.4
1	25.4	0.4000	0.4000	320	2.4	230	1.5	160	1.3	130	0.7	350	3.2	770	11.2
1 1/4	31.75	0.5000	0.5000	260	1.6	180	1.0	130	1.0	110	0.6	280	2.0	610	7.5

Finishing Condition

Work Material				Carbon Steels		Alloy Steels		Die Steels Stainless Steels		Nickel Alloys Titanium Alloys		Cast Iron		Aluminum Alloys Copper Alloys Nonferrous Alloys	
Milling Conditions															
Dia. of Mill		Depth of Cut (inch)													
(inch)	(mm)	a _s	Pf	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
—	2	0.0079	0.0111	6,600	13.0	4,600	8.3	3,300	5.1	2,700	3.2	7,300	15.0	16,000	39.4
1/8	3.175	0.0079	0.0140	5,200	13.8	3,500	8.7	2,500	5.5	2,000	3.3	5,700	15.9	12,400	41.3
—	4	0.0079	0.0157	4,600	14.6	3,200	9.1	2,300	5.9	1,800	3.4	5,000	16.5	11,000	43.3
3/16	4.7625	0.0079	0.0172	2,900	9.8	2,100	6.3	1,500	4.0	1,200	2.3	3,000	11.0	6,400	29.9
—	6	0.0197	0.0193	2,400	10.2	1,700	6.7	1,200	4.3	960	2.5	2,600	11.8	5,800	31.5
1/4	6.35	0.0197	0.0198	2,400	10.6	1,700	7.1	1,200	4.4	970	2.6	2,500	12.2	5,700	32.7
3/8	9.525	0.0197	0.0243	1,900	12.2	1,400	8.0	920	5.0	750	3.0	2,100	14.4	4,300	37.4
—	10	0.0197	0.0249	1,800	12.6	1,300	8.3	900	5.1	730	3.1	2,000	15.0	4,400	39.4
1/2	12.7	0.0197	0.0280	1,600	13.4	1,200	8.9	780	5.5	650	3.4	1,800	16.3	3,900	41.3
5/8	15.875	0.0197	0.0314	1,400	15.4	1,000	9.6	700	6.1	580	3.7	1,600	18.2	3,400	44.9
—	16	0.0197	0.0315	1,400	15.4	1,000	9.8	700	6.3	570	3.8	1,600	18.5	3,400	45.3
3/4	19.05	0.0197	0.0344	1,400	17.1	920	10.4	620	7.0	530	3.9	1,500	19.5	3,200	51.2
—	20	0.0197	0.0352	1,300	17.3	890	10.6	600	7.1	510	3.9	1,400	19.7	3,100	51.2
—	25	0.0197	0.0394	1,100	18.1	800	11.8	600	7.9	450	4.3	1,300	22.4	2,700	55.1
1	25.4	0.0197	0.0397	1,100	18.5	810	12.0	600	7.9	460	4.4	1,300	22.6	2,700	55.1
1 1/4	31.75	0.0197	0.0444	950	20.1	710	13.2	480	7.9	400	4.8	1,100	23.0	2,400	61.0

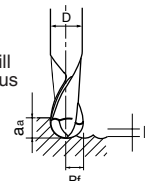
1) When using Extra Long End mills, reduce the feed 40% of values on table above.

2) In finishing process, depth of cut (a_s & Pf) is calculated the casp (=h) to be 0.004".

3) In dry milling, reduce the RPM and feed rate 30% of values on table above. (recommended air blow)

4) Adjust milling condition when unusual vibration or sound occurs.

D: Dia. of Mill
R: Ball Radius



Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

4-Flute Ball End mills Single End / Regular, HSS-Co List No. 6281

Roughing Condition

Work Material				Carbon Steels		Alloy Steels		Die Steels Stainless Steels		Nickel Alloys Titanium Alloys		Cast Iron		Aluminum Alloys Copper Alloys Nonferrous Alloys	
Milling Conditions															
Dia. of Mill		Depth of Cut (inch)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
(inch)	(mm)	a _s	Pf												
—	2	0.031	0.031	4,000	2.2	2,800	1.4	2,000	1.1	1,600	0.7	4,400	2.8	9,600	9.4
1/8	3.175	0.050	0.050	2,600	2.4	1,800	1.5	1,300	1.1	1,100	0.7	2,800	2.9	6,100	10.2
—	4	0.063	0.063	2,000	2.5	1,700	1.6	1,000	1.2	800	0.7	2,200	3.1	4,800	10.6
3/16	4.7625	0.075	0.075	1,700	2.6	1,200	1.6	840	1.3	680	0.8	1,900	3.1	4,100	10.8
—	6	0.094	0.094	1,300	2.7	930	1.7	660	1.3	530	0.8	1,500	3.2	3,200	11.0
1/4	6.35	0.100	0.100	1,300	2.7	890	1.7	630	1.3	510	0.8	1,400	3.3	3,100	11.4
3/8	9.525	0.150	0.150	850	2.8	600	1.8	420	1.4	340	0.8	920	3.3	2,100	11.6
—	10	0.157	0.157	800	2.8	560	1.8	400	1.4	320	0.8	880	3.4	1,900	11.8
1/2	12.7	0.200	0.200	640	2.8	450	1.8	320	1.4	260	0.8	690	3.4	1,600	11.8
5/8	15.875	0.250	0.250	510	2.8	360	1.8	260	1.4	210	0.8	560	3.4	1,300	11.8
—	16	0.252	0.252	500	2.8	350	1.8	250	1.4	200	0.8	550	3.4	1,200	11.8
3/4	19.05	0.300	0.300	430	2.8	300	1.8	210	1.4	170	0.8	460	3.4	1,100	11.8
—	20	0.315	0.315	400	2.8	280	1.7	200	1.4	160	0.8	440	3.4	960	11.8
—	25	0.394	0.394	320	2.5	220	1.5	160	1.3	130	0.7	350	3.3	760	11.4
1	25.4	0.400	0.400	320	2.4	230	1.5	160	1.3	130	0.7	350	3.2	770	11.2
1 1/4	31.75	0.500	0.500	260	1.6	180	1.0	130	1.0	110	0.6	280	2.0	610	7.5

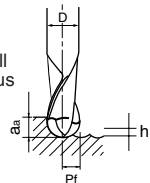
Finishing Condition

Work Material				Carbon Steels		Alloy Steels		Die Steels Stainless Steels		Nickel Alloys Titanium Alloys		Cast Iron		Aluminum Alloys Copper Alloys Nonferrous Alloys	
Milling Conditions															
Dia. of Mill		Depth of Cut (inch)													
(inch)	(mm)	a _s	Pf	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
—	2	0.008	0.011	6,600	13.0	4,600	8.3	3,300	5.1	2,700	3.2	7,300	15.0	16,000	39.4
1/8	3.175	0.008	0.014	5,200	13.8	3,500	8.7	2,500	5.5	2,000	3.3	5,700	15.9	12,400	41.3
—	4	0.008	0.016	4,600	14.6	3,200	9.1	2,300	5.9	1,800	3.4	5,000	16.5	11,000	43.3
3/16	4.7625	0.008	0.017	2,900	9.8	2,100	6.3	1,500	4.0	1,200	2.3	3,000	11.0	6,400	29.9
—	6	0.020	0.019	2,400	10.2	1,700	6.7	1,200	4.3	960	2.5	2,600	11.8	5,800	31.5
1/4	6.35	0.020	0.020	2,400	10.6	1,700	7.1	1,200	4.4	970	2.6	2,500	12.2	5,700	32.7
3/8	9.525	0.020	0.024	1,900	12.2	1,400	8.0	920	5.0	750	3.0	2,100	14.4	4,300	37.4
—	10	0.020	0.025	1,800	12.6	1,300	8.3	900	5.1	730	3.1	2,000	15.0	4,400	39.4
1/2	12.7	0.020	0.028	1,600	13.4	1,200	8.9	780	5.5	650	3.4	1,800	16.3	3,900	41.3
5/8	15.875	0.020	0.031	1,400	15.4	1,000	9.6	700	6.1	580	3.7	1,600	18.2	3,400	44.9
—	16	0.020	0.031	1,400	15.4	1,000	9.8	700	6.3	570	3.8	1,600	18.5	3,400	45.3
3/4	19.05	0.020	0.034	1,400	17.1	920	10.4	620	7.0	530	3.9	1,500	19.5	3,200	51.2
—	20	0.020	0.035	1,300	17.3	890	10.6	600	7.1	510	3.9	1,400	19.7	3,100	51.2
—	25	0.020	0.039	1,100	18.1	800	11.8	600	7.9	450	4.3	1,300	22.4	2,700	55.1
1	25.4	0.020	0.040	1,100	18.5	810	12.0	600	7.9	460	4.4	1,300	22.6	2,700	55.1
1 1/4	31.75	0.020	0.044	950	20.1	710	13.2	480	7.9	400	4.8	1,100	23.0	2,400	61.0

1) In finishing process, depth of cut (a_s & Pf) is calculated the casp (=h) to be 0.004".

2) In dry milling, reduce the RPM and feed rate 30% of values on table above. (recommended air blow)

3) Adjust milling condition when unusual vibration or sound occurs.

D: Dia. of Mill
R: Ball RadiusTechnical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

Roughing and Finishing (Heavy Duty) End Mills List No. 6367

Work Material		Carbon Steels		Alloy Steels		Die Steels Stainless Steels		Nickel Alloys Titanium Alloys		Cast Iron		Aluminum Alloys Copper Alloys Nonferrous Alloys	
Milling Conditions													
Dia. of Mill (inch)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
1/4		1,300	5.9	900	3.7	700	2.1	510	1.5	1,600	17.3	3,100	31.5
3/8		820	5.9	600	3.8	410	2.1	340	1.5	1,100	17.7	2,100	32.1
1/2		620	5.9	450	3.8	310	2.1	260	1.5	800	17.3	1,600	31.9
5/8		490	5.9	360	3.7	250	2.1	210	1.5	610	17.1	1,300	31.5
3/4		410	5.6	300	3.6	210	2.0	170	1.4	510	16.3	1,100	31.5
1		310	5.5	230	3.5	160	2.2	130	1.4	380	15.7	800	29.5
1 1/4		250	4.3	180	2.7	130	1.5	110	1.1	310	12.6	700	23.6
1 1/2		210	3.5	150	2.2	110	1.2	90	0.8	260	9.8	600	18.5
1 3/4		180	2.4	130	1.6	90	0.9	80	0.6	220	7.5	500	13.8
2		160	2.0	120	1.4	80	0.7	70	0.5	190	5.9	400	11.0
Depth of Cut	a _s	1.5D											
	a _r	0.25D											
	H	0.5D											

Roughing (HOG) End Mills	List No. 6303
Roughing (HOG) End Mills / Fine Pitch Multi Flute	List No. 6307
Roughing (HOG) End Mills / 3 Flute for Aluminum ¹⁾	List No. 6305 ¹⁾

Work Material		Carbon Steels		Alloy Steels		Die Steels Stainless Steels		Nickel Alloys Titanium Alloys		Cast Iron		Aluminum Alloys	
Milling Conditions												Copper Alloys	
		Dia. of Mill (inch)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
1/4		1,300	5.1	900	3.1	700	1.7	510	1.2	1,600	6.7	3,100	26.4
3/8		820	5.1	600	3.1	410	1.7	340	1.2	1,100	6.7	2,100	26.4
1/2		620	5.1	450	3.2	310	1.7	260	1.2	800	6.7	1,600	26.4
5/8		490	5.1	360	3.1	250	1.7	210	1.2	610	6.7	1,300	26.4
3/4		410	5.1	300	3.0	210	1.7	170	1.2	510	6.7	1,100	26.4
1		310	5.1	230	3.1	160	1.8	130	1.2	380	6.7	800	26.4
1 1/4		250	4.9	180	3.1	130	1.8	110	1.2	310	6.7	700	26.4
1 1/2		210	3.5	150	2.3	110	1.3	90	0.9	260	5.3	600	21.7
1 3/4		180	2.6	130	1.6	90	0.9	80	0.6	220	3.7	500	15.7
2		160	2.4	120	1.6	80	0.9	70	0.6	190	3.5	400	14.2
Depth of Cut		a _s	1.5D										
		a _r	0.25D										
		H	0.5D										

Roughing (HOG) End Mills / Metric List No. 6304

Work Material		Carbon Steels		Alloy Steels		Die Steels Stainless Steels		Nickel Alloys Titanium Alloys		Cast Iron		Aluminum Alloys Copper Alloys Nonferrous Alloys	
Milling Conditions													
Dia. of Mill (mm)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
12		660	5.1	460	3.2	330	1.8	270	1.2	800	6.7	1,300	26.4
15		530	5.1	370	3.1	270	1.8	210	1.2	640	6.7	1,100	26.4
20		400	4.7	280	3.0	200	1.7	160	1.1	480	6.7	800	25.6
25		320	4.3	220	2.8	160	1.6	130	1.1	380	6.3	700	24.8
30		270	3.9	190	2.5	130	1.4	110	0.9	320	5.9	600	22.4
40		200	2.6	140	1.7	100	0.9	80	0.6	240	3.9	500	14.6
50		160	1.9	110	1.2	80	0.7	64	0.4	190	2.8	400	10.6
Depth of Cut	a _a	1.5D											
	a _r	0.25D											
	H	0.5D											

1) Please refer to the condition of "Aluminum Alloys" when machining Aluminum materials.

2) The above cutting speeds and feeds apply to regular end mill flute length.

For long fluted end mills please use the following factors below:

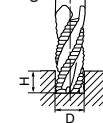
Cutting Length	Reduce Feed by
2.5 × Diameter	15%
3 × Diameter	25%
4 × Diameter	55%

3) In dry milling, reduce the RPM and Feed 30% of values on table above. (recommended air blow)

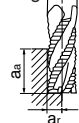
4) Adjust drilling condition when unusual vibration or sound occurs.

D: Dia. of Mill

Slotting



Side Milling



Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

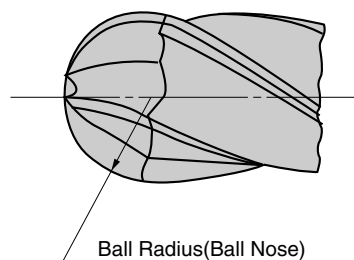
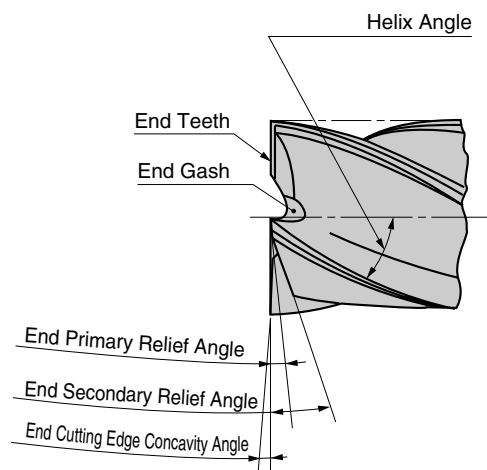
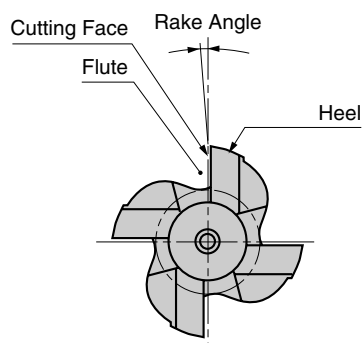
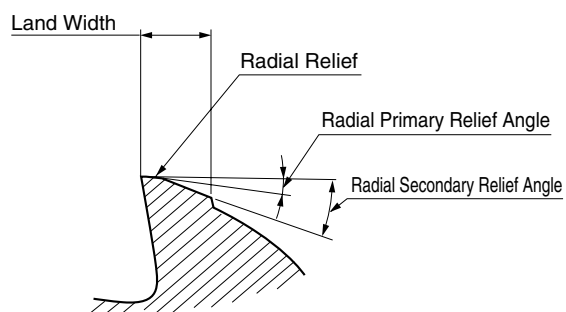
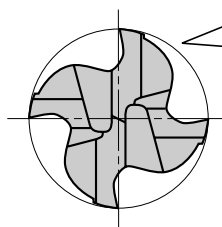
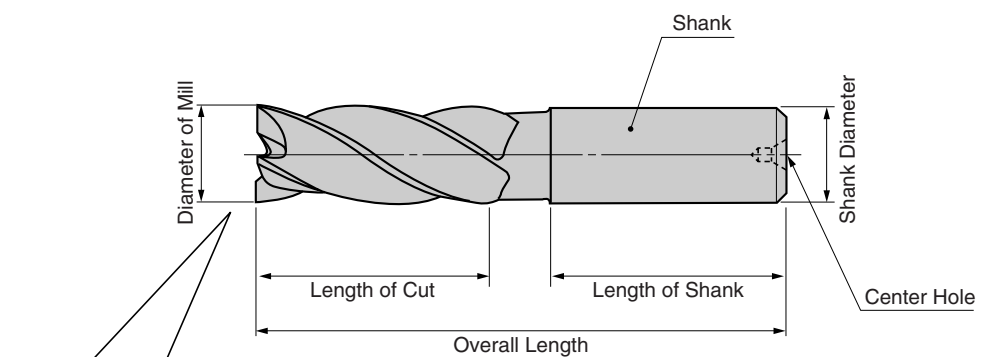
END MILLS
Cutting Condition

TAPS

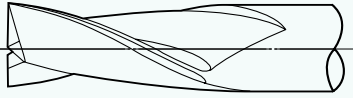
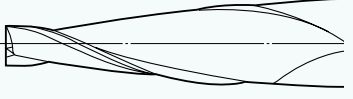
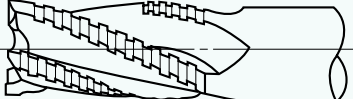
TAPS
Cutting Condition

Others

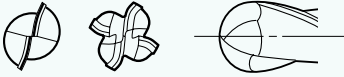
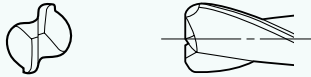
END MILL NOMENCLATURE



THE PERIPHERAL TEETH AND THE FEATURES

Type	Form	Features
Square type		• Used for general purpose, that is slotting, side milling, etc. • Used for every cutting. That is rough cut, semi-finish cut and finish cut.
Tapered type		• Used for milling of draft angle of die components. • The peripheral teeth is taper.
Roughing type (HOG)		• Suitable for rough milling, because of the small cutting resistance, and small cutting chips by the wavy type nicks. • Do not use for finish milling because of too much roughness.
HEAVY type (Roughing and Finishing)		The cutting resistance is larger than roughing endmill, but smaller than square teeth endmill. Suitable for semi-finish milling and the parts which not required accurate tolerance.

THE END TEETH TYPE AND THE FEATURE

Type	Form	Features
Square type with center hole		• Used for general purpose, that is slotting, side milling, etc. • Can not be used for plunge feed.
Square type without center hole		• Used for general purpose, that is slotting, side milling, etc. • Can be used for plunge feed. 2 Flutes is better than multi flutes for plunge cut.
Ball		• Used for contour milling or copy milling of die components. • The center of teeth does not have better cutting performance because of too small chip pocket and cutting speed.
Corner radius		• Suitable for radius shape milling for corner of die components or machine parts. • Suitable for high-speed contour milling because of it's rigidity.

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

END MILLS / TOLERANCE OF DIAMETER

DESCRIPTION	LIST NO.	Dia. of Mill		TOLERANCE (Inch)
		Above	Up to	
2-FLUTE SINGLE END	6230		10(mm)	0/-0.0008
		10(mm)	30(mm)	0/-0.0010
		30(mm)		0/-0.0012
	6231	1/8~2(Inch)		+0.0010/0
	6231X	1/8~1-1/2(Inch)		+0.0010/0
	6231H	1/4~2(Inch)		+0.0030/0
	6233	1/4~2(Inch)		+0.0010/0
	231	1/8~2-1/2(Inch)		+0.0010/0
	291	1/8~2(Inch)		+0.0010/0
	6291	1/8~1-1/2(Inch)		+0.0010/0
	6290	1.5~40.0(mm)		0/-0.0010
	6293	1/4~1-1/4(Inch)		+0.0030/0
2-FLUTE DOUBLE END	261	1/8~1(Inch)		0/-0.0015
	6261	1/8~1(Inch)		0/-0.0015
	295	1/8~1(Inch)		0/-0.0015
	6295	1/8~1(Inch)		0/-0.0015
4-FLUTE SINGLE END	6210		10(mm)	+0.0008/0
		10(mm)	30(mm)	+0.0010/0
		30(mm)		+0.0012/0
	6213	1/4~1-1/4(Inch)		+0.0010/0
	211	1/8~2(Inch)		+0.0010/0
	213	1/4~2(Inch)		+0.0010/0
	215	1/4~1-1/4(Inch)		+0.0010/0
	6281		3/8(Inch)	0/-0.0023
		3/8(Inch)	5/8(Inch)	0/-0.0028
		5/8(Inch)	1(Inch)	0/-0.0033
		1(Inch)		0/-0.0039

DESCRIPTION	LIST NO.	Dia. of Mill		TOLERANCE (Inch)
		Above	Up to	
4-FLUTE DOUBLE END	6241	1/8~1(Inch)		+0.0030/0
	271	1/8~1(Inch)		0/-0.0015
	6271	1/8~1(Inch)		0/-0.0015
MULTI-FLUTE SINGLE END	6211M	1/8~2(Inch)		+0.0010/0
	6211X	1/8~1-1/2(Inch)		+0.0010/0
	6201	1/8~2(Inch)		+0.0010/0
	6203	1/4~2(Inch)		+0.0010/0
	6207	1/4~2(Inch)		+0.0010/0
	6303	1/4~2(Inch)		±0.0040
ROUGHING (HOG)	6303P	1/4~2(Inch)		±0.0040
	6305	1/4~2(Inch)		±0.0040
	6307	1/4~2(Inch)		±0.0040
	6304	12.0~50.0(mm)		±0.0040
	6303X	1/4~2(Inch)		±0.0040
	6367	1/4~3(Inch)		+0.0010/0
ROUGHING AND FINISHING	6367P	1/4~2(Inch)		+0.0010/0
	6367X	1/4~2(Inch)		+0.0010/0
PM-HSS HIGH HELIX	7221P	1/4~1-1/2(Inch)		+0.0010/0
GENAC"SG" 2-FLUTE SINGLE END	9261X	1/8~1(Inch)		0/-0.0020
	9265X	1/8~1(Inch)		0/-0.0020
	9271X	1/8~1(Inch)		0/-0.0020
	9275X	1/8~1(Inch)		0/-0.0020
GENAC"SG" 4-FLUTE SINGLE END	9263X	1/8~1(Inch)		0/-0.0020
	9267X	1/8~1(Inch)		0/-0.0020
	9273X	1/8~1(Inch)		0/-0.0020
	9277X	1/8~1(Inch)		0/-0.0020
GENAC"SG"ROUGHING	9251X	1/4~1-1/4(Inch)		0/-0.0020
HIGH HELIX 3-FLUTE	9221X	1/8~1(Inch)		0/-0.0020

Milling Terminology

Terms	Descriptions	Formulas
SFM	Surface Feet Per Minute	$D \times \text{RPM} \times 0.26$
RPM	Revolutions Per Minute	$\frac{\text{SFM} \times 3.82}{\text{RPM}}$
D	Cutter Diameter	

1. Correct Selection of End Mills

It is necessary to choose the most suitable end mills considering cutting efficiency, accuracy and so on for high efficient machining.

Tool Material

HSS-Co (equivalent to SKH59) shows excellent performance for cutting normal steel to non-ferrous alloy and cast iron. Select coated HSS, PM-HSS, FAX or Carbide for more efficient and long lasting milling.

Number of Flutes

Generally, 2-Flute is used for slot milling because of its wide chip pocket. 4-Flute is used for side milling because of its high rigidity.

Helix Angle

Generally 30° is used because better surface finish is obtained by helix angle around 30°. Lower helix is good for keyway slotting because the slot inclination is small. The bigger is the helix, the better will be the surface finish so that the high helix end mills will be used for contour milling.

Guidance for no. of flutes selection

Functions	Characteristics	No. of Flutes	
		2-Flt	4-Flt
Strength	Twist rigidity	○	◎
	Bending rigidity	○	◎
Surface Finish	Roughness	○	◎
	Waving	○	◎
	Inclination	○	◎
Tool Life S50C _(200HB)	Feed (mm/tooth) constant	○	◎
	Wear Broken	○	◎
SKD11 _(320HB)	Feed (mm/min.) constant	○	◎
	Wear Broken	○	◎
Chip disposal	Chip jam	○	◎
	Chip exhaust	○	◎
Resharpening	Out dia relief	◎	○
	End teeth	◎	○
Form modify	Ball nose, Taper Form	◎	○

◎ Great ○ Good

Functions	Characteristics	No. of Flutes	
		2-Flt	4-Flt
Drilling	Counter Sink	◎	○
	Surface Roughness	◎	○
	Enlargement of Holes	◎	○
Cutting	Finishing	○	◎
	Light Duty	○	◎
	Heavy Duty	○	◎
Slotting	Chip exhaust	◎	○
	Enlarge, Eccentricity	◎	○
	Keyway Cutting	◎	○
Side Milling	Milling Accuracy	○	◎
	Chattering Vibration	◎	○
Work Material	Alloy Steel	○	◎
	Cast Iron	○	◎
	Non-ferrous material	◎	○
	Difficult machining	○	◎

◎ Great ○ Good

Characteristics of end mill helix

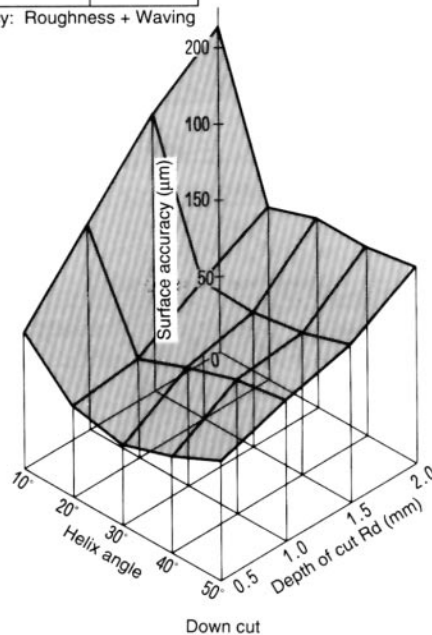
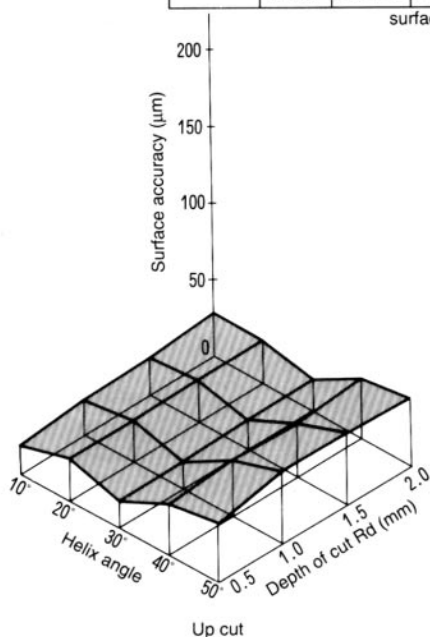
Range of helix angle	Cutting resistance			Surface accuracy			Tool life			Resharpening	
	Torque	Bendg	Thrust	Roughness	Waving	Inclination	Flank Wear	Out dia. Downsize	Breakage	Peripheral Relief	End teeth
Low helix	○	○	●	○	●	●	○	△	○	●	●
Standard helix	●	●	○	●	○	○	●	○	●	●	●
High helix	●	●	△	●	△	○	○	●	○	○	○

● Great ○ Good △ OK —Judging from usage of end mills

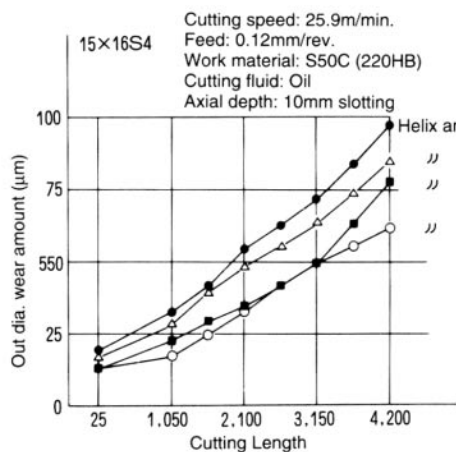
HELIX ANGLE AND SURFACE ACCURACY

End mill	Speed	Feed	Material	Axial Depth	Cutg. Fluid
15S4	20.6 m/min.	0.05 mm/Tth	S50C (200HB)	35mm	Oil

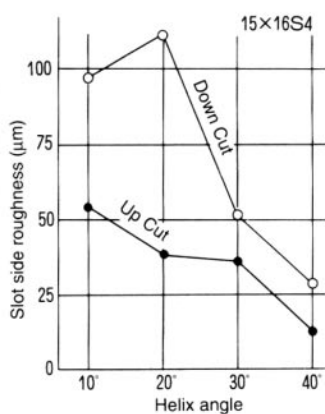
surface accuracy: Roughness + Waving



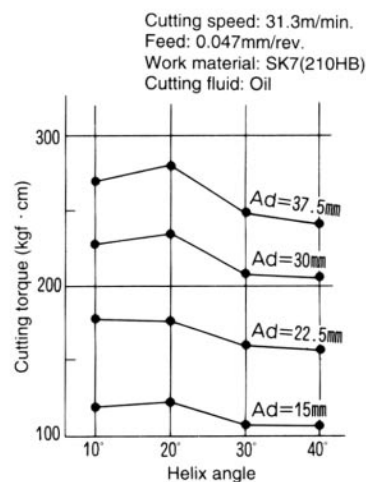
Helix angle & Surface accuracy



Relation between Helix angle and Out dia wear amount



Relation between Helix angle and Slot side roughness



Relation between Helix angle and Cutting torque

2. Maintenance of machine and Fixture

3. Correct Holding of End Mills

It is important for the milling chuck to have the following conditions.

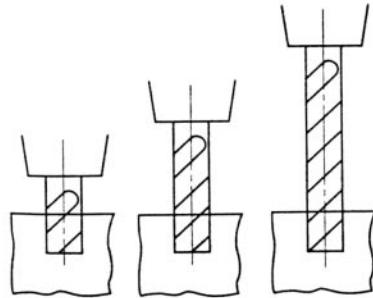
1. Strong chucking force
2. Accurate chucking
3. Rigid chucking
4. Easy handling
5. Excellent safety

4. Firm fixture of the work

5. Proper selection of cutting conditions

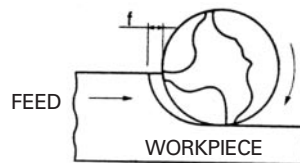
6. Proper resharping

STRENGTH COMPARISON BY FLUTE LENGTH

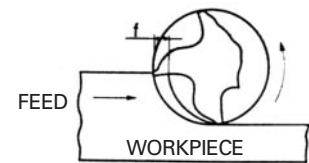


Flute length ratio	1	1.4	2.5
Strength ratio	155	19	1

CUTTING DIRECTION



UPCUT



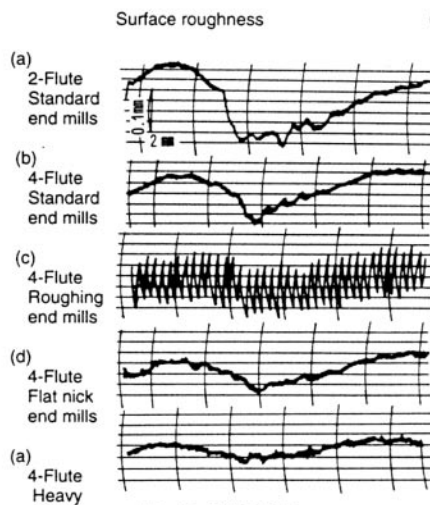
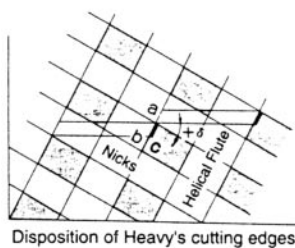
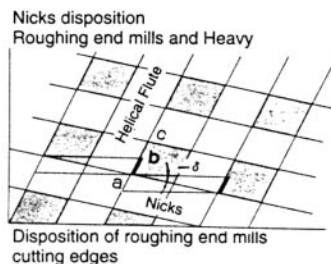
DOWNCUT

	Surface Finish	Tool Life	Application
Upcut			Finish
Downcut			Rough or Semi Finish

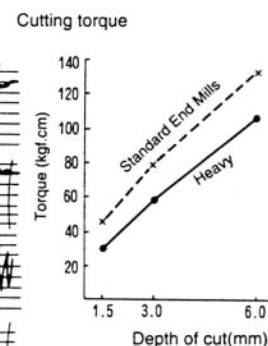
HEAVY'S FEATURES (Rough and Finish)

1. Nachi Heavy is designed with specially formed and disposed nicks so that it may decrease cutting resistance and minimize waviness or vibrations on the surface finish.
2. Diameter rotation generates a straight line. Therefore surface finish is excellent.
3. Chips flow out easily because of their chopped form.
4. Cutting fluid penetration is very smooth.

Example of Heavy and other end mills performances



Material: SK7,200HB
End mill: $\phi 15$
Speed: 20.6 m/min.
Feed: 52mm/min.(down cut)
Depth of cut: Ad=30mm, Rd=4mm
Cutting fluid: oil



Material: SKD11,210HB
End mill: 12, 4-flute
Speed: 20.7m/min.
Feed: 0.025mm/tooth
Width of cut: 21.5mm
Cutting fluid: oil

NACHI THE BETTER END MILL

CNC Tolerances

New Nachi Premium Material End Mills are now made to CNC cutting diameter tolerances. The present close tolerance of Nachi End Mills is now closer than ever, as per table below.

Lead Specified

New Nachi Premium Material End Mills have the lead of spiral marked on the shank. This eliminates measuring the lead when setting up for resharpening and is a real time saver.

M-42

**PM
HI-HELIX**

**EXCELL
MILL**

**ROUGH &
FINISH**

**HOG
MILL**



NACHI CNC TOLERANCE (Cutting Diameter)

+0.0010 0				0 -0.0010	
List No.	Tool No.	List No.	Tool No.	List No.	Tool No.
6201	PF	6233	PGE	6230	MPG
6203	PFL	6367	PK	6290	MPR
6207	PFX	6367P	PKP	±.0040	
6210	HPF	6367X	PKX		
6211M	PFC	7221P	PHP	6303	PQ
6211X	PFCX	0 -0.0015		6303P	PQP
6213	PFLC			6303X	PQX
6231	PG	6261	PC	6304	MPQ
6231X	PGX	6295	PRR	6305	PQA
				6307	PQF

*Some items, present stock until depleted.

WHEN PERFORMANCE COUNTS, COUNT ON GENAC

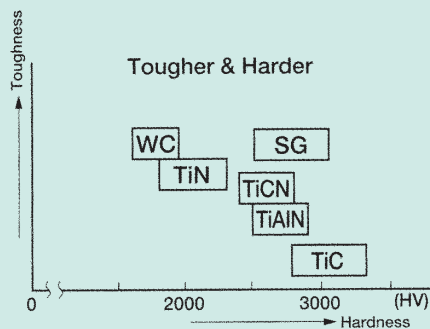
Genac Mills provide

- Higher Productivity
- Greater Cost Efficiency
- Highest Wear Resistance
- 3x Longer Life than TiN Carbide
- Precision Cutting
- ...and unique Nachi Geometry

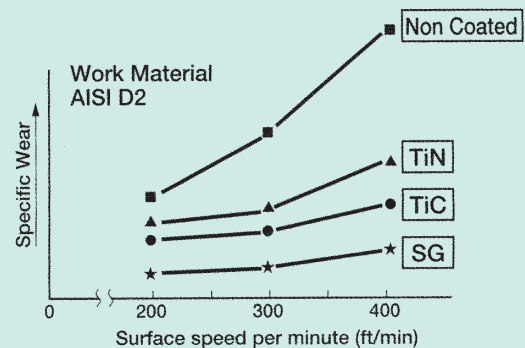
Plus Nachi's unique start-to-finish total quality control for higher precision, better performance, closer tolerances and greater durability. Genac mills available in six standard types for super cutting performance. **All Competitively Priced!**



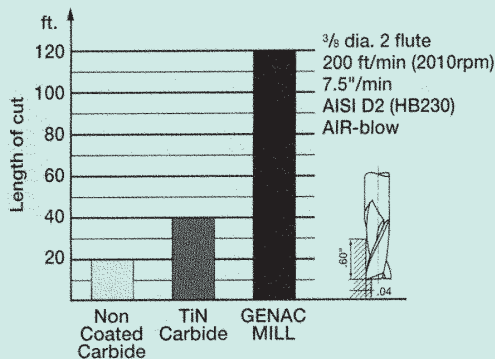
"SG" Coating with High Toughness & Hardness



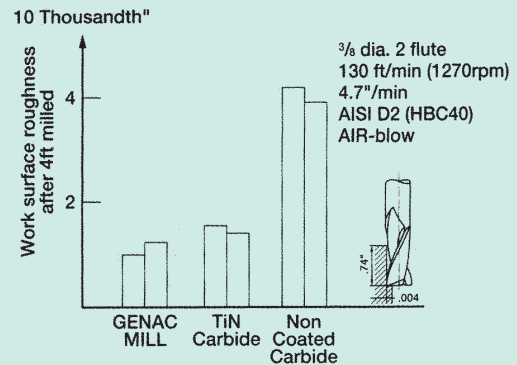
"SG" Coating offers Superior Wear Resistance



Tool Life



Surface Roughness



Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

RESHARPENING OF END MILLS

End mills should be sharpened before wear land exceeds the values shown in table to the right by grinding the cutting surface. Care should be taken to duplicate the original factory rake angle.

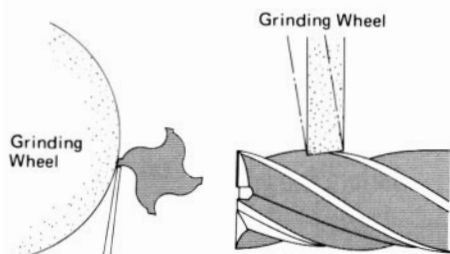
Peripheral Primary Relief Wear	Kind of Cutting Operation
.004 - .006	Precision Cutting Keyway Cutting
.012 max.	General Cutting
.020 - .025	Rough Cutting

Grinding Wheel Selections and Grinding Operations

End Mill Material	Application	Shape	Wheel Identification	Wheel (SFPM)	Infeed (.0001"/pass)
Cobalt High Speed Steel	Peripheral Relief	Straight	WA60J, WA60K	3800~5000	Rough 12~24 Finish 4~12
	End Teeth	Flare Cup	WA60~80K		
	Tooth Face	Dish	WA60K, WA80K		
Cobalt Vanadium High Speed Steel	Peripheral Relief	Straight	CBN 120~220	3800~5000	Rough 4~8 Finish 2~4
	End Teeth	Flare Cup	CBN 120~140		
	Tooth Face	Dish	CBN 120~140		
Carbide	Rough	Straight Flare Cup Dish	DA100N	2600~3300	4~8
			GC60~80GmV		12~24
	Finish	Straight Flare Cup Dish	DA150~180N		2~12
			GC100~120GmV		4~12

Resharpener Methods

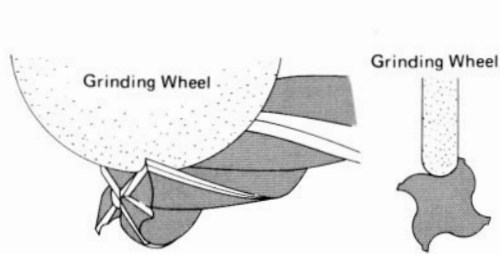
Primary Relief Grinding



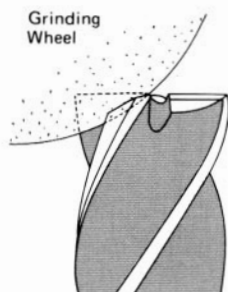
End Primary Relief Grinding



Tooth Face Grinding



End Gash Grinding

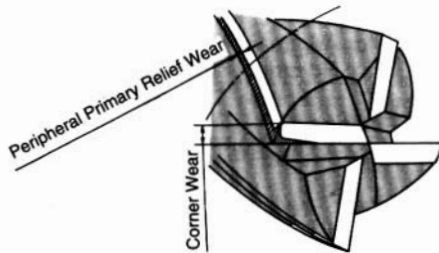


Application for Relief Angle, and Radial Rake Angle

Work Material	Radial Relief		Axial Relief		Tooth Face (Radial Rake Angle)
	Primary	Secondary	Primary	Secondary	
Steel	6° ~ 10°	20° ~ 25°	3° ~ 7°	10° ~ 25°	15°
Cast Iron	8° ~ 12°	20° ~ 25°	3° ~ 7°	10° ~ 25°	12°
Copper	10° ~ 15°	20° ~ 25°	8° ~ 12°	10° ~ 25°	10° ~ 20°
Light Alloy, Non-Ferrous Metal	10° ~ 15°	20° ~ 25°	8° ~ 12°	10° ~ 25°	15° ~ 20°

As for smaller mill dia, adopt bigger peripheral relief angle.

RESHARPENING OF END MILLS



Peripheral Primary Relief Wear(mm)	Kind of Cutting Operation
0.1 ~ 0.15	Precision Cutting Keyway Cutting
0.3	General Cutting
0.5 ~ 0.7	Rough Cutting

Timing for Resharpener

Proper tooth profile must always be kept to ensure a longer tool life so that a higher productivity can be achieved. Generally, a timing for the resharpener can be observed by a wear on the peripheral primary relief as in shown above.

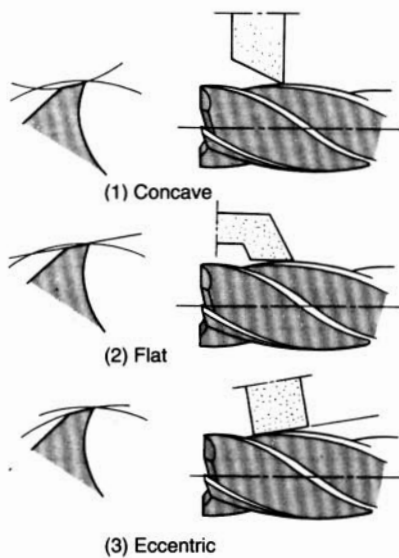
Resharpener methods of end mills are classified into (A) Peripheral Primary Relief Grinding for conventional types of end mills

(B) Tooth Face (Rake Face) Grinding for roughing end mills, and coated end mills and formed end mills.

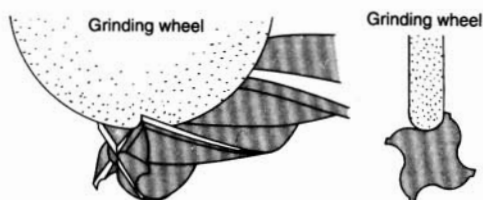
(C) End Tooth Grinding for Keyway end mills.

In case of (A), (C) is also required after 2 - 3 times of regrounding.

Out Dia. Relief Grinding

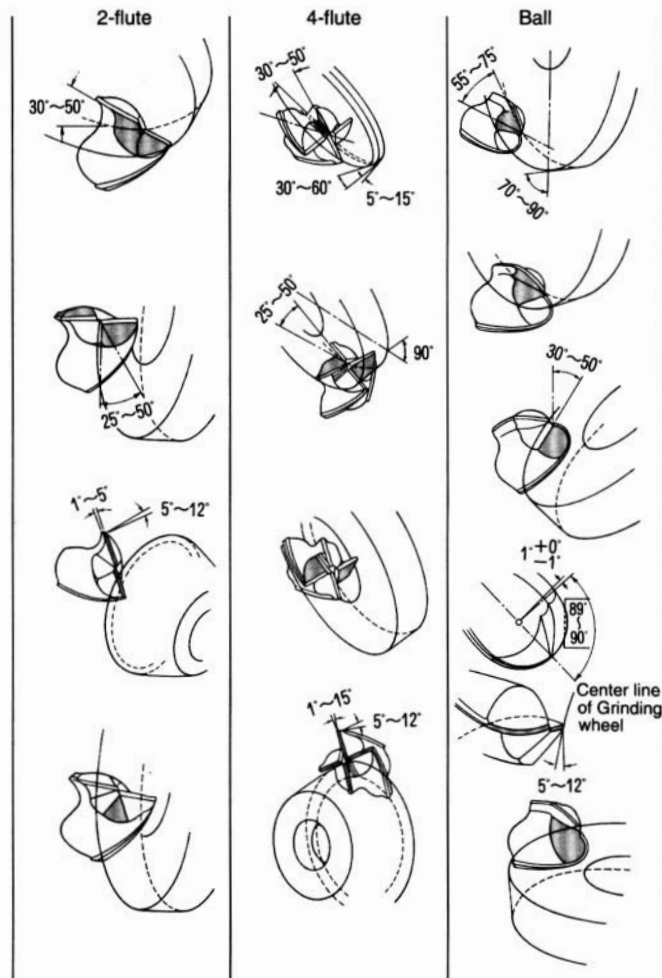


Tooth Face Grinding



In regrounding coated end mills, tooth face (rake face) grinding is desirable.

End Tooth Grinding

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

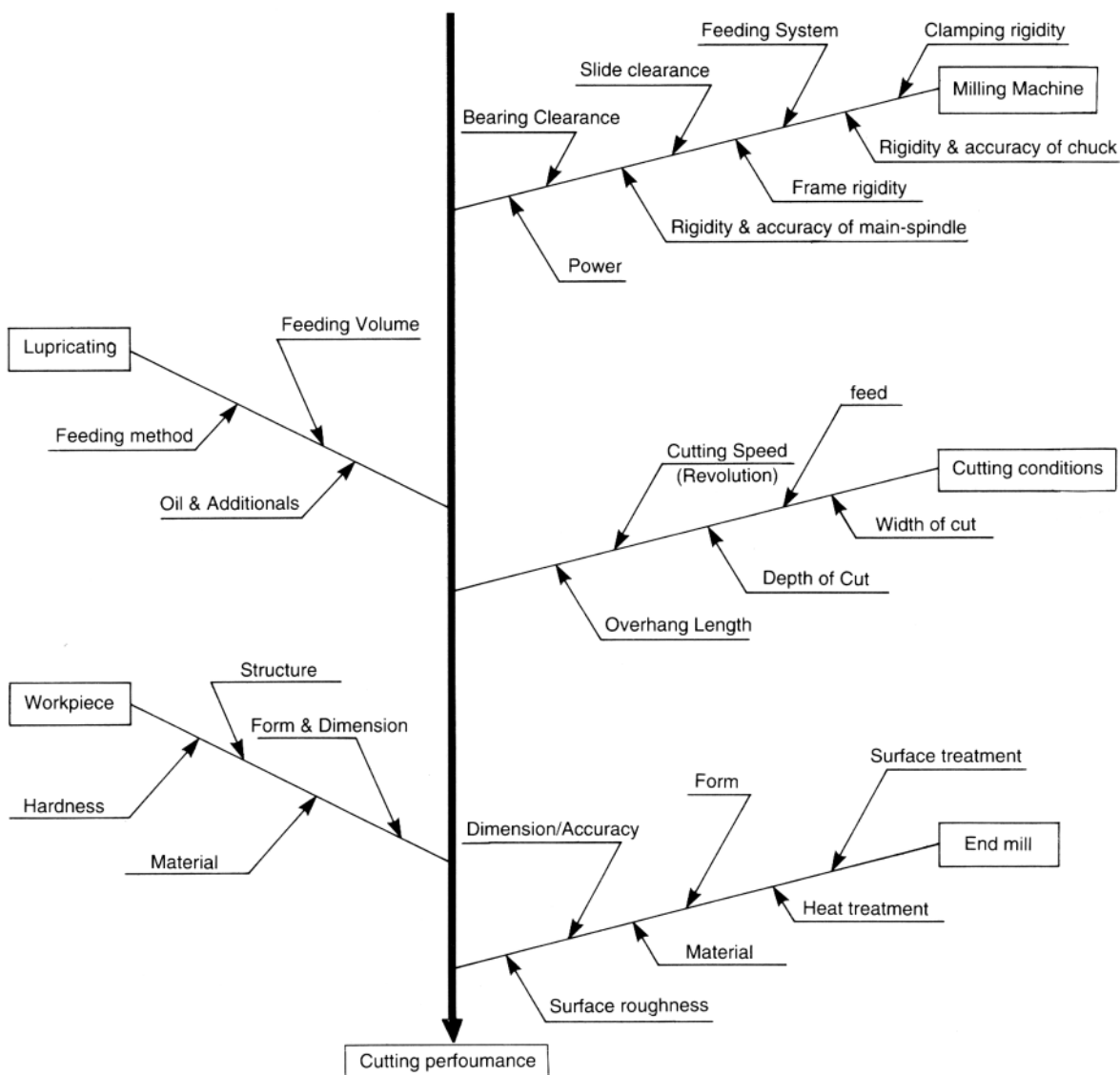
TAPS

TAPS
Cutting Condition

Others

CAUSES AND REMEDY FOR END MILL PROBLEM

Factors of end mill performance There are such causes which affect the end mill performance as shown in the figure. This so many factors are affecting the performance and end mills can not work well unless every factor is in the best condition.



Cutting Performance	
1. Finished Accuracy	5. Breakage
2. Finished Roughness	6. Cutting noise
3. Wear	7. Burned Chips
4. Chipping	

TROUBLE-SHOOTING GUIDE FOR END MILL PROBLEMS

	Troubles	Factors	Countermeasures
Surface Roughness	Rough Finish	Chatter	• Increase rigidity of workpiece fixture • Check machine condition, horsepower (H,P) • Reduce cutting speed • Consider conventional (up-cut) milling • Use shortest possible length of tool, consider using special long reach holder
		Uneven hardness of workpiece	• Use even hardness material
		Insufficient rake or relief	• Resharpener cutter to correct geometry to suit cutting conditions
		Built-up edge, cold welding	• Remove built-up edge & cold welding • Check deterioration of cutting fluid
		Dull cutting edge	• Provide timely resharpener
		Speed too high	• Reduce cutting speed
		Improper or lack of cutting fluid	• Change cutting fluid or lubricating system
	Torn Finish	Uneven wear on teeth	• Remove wear by regrinding
		Cold welding on teeth	• Remove cold welding • Change cutting fluid
	Waviness	Bruise on teeth	• Handle end mill carefully
		Too small number of flutes Heavy cutting conditions Helix angle too big	• Try multi flute end mill, 2FLfi3FLfi4FL • Reduce amount of radial depth of cut and feed • Use lower helix angle end mill
Form Error	Squareness (Perpendicularity)	Heavy cutting conditions Excessive overhang of cutter or workpiece Angular error of fixture	• Reduce depth of cut and feed • Use shortest possible length of tool, consider using special long reach holder • Correct fixture angle
Tool Life	Short Life per Resharpener	Material too hard	• Provide proper annealing • Reduce feed and use upper grade material end mill
		Incorrect feed	• Define proper feed
		Built-up edge, cold welding	• Remove built-up edge or cold welding • Use activative cutting fluid
		Insufficient coolant	• Use proper cutting fluid • Increase rate of coolant flow
		Incorrect resharpener	• Resharpener cutter to correct geometry to suit cutting conditions
	Total Tool Life Too Short	Less number of resharpener	• Regrind relief angle smaller • Provide proper resharpener amount
		Improper time of resharpener	• Provide timely resharpener
	Excessive Wear	Material defect of workpiece	• Use evenness hardness material
		Improper rake or relief	• Resharpener cutter to correct geometry to suit cutting conditions
		Insufficient performance of end mill	• Use upper grade material end mill • Try to use coated end mill
		Unsuitable cutting fluid	• Select proper cutting fluid • Correct lubricating system
		Improper time of resharpener	• Provide timely resharpener
		Incorrect resharpener	• Improve surface roughness on resharpener • Prevent overheat of cutter grinding • Remove built-up edge and weld deposit
	Chipping or Cracking	Chatter	• Increase rigidity of workpiece fixture
		Material defect or workpiece	• Use even hardness material • Remove abnormal parts such as scale, sandtumbling etc.
		Feed too high	• Reduce feed speed
		Dull cutting edge	• Provide resharpener
		Deterioration of cutting fluid	• Provide new cutting fluid
	Breakage	Lack of rigidity in set-up	• Check component or fixture for security and rigidity
		Dull cutting edge	• Provide Resharpener
		Careless handling	• Handle end mill carefully
		Chip cram	• Remove chips by air-jet cutting fluid

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

TAPS

Visual Index

- Guide to Mark
- Technical Information
- Selection Chart
- Sizes
- Cutting Condition
- Technical Reference

Features

1. **Nachi Viper Taflet Taps** are specially engineered for steels, and require less torque than conventional coldform taps. This reduces the chance of breakage.
2. **Nachi Viper Taflet Taps** are steam oxide surface treated to limit adhesion from fusion, and carries coolant to the work area. Bright finish is available when required.
3. **Nachi Viper Taflet Taps** have more radial sections for higher accuracy of internal threads in steel. This compares favorably to coldform internal threads, which aren't always clean and accurate.



VIPER TAFLET

Work Materials

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

Performance

TAFLET

Fiber flow is:

NOT INTERRUPTED.

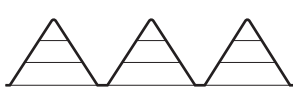


Female thread cut by a TAFLET

Cutting Tap

Fiber flow is:

INTERRUPTED.



Female thread cut by a cutting tap

Features of TAFLET

Item	Cutting tap	TAFLET	TAFLET features
Tap breakdown	×	○	Does not break because there is no groove
Trouble caused by chips	×	○	No trouble because there is no chip
Accuracy of female thread	×	○	Little variations because of cold forming tapping
Female thread surface roughness	×	○	Excellent because threads are finished by sliding over the tap surface
Tapping torque	○	×	1.5 through 2.5 times the torque of a cutting tap
Female thread strength	×	○	Excellent because fiber flow is not interrupted in plastic working
Workpiece	○	×	Limited to the material of good malleability



DLC TAFLET

DLC TAFLET

NEW

Semi-Dry Tapping

Forming tap with DLC coating can be used in Aluminum, Aluminum Alloys, Die Cast Aluminum.

The tap shown below, M6x1.0, tapped 1,000 holes in A6061 with mist hole lube applied and has minimum adhesion of material.

Size: M6x1.0

Work Material: A6061-T6

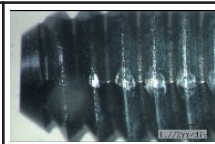
Speed: 15m/min (49.2SFM)

Feed: 1.0mm/rev (0.039IPR)

Depth of Thread: 13mm

Coolant: mist lube (25cc x 2 nozzle /h)

1000
Hole



Stocked Size	Taps Name	List No.	Page
	DLC TAFLET THREAD FORMING TAPS / Fractional Sizes	6955	234
	DLC TAFLET THREAD FORMING TAPS / Machine Screw Sizes	6957	234
	DLC TAFLET THREAD FORMING TAPS / Metric Sizes	6956	235
	VIPER TAFLET THREAD FORMING TAPS / Machine Screw Sizes	995	246
	VIPER TAFLET THREAD FORMING TAPS / Fractional Sizes	995	247
	VIPER TAFLET THREAD FORMING TAPS / Metric Sizes	996	248

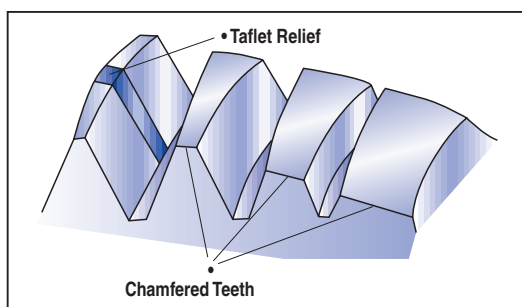
Features

- Viper T Series are suitable for various material.
- "Viper T for STAINLESS" series are the best taps for STAINLESS STEEL.

Work Materials

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

Performance



The results provide two-fold benefits. The first is minimal or no oversized thread diameter over the entire thread length, with smooth thread surfaces. The second is smooth chip ejection, ensuring freedom from chips for trouble-free performance, especially on machining centers and on unattended machining lines.



Nachi TDT Viper T-Series Taps were specifically designed to overcome the major difficulties of spiral fluted taps: oversizing and chip control. An all-new approach to these limitations also provides double-action tapping — **cutting** with chamfered teeth, plus **cold rolled forming** with a specially engineered shape of thread that we call Taflet Relief.



Conventional Taps

T-Series Taps

Stocked Size	Taps Name	List No.	Page
	VIPER T / Spiral Flute-Machine Screw Sizes	7981	239
	VIPER T / Spiral Flute-Fractional Sizes	7981	239
	VIPER T / Spiral Point-Machine Screw Sizes	7971	240
	VIPER T / Spiral Point-Fractional Sizes	7971	240
	VIPER T / Spiral Flute-Metric Sizes	7980	241
	VIPER T / Spiral Point-Metric Sizes	7970	241
	VIPER T / Spiral Flute-Machine Screw Sizes	7987	242
	VIPER T / Spiral Flute-Fractional Sizes	7987	242
	VIPER T FOR STAINLESS STEEL / Spiral Point-Machine Screw	7977	243
	VIPER T FOR STAINLESS STEEL / Spiral Point-Fractional Sizes	7977	243
	VIPER T FOR STAINLESS STEEL / Spiral Flute-Metric Sizes	7982	244
	VIPER T FOR STAINLESS STEEL / Spiral Point-Metric Sizes	7972	244

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

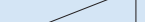
Others

HIGH PERFORMANCE TAPS

●:Great ○:Good △:OK

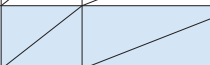
Taps Name	Material	Coating	Stock USA ● Japan ○		Stock Size	LIST No			Hole Condition				Workpiece Material										
						Page			<1.5 x Dia.	1.5 x Dia. ≤ 2.5 x Dia.	<1.5 x Dia.	1.5 x Dia. ≤ 2.5 x Dia.	Structural Steel	Carbon Steel	Alloy Steel (4140, 4330)	Pre- Hardened Steel	Die Steel	Hardened Steel		Stainless Steel	Cast Iron	Aluminum Alloy	Copper Alloys
						Size	Cutting Condition										HRc 25 to 40	HRc 45 to 50	HRc 50 to 65				
DLC TAFLET THREAD FORMING TAPS Fractional Sizes	HSSE-V	DLC	●	Inch	1/4 to 1/2	6955			●	○	●	○									●	●	
DLC TAFLET THREAD FORMING TAPS Machine Screw Sizes			●	Inch	2 to 12	6957			●	○	●	○									●	●	
DLC TAFLET THREAD FORMING TAPS Metric Sizes			●	Metric	2 to 12	6956			●	○	●	○										●	●
SG Low Spiral TAPS Machine Screw Sizes & Fractional Sizes	HSSE	SG	●	Inch	2 to 12, 1/4 to 1	6959			●	○	●	○	△	△	△	○	●	△			△	△	
SG Low Spiral TAPS Metric Sizes			●	Metric	3 to 24	6958			●	○	●	○	△	△	△	○	●	△			△	△	

VIPER T-SERIES FOR GENERAL PURPOSE

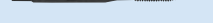
Taps Name	Material	Coating	Stock USA ● Japan ○		Stock Size	LIST No			Hole Condition				Workpiece Material										
						Page			<1.5 x Dia.	1.5 x Dia. ≤ 2.5 x Dia.	<1.5 x Dia.	1.5 x Dia. ≤ 2.5 x Dia.	Structural Steel	Carbon Steel	Alloy Steel (4140, 4330)	Pre- Hardened Steel	Die Steel	Hardened Steel		Stainless Steel	Cast Iron	Aluminum Alloy	Copper Alloys
						Size	Cutting Condition										HRc	HRc					
															25 to 40	45 to 50	50 to 65						
VIPER T / Spiral Point-Fractional Sizes	HSSE-V	Black Oxide	●	Inch	1/4 to 1	7971					●	●	○	○	○	○				○	○	○	
240						271																	
VIPER T / Spiral Point-Machine Screw Sizes			●	Inch	2 to 12	7971					●	●	○	○	○	○				○	○	○	
240						271																	
VIPER T / Spiral Point-Metric Sizes			●	Inch	M3 to M24	7970					●	●	○	○	○	○				○	○	○	
241						271																	
VIPER T / Spiral Flute-Fractional Sizes	●	Inch	1/4 to 1	7981			●	○	○	△	○	○	○	○				○	○	○			
239				271																			
VIPER T / Spiral Flute-Machine Screw Sizes	●	Inch	2 to 12	7981			●	○	○	△	○	○	○	○				○	○	○			
239				271																			
VIPER T / Spiral Flute-Metric Sizes	●	Inch	M3 to M24	7980			●	○	○	△	○	○	○	○				○	○	○			
241				271																			

VIPER T-SERIES FOR STAINLESS STEEL

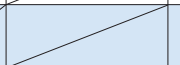
●:Great ○:Good △:OK

Taps Name	Material	Coating	Stock USA ● Japan ○		Stock Size	LIST No			Hole Condition				Workpiece Material										
						Page Size Cutting Condition			<1.5 x Dia.	1.5 x Dia. ≤ 2.5 x Dia.	<1.5 x Dia.	1.5 x Dia. ≤ 2.5 x Dia.	Structural Steel	Carbon Steel	Alloy Steel (4140, 4330)	Pre- Hardened Steel	Die Steel	Hardened Steel		Stainless Steel	Cast Iron	Aluminum Alloy	Copper Alloys
																	HRc	HRc					
																	25 to 40	45 to 50	50 to 65				
VIPER T / Spiral Point-Fractional Sizes	HSSE	Black Oxide	●	Inch	1/4 to 1	7977				●	○	△	△				●	△	△	△			
243 271																							
VIPER T / Spiral Point-Machine Screw Sizes			●	Inch	2 to 12	7977				●	○	△	△				●	△	△	△			
243 271																							
VIPER T / Spiral Point-Metric Sizes			●	Metric	M3 to M24	7972				●	○	△	△				●	△	△	△			
244 271																							
VIPER T / Spiral Flute-Fractional Sizes			●	Inch	1/4 to 1	7987			●	○	○	△	△	△	△			●	△	△	△		
242 271																							
VIPER T / Spiral Flute-Machine Screw Sizes			●	Inch	2 to 12	7987			●	○	○	△	△	△	△			●	△	△	△		
242 271																							
VIPER T / Spiral Flute-Metric Sizes			●	Metric	M3 to M24	7982			●	○	○	△	△	△	△			●	△	△	△		
244 271																							

VIPER TAFLET

Taps Name	Material	Coating	Stock USA ● Japan ○		Stock Size	LIST No			Hole Condition				Workpiece Material										
						Page Size Cutting Condition			<1.5 x Dia.	1.5 x Dia. ≤ 2.5 x Dia.	<1.5 x Dia.	1.5 x Dia. ≤ 2.5 x Dia.	Structural Steel	Carbon Steel	Alloy Steel (4140, 4330)	Pre- Hardened Steel	Die Steel	Hardened Steel		Stainless Steel	Cast Iron	Aluminum Alloy	Copper Alloys
																	HRc 25 to 40	45 to 50	50 to 65				
THREAD FORMING TAPS / Machine Screw Sizes	HSSE-V	Black Oxide	●	Inch	0 to 12	995			●	○	●	○	●	●	●	●				○			
246 271							○																
THREAD FORMING TAPS / Fractional Sizes			●	Inch	1/4 to 3/4			995			●	○	●	○	●	●	●	●				○	
247 271							○	●	○														
THREAD FORMING TAPS / Metric Sizes			●	Inch	2 to 20					996			●	○	●	○	●	●	●	●			
						248 271			○	●	○												

VTP TAPS

Taps Name	Material	Coating	Stock USA ● Japan ○		Stock Size	LIST No			Hole Condition				Workpiece Material										
						Page Size	Cutting Condition		<1.5 x Dia.	1.5 x Dia. ≤ 2.5 x Dia.	<1.5 x Dia.	1.5 x Dia. ≤ 2.5 x Dia.	Structural Steel	Carbon Steel	Alloy Steel (4140, 4330)	Pre- Hardened Steel	Die Steel	Hardened Steel		Stainless Steel	Cast Iron	Aluminum Alloy	Copper Alloys
																	HRc 25 to 40	HRc 45 to 50	HRc 50 to 65				
Spiral Point-Fractional Sizes	HSSE-V	Black Oxide	●	Inch	1/4 to 1	971					●	○	○	○									
251						271																	
973						271																	
Spiral Point-Machine Screw Sizes			●	Inch	2 to 10	973					●	○	○	○									
251						271																	
982						271																	
Spiral Point-Metric Sizes			●	Metric	3 to 18	982					●	○	○	○									
255						271																	
991		271																					
Roll Form-Fractional Sizes	PREMIUM	●	Inch	1/4 to 3/4	991			●	○	●	○	○											
253					271																		
993					271																		
Roll Form-Machine Screw Sizes		●	Inch	0 to 12	993			●	○	●	○	○											
252					271																		
981					271																		
Spiral Flute-Fractional Sizes		●	Inch	1/4 to 1	981			●	○	○	△	○	○	○									
250					271																		
983					271																		
Spiral Flute-Machine Screw Sizes	HSSE-V	●	Inch	2 to 10	983			●	○	○	△	○	○	○									
250					271																		
980					271																		
Spiral Flute-Metric Sizes		●	Metric	3 to 18	980			●	○	○	△	○	○	○									
255					271																		

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

TiN Coated

●:Great ○:Good △:OK

Taps Name	Material	Coating	Stock USA ● Japan ○		Stock Size	LIST No			Hole Condition				Workpiece Material										
						Page Size	Cutting Condition		<1.5 x Dia.	1.5 x Dia. ≤ 2.5 x Dia.	<1.5 x Dia.	1.5 x Dia. ≤ 2.5 x Dia.	Structural Steel	Carbon Steel	Alloy Steel (4140, 4330)	Pre- Hardened Steel	Die Steel	Hardened Steel		Stainless Steel	Cast Iron	Aluminum Alloy	Copper Alloys
																	HRc 25 to 40	HRc 45 to 50	HRc 50 to 65				
Hand Taps-Fractional Sizes	HSS	TiN	●	Inch	1/4 to 1-1/2	911P			●	△	●	○	●	●	●	○				○	○	○	○
Hand Taps-Machine Screw Sizes						913P			●	△	●	○	●	●	●	○				○	○	○	○
Spiral Point-Fractional Sizes			●	Inch	1/4 to 3/4	921P			△	△	●	○	●	●	●	○				○	○	○	○
Spiral Point-Machine Screw Sizes			●	Inch	0 to 12	923P			△	△	●	○	●	●	●	○				○	○	○	○
Taper Pipe Taps-Regular (NPT)			●	Inch	1/16 to 2	941P			●	△	●	△	●	●	●	○				○	○	○	○

STANDARD TAPS

Taps Name	Material	Coating	Stock USA ● Japan ○		Stock Size	LIST No			Hole Condition				Workpiece Material										
						Page Size	Cutting Condition		<1.5 x Dia.	1.5 x Dia. ≤ 2.5 x Dia.	<1.5 x Dia.	1.5 x Dia. ≤ 2.5 x Dia.	Structural Steel	Carbon Steel	Alloy Steel (4140, 4330)	Pre- Hardened Steel	Die Steel	Hardened Steel		Stainless Steel	Cast Iron	Aluminum Alloy	Copper Alloys
																	HRc 25 to 40	HRc 45 to 50	HRc 50 to 65				
Hand Taps-Fractional Sizes	HSS	Bright	●	Inch	1/4 to 1-1/2	911			●	○	●	○	△	△	△	△					△	△	△
Hand Taps-Machine Screw Sizes			●	Inch	0 to 12	913			●	○	●	○	△	△	△	△					△	△	△
Spiral Point-Machine Screw Sizes			●	Inch	0 to 12	923					●	○	△	△	△	△					△	△	△
Spiral Point-Machine Screw		Black Oxide	●	Inch	0 to 12	923S					●	○	△	△	△	△					△	△	△
Spiral Point-Fractional Sizes		Bright	●	Inch	1/4 to 3/4	921					●	○	△	△	△	△					△	△	△
Spiral Point-Fractional Sizes		Black Oxide	●	Inch	1/4 to 3/4	921S					●	○	△	△	△	△					△	△	△
Hand Taps-.005 Oversized		Bright	●	Inch	6 to 10, 1/4 to 1	915			●	○	●	○	△	△	△	△					△	△	△
Spiral Point-.005 Oversized			●	Inch	6 to 10, 1/4 to 3/4	925					●	○	△	△	△	△					△	△	△
Regular Spiral Flute-Fractional Sizes			●	Inch	1/4 to 1-1/2	931			●	○	○	△	△	△	△	△					△	△	△
Regular Spiral Flute-Machine Screw Sizes			●	Inch	3 to 12	933			●	○	○	△	△	△	△	△					△	△	△
Fast Spiral Flute-Fractional Sizes			●	Inch	1/4 to 1/2	931H			●	○	○	△	△	△	△	△					△	△	△
Fast Spiral Flute-Machine Screw Sizes			●	Inch	3 to 10	933H			●	○	○	△	△	△	△	△					△	△	△
Hand Taps-Cast Iron Taps		Black Oxide	●	Inch	1/4 to 3/4	969			●	○	●	○	△	△	△	△					●	○	○

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

PIPE TAPS

●:Great ○:Good △:OK

Taps Name	Material	Coating	Stock USA ● Japan ○		Stock Size	LIST No			Hole Condition				Workpiece Material																											
						Page			<1.5 x Dia.	1.5 x Dia. ≤ 2.5 x Dia.	<1.5 x Dia.	1.5 x Dia. ≤ 2.5 x Dia.	Structural Steel	Carbon Steel	Alloy Steel (4140, 4330)	Pre- Hardened Steel	Die Steel	Hardened Steel		Stainless Steel	Cast Iron	Aluminum Alloy	Copper Alloys																	
						Size	Cutting Condition										HRC 25 to 40	HRC 45 to 50 50 to 65																						
Taper Pipe Taps-Regular (NPT)	HSS	Bright	●	Inch	1/16 to 2	941			○	△	○	△	△	△	△					△	△	△																		
						265	271																																	
Taper Pipe Taps-Dry Seal (NPTF)																										941D			○	△	○	△	△	△					△	△
	265	271																																						
Taper Pipe Taps-Interrupted (NPT)			●	Inch	1/8 to 2	943			○	△	○	△	△	△					△	△	△																			
	265	271																																						
																							943																	
Taper Pipe Taps-Regular-Spiral Flute (NPT)	PREMIUM	Black Oxide	●	Inch	1/16 to 1	947			○	△	○	△	○	○	○					○	○	○																		
						266	271																																	
Taper Pipe Taps-Dry Seal-Spiral Flute (NPTF)																							●	Inch	1/16 to 1	947D			○	△	○	△	○	○					○	○
	266	271																																						
						947D																																		
Straight Pipe Taps-Regular (NPS)	HSS	Bright	●	Inch	1/8 to 1	945			○	△	○	△	△	△					△	△	△																			
						266	271																																	
Straight Pipe Taps-Dry Seal (NPSF)																						●	Inch	1/8 to 1	945D			○	△	○	△	△					△	△	△	
	266	271																																						
						945D																																		

METRIC

Taps Name	Material	Coating	Stock USA ● Japan ○		Stock Size	LIST No			Hole Condition				Workpiece Material											
						Page			<1.5 x Dia.	1.5 x Dia. ≤ 2.5 x Dia.	<1.5 x Dia.	1.5 x Dia. ≤ 2.5 x Dia.	Structural Steel	Carbon Steel	Alloy Steel (4140, 4330)	Pre- Hardened Steel	Die Steel	Hardened Steel		Stainless Steel	Cast Iron	Aluminum Alloy	Copper Alloys	
						Size	Cutting Condition										Hrc	Hrc						
Hand Taps-Metric Sizes	HSS		●	Metric	M2 to M30	910			●	○	●	○	△	△	△	△					△	△	△	
						270	271																	
Spiral Point-Metric Sizes			●	Metric	M2.5 to M16	920			●	○	●	○	△	△	△	△						△	△	△
						270	271																	

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

DLC TAFLET THREAD FORMING TAPS / FRACTIONAL SIZE

DLC TAFLET THREAD FORMING TAPS / MACHINE SCREW SIZES

List No.6955

Fractional Size



Bottoming Style
DLC Coating



Forming TAP with DLC coating can be used in Aluminum Alloy,
Die Cast Aluminum and Copper.

Nominal Size	Thread/Inch		E. D. P. Numbers								Dimensions			Std. Pack.
	NC UNC	NF UNF	H2	H3	H4	H5	H6	H7	H8	H10	Overall Length	Length of Thread	Shank Dia.	
1/4	20	28			97838 97840		97912 97914				2 1/2 2 1/2	0.591 0.591	0.255 0.255	12 12
5/16	18	24				97873 97875		97931 97933			2 23/32 2 23/32	0.669 0.669	0.318 0.318	12 12
3/8	16	24				97877 97879		97935 97937			2 15/16 2 15/16	0.748 0.748	0.381 0.381	12 12
7/16	14					97881			97961		3 5/32	0.866	0.323	12
1/2	13					97885			97965		3 3/8	0.984	0.367	12

List No.6957

Machine Screw Sizes



Bottoming Style
DLC Coating



Forming TAP with DLC coating can be used in Aluminum Alloy,
Die Cast Aluminum and Copper.

Nominal Size	Thread/Inch		E. D. P. Numbers								Dimensions			Std. Pack.
	NC UNC	NF UNF	H2	H3	H4	H5	H6	H7	H8	H10	Overall Length	Length of Thread	Shank Dia.	
2	56		97738	97776							1 3/4	0.437	0.141	12
4	40			97784		97857					1 7/8	0.354	0.141	12
6	32			97792		97865					2	0.433	0.141	12
8	32			97796		97869					2 1/8	0.472	0.168	12
10	24				97830		97904				2 3/8	0.551	0.194	12
		32			97832		97906				2 3/8	0.551	0.194	12
12	24				97834		97908				2 3/8	0.551	0.220	12

List No.6956

Metric Sizes



Bottoming Style
DLC Coating



Forming TAP with DLC coating can be used in Aluminum Alloy,
Die Cast Aluminum and Copper.

Nominal Size (mm)	Pitch (mm)	E. D. P. Numbers								Dimensions			Std. Pack.
		D3	D4	D5	D6	D7	D8	D9	D10	Overall Length	Length of Thread	Shank Dia.	
2	0.4	91002								1 3/4	0.437	0.119	12
2.5	0.45	91008								1 13/16	0.500	0.119	12
3	0.5	91011								1 15/16	0.394	0.141	12
4	0.7		91017							2 1/8	0.472	0.168	12
5	0.8		91023							2 3/8	0.551	0.194	12
6	1			91026				91027		1 1/2	0.591	0.255	12
8	1.25						91035	91036		2 23/32	0.669	0.318	12
10	1.25						91038			2 15/16	0.748	0.381	12
	1.5							91041		2 15/16	0.748	0.381	12
12	1.75								91047	3 3/8	0.984	0.367	12

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

SG LO-SPIRAL FLUTED TAPS / MACHINE SCREW SIZES & FRACTIONAL SIZE

List No.6959



Modified Bottoming Style 2 1/2 to 3 Thread Lead
SG Coating



Nominal Size	Thread/Inch		No. of Flutes	E.D.P. Numbers							Dimensions			Std . Pack.		
	NC UNC	NF UNF		GT3	GT4	GT5	GT6	GT7	GT8	GT9	Overall Length	Length of Thread	Shank Dia.			
MACHINE SCREW SIZES																
2	56		3	94597							1 3/4	0.437	0.141	12		
		64	3	94598							1 3/4	0.437	0.141	12		
3	48		3		94599						1 13/16	0.500	0.141	12		
		56	3	94600							1 13/16	0.500	0.141	12		
4	40		3			94601					1 7/8	0.236	0.141	12		
		48	3		94602						1 7/8	0.236	0.141	12		
5	40		3			94603					1 15/16	0.236	0.141	12		
		44	3			94604					1 15/16	0.236	0.141	12		
6	32		3			94605					2	0.276	0.141	12		
		40	3			94606					2	0.276	0.141	12		
8	32		3			94607					2 1/8	0.276	0.168	12		
		36	3			94608					2 1/8	0.276	0.168	12		
10	24		3				94609				2 3/8	0.354	0.194	12		
		32	3			94610					2 3/8	0.354	0.194	12		
12	24		3				94611				2 3/8	0.354	0.220	12		
		28	3				94612				2 3/8	0.354	0.220	12		
FRACTIONAL SIZES																
1/4	20		3					94613			2 1/2	0.433	0.255	12		
		28	3				94614				2 1/2	0.433	0.255	12		
5/16	18		3					94615			2 23/32	0.472	0.318	12		
		24	3					94616			2 23/32	0.472	0.318	12		
3/8	16		3						94617		2 15/16	0.551	0.381	12		
		24	3						94618		2 15/16	0.551	0.381	12		
7/16	14		3							94619	3 5/32	0.709	0.323	12		
		20	3							94620	3 5/32	0.709	0.323	12		
1/2	13		3							94621	3 3/8	0.787	0.367	12		
		20	3							94622	3 3/8	0.787	0.367	12		
9/16	12		3							94623	3 19/32	0.827	0.429	6		
		18	3							94624	3 19/32	0.827	0.429	6		
5/8	11		3								94625	3 13/16	0.905	0.480	6	
		18	3							94626	3 13/16	0.905	0.480	6		
3/4	10		4								94627	4 1/4	0.984	0.590	6	
		16	4								94628	4 1/4	0.984	0.590	6	
7/8	9		4									94629	4 11/16	1.102	0.697	3
		14	4									94630	4 11/16	1.102	0.697	3
1	8		4								94631	5 1/8	1.260	0.800	3	
		12	4								94632	5 1/8	1.260	0.800	3	

SG LO-SPIRAL FLUTED TAPS / METRIC SIZES

List No.6958 Metric Sizes



Modified Bottoming Style 2 1/2 to 3 Thread Lead
SG Coating



Nominal Size (mm)	Pitch (mm)	No. Of Flutes	E. D. P. Numbers					Dimensions			Std. Pack.
			GT5	GT6	GT7	GT8	GT9	Overall Length	Length of Thread	Shank Dia.	
METRIC											
3	0.5	3	59615					1 15/16	0.236	0.141	12
4	0.7	3	59617					2 1/8	0.276	0.168	12
5	0.8	3		59619				2 3/8	0.354	0.194	12
6	1	3		59620				2 1/2	0.433	0.255	12
8	1	3		59622				2 23/32	0.472	0.318	12
	1.25	3		59623				2 23/32	0.472	0.318	12
10	1.25	3		59624				2 15/16	0.551	0.381	12
	1.5	3			59625			2 15/16	0.551	0.381	12
12	1.25	3				59626		3 3/8	0.669	0.367	12
	1.75	3				59627		3 3/8	0.669	0.367	12
14	1.5	3				59628		3 19/32	0.787	0.429	6
	2	3				59629		3 19/32	0.787	0.429	6
16	1.5	3				59630		3 13/16	0.787	0.480	6
	2	3				59631		3 13/16	0.787	0.480	6
18	1.5	4				59632		4 1/32	0.984	0.542	6
	2.5	4					59633	4 1/32	0.984	0.542	6
20	1.5	4				59634		4 15/32	0.984	0.652	6
	2.5	4					59635	4 15/32	0.984	0.652	6
22	1.5	4				59636		4 11/16	0.984	0.697	3
	2.5	4					59637	4 11/16	0.984	0.697	3
24	1.5	4				59638		4 29/32	1.181	0.760	3
	3	4					59639	4 29/32	1.181	0.760	3

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

NACHI VIPER

Viper taps go straight to the heart of tough work with problem-free tapping of stainless steel and other advanced metals. They provide superior threads and less torque, faster chip removal and cooler tapping job after job.

All this because Viper taps are made exclusively of specialty high speed steels, heat treated to maximize the advanced heat resistance characteristics of Cobalt and Tungsten and the wear resistance of Vanadium.

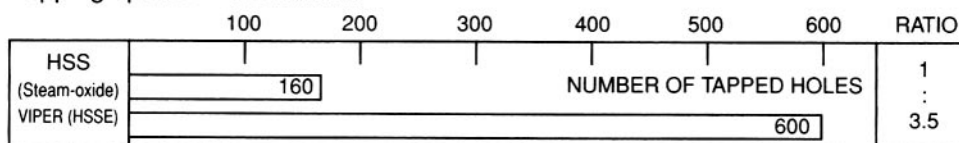
No tap is better engineered than Viper to demonstrate a longer tool life working in advanced materials with less down time and more economy. The special geometry extends tap life and the standard steam oxide maximizes the cooling effect to make rigorous tapping easy. Bright finish taps are also available where required for non-ferrous materials or special coatings as required. CNC manufacturing assures consistent quality time after time.



COMPARISON CHART

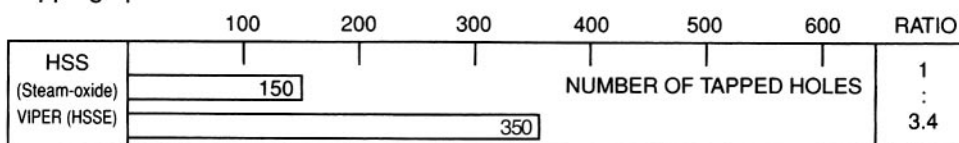
TOOL LIFE COMPARISON TEST RESULT (1)

Tap: Spiral point tap M10 x 1.5 Plug
Material: SUS 630 (HRC=45), Thickness 20mm
Drill: 8.5mm dia.
Tapping speed: 8.8 m/min.



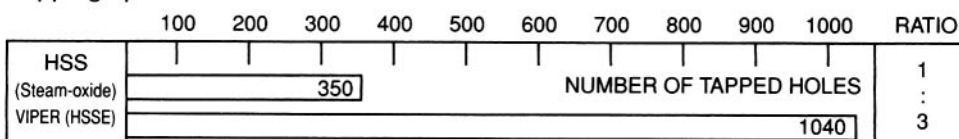
TOOL LIFE COMPARISON TEST RESULT (2)

Tap: Spiral point tap M12 x 1.75 Plug
Material: SUS 304 (HRC=30~35) Cold formed nut, Thickness 15mm
Drill: 10.3mm dia.
Tapping speed: 9.5 m/min.



TOOL LIFE COMPARISON TEST RESULT (3)

Tap: Spiral point tap M8 x 1.25 C2.5P Plug
Material: SUS 304 (HRC=20~25), Thickness 18mm
Drill: 6.7mm dia.
Tapping speed: 8.2 m/min.



List No.7981



Modified Bottoming Style, 2 1/2 To 3 Thread Lead
Surface Treated

VANADIUM HIGH SPEED STEEL HSSE-V



Nominal Size	Thread/Inch		No. of Flutes	E.D.P. Numbers							Dimensions			Std . Pack.
	NC UNC	NF UNF		GT3	GT4	GT5	GT6	GT7	GT8	GT9	Overall Length	Length of Thread	Shank Dia.	
MACHINE SCREW SIZES														
2	56		3	97597	—	—	—	—	—	—	1 3/4	0.437	0.141	12
		64	3	97598	—	—	—	—	—	—	1 3/4	0.437	0.141	12
3	48		3	—	97599	—	—	—	—	—	1 13/16	0.500	0.141	12
		56	3	97600	—	—	—	—	—	—	1 13/16	0.500	0.141	12
4	40		3	—	—	97601	—	—	—	—	1 7/8	0.236	0.141	12
		48	3	—	97602	—	—	—	—	—	1 7/8	0.236	0.141	12
5	40		3	—	—	97603	—	—	—	—	1 15/16	0.236	0.141	12
		44	3	—	—	97604	—	—	—	—	1 15/16	0.236	0.141	12
6	32		3	—	—	97605	—	—	—	—	2	0.276	0.141	12
		40	3	—	—	97606	—	—	—	—	2	0.276	0.141	12
8	32		3	—	—	97607	—	—	—	—	2 1/8	0.276	0.168	12
		36	3	—	—	97608	—	—	—	—	2 1/8	0.276	0.168	12
10	24		3	—	—	—	97609	—	—	—	2 3/8	0.354	0.194	12
		32	3	—	—	97610	—	—	—	—	2 3/8	0.354	0.194	12
12	24		3	—	—	—	97611	—	—	—	2 3/8	0.354	0.220	12
		28	3	—	—	—	97612	—	—	—	2 3/8	0.354	0.220	12
FRACTIONAL SIZES														
1/4	20		3	—	97633	—	—	97613	—	—	2 1/2	0.433	0.255	12
		28	3	—	97638	—	97614	—	—	—	2 1/2	0.433	0.255	12
5/16	18		3	—	97643	—	—	97615	—	—	2 23/32	0.472	0.318	12
		24	3	—	97648	—	—	97616	—	—	2 23/32	0.472	0.318	12
3/8	16		3	—	97653	—	—	—	97617	—	2 15/16	0.551	0.381	12
		24	3	—	97658	—	—	97618	—	—	2 15/16	0.551	0.381	12
7/16	14		3	—	97663	—	—	—	97619	—	3 5/32	0.709	0.323	12
		20	3	—	97668	—	—	—	97620	—	3 5/32	0.709	0.323	12
1/2	13		3	—	97673	—	—	—	97621	—	3 3/8	0.787	0.367	12
		20	3	—	97678	—	—	—	97622	—	3 3/8	0.787	0.367	12
9/16	12		3	—	97683	—	—	—	97623	—	3 19/32	0.827	0.429	6
		18	3	—	97688	—	—	—	97624	—	3 19/32	0.827	0.429	6
5/8	11		3	—	97693	—	—	—	—	97625	3 13/16	0.906	0.480	6
		18	3	—	97698	—	—	—	97626	—	3 13/16	0.906	0.480	6
3/4	10		3	—	97705	—	—	—	—	97627	4 1/4	0.984	0.590	6
		16	3	—	97710	—	—	—	97628	—	4 1/4	0.984	0.590	6
7/8	9		4	—	—	97715	—	—	—	97629	4 11/16	1.102	0.697	3
		14	4	—	—	97720	—	—	—	97630	4 11/16	1.102	0.697	3
1	8		4	—	—	97725	—	—	—	97631	5 1/8	1.260	0.800	3
		12	4	—	—	97730	—	—	—	97632	5 1/8	1.260	0.800	3

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

VIPER T SERIES-SPIRAL POINTED / GENERAL PURPOSE

List No.7971



Plug Style, 4 To 5 Thread
Surface Treated

VANADIUM HIGH SPEED STEEL HSSE-V



Nominal Size	Thread/Inch		No. of Flutes	E.D.P. Numbers							Dimensions			Std . Pack.
	NC UNC	NF UNF		GT3	GT4	GT5	GT6	GT7	GT8	GT9	Overall Length	Length of Thread	Shank Dia.	
MACHINE SCREW SIZES														
2	56	2	2	98597	—	—	—	—	—	—	1 3/4	0.437	0.141	12
		64	2	98598	—	—	—	—	—	—	1 3/4	0.437	0.141	12
3	48	2	2	—	98599	—	—	—	—	—	1 13/16	0.500	0.141	12
		56	2	98600	—	—	—	—	—	—	1 13/16	0.500	0.141	12
4	40	2	2	—	—	98601	—	—	—	—	1 7/8	0.354	0.141	12
		48	2	—	98602	—	—	—	—	—	1 7/8	0.354	0.141	12
5	40	3	3	—	—	98603	—	—	—	—	1 15/16	0.394	0.141	12
		44	3	—	—	98604	—	—	—	—	1 15/16	0.394	0.141	12
6	32	3	3	—	—	98605	—	—	—	—	2	0.433	0.141	12
		40	3	—	—	98606	—	—	—	—	2	0.433	0.141	12
8	32	3	3	—	—	98607	—	—	—	—	2 1/8	0.472	0.168	12
		36	3	—	—	98608	—	—	—	—	2 1/8	0.472	0.168	12
10	24	3	3	—	—	—	98609	—	—	—	2 3/8	0.551	0.194	12
		32	3	—	—	98610	—	—	—	—	2 3/8	0.551	0.194	12
12	24	3	3	—	—	—	98611	—	—	—	2 3/8	0.551	0.220	12
		28	3	—	—	—	98612	—	—	—	2 3/8	0.551	0.220	12
FRACTIONAL SIZES														
1/4	20	3	3	—	98633	—	—	98613	—	—	2 1/2	0.591	0.255	12
		28	3	—	98638	—	98614	—	—	—	2 1/2	0.591	0.255	12
5/16	18	3	3	—	98643	—	—	98615	—	—	2 23/32	0.669	0.318	12
		24	3	—	98648	—	—	98616	—	—	2 23/32	0.669	0.318	12
3/8	16	3	3	—	98653	—	—	—	98617	—	2 15/16	0.748	0.381	12
		24	3	—	98658	—	—	98618	—	—	2 15/16	0.748	0.381	12
7/16	14	3	3	—	98663	—	—	—	98619	—	3 5/32	0.984	0.323	12
		20	3	—	98668	—	—	—	98620	—	3 5/32	0.984	0.323	12
1/2	13	3	3	—	98673	—	—	—	98621	—	3 3/8	1.142	0.367	12
		20	3	—	98678	—	—	—	98622	—	3 3/8	1.142	0.367	12
9/16	12	3	3	—	98683	—	—	—	98623	—	3 19/32	1.181	0.429	6
		18	3	—	98688	—	—	—	98624	—	3 19/32	1.181	0.429	6
5/8	11	3	3	—	98693	—	—	—	—	98625	3 13/16	1.260	0.480	6
		18	3	—	98698	—	—	—	98626	—	3 13/16	1.260	0.480	6
3/4	10	3	3	—	98705	—	—	—	—	98627	4 1/4	1.457	0.590	6
		16	3	—	98710	—	—	—	98628	—	4 1/4	1.457	0.590	6
7/8	9	3	3	—	—	98715	—	—	—	98629	4 11/16	1.496	0.697	3
		14	4	—	—	98720	—	—	—	98630	4 11/16	1.496	0.697	3
1	8	3	3	—	—	98725	—	—	—	98631	5 1/8	1.772	0.800	3
		12	4	—	—	98730	—	—	—	98632	5 1/8	1.772	0.800	3

List No.7980

Spiral Fluted

VANADIUM HIGH SPEED STEEL HSSE-V

Modified Bottoming Style, 2 1/2 To 3 Thread
Surface Treated

Nominal Size (mm)	Pitch (mm)	No. Of Flutes	E.D.P. Number					Dimensions			Std. Pack.
			GT5	GT6	GT7	GT8	GT9	Overall Length	Length of Thread	Shank Dia.	
METRIC											
3	0.5	3	57615	—	—	—	—	1 15/16	0.236	0.141	12
3.5	0.6	3	57616	—	—	—	—	2	0.276	0.141	12
4	0.7	3	57617	—	—	—	—	2 1/8	0.276	0.168	12
5	0.8	3	—	57619	—	—	—	2 3/8	0.354	0.194	12
6	1	3	—	57620	—	—	—	2 1/2	0.433	0.255	12
7	1	3	—	57621	—	—	—	2 23/32	0.472	0.318	12
8	1	3	—	57622	—	—	—	2 23/32	0.472	0.318	12
8	1.25	3	—	57623	—	—	—	2 23/32	0.472	0.318	12
10	1.25	3	—	57624	—	—	—	2 15/16	0.551	0.381	12
10	1.5	3	—	—	57625	—	—	2 15/16	0.551	0.381	12
12	1.25	3	—	—	—	57626	—	3 3/8	0.669	0.367	12
12	1.75	3	—	—	—	57627	—	3 3/8	0.669	0.367	12
14	1.5	3	—	—	—	57628	—	3 19/32	0.787	0.429	6
14	2	3	—	—	—	57629	—	3 19/32	0.787	0.429	6
16	1.5	3	—	—	—	57630	—	3 13/16	0.787	0.480	6
16	2	3	—	—	—	57631	—	3 13/16	0.787	0.480	6
18	1.5	3	—	—	—	57632	—	4 1/32	0.984	0.542	6
18	2.5	3	—	—	—	—	57633	4 1/32	0.984	0.542	6
20	1.5	4	—	—	—	57634	—	4 15/32	0.984	0.652	6
20	2.5	4	—	—	—	—	57635	4 15/32	0.984	0.652	6
22	1.5	4	—	—	—	57636	—	4 11/16	0.984	0.697	3
22	2.5	4	—	—	—	—	57637	4 11/16	0.984	0.697	3
24	1.5	4	—	—	—	57638	—	4 29/32	1.181	0.760	3
24	3	4	—	—	—	—	57639	4 29/32	1.181	0.760	3

List No.7970

Spiral Pointed

VANADIUM HIGH SPEED STEEL HSSE-V

Plugstyle, 4 To 5 Thread
Surface Treated

Nominal Size (mm)	Pitch (mm)	No. Of Flutes	E.D.P. Number					Dimensions			Std. Pack.
			GT5	GT6	GT7	GT8	GT9	Overall Length	Length of Thread	Shank Dia.	
METRIC											
3	0.5	3	58615	—	—	—	—	1 15/16	0.394	0.141	12
3.5	0.6	3	58616	—	—	—	—	2	0.433	0.141	12
4	0.7	3	58617	—	—	—	—	2 1/8	0.472	0.168	12
5	0.8	3	—	58619	—	—	—	2 3/8	0.551	0.194	12
6	1	3	—	58620	—	—	—	2 1/2	0.591	0.255	12
7	1	3	—	58621	—	—	—	2 23/32	0.669	0.318	12
8	1	3	—	58622	—	—	—	2 23/32	0.669	0.318	12
8	1.25	3	—	58623	—	—	—	2 23/32	0.669	0.318	12
10	1.25	3	—	58624	—	—	—	2 15/16	0.748	0.381	12
10	1.5	3	—	—	58625	—	—	2 15/16	0.748	0.381	12
12	1.25	3	—	—	—	58626	—	3 3/8	1.142	0.367	12
12	1.75	3	—	—	—	58627	—	3 3/8	1.142	0.367	12
14	1.5	3	—	—	—	58628	—	3 19/32	1.181	0.429	6
14	2	3	—	—	—	58629	—	3 19/32	1.181	0.429	6
16	1.5	3	—	—	—	58630	—	3 13/16	1.260	0.480	6
16	2	3	—	—	—	58631	—	3 13/16	1.260	0.480	6
18	1.5	3	—	—	—	58632	—	4 1/32	1.457	0.542	6
18	2.5	3	—	—	—	—	58633	4 1/32	1.457	0.542	6
20	1.5	3	—	—	—	58634	—	4 15/32	1.457	0.652	6
20	2.5	3	—	—	—	—	58635	4 15/32	1.457	0.652	6
22	1.5	4	—	—	—	58636	—	4 11/16	1.496	0.697	3
22	2.5	3	—	—	—	—	58637	4 11/16	1.496	0.697	3
24	1.5	4	—	—	—	58638	—	4 29/32	1.772	0.760	3
24	3	3	—	—	—	—	58639	4 29/32	1.772	0.760	3

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

List No.7987



Modified Bottoming Style 2 1/2 To 3 Thread Lead
Surface Treated

COBALT/VANADIUM HIGH SPEED STEEL HSSE



Nominal Size	Thread/Inch		No. of Flutes	E.D.P. Numbers							Dimensions			Std . Pack.
	NC UNC	NF UNF		GT3	GT4	GT5	GT6	GT7	GT8	GT9	Overall Length	Length of Thread	Shank Dia.	
MACHINE SCREW SIZES														
2	56		3	96597	—	—	—	—	—	—	1 3/4	0.437	0.141	12
		64	3	96598	—	—	—	—	—	—	1 3/4	0.437	0.141	12
3	48		3	—	96599	—	—	—	—	—	1 13/16	0.500	0.141	12
		56	3	96600	—	—	—	—	—	—	1 13/16	0.500	0.141	12
4	40		3	—	—	96601	—	—	—	—	1 7/8	0.236	0.141	12
		48	3	—	96602	—	—	—	—	—	1 7/8	0.236	0.141	12
5	40		3	—	—	96603	—	—	—	—	1 15/16	0.236	0.141	12
		44	3	—	—	96604	—	—	—	—	1 15/16	0.236	0.141	12
6	32		3	—	—	96605	—	—	—	—	2	0.276	0.141	12
		40	3	—	—	96606	—	—	—	—	2	0.276	0.141	12
8	32		3	—	—	96607	—	—	—	—	2 1/8	0.276	0.168	12
		36	3	—	—	96608	—	—	—	—	2 1/8	0.276	0.168	12
10	24		3	—	—	—	96609	—	—	—	2 3/8	0.354	0.194	12
		32	3	—	—	96610	—	—	—	—	2 3/8	0.354	0.194	12
12	24		3	—	—	—	96611	—	—	—	2 3/8	0.354	0.220	12
		28	3	—	—	—	96612	—	—	—	2 3/8	0.354	0.220	12
FRACTIONAL SIZES														
1/4	20		3	—	—	—	—	96613	—	—	2 1/2	0.433	0.255	12
		28	3	—	—	—	96614	—	—	—	2 1/2	0.433	0.255	12
5/16	18		3	—	—	—	—	96615	—	—	2 23/32	0.472	0.318	12
		24	3	—	—	—	—	96616	—	—	2 23/32	0.472	0.318	12
3/8	16		3	—	—	—	—	—	96617	—	2 15/16	0.551	0.381	12
		24	3	—	—	—	—	96618	—	—	2 15/16	0.551	0.381	12
7/16	14		3	—	—	—	—	—	96619	—	3 5/32	0.709	0.323	12
		20	3	—	—	—	—	—	96620	—	3 5/32	0.709	0.323	12
1/2	13		3	—	—	—	—	—	96621	—	3 3/8	0.787	0.367	12
		20	3	—	—	—	—	—	96622	—	3 3/8	0.787	0.367	12
9/16	12		3	—	—	—	—	—	96623	—	3 19/32	0.827	0.429	6
		18	3	—	—	—	—	—	96624	—	3 19/32	0.827	0.429	6
5/8	11		3	—	—	—	—	—	—	96625	3 13/16	0.905	0.480	6
		18	3	—	—	—	—	—	96626	—	3 13/16	0.905	0.480	6
3/4	10		3	—	—	—	—	—	—	96627	4 1/4	0.984	0.590	6
		16	3	—	—	—	—	—	96628	—	4 1/4	0.984	0.590	6
7/8	9		4	—	—	—	—	—	—	96629	4 11/16	1.102	0.697	3
		14	4	—	—	—	—	—	—	96630	4 11/16	1.102	0.697	3
1	8		4	—	—	—	—	—	—	96631	5 1/8	1.260	0.800	3
		12	4	—	—	—	—	—	—	96632	5 1/8	1.260	0.800	3

List No.7977



Plug Style, 4 To 5 Thread Lead
Surface Treated

COBALT/VANADIUM HIGH SPEED STEEL HSS



Nominal Size	Thread/Inch		No. of Flutes	E.D.P. Numbers							Dimensions			Std . Pack.
	NC UNC	NF UNF		GT3	GT4	GT5	GT6	GT7	GT8	GT9	Overall Length	Length of Thread	Shank Dia.	
MACHINE SCREW SIZES														
2	56		2	95597	—	—	—	—	—	—	1 3/4	0.437	0.141	12
		64	2	95598	—	—	—	—	—	—	1 3/4	0.437	0.141	12
3	48		2	—	95599	—	—	—	—	—	1 13/16	0.500	0.141	12
		56	2	95600	—	—	—	—	—	—	1 13/16	0.500	0.141	12
4	40		2	—	—	95601	—	—	—	—	1 7/8	0.354	0.141	12
		48	2	—	95602	—	—	—	—	—	1 7/8	0.354	0.141	12
5	40		3	—	—	95603	—	—	—	—	1 15/16	0.394	0.141	12
		44	3	—	—	95604	—	—	—	—	1 15/16	0.394	0.141	12
6	32		3	—	—	95605	—	—	—	—	2	0.433	0.141	12
		40	3	—	—	95606	—	—	—	—	2	0.433	0.141	12
8	32		3	—	—	95607	—	—	—	—	2 1/8	0.472	0.168	12
		36	3	—	—	95608	—	—	—	—	2 1/8	0.472	0.168	12
10	24		3	—	—	—	95609	—	—	—	2 3/8	0.551	0.194	12
		32	3	—	—	95610	—	—	—	—	2 3/8	0.551	0.194	12
12	24		3	—	—	—	95611	—	—	—	2 3/8	0.551	0.220	12
		28	3	—	—	—	95612	—	—	—	2 3/8	0.551	0.220	12
FRACTIONAL SIZES														
1/4	20		3	—	—	—	—	95613	—	—	2 1/2	0.591	0.255	12
		28	3	—	—	—	—	95614	—	—	2 1/2	0.591	0.255	12
5/16	18		3	—	—	—	—	95615	—	—	2 23/32	0.669	0.318	12
		24	3	—	—	—	—	95616	—	—	2 23/32	0.669	0.318	12
3/8	16		3	—	—	—	—	—	95617	—	2 15/16	0.748	0.381	12
		24	3	—	—	—	—	95618	—	—	2 15/16	0.748	0.381	12
7/16	14		3	—	—	—	—	—	95619	—	3 5/32	0.984	0.323	12
		20	3	—	—	—	—	—	95620	—	3 5/32	0.984	0.323	12
1/2	13		3	—	—	—	—	—	95621	—	3 3/8	1.142	0.367	12
		20	3	—	—	—	—	—	95622	—	3 3/8	1.142	0.367	12
9/16	12		3	—	—	—	—	—	95623	—	3 19/32	1.181	0.429	6
		18	3	—	—	—	—	—	95624	—	3 19/32	1.181	0.429	6
5/8	11		3	—	—	—	—	—	—	95625	3 13/16	1.260	0.480	6
		18	3	—	—	—	—	—	95626	—	3 13/16	1.260	0.480	6
3/4	10		3	—	—	—	—	—	—	95627	4 1/4	1.457	0.590	6
		16	3	—	—	—	—	—	95628	—	4 1/4	1.457	0.590	6
7/8	9		3	—	—	—	—	—	—	95629	4 11/16	1.496	0.697	3
		14	4	—	—	—	—	—	—	95630	4 11/16	1.496	0.697	3
1	8		3	—	—	—	—	—	—	95631	5 1/8	1.772	0.800	3
		12	4	—	—	—	—	—	—	95632	5 1/8	1.772	0.800	3

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.7982

Spiral Fluted

COBALT/VANADIUM HIGH SPEED STEEL



Modified Bottoming Style 2 1/2 To 3 Thread Lead
Surface Treated



Nominal Size (mm)	Pitch (mm)	No. Of Flutes	E.D.P. Number					Dimensions			Std. Pack.
			GT5	GT6	GT7	GT8	GT9	Overall Length	Length of Thread	Shank Dia.	
METRIC											
3	0.5	3	56615	—	—	—	—	1 15/16	0.236	0.141	12
3.5	0.6	3	56616	—	—	—	—	2	0.276	0.141	12
4	0.7	3	56617	—	—	—	—	2 1/8	0.276	0.168	12
5	0.8	3	—	56619	—	—	—	2 3/8	0.354	0.194	12
6	1	3	—	56620	—	—	—	2 1/2	0.433	0.255	12
7	1	3	—	56621	—	—	—	2 23/32	0.472	0.318	12
8	1	3	—	56622	—	—	—	2 23/32	0.472	0.318	12
8	1.25	3	—	56623	—	—	—	2 23/32	0.472	0.318	12
10	1.25	3	—	56624	—	—	—	2 15/16	0.551	0.381	12
10	1.5	3	—	—	56625	—	—	2 15/16	0.551	0.381	12
12	1.25	3	—	—	—	56626	—	3 3/8	0.669	0.367	12
12	1.75	3	—	—	—	56627	—	3 3/8	0.669	0.367	12
14	1.5	3	—	—	—	56628	—	3 19/32	0.787	0.429	6
14	2	3	—	—	—	56629	—	3 19/32	0.787	0.429	6
16	1.5	3	—	—	—	56630	—	3 13/16	0.787	0.480	6
16	2	3	—	—	—	56631	—	3 13/16	0.787	0.480	6
18	1.5	4	—	—	—	56632	—	4 1/32	0.984	0.542	6
18	2.5	4	—	—	—	—	56633	4 1/32	0.984	0.542	6
20	1.5	4	—	—	—	56634	—	4 15/32	0.984	0.652	6
20	2.5	4	—	—	—	—	56635	4 15/32	0.984	0.652	6
22	1.5	4	—	—	—	56636	—	4 11/16	0.984	0.697	3
22	2.5	4	—	—	—	—	56637	4 11/16	0.984	0.697	3
24	1.5	4	—	—	—	56638	—	4 29/32	1.181	0.760	3
24	3	4	—	—	—	—	56639	4 29/32	1.181	0.760	3

List No.7972

Spiral Pointed

COBALT/VANADIUM HIGH SPEED STEEL HSSE



Plug Style, 4 To 5 Thread Lead
Surface Treated



Nominal Size (mm)	Pitch (mm)	No. Of Flutes	E.D.P. Number					Dimensions			Std. Pack.
			GT5	GT6	GT7	GT8	GT9	Overall Length	Length of Thread	Shank Dia.	
METRIC											
3	0.5	3	55615	—	—	—	—	1 15/16	0.394	0.141	12
3.5	0.6	3	55616	—	—	—	—	2	0.433	0.141	12
4	0.7	3	55617	—	—	—	—	2 1/8	0.472	0.168	12
5	0.8	3	—	55619	—	—	—	2 3/8	0.551	0.194	12
6	1	3	—	55620	—	—	—	2 1/2	0.591	0.255	12
7	1	3	—	55621	—	—	—	2 23/32	0.669	0.318	12
8	1	3	—	55622	—	—	—	2 23/32	0.669	0.318	12
8	1.25	3	—	55623	—	—	—	2 23/32	0.669	0.318	12
10	1.25	3	—	55624	—	—	—	2 15/16	0.748	0.381	12
10	1.5	3	—	—	55625	—	—	2 15/16	0.748	0.381	12
12	1.25	3	—	—	—	55626	—	3 3/8	1.141	0.367	12
12	1.75	3	—	—	—	55627	—	3 3/8	1.141	0.367	12
14	1.5	3	—	—	—	55628	—	3 19/32	1.181	0.429	6
14	2	3	—	—	—	55629	—	3 19/32	1.181	0.429	6
16	1.5	3	—	—	—	55630	—	3 13/16	1.260	0.480	6
16	2	3	—	—	—	55631	—	3 13/16	1.260	0.480	6
18	1.5	3	—	—	—	55632	—	4 1/32	1.457	0.542	6
18	2.5	3	—	—	—	—	55633	4 1/32	1.457	0.542	6
20	1.5	3	—	—	—	55634	—	4 15/32	1.457	0.652	6
20	2.5	3	—	—	—	—	55635	4 15/32	1.457	0.652	6
22	1.5	4	—	—	—	55636	—	4 11/16	1.496	0.697	3
22	2.5	3	—	—	—	—	55637	4 11/16	1.496	0.697	3
24	1.5	4	—	—	—	55638	—	4 29/32	1.772	0.760	3
24	3	3	—	—	—	—	55639	4 29/32	1.772	0.760	3

Taflet Taps for economical and efficient thread forming

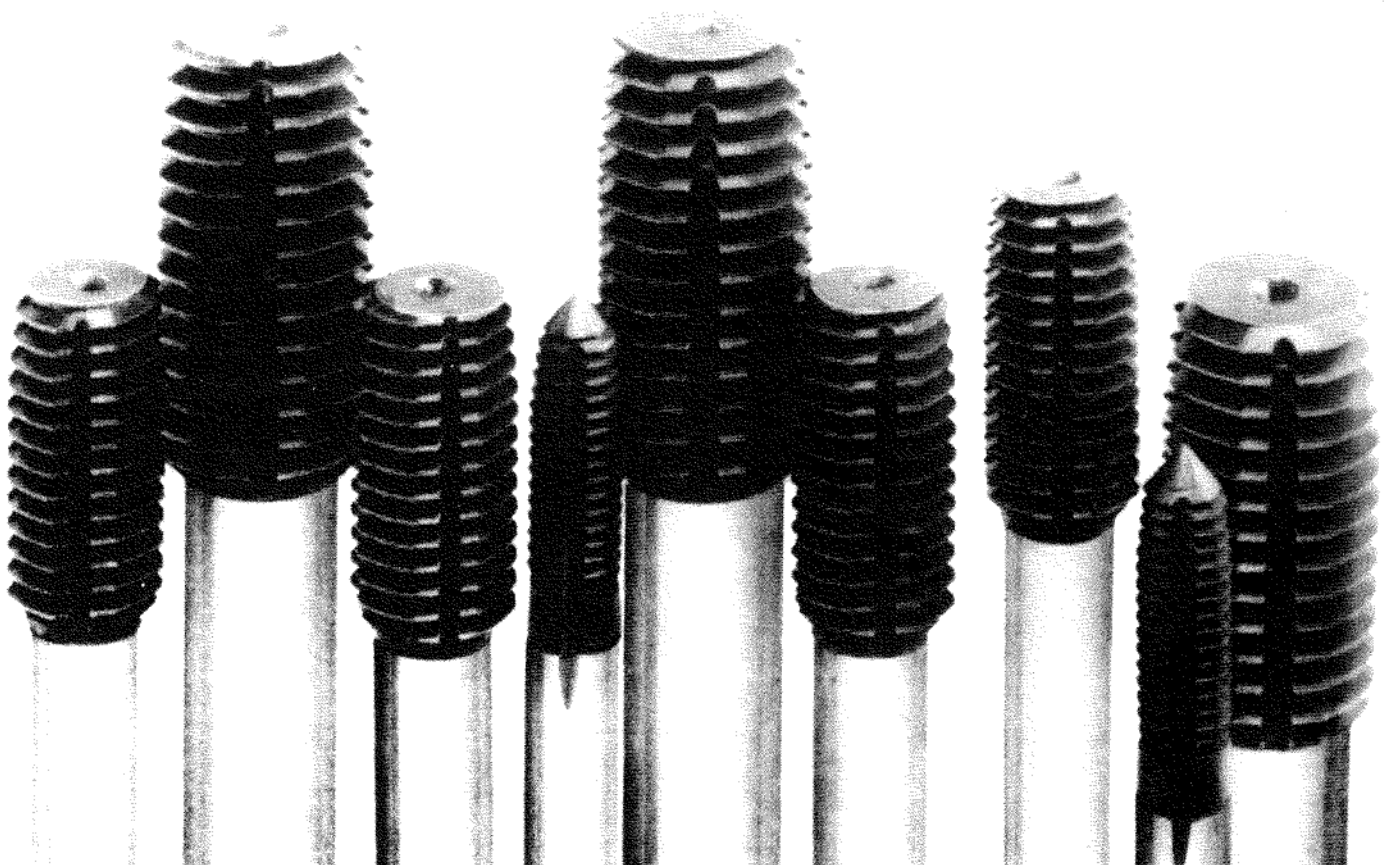
NACHI Viper Taflet taps are designed for economical and efficient tapping of steel. No chips are produced with Taflet taps. The threads are formed by displacement of the metal. Threads produced this way are generally more accurate and stronger than threads produced by conventional tapping.

Advantages of NACHI Viper Taflet Taps

Conventional coldform taps for steel require high torque. NACHI Viper Taflet taps have been specially engineered for steels and require less torque, reducing the chance of breaking.

In conventional coldform threading, rapid wear and adhesion due to high frictional heat may occur. NACHI Viper Taflet tap's steam oxide surface treatment limits adhesion from fusion and carries coolant to the work area. Bright finish is also available when required.

Conventional coldform internal threads aren't always clean and accurate. NACHI Viper Taflet taps have more radial sections for higher accuracy of internal threads in steel.



List No.995 Machine Screw Sizes

VANADIUM HIGH SPEED STEEL HSSE-V



Plug & Bottoming Style
Surface Treated



Nominal Size	Thread/Inch		Chamfer Style*	E.D.P. Numbers						Dimensions			Std . Pack.
	NC UNC	NF UNF		H2	H3	H4	H5	H6	H10	Overall Length	Length of Thread	Shank Dia.	
0		80	B	77732	—	—	—	—	—	1 5/8	0.311	0.141	12
1	64		B	77734	—	—	—	—	—	1 11/16	0.374	0.141	12
		72	B	77736	—	—	—	—	—	1 11/16	0.374	0.141	12
2	56		B	77738	77776	—	—	—	—	1 3/4	0.437	0.141	12
		64	B	77740	77778	—	—	—	—	1 3/4	0.437	0.141	12
3	48		B	77742	77780	—	—	—	—	1 13/16	0.500	0.141	12
		56	B	—	77782	—	—	—	—	1 13/16	0.500	0.141	12
4	40		P	—	77783	—	77856	—	—	1 7/8	0.354	0.141	12
			B	—	77784	—	77857	—	—	1 7/8	0.354	0.141	12
		48	P	—	77785	—	77858	—	—	1 7/8	0.354	0.141	12
			B	—	77786	—	77859	—	—	1 7/8	0.354	0.141	12
5	40		P	—	77787	—	77860	—	—	1 15/16	0.394	0.141	12
			B	—	77788	—	77861	—	—	1 15/16	0.394	0.141	12
		44	P	—	77789	—	77862	—	—	1 15/16	0.394	0.141	12
			B	—	77790	—	77863	—	—	1 15/16	0.394	0.141	12
6	32		P	—	77791	—	77864	—	77970	2	0.433	0.141	12
			B	—	77792	—	77865	—	77971	2	0.433	0.141	12
		40	P	—	77793	—	77866	—	—	2	0.433	0.141	12
			B	—	77794	—	77867	—	—	2	0.433	0.141	12
8	32		P	—	77795	—	77868	—	77972	2 1/8	0.472	0.168	12
			B	—	77796	—	77869	—	77973	2 1/8	0.472	0.168	12
		36	P	—	77797	—	77870	—	—	2 1/8	0.472	0.168	12
			B	—	77798	—	77871	—	—	2 1/8	0.472	0.168	12
10	24		P	—	—	77829	—	77903	77974	2 3/8	0.551	0.194	12
			B	—	—	77830	—	77904	77975	2 3/8	0.551	0.194	12
		32	P	—	—	77831	—	77905	77976	2 3/8	0.551	0.194	12
			B	—	—	77832	—	77906	77977	2 3/8	0.551	0.194	12
12	24		P	—	—	77833	—	77907	—	2 3/8	0.551	0.220	12
			B	—	—	77834	—	77908	—	2 3/8	0.551	0.220	12
		28	P	—	—	77835	—	77909	—	2 3/8	0.551	0.220	12
			B	—	—	77836	—	77910	—	2 3/8	0.551	0.220	12

* P : Plug, B : Bottom

List No.995 Fractional Sizes

Plug & Bottoming Style
Surface Treated

VANADIUM HIGH SPEED STEEL HSSE-V



Nominal Size	Thread/Inch		Chamfer Style*	E.D.P. Numbers						Dimensions			Std . Pack.
	NC UNC	NF UNF		H4	H5	H6	H7	H8	H10	Overall Length	Length of Thread	Shank Dia.	
1/4	20		P	77837	—	77911	—	—	77978	2 1/2	0.591	0.255	12
			B	77838	—	77912	—	—	77979	2 1/2	0.591	0.255	12
	28		P	77839	—	77913	—	—	77980	2 1/2	0.591	0.255	12
			B	77840	—	77914	—	—	77981	2 1/2	0.591	0.255	12
5/16	18		P	—	77872	—	77930	—	—	2 23/32	0.669	0.318	12
			B	—	77873	—	77931	—	—	2 23/32	0.669	0.318	12
	24		P	—	77874	—	77932	—	—	2 23/32	0.669	0.318	12
			B	—	77875	—	77933	—	—	2 23/32	0.669	0.318	12
3/8	16		P	—	77876	—	77934	—	—	2 15/16	0.748	0.381	12
			B	—	77877	—	77935	—	—	2 15/16	0.748	0.381	12
	24		P	—	77878	—	77936	—	—	2 15/16	0.748	0.381	12
			B	—	77879	—	77937	—	—	2 15/16	0.748	0.381	12
7/16	14		P	—	77880	—	—	77960	—	3 5/32	0.866	0.323	12
			B	—	77881	—	—	77961	—	3 5/32	0.866	0.323	12
	20		P	—	77882	—	—	77962	—	3 5/32	0.866	0.323	12
			B	—	77883	—	—	77963	—	3 5/32	0.866	0.323	12
1/2	13		P	—	77884	—	—	77964	—	3 3/8	0.984	0.367	12
			B	—	77885	—	—	77965	—	3 3/8	0.984	0.367	12
	20		P	—	77886	—	—	77966	—	3 3/8	0.984	0.367	12
			B	—	77887	—	—	77967	—	3 3/8	0.984	0.367	12
9/16	12		P	—	—	—	77946	—	77990	3 19/32	0.984	0.429	6
			B	—	—	—	77947	—	77991	3 19/32	0.984	0.429	6
	18		P	—	—	—	77948	—	77992	3 19/32	0.984	0.429	6
			B	—	—	—	77949	—	77993	3 19/32	0.984	0.429	6
5/8	11		P	—	—	—	77950	—	77994	3 13/16	1.102	0.480	6
			B	—	—	—	77951	—	77995	3 13/16	1.102	0.480	6
	18		P	—	—	—	77952	—	77996	3 13/16	1.102	0.480	6
			B	—	—	—	77953	—	77997	3 13/16	1.102	0.480	6
3/4	10		P	—	—	—	77954	—	77998	4 1/4	1.181	0.590	6
			B	—	—	—	77955	—	77999	4 1/4	1.181	0.590	6
	16		P	—	—	—	77956	—	78000	4 1/4	1.181	0.590	6
			B	—	—	—	77957	—	78001	4 1/4	1.181	0.590	6

* P : Plug, B : Bottom

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

VIPER TAFLET METRIC TAPS FOR STEELS

List No.996 Metric Sizes



Plug & Bottoming Style
Surface Treated

VANADIUM HIGH SPEED STEEL HSSE-V



Nominal Size (mm)	Pitch (mm)	Chamfer Style*	E.D.P. Numbers									Dimensions			Std . Pack.
			D3	D4	D5	D6	D7	D8	D9	D10	D11	Overall Length	Length of Thread	Shank Dia.	
2	0.4	P	51001	—	—	—	—	—	—	—	—	1 3/4	0.437	0.119	12
		B	51002	—	—	—	—	—	—	—	—	1 3/4	0.437	0.119	12
2.2	0.45	P	51004	—	—	—	—	—	—	—	—	1 3/4	0.437	0.119	12
		B	51005	—	—	—	—	—	—	—	—	1 3/4	0.437	0.119	12
2.5	0.45	P	51007	—	—	—	—	—	—	—	—	1 13/16	0.500	0.119	12
		B	51008	—	—	—	—	—	—	—	—	1 13/16	0.500	0.119	12
3	0.5	P	51010	—	—	—	—	—	—	—	—	1 15/16	0.394	0.141	12
		B	51011	—	—	—	—	—	—	—	—	1 15/16	0.394	0.141	12
3.5	0.6	P	51013	—	—	—	—	—	—	—	—	2	0.433	0.141	12
		B	51014	—	—	—	—	—	—	—	—	2	0.433	0.141	12
4	0.7	P	—	51016	—	—	—	—	—	—	—	2 1/8	0.472	0.168	12
		B	—	51017	—	—	—	—	—	—	—	2 1/8	0.472	0.168	12
4.5	0.75	P	—	51019	—	—	—	—	—	—	—	2 3/8	0.551	0.184	12
		B	—	51020	—	—	—	—	—	—	—	2 3/8	0.551	0.184	12
5	0.8	P	—	51022	—	—	—	—	—	—	—	2 3/8	0.551	0.194	12
		B	—	51023	—	—	—	—	—	—	—	2 3/8	0.551	0.194	12
6	1	P	—	—	51025	—	—	—	—	—	—	1 1/2	0.591	0.255	12
		B	—	—	51026	—	—	—	—	—	—	1 1/2	0.591	0.255	12
7	1	P	—	—	—	51028	—	—	—	—	—	2 23/32	0.669	0.318	12
		B	—	—	—	51029	—	—	—	—	—	2 23/32	0.669	0.318	12
8	1	P	—	—	51031	—	—	—	—	—	—	2 23/32	0.669	0.318	12
		B	—	—	51032	—	—	—	—	—	—	2 23/32	0.669	0.318	12
	1.25	P	—	—	—	—	—	51034	—	—	—	2 23/32	0.669	0.318	12
		B	—	—	—	—	—	51035	—	—	—	2 23/32	0.669	0.318	12
10	1.25	P	—	—	—	—	—	51037	—	—	—	2 15/16	0.748	0.381	12
		B	—	—	—	—	—	51038	—	—	—	2 15/16	0.748	0.381	12
	1.50	P	—	—	—	—	—	—	51040	—	—	2 15/16	0.748	0.381	12
		B	—	—	—	—	—	—	51041	—	—	2 15/16	0.748	0.381	12
12	1.25	P	—	—	—	—	—	—	51043	—	—	3 3/8	0.984	0.367	12
		B	—	—	—	—	—	—	51044	—	—	3 3/8	0.984	0.367	12
	1.75	P	—	—	—	—	—	—	—	51046	—	3 3/8	0.984	0.367	12
		B	—	—	—	—	—	—	—	51047	—	3 3/8	0.984	0.367	12
14	1.5	P	—	—	—	—	—	—	—	51049	—	3 19/32	0.984	0.429	6
		B	—	—	—	—	—	—	—	51050	—	3 19/32	0.984	0.429	6
	2	P	—	—	—	—	—	—	—	—	51052	3 19/32	0.984	0.429	6
		B	—	—	—	—	—	—	—	—	51053	3 19/32	0.984	0.429	6
16	1.5	P	—	—	—	—	—	—	—	51055	—	3 13/16	1.102	0.480	6
		B	—	—	—	—	—	—	—	51056	—	3 13/16	1.102	0.480	6
	2	P	—	—	—	—	—	—	—	—	51058	3 13/16	1.102	0.480	6
		B	—	—	—	—	—	—	—	—	51059	3 13/16	1.102	0.480	6
18	1.5	P	—	—	—	—	—	—	—	51061	—	4 1/32	1.102	0.542	6
		B	—	—	—	—	—	—	—	51062	—	4 1/32	1.102	0.542	6
	2.5	P	—	—	—	—	—	—	—	—	51064	4 1/32	1.102	0.542	6
		B	—	—	—	—	—	—	—	—	51065	4 1/32	1.102	0.542	6
20	1.5	P	—	—	—	—	—	—	—	51067	—	4 15/32	1.181	0.652	6
		B	—	—	—	—	—	—	—	51068	—	4 15/32	1.181	0.652	6
	2.5	P	—	—	—	—	—	—	—	—	51070	4 15/32	1.181	0.652	6
		B	—	—	—	—	—	—	—	—	51071	4 15/32	1.181	0.652	6

* P : Plug, B : Bottom

Tailet Taps

Nom. Dia	Threads/Inch		Basic Major Dia.	75%		65%		55%	
	NC UNC	NF UNF		Theoretical Core Hole	Nearest Drill Dia.	Theoretical Core Hole	Nearest Drill Dia.	Theoretical Core Hole	Nearest Drill Dia.
0		80	.0600	.0536	1.35mm	.0545	—	.0553	#54
1	64		.0730	.0650	1.65mm	.0661	—	.0672	#51
		72	.0730	.0659	1.65mm	.0669	1.7mm	.0679	#51
2	56		.0860	.0769	1.95mm	.0781	5/64	.0794	2.0mm
		64	.0860	.0780	5/64	.0791	2.0mm	.0802	—
3	48		.0990	.0884	2.25mm	.0898	#43	.0913	2.3mm
		56	.0990	.0899	#43	.0911	2.3mm	.0924	2.35mm
4	40		.1120	.0993	2.5mm	.1010	#39	.1027	2.6mm
		48	.1120	.1014	#38	.1028	2.6mm	.1166	#37
5	40		.1250	.1123	#34	.1140	#33	.1157	#32
		44	.1250	.1134	#33	.1150	2.9mm	.1166	#32
6	32		.1380	.1221	3.1mm	.1242	—	.1263	3.2mm
		40	.1380	.1253	1/8	.1270	3.2mm	.1287	#30
8	32		.1640	.1481	3.7mm	.1502	#25	.1523	#24
		36	.1640	.1498	#25	.1517	#24	.1537	3.9mm
10	24		.1900	.1688	—	.1716	11/64	.1746	#17
		32	.1900	.1741	#17	.1762	—	.1784	4.5mm
12	24		.2160	.1948	#10	.1976	5.0mm	.2006	5.1mm
		28	.2160	.1978	5.0mm	.2002	#8	.2028	—
1/4	20		.2500	.2245	5.7mm	.2280	#1	.2315	—
		28	.2500	.2318	—	.2342	A	.2368	6.0mm
5/16	18		.3125	.2842	7.2mm	.2879	7.3mm	.2917	7.4mm
		24	.3125	.2913	7.4mm	.2941	M	.2969	19/64
3/8	16		.3750	.3431	11/32	.3474	S	.3516	—
		24	.3750	.3538	9.0mm	.3566	—	.3594	23/64
7/16	14		.4375	.4011	—	.4059	13/32	.4108	—
		20	.4375	.4120	#2	.4154	—	.4188	—
1/2	13		.5000	.4608	—	.4660	—	.4712	12mm
		20	.5000	.4745	—	.4779	—	.4813	—
9/16	12		.5625	.5200	—	.5257	—	.5313	17/32
		18	.5625	.5342	13.5mm	.5379	—	.5417	—
5/8	11		.6250	.5787	37/64	.5848	37/64	.5910	15mm
		18	.6250	.5967	19/32	.6004	—	.6042	—
3/4	10		.7500	.6990	—	.7058	45/64	.7126	—
		16	.7500	.7181	23/32	.7224	—	.7266	—

Nom. Dia	Pitch	Theoretical Core Hole Size						Suggested	Taps
		Min.		Max.					
		Inches	mm	5H Class		6H Class			
		Inches	mm	Inches	mm	Inches	mm		
3	0.5	.1071	2.72	.1094	2.79	.1098	2.79	H5	H6
3.5	0.6	.1244	3.16	.1268	3.22	.1276	3.24	H5	H7
4	0.7	.1417	3.60	.1445	3.67	.1453	3.69	H6	H7
5	0.8	.1791	4.55	.1823	4.63	.1831	4.65	H6	H8
6	1	.2142	5.44	.2177	5.53	.2185	5.55	H7	H9
8	1.25	.2870	7.29	.2913	7.40	.2925	7.43	H8	H10
10	1.5	.3602	9.15	.3602	9.27	.3665	9.31	H9	H11
12	1.75	.4335	11.01	.4368	11.14	.4402	11.18	H10	H12
14	2	.5067	12.87	.5126	13.02	.5142	13.06	H11	H13
16	2	.5854	14.87	.5913	15.02	.5929	15.06	H11	H13
20	2.5	.7315	18.58	.7386	18.76	.7409	18.82	H11	H14

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

List No.983 Machine Screw Sizes

Modified Bottoming Style 2-1/2 To 3 Thread Lead
Surface Treated

VANADIUM HIGH SPEED STEEL HSSE-V

Nominal Size	Thread/Inch		No. of Flutes	E.D.P. Numbers						Dimensions			Std . Pack.
	NC UNC	NF UNF		H2	H3	H4	H5	H6	H7	Overall Length	Length of Thread	Shank Dia.	
2	56		2	88239	—	—	—	—	—	1 3/4	0.433	0.141	12
3	48		2	88240	—	—	—	—	—	1 13/16	0.500	0.141	12
4	40		2	88241	88242	88243	—	—	—	1 7/8	0.236	0.141	12
5	40		3	88253	—	—	—	—	—	1 15/16	0.236	0.141	12
6	32		3	—	88263	88264	88265	88266	88267	2	0.276	0.141	12
8	32		3	—	88277	88278	88279	88280	88281	2 1/8	0.276	0.168	12
10	24		3	—	88291	—	88292	88293	88294	2 3/8	0.354	0.194	12
		32	3	—	88299	88300	88301	—	88303	2 3/8	0.354	0.194	12

List No.981 Fractional Sizes

Modified Bottoming Style 2-1/2 To 3 Thread Lead
Surface Treated

VANADIUM HIGH SPEED STEEL HSSE-V

Nominal Size	Thread/Inch		No. of Flutes	E.D.P. Numbers						Dimensions			Std . Pack.
	NC UNC	NF UNF		H2	H3	H4	H5	H6	H7	Overall Length	Length of Thread	Shank Dia.	
1/4	20		3	—	88057	—	88060	—	88062	2 1/2	0.433	0.255	12
		28	3	—	88071	88072	88073	88074	88075	2 1/2	0.433	0.255	12
5/16	18		3	—	88081	—	88083	—	88085	2 23/32	0.472	0.318	12
		24	3	—	88095	88096	88097	—	88098	2 23/32	0.472	0.318	12
3/8	16		3	—	88103	—	88105	—	88107	2 15/16	0.551	0.381	12
		24	3	—	88111	88112	88113	—	88115	2 15/16	0.551	0.381	12
7/16	14		3	—	88117	—	88119	—	—	3 5/32	0.591	0.323	12
		20	3	—	88123	—	88125	—	—	3 5/32	0.591	0.323	12
1/2	13		3	—	88131	—	88133	—	88135	3 3/8	0.630	0.367	12
		20	3	—	88139	—	88141	—	—	3 3/8	0.630	0.367	12
9/16	12		3	—	88145	—	—	—	—	3 19/32	0.709	0.429	6
		18	3	—	88146	—	—	—	—	3 19/32	0.709	0.429	6
5/8	11		3	—	88149	—	88151	—	88153	3 13/16	0.748	0.480	6
		18	3	—	88157	—	88159	—	—	3 13/16	0.748	0.480	6
3/4	10		3	—	88167	—	—	—	88171	4 1/4	0.827	0.590	6
		16	3	—	88175	—	88177	—	—	4 1/4	0.827	0.590	6
7/8	9		4	—	88180	—	—	—	—	4 11/16	0.906	0.697	6
		14	4	—	88185	—	—	—	—	4 11/16	0.906	0.697	6
1	8		4	—	88190	—	—	—	—	5 1/8	0.984	0.800	3

List No.973 Machine Screw Sizes

Plug Style 4 to 5 Threads
Surface Treated

VANADIUM HIGH SPEED STEEL HSSE-V

Nominal Size	Thread/Inch		No. of Flutes	E.D.P. Numbers						Dimensions			Std . Pack.
	NC UNC	NF UNF		H2	H3	H4	H5	H6	H7	Overall Length	Length of Thread	Shank Dia.	
2	56		2	87216	87218	—	—	—	—	1 3/4	0.437	0.141	12
3	48		2	87220	—	—	—	—	—	1 13/16	0.500	0.141	12
4	40		2	87240	87242	87243	87244	—	—	1 7/8	0.354	0.141	12
5	40		2	87252	—	—	—	—	—	1 15/16	0.394	0.141	12
6	32		2	87258	87260	87261	87264	87265	87266	2	0.433	0.141	12
8	32		3	87272	87274	87275	87278	87279	87280	2 1/8	0.472	0.168	12
10	24		3	—	87288	—	87290	—	—	2 3/8	0.551	0.194	12
		32	3	87294	87296	87297	87300	87301	87302	2 3/8	0.551	0.194	12

List No.971 Fractional Sizes

Plug Style 4 to 5 Threads
Surface Treated

VANADIUM HIGH SPEED STEEL HSSE-V

Nominal Size	Thread/Inch		No. of Flutes	E.D.P. Numbers						Dimensions			Std . Pack.
	NC UNC	NF UNF		H2	H3	H4	H5	H6	H7	Overall Length	Length of Thread	Shank Dia.	
1/4	20		3	87052	87056	—	87060	—	87062	2 1/2	0.591	0.255	12
		28	3	87066	87068	87070	87071	87072	87073	2 1/2	0.591	0.255	12
5/16	18		3	—	87080	—	87084	—	87086	2 23/32	0.669	0.318	12
		24	3	—	87094	87096	87097	87098	87099	2 23/32	0.669	0.318	12
3/8	16		3	—	87102	—	87104	—	87106	2 15/16	0.748	0.381	12
		24	3	—	87110	87112	87113	87114	87115	2 15/16	0.748	0.381	12
7/16	14		3	—	87116	—	87120	—	—	3 5/32	0.866	0.323	12
		20	3	—	87122	—	87126	87127	87129	3 5/32	0.866	0.323	12
1/2	13		3	—	87130	—	87134	—	87136	3 3/8	0.984	0.367	12
		20	3	—	87138	—	87140	87141	87142	3 3/8	0.984	0.367	12
9/16	12		3	—	87143	—	—	—	—	3 19/32	0.984	0.429	6
		18	3	—	87144	—	—	—	—	3 19/32	0.984	0.429	6
5/8	11		3	—	87148	—	87152	—	87154	3 13/16	1.102	0.480	6
		18	3	—	87158	—	87159	—	—	3 13/16	1.102	0.480	6
3/4	10		3	—	87164	—	—	—	87167	4 1/4	1.181	0.590	6
		16	3	—	87168	—	87169	—	—	4 1/4	1.181	0.590	6
7/8	9		3	—	87170	—	—	—	—	4 11/16	1.299	0.697	3
		14	3	—	87171	—	—	—	—	4 11/16	1.299	0.697	3
1	8		3	—	87172	—	—	—	—	5 1/8	1.378	0.800	3

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

List No.993 Machine Screw Sizes**PREMIUM TYPE STEEL**

Surface Treated



Nominal Size	Thread/Inch		Pitch Diameter Limits	E.D.P. Numbers		Dimensions			Std . Pack.
	NC UNC	NF UNF		Plug	Bottom	Overall Length	Length of Thread	Shank Dia.	
0		80	H2		82003	1 5/8	0.311	0.141	12
1	64		H2		82009	1 11/16	0.374	0.141	12
1		72	H2		82015	1 11/16	0.374	0.141	12
2	56		H2		82021	1 3/4	0.437	0.141	12
2	56		H3		82024	1 3/4	0.437	0.141	12
2		64	H2		82030	1 3/4	0.437	0.141	12
2		64	H3		82033	1 3/4	0.437	0.141	12
3	48		H2		82039	1 13/16	0.500	0.141	12
3	48		H3		82042	1 13/16	0.500	0.141	12
3		56	H2		82048	1 13/16	0.500	0.141	12
3		56	H3		82051	1 13/16	0.500	0.141	12
4	40		H3	82056	82057	1 7/8	0.354	0.141	12
4	40		H5	82062	82063	1 7/8	0.354	0.141	12
4		48	H3	82068	82069	1 7/8	0.354	0.141	12
4		48	H5	82074	82075	1 7/8	0.354	0.141	12
5	40		H3	82080	82081	1 15/16	0.394	0.141	12
5	40		H5	82086	82087	1 15/16	0.394	0.141	12
5		44	H3	82092	82093	1 15/16	0.394	0.141	12
5		44	H5	82098	82099	1 15/16	0.394	0.141	12
6	32		H3	82104	82105	2	0.433	0.141	12
6	32		H5	82110	82111	2	0.433	0.141	12
6	32		H10	82119	82120	2	0.433	0.141	12
6		40	H3	82122	82123	2	0.433	0.141	12
6		40	H5	82128	82129	2	0.433	0.141	12
8	32		H3	82140	82141	2 1/8	0.472	0.168	12
8	32		H5	82146	82147	2 1/8	0.472	0.168	12
8	32		H10	82152	82153	2 1/8	0.472	0.168	12
8		36	H3	82158	82159	2 1/8	0.472	0.168	12
8		36	H5	82164	82165	2 1/8	0.472	0.168	12
10	24		H4	82179	82180	2 3/8	0.551	0.194	12
10	24		H6	82185	82186	2 3/8	0.551	0.194	12
10	24		H10	82191	82192	2 3/8	0.551	0.194	12
10		32	H4	82200	82201	2 3/8	0.551	0.194	12
10		32	H6	82206	82207	2 3/8	0.551	0.194	12
10		32	H10	82212	82213	2 3/8	0.551	0.194	12
12	24		H4	82218	82219	2 3/8	0.551	0.220	12
12	24		H6	82224	82225	2 3/8	0.551	0.220	12
12		28	H4	82236	82237	2 3/8	0.551	0.220	12
12		28	H6	82242	82243	2 3/8	0.551	0.220	12

Roll thread forming taps designed with more lobes and lubrication grooves. The extra lobes and grooves reduce tapping torque by allowing more coolant to reach critical contact areas.

List No.991 Fractional Sizes**PREMIUM TYPE STEEL**

Surface Treated



Nominal Size	Thread/Inch		Pitch Diameter Limits	E.D.P. Numbers		Dimensions			Std . Pack.
	NC UNC	NF UNF		Plug	Bottom	Overall Length	Length of Thread	Shank Dia.	
1/4	20		H4	82254	82255	2 1/2	0.591	0.255	12
1/4	20		H6	82260	82261	2 1/2	0.591	0.255	12
1/4	20		H10	82266	82267	2 1/2	0.591	0.255	12
1/4		28	H4	82272	82273	2 1/2	0.591	0.255	12
1/4		28	H6	82278	82279	2 1/2	0.591	0.255	12
1/4		28	H10	82284	82285	2 1/2	0.591	0.255	12
5/16	18		H5	82293	82294	2 23/32	0.669	0.318	12
5/16	18		H7	82299	82300	2 23/32	0.669	0.318	12
5/16		24	H5	82311	82312	2 23/32	0.669	0.318	12
5/16		24	H7	82317	82318	2 23/32	0.669	0.318	12
3/8	16		H5	82326	82327	2 15/16	0.748	0.381	12
3/8	16		H7	82332	82333	2 15/16	0.748	0.381	12
3/8		24	H5	82341	82342	2 15/16	0.748	0.381	12
3/8		24	H7	82347	82348	2 15/16	0.748	0.381	12
7/16	14		H5	82356	82357	3 5/32	0.866	0.323	12
7/16	14		H8	82365	82366	3 5/32	0.866	0.323	12
7/16		20	H5	82374	82375	3 5/32	0.866	0.323	12
7/16		20	H8	82383	82384	3 5/32	0.866	0.323	12
1/2	13		H5	82292	82393	3 3/8	0.984	0.367	12
1/2	13		H8	82401	82402	3 3/8	0.984	0.367	12
1/2		20	H5	82410	82411	3 3/8	0.984	0.367	12
1/2		20	H8	82419	82420	3 3/8	0.984	0.367	12
9/16	12		H7	82431	82432	3 19/32	0.984	0.429	6
9/16	12		H10	82437	82438	3 19/32	0.984	0.429	6
9/16		18	H7	82446	82447	3 19/32	0.984	0.429	6
9/16		18	H10	82452	82453	3 19/32	0.984	0.429	6
5/8	11		H7	82461	82462	3 13/16	1.102	0.480	6
5/8	11		H10	82467	82468	3 13/16	1.102	0.480	6
5/8		18	H7	82476	82477	3 13/16	1.102	0.480	6
5/8		18	H10	82482	82483	3 13/16	1.102	0.480	6
3/4	10		H7	82491	82492	4 1/4	1.181	0.590	6
3/4	10		H10	82497	82498	4 1/4	1.181	0.590	6
3/4		16	H7	82506	82507	4 1/4	1.181	0.590	6
3/4		16	H10	82512	82513	4 1/4	1.181	0.590	6

Roll thread forming taps designed with more lobes and lubrication grooves. The extra lobes and grooves reduce tapping torque by allowing more coolant to reach critical contact areas.

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

VTP TAP BLANK DIMENSIONS

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

Nominal Size	Overall Length	Length of Thread			Square Length	Size of Square	Shank Diameter
		971-973	991-993	981-983			
0	1 5/8	0.311	0.311		3/16	0.110	0.141
1	1 11/16	0.374	0.374		3/16	0.110	0.141
2	1 3/4	0.437	0.437		3/16	0.110	0.141
3	1 13/16	0.500	0.500		3/16	0.110	0.141
4	1 7/8	0.354	0.354	0.236	3/16	0.110	0.141
5	1 15/16	0.394	0.394	0.236	3/16	0.110	0.141
6	2	0.433	0.433	0.276	3/16	0.110	0.141
8	2 1/8	0.472	0.472	0.276	3/16	0.131	0.168
10NC	2 3/8	0.551	0.551	0.354	1/4	0.152	0.194
10NF	2 3/8	0.551	0.551	0.354	1/4	0.152	0.194
12	2 3/8	0.551	0.551	0.354	9/32	0.165	0.220
1/4NC	2 1/2	0.591	0.591	0.433	5/16	0.191	0.255
1/4NF	2 1/2	0.591	0.591	0.433	5/16	0.191	0.255
5/16NC	2 23/32	0.669	0.669	0.472	3/8	0.238	0.318
5/16NF	2 23/32	0.669	0.669	0.472	3/8	0.238	0.318
3/8NC	2 15/16	0.748	0.748	0.551	7/16	0.286	0.381
3/8NF	2 15/16	0.748	0.748	0.551	7/16	0.286	0.381
7/16NC	3 5/32	0.866	0.866	0.591	13/32	0.242	0.323
7/16NF	3 5/32	0.866	0.866	0.591	13/32	0.242	0.323
1/2NC	3 3/8	0.984	0.984	0.630	7/16	0.275	0.367
1/2NF	3 3/8	0.984	0.984	0.630	7/16	0.275	0.367
9/16NC	3 19/32	0.984	0.984	0.709	1/2	0.322	0.429
9/16NF	3 19/32	0.984	0.984	0.709	1/2	0.322	0.429
5/8NC	3 13/16	1.102	1.102	0.748	9/16	0.360	0.480
5/8NF	3 13/16	1.102	1.102	0.748	9/16	0.360	0.480
3/4NC	4 1/4	1.181	1.181	0.827	11/64	0.441	0.590
3/4NF	4 1/4	1.181	1.181	0.827	11/64	0.441	0.590

VTP Taps are manufactured from premium type-High Vanadium High Speed Steel

They have a High Vanadium content for superior wear resistance, and are specially heat-treated for toughness.

The black oxide surface treatment provides extra lubricity and resistance to galling pickup.

Tap geometry designed for optimum cutting performance and close control of tapped holes size.

VTP METRIC TAPS SPIRAL FLUTED

VTP METRIC TAPS SPIRAL POINTED

List No.980 Spiral Fluted

VANADIUM HIGH SPEED STEEL HSSE-V



Modified Bottoming Style 2-1/2 To 3 Thread Lead
Surface Treated



Nominal Size (mm)	Pitch (mm)	No. Of Flutes	E.D.P. Number					Dimensions			Std. Pack.
			D3	D4	D5	D6	D7	Overall Length	Length of Thread	Shank Dia.	
3	0.5	3	54615	—	—	—	—	1 15/16	0.236	0.141	12
3.5	0.6	3	—	54616	—	—	—	2	0.276	0.141	12
4	0.7	3	—	54617	—	—	—	2 1/8	0.276	0.168	12
5	0.8	3	—	54619	—	—	—	2 3/8	0.354	0.194	12
6	1	3	—	—	54620	—	—	2 1/2	0.433	0.255	12
7	1	3	—	—	54621	—	—	2 23/32	0.472	0.318	12
8	1	3	—	—	54622	—	—	2 23/32	0.472	0.318	12
8	1.25	3	—	—	54623	—	—	2 23/32	0.472	0.318	12
10	1.25	3	—	—	54624	—	—	2 15/16	0.551	0.381	12
10	1.5	3	—	—	—	54625	—	2 15/16	0.551	0.381	12
12	1.25	3	—	—	54626	—	—	3 3/8	0.630	0.367	12
12	1.75	3	—	—	—	54627	—	3 3/8	0.630	0.367	12
14	1.5	3	—	—	—	54628	—	3 19/32	0.551	0.429	6
14	2	3	—	—	—	—	54629	3 19/32	0.709	0.429	6
16	1.5	3	—	—	—	54630	—	3 13/16	0.551	0.480	6
16	2	3	—	—	—	—	54631	3 13/16	0.709	0.480	6
18	1.5	3	—	—	—	54632	—	4 1/32	0.551	0.542	6
18	2.5	3	—	—	—	—	54633	4 1/32	0.874	0.542	6

List No.982 Spiral Pointed

VANADIUM HIGH SPEED STEEL HSSE-V



Plug Style, 4 To 5 Thread Lead
Surface Treated



Nominal Size (mm)	Pitch (mm)	No. Of Flutes	E.D.P. Number					Dimensions			Std. Pack.
			D3	D4	D5	D6	D7	Overall Length	Length of Thread	Shank Dia.	
3	0.5	3	52615	—	—	—	—	1 15/16	0.394	0.141	12
3.5	0.6	3	—	52616	—	—	—	2	0.433	0.141	12
4	0.7	3	—	52617	—	—	—	2 1/8	0.472	0.168	12
5	0.8	3	—	52619	—	—	—	2 3/8	0.551	0.194	12
6	1	3	—	—	52620	—	—	2 1/2	0.591	0.255	12
7	1	3	—	—	52621	—	—	2 23/32	0.669	0.318	12
8	1	3	—	—	52622	—	—	2 23/32	0.669	0.318	12
8	1.25	3	—	—	52623	—	—	2 23/32	0.669	0.318	12
10	1.25	3	—	—	52624	—	—	2 15/16	0.748	0.381	12
10	1.5	3	—	—	—	52625	—	2 15/16	0.748	0.381	12
12	1.25	3	—	—	52626	—	—	3 3/8	0.984	0.367	12
12	1.75	3	—	—	—	52627	—	3 3/8	0.984	0.367	12
14	1.5	3	—	—	—	52628	—	3 19/32	0.984	0.429	6
14	2	3	—	—	—	—	52629	3 19/32	0.984	0.429	6
16	1.5	3	—	—	—	52630	—	3 13/16	1.102	0.480	6
16	2	3	—	—	—	—	52631	3 13/16	1.102	0.480	6
18	1.5	3	—	—	—	52632	—	4 1/32	1.102	0.542	6
18	2.5	3	—	—	—	—	52633	4 1/32	1.102	0.542	6

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

STANDARD HAND TAPS

List No.911 Fractional Sizes

Bright Finish

HIGH SPEED STEEL

**List No.911P** Fractional Sizes

Titanium Nitride Coated

HIGH SPEED STEEL-TIN COATED



Size	Thread		Pitch Diameter Limits	Number of Flutes	E.D.P.						Dimensions			Std . Pack.
	UNC	UNF			Taper		Plug		Bottom		Overall Length	Thread Length	Shank Dia.	
					L911	L911P	L911	L911P	L911	L911P				
1/4	20		H2	4	64059		64060		64061		2 1/2	1	0.255	12
1/4	20		H3	4	64068	24068	64069	24069	64070	24070	2 1/2	1	0.255	12
1/4	20		H5	4			64075		64076		2 1/2	1	0.255	12
1/4		28	H3	4	64089	24089	64090	24090	64091	24091	2 1/2	1	0.255	12
1/4		28	H4	4			64093		64094		2 1/2	1	0.255	12
5/16	18		H2	4	64098		64099		64100		2 23/32	1 1/8	0.318	12
5/16	18		H3	4	64107	24107	64108	24108	64109	24109	2 23/32	1 1/8	0.318	12
5/16	18		H5	4			64111		64112		2 23/32	1 1/8	0.318	12
5/16		24	H3	4	64122	24122	64123	24123	64124	24124	2 23/32	1 1/8	0.318	12
5/16		24	H4	4			64126		64127		2 23/32	1 1/8	0.318	12
3/8	16		H2	4	64131		64132		64133		2 15/16	1 1/4	0.381	12
3/8	16		H3	4	64137	24137	64138	24138	64139	24139	2 15/16	1 1/4	0.381	12
3/8	16		H5	4			64141		64142		2 15/16	1 1/4	0.381	12
3/8		24	H3	4	64152	24152	64153	24153	64154	24154	2 15/16	1 1/4	0.381	12
3/8		24	H4	4			64156		64157		2 15/16	1 1/4	0.381	12
7/16	14		H3	4	64167	24167	64168	24168	64169	24169	3 5/32	1 7/16	0.323	12
7/16		20	H3	4	64182	24182	64183	24183	64184	24184	3 5/32	1 7/16	0.323	12
1/2	13		H3	4	64197	24197	64198	24198	64199	24199	3 3/8	1 21/32	0.367	12
1/2	13		H5	4			64201		64202		3 3/8	1 21/32	0.367	12
1/2		20	H3	4	64212	24212	64213	24213	64214	24214	3 3/8	1 21/32	0.367	12
1/2		20	H5	4			64216		64217		3 3/8	1 21/32	0.367	12
9/16	12		H3	4	64221	24221	64222	24222	64223	24223	3 19/32	1 21/32	0.429	6
9/16		18	H3	4	64230	24230	64231	24231	64232	24232	3 19/32	1 21/32	0.429	6
5/8	11		H3	4	64242	24242	64243	24243	64244	24244	3 13/16	1 13/16	0.480	6
5/8	11		H5	4			64246		64247		3 13/16	1 13/16	0.480	6
5/8		18	H3	4	64254	24254	64255	24255	64256	24256	3 13/16	1 13/16	0.480	6
5/8		18	H5	4			64258		64259		3 13/16	1 13/16	0.480	6
11/16	11		H3	4	64260		64261		64262		4 1/32	1 13/16	0.542	6
11/16		16	H3	4	64263		64264		64265		4 1/32	1 13/16	0.542	6
3/4	10		H3	4	64272	24272	64273	24273	64274	24274	4 1/4	2	0.590	6
3/4	10		H5	4			64276		64277		4 1/4	2	0.590	6
3/4		16	H3	4	64284	24284	64285	24285	64286	24286	4 1/4	2	0.590	6
3/4		16	H5	4			64288		64289		4 1/4	2	0.590	6
7/8	9		H4	4	64293	24293	64294	24294	64295	24295	4 11/16	2 7/32	0.697	3
7/8		14	H4	4	64302	24302	64303	24303	64304	24304	4 11/16	2 7/32	0.697	3
1	8		H4	4	64311	24311	64312	24312	64313	24313	5 1/8	2 1/2	0.800	3
1		12	H4	4	64314		64315		64316		5 1/8	2 1/2	0.800	3
1		14	H4	4	64320		64321		64322		5 1/8	2 1/2	0.800	3
1 1/8	7		H4	4	64323		64324		64325		5 7/16	2 9/16	0.896	1
1 1/8		12	H4	4	64326		64327		64328		5 7/16	2 9/16	0.896	1
1 1/4	7		H4	4	64329		64330		64331		5 3/4	2 9/16	1.021	1
1 1/4		12	H4	6	64332		64333		64334		5 3/4	2 9/16	1.021	1
1 3/8	6		H4	4	64335		64336		64337		6 1/16	3	1.108	1
1 3/8		12	H4	6	64338		64339		64340		6 1/16	3	1.108	1
1 1/2	6		H4	4	64341		64342		64343		6 3/8	3	1.233	1
1 1/2		12	H4	6	64344		64345		64346		6 3/8	3	1.233	1

Order by EDP Number

List No.913 Machine Screw Size

Bright Finish

HIGH SPEED STEEL

**List No.913P** Machine Screw Sizes

Titanium Nitride

HIGH SPEED STEEL-TIN COATED



Nominal Tap Size	Threads		Pitch Diameter Limits	Number of Flutes	E.D.P. Numbers						Dimensions			Std . Pack.
	NC UNC	NF UNF			Taper		Plug		Bottom		Overall Length	Thread Length	Shank Dia.	
					L913	L913P	L913	L913P	L913	L913P				
0		80	H1	2	64360		64361		64362		1 5/8	5/16	0.141	12
0		80	H2	2			64364	24364	64365	24365	1 5/8	5/16	0.141	12
1	64		H1	2	64366		64367		64368		1 11/16	3/8	0.141	12
1	64		H2	2			64370				1 11/16	3/8	0.141	12
1		72	H1	2	64372		64373		64374		1 11/16	3/8	0.141	12
1		72	H2	2			64376		64377		1 11/16	3/8	0.141	12
2	56		H1	3	64381		64382		64383		1 3/4	7/16	0.141	12
2	56		H2	3	64387	24387	64388	24388	64389	24389	1 3/4	7/16	0.141	12
2		64	H1	3	64390		64391		64392		1 3/4	7/16	0.141	12
2		64	H2	3	64393		64394		64395		1 3/4	7/16	0.141	12
3	48		H1	3			64397				1 13/16	1/2	0.141	12
3	48		H2	3	64402		64403		64404		1 13/16	1/2	0.141	12
3		56	H1	3			64406				1 13/16	1/2	0.141	12
3		56	H2	3	64408		64409		64410		1 13/16	1/2	0.141	12
4	36		H2	3	64411		64412		64413		1 7/8	9/16	0.141	12
4	40		H1	3	64417		64418		64419		1 7/8	9/16	0.141	12
4	40		H2	3	64423	24423	64424	24424	64425	24425	1 7/8	9/16	0.141	12
4		48	H1	3			64427				1 7/8	9/16	0.141	12
4		48	H2	3	64429		64430		64431		1 7/8	9/16	0.141	12
5	40		H1	3			64433		64434		1 15/16	5/8	0.141	12
5	40		H2	3	64438	24438	64439	24439	64440	24440	1 15/16	5/8	0.141	12
5		44	H1	3			64442		64443		1 15/16	5/8	0.141	12
5		44	H2	3	64447		64448		64449		1 15/16	5/8	0.141	12
6	32		H2	3	64459		64460		64461		2	11/16	0.141	12
6	32		H3	3	64465	24465	64466	24466	64467	24467	2	11/16	0.141	12
6	32		H7	3			64469		64470		2	11/16	0.141	12
6		40	H1	3			64472				2	11/16	0.141	12
6		40	H2	3	64477		64478		64479		2	11/16	0.141	12
8	32		H2	4	64495		64496		64497		2 1/8	3/4	0.168	12
8	32		H3	4	64504	24504	64505	24505	64506	24506	2 1/8	3/4	0.168	12
8	32		H7	4			64508		64509		2 1/8	3/4	0.168	12
8		36	H1	4			64515				2 1/8	3/4	0.168	12
8		36	H2	4	64517		64518		64519		2 1/8	3/4	0.168	12
10	24		H2	4	64532		64533		64534		2 3/8	7/8	0.194	12
10	24		H3	4	64541	24541	64542	24542	64543	24543	2 3/8	7/8	0.194	12
10	24		H7	4			64548		64549		2 3/8	7/8	0.194	12
10		32	H2	4	64562		64563		64564		2 3/8	7/8	0.194	12
10		32	H3	4	64571	24571	64572	24572	64573	24573	2 3/8	7/8	0.194	12
10		32	H7	4			64578		64579		2 3/8	7/8	0.194	12
12	24		H3	4	64583	24583	64584	24584	64585	24585	2 3/8	15/16	0.220	12
12		28	H3	4	64589		64590		64591		2 3/8	15/16	0.220	12

Order by EDP Number

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

STANDARD HAND TAPS / 2 FLUTES AND 3 FLUTES

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

* **List No.959** Optional 2 Flute

Surface Treated

HIGH SPEED STEEL



Size	Threads		Thread Limit	Number of Flutes	E.D.P.		Dimensions			Std. Pack.
	UNC	UNF			Plug*	Bottom*	Overall Length	Thread Length	Shank Dia.	
2	56		H1	2	70601	70602	1 3/4	7/16	0.141	12
	56		H2	2	70651	70652	1 3/4	7/16	0.141	12
3	48		H2	2	70657	70658	1 13/16	1/2	0.141	12
4	40		H1	2	70613		1 7/8	9/16	0.141	12
	40		H2	2	70663	70664	1 7/8	9/16	0.141	12
5	40		H2	2	70672	70673	1 15/16	5/8	0.141	12
		44	H2	2	70675		1 15/16	5/8	0.141	12
6	32		H1	2	70628		2	11/16	0.141	12
	32		H2	2	70678	70679	2	11/16	0.141	12
	32		H3	2	70728	70729	2	11/16	0.141	12
		40	H2	2	70681		2	11/16	0.141	12
8	32		H2	2	70684	70685	2 1/8	3/4	0.168	12
	32		H3	2	70734	70735	2 1/8	3/4	0.168	12
10	24		H2	2	70690	70691	2 3/8	7/8	0.194	12
	24		H3	2	70740	70741	2 3/8	7/8	0.194	12
10		32	H2	2	70693	70694	2 3/8	7/8	0.194	12
		32	H3	2	70743	70744	2 3/8	7/8	0.194	12
1/4	20		H3	2	71951	71952	2 1/2	1	0.255	12
		28	H3	2	71954	71955	2 1/2	1	0.255	12
5/16	18		H3	2	71957	71958	2 23/32	1 1/8	0.318	12

* item will be discontinued, after stock has been depleted.

* **List No.961** Optional 3 Flute

Surface Treated

HIGH SPEED STEEL



Size	Threads		Thread Limit	Number of Flutes	E.D.P.		Dimensions			Std. Pack.
	UNC	UNF			Plug*	Bottom*	Overall Length	Thread Length	Shank Dia.	
8	32		H1	3	70401	70402	2 1/8	3/4	0.168	12
	32		H2	3	70451	70452	2 1/8	3/4	0.168	12
	32		H3	3	70501	70502	2 1/8	3/4	0.168	12
10	24		H1	3	70407		2 3/8	7/8	0.194	12
	24		H2	3	70457		2 3/8	7/8	0.194	12
	24		H3	3	70507	70508	2 3/8	7/8	0.194	12
		32	H2	3	70460	70461	2 3/8	7/8	0.194	12
		32	H3	3	70510	70511	2 3/8	7/8	0.194	12
1/4	20		H1	3	71601		2 1/2	1	0.255	12
	20		H2	3	71651		2 1/2	1	0.255	12
	20		H3	3	71701	71702	2 1/2	1	0.255	12
	20		H5	3	71801	71802	2 1/2	1	0.255	12
		28	H3	3	71704	71705	2 1/2	1	0.255	12
5/16	18		H1	3	71607		2 23/32	1 1/8	0.318	12
	18		H3	3	71707	71708	2 23/32	1 1/8	0.318	12
	18		H5	3	71807	71808	2 23/32	1 1/8	0.318	12
		24	H3	3	71710	71711	2 23/32	1 1/8	0.318	12
3/8	16		H1	3	71613		2 15/16	1 1/4	0.381	12
	16		H3	3	71713	71714	2 15/16	1 1/4	0.381	12
	16		H5	3	71813	71814	2 15/16	1 1/4	0.381	12
		24	H3	3	71716	71717	2 15/16	1 1/4	0.381	12
7/16	14		H3	3	71719	71720	3 5/32	1 7/16	0.323	12
		20	H3	3	71722		3 5/32	1 7/16	0.323	12
1/2	13		H3	3	71725	71726	3 3/8	1 21/32	0.367	12
		20	H3	3	71728		3 3/8	1 21/32	0.367	12

* item will be discontinued, after stock has been depleted.

List No.969 For Cast Iron**HIGH SPEED STEEL**

Size	Threads		Thread Limit	Number of Flutes	E.D.P.		Dimensions			Std. Pack.
	UNC	UNF			Plug	Bottom	Overall Length	Thread Length	Shank Dia.	
1/4	20		H3	4	76001	76002	2 1/2	1	0.255	12
	20		H5	4	76003	76004	2 1/2	1	0.255	12
		28	H3	4	76005	76006	2 1/2	1	0.255	12
5/16	18		H3	4	76007	76008	2 23/32	1 1/8	0.318	12
	18		H5	4	76009	76010	2 23/32	1 1/8	0.318	12
		24	H3	4	76011	76012	2 23/32	1 1/8	0.318	12
3/8	16		H3	4	76013	76014	2 15/16	1 1/4	0.381	12
	16		H5	4	76015	76016	2 15/16	1 1/4	0.381	12
		24	H3	4	76017	76018	2 15/16	1 1/4	0.381	12
7/16	14		H3	4	76019	76020	3 5/32	1 7/16	0.323	12
	14		H5	4	76021	76022	3 5/32	1 7/16	0.323	12
		20	H3	4	76023	76024	3 5/32	1 7/16	0.323	12
		20	H5	4	76025	76026	3 5/32	1 7/16	0.323	12
1/2	13		H3	4	76027	76028	3 3/8	1 21/32	0.367	12
	13		H5	4	76029	76030	3 3/8	1 21/32	0.367	12
		20	H3	4	76031	76032	3 3/8	1 21/32	0.367	12
		20	H5	4	76033	76034	3 3/8	1 21/32	0.367	12
9/16	12		H3	4	76035	76036	3 19/32	1 21/32	0.429	6
		18	H3	4	76037	76038	3 19/32	1 21/32	0.429	6
5/8	11		H3	4	76039	76040	3 13/16	1 13/16	0.480	6
		18	H3	4	76041	76042	3 13/16	1 13/16	0.480	6
3/4	10		H3	4	76043	76044	4 1/4	2	0.590	6
		16	H3	4	76045	76046	4 1/4	2	0.590	6

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

STANDARD TAPS SPIRAL POINTED / FRACTIONAL SIZES

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

List No.921 Fractional Sizes

Plug and Bottoming Style

*(Bottom style will be discontinued)

Bright Finish**HIGH SPEED STEEL****List No.921P** Fractional Sizes

Plug and Bottoming Style

*(Bottom style will be discontinued)

Titanium Nitride Coated**HIGH SPEED STEEL-TIN COATED****List No.921S** Fractional Sizes

Plug Style

Surface Treated**HIGH SPEED STEEL**

Nominal Tap Size	Threads per inch		Pitch Diameter Limits	Number of Flutes	E.D.P. Numbers					Dimensions			Std. Pack.
	NC UNC	NF UNF			Plug			Bottom		Overall Length	Thread Length	Shank Dia.	
					L921	L921S	L921P	L921*	L921P*				
1/4	20		H3	2	67054	67402	27054	67055	27055	2 1/2	1	0.255	12
1/4	20		H3	3	67056					2 1/2	1	0.255	12
1/4		28	H3	2	67068	67409	27068	67069	27069	2 1/2	1	0.255	12
5/16	18		H3	2	67078	67414	27078	67079	27079	2 23/32	1 1/8	0.318	12
5/16	18		H3	3	67080		27080			2 23/32	1 1/8	0.318	12
5/16		24	H3	2	67092	67421	27092	67093	27093	2 23/32	1 1/8	0.318	12
3/8	16		H2	3	67100					2 15/16	1 1/4	0.381	12
3/8	16		H3	3	67102	67426	27102	67103	27103	2 15/16	1 1/4	0.381	12
3/8	16		H5	3	67104		27106			2 15/16	1 1/4	0.381	12
3/8		24	H3	3	67110	67430	27110			2 15/16	1 1/4	0.381	12
7/16	14		H3	3	67116	67433	27116	67117		3 5/32	1 7/16	0.323	12
7/16		20	H3	3	67122	67436	27122			3 5/32	1 7/16	0.323	12
1/2	13		H3	3	67130	67440	27130			3 3/8	1 21/32	0.367	12
1/2		20	H3	3	67138	67444	27138			3 3/8	1 21/32	0.367	12
9/16	12		H3	3	67142		27142			3 19/32	1 21/32	0.429	6
5/8	11		H3	3	67148	67447	27148			3 13/16	1 13/16	0.480	6
3/4	10		H3	3	67150	67450	27150			4 1/4	2	0.590	6

Order by EDP Number

* L921&L921P Bottom style will be discontinued, after stock has been depleted.

List No.923 Machine Screw Sizes

Plug and Bottoming Style
 *(Bottom style will be discontinued)

Bright Finish

HIGH SPEED STEEL

**List No.923P** Machine Screw Sizes

Plug and Bottoming Style
 *(Bottom style will be discontinued)

Titanium Nitride Coated

HIGH SPEED STEEL-TIN COATED

**List No.923S** Machine Screw Sizes

Plug Style
Surface Treated

HIGH SPEED STEEL



Nominal Tap Size	Threads per inch		Pitch Diameter Limits	Number of Flutes	E.D.P. Numbers					Dimensions			Std. Pack.
	NC UNC	NF UNF			Plug			Bottom		Overall Length	Thread Length	Shank Dia.	
					L923	L923S	L923P	L923*	L923P*				
0		80	H1	2	67200			67201		1 5/8	5/16	0.141	12
0		80	H2	2	67202 27202			67203		1 5/8	5/16	0.141	12
1	64		H1	2	67206			67207		1 11/16	3/8	0.141	12
1	64		H2	2	67208			67209		1 11/16	3/8	0.141	12
1			H1	2	67210			67211		1 11/16	3/8	0.141	12
1			H2	2	67212			67213		1 11/16	3/8	0.141	12
2	56		H1	2	67214			67215		1 3/4	7/16	0.141	12
2	56		H2	2	67216 27216			67217		1 3/4	7/16	0.141	12
2			H2	2	67224			67225		1 3/4	7/16	0.141	12
3	48		H2	2	67228 67514			67229		1 13/16	1/2	0.141	12
3		56	H2	2	67234 67517			67235		1 13/16	1/2	0.141	12
4	36NS		H2	2	67236			67239		1 7/8	9/16	0.141	12
4	40		H1	2	67238			67239		1 7/8	9/16	0.141	12
4	40		H2	2	67240 67520 27240			67241		1 7/8	9/16	0.141	12
4			H2	2	67248 67524			67249		1 7/8	9/16	0.141	12
5	40		H1	2	67250			67251		1 15/16	5/8	0.141	12
5	40		H2	2	67252 67526 27252			67253		1 15/16	5/8	0.141	12
5			H2	2	67254 67527			67255		1 15/16	5/8	0.141	12
6	32		H2	2	67258 27258			67259		2	11/16	0.141	12
6	32		H3	2	67260 67530 27260			67261		2	11/16	0.141	12
6	32		H7	2	67264					2	11/16	0.141	12
6			H2	2	67268 67534			67269		2	11/16	0.141	12
8	32		H2	2	67272 27272			67273		2 1/8	3/4	0.168	12
8	32		H3	2	67274 67537 27274			67275		2 1/8	3/4	0.168	12
8	32		H7	2	67278					2 1/8	3/4	0.168	12
8			H2	2	67282 67541			67283		2 1/8	3/4	0.168	12
10	24		H2	2	67286 27286			67287		2 3/8	7/8	0.194	12
10	24		H3	2	67288 67544 27288			67289 27289		2 3/8	7/8	0.194	12
10	24		H7	2	67290					2 3/8	7/8	0.194	12
10			H2	2	67294 27294			67295		2 3/8	7/8	0.194	12
10			H3	2	67296 67548 27296			67297 27297		2 3/8	7/8	0.194	12
10		32	H7	2	67300					2 3/8	7/8	0.194	12
12	24		H3	2	67304 67552 27304			67305		2 3/8	15/16	0.220	12

Order by EDP Number

* L923&L923P Bottom style will be discontinued, after stock has been depleted.

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

STANDARD TAPS / SPIRAL FLUTED

List No.931 Fractional Sizes



Spiral Fluted

* Plug style will be discontinued.

Bright Finish

HIGH SPEED STEEL



Nominal Tap Size	Threads Per Inch		Pitch Dia. Limit	Number of Flutes	E.D.P.		Dimensions			Std. Pack.
	UNC	UNF			Plug*	Bottom	Overall Length	Thread Length	Shank Dia.	
1/4	20		H3	2	68054	68055	2 1/2	1	0.255	12
1/4	20		H3	3	68056	68057	2 1/2	1	0.255	12
1/4		28	H3	2	68068	68069	2 1/2	1	0.255	12
1/4		28	H3	3	68070	68071	2 1/2	1	0.255	12
5/16	18		H3	2	68078	68079	2 23/32	1 1/8	0.318	12
5/16	18		H3	3	68080	68081	2 23/32	1 1/8	0.318	12
5/16		24	H3	2	68092	68093	2 23/32	1 1/8	0.318	12
5/16		24	H3	3	68094	68095	2 23/32	1 1/8	0.318	12
3/8	16		H3	3	68102	68103	2 15/16	1 1/4	0.381	12
3/8		24	H3	3	68110	68111	2 15/16	1 1/4	0.381	12
7/16	14		H3	3	68116	68117	3 5/32	1 7/16	0.323	12
7/16		20	H3	3	68122	68123	3 5/32	1 7/16	0.323	12
1/2	13		H3	3	68130	68131	3 3/8	1 21/32	0.367	12
1/2		20	H3	3	68138	68139	3 3/8	1 21/32	0.367	12

Order by EDP Number

* L931 Plug style will be discontinued, after stock has been depleted.

List No.933 Machine Screw Sizes



Spiral Fluted

* Plug style will be discontinued.

Bright Finish

HIGH SPEED STEEL



Nominal Tap Size	Threads Per Inch		Pitch Dia. Limit	Number of Flutes	E.D.P.		Dimensions			Std. Pack.
	UNC	UNF			Plug*	Bottom	Overall Length	Thread Length	Shank Dia.	
3	48		H2	2	68228	68229	1 13/16	1/2	0.141	12
3		56	H2	2	68234	68235	1 13/16	1/2	0.141	12
4	40		H2	2	68240	68241	1 7/8	9/16	0.141	12
4		48	H2	2	68248	68249	1 7/8	9/16	0.141	12
5	40		H2	2	68252	68253	1 15/16	5/8	0.141	12
5		44	H2	2	68254	68255	1 15/16	5/8	0.141	12
6	32		H3	2	68260	68261	2	11/16	0.141	12
6		40	H2	2	68268	68269	2	11/16	0.141	12
8	32		H3	2	68274	68275	2 1/8	3/4	0.168	12
8		36	H2	2	68282	68283	2 1/8	3/4	0.168	12
10	24		H3	2	68288	68289	2 3/8	7/8	0.194	12
10		32	H3	2	68296	68297	2 3/8	7/8	0.194	12
12	24		H3	2	68304	68305	2 3/8	15/16	0.220	12
12		28	H3	2	68306	68307	2 3/8	15/16	0.220	12

Order by EDP Number

* L933 Plug style will be discontinued, after stock has been depleted.

List No.931H Fractional Sizes

High Helix Taps
Fast Spiral Flute

* Plug style will be discontinued.

Bright Finish

HIGH SPEED STEEL



Nominal Tap Size	Threads Per Inch		Pitch Dia. Limit	Number of Flutes	E.D.P.		Dimensions			Std. Pack.
	UNC	UNF			Plug*	Bottom	Overall Length	Thread Length	Shank Dia.	
1/4	20		H3	3	68356	68357	2 1/2	1	0.255	12
1/4		28	H3	3	68370	68371	2 1/2	1	0.255	12
5/16	18		H3	3	68380	68381	2 23/32	1 1/8	0.318	12
5/16		24	H3	3	68394	68395	2 23/32	1 1/8	0.318	12
3/8	16		H3	3	68402	68403	2 15/16	1 1/4	0.381	12
3/8		24	H3	3	68410	68411	2 15/16	1 1/4	0.381	12
7/16	14		H3	3	68416	68417	3 5/32	1 7/16	0.323	12
7/16		20	H3	3	68422	68423	3 5/32	1 7/16	0.323	12
1/2	13		H3	3	68430	68431	3 3/8	1 21/32	0.367	12
1/2		20	H3	3	68438	68439	3 3/8	1 21/32	0.367	12

Order by EDP Number

* L931H Plug style will be discontinued, after stock has been depleted.

List No.933H Machine Screw Sizes

High Helix Taps
Fast Spiral Flute

* Plug style will be discontinued.

Bright Finish

HIGH SPEED STEEL



Nominal Tap Size	Threads Per Inch		Pitch Dia. Limit	Number of Flutes	E.D.P.		Dimensions			Std. Pack.
	UNC	UNF			Plug*	Bottom	Overall Length	Thread Length	Shank Dia.	
3	48		H2	2	68528	68529	1 13/16	1/2	0.141	12
4	40		H2	2	68540	68541	1 7/8	9/16	0.141	12
5	40		H2	2	68552	68553	1 15/16	5/8	0.141	12
6	32		H3	2	68560	68561	2	1 1/16	0.141	12
8	32		H3	3	68572	68573	2 1/8	3/4	0.168	12
10	24		H3	3	68586	68587	2 3/8	7/8	0.194	12
10		32	H3	3	68594	68595	2 3/8	7/8	0.194	12

Order by EDP Number

* L933H Plug style will be discontinued, after stock has been depleted.

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

List No.915

Fractional Sizes & Machine Screw Sizes

HIGH SPEED STEEL



Hand Taps

Plug Style

.005 Oversized

Bright Finish



Nominal Tap Size	Threads		Pitch Limits	Number of Flutes	E.D.P. Number	Dimensions			Std. Pack.
	UNC	UNF				Overall Length	Thread Length	Shank Dia.	
6	32		H13	3	64612	2	11/16	0.141	12
8	32		H13	4	64614	2 1/8	3/4	0.168	12
10	24		H13	4	64616	2 3/8	7/8	0.194	12
10		32	H13	4	64617	2 3/8	7/8	0.194	12
1/4	20		H13	4	64621	2 1/2	1	0.255	12
1/4		28	H13	4	64622	2 1/2	1	0.255	12
5/16	18		H13	4	64623	2 23/32	1 1/8	0.318	12
5/16		24	H13	4	64624	2 23/32	1 1/8	0.318	12
3/8	16		H13	4	64625	2 15/16	1 1/4	0.381	12
3/8		24	H13	4	64626	2 15/16	1 1/4	0.381	12
7/16	14		H13	4	64627	3 5/32	1 7/16	0.323	12
7/16		20	H13	4	64628	3 5/32	1 7/16	0.323	12
1/2	13		H13	4	64629	3 3/8	1 21/32	0.367	12
1/2		20	H13	4	64630	3 3/8	1 21/32	0.367	12
9/16	12		H13	4	64631	3 19/32	1 21/32	0.429	6
5/8	11		H13	4	64633	3 13/16	1 13/16	0.480	6
3/4	10		H13	4	64637	4 1/4	2	0.590	6
7/8	9		H13	4	64639	4 11/16	2 7/32	0.697	3
1	8		H13	4	64641	5 1/8	2 1/2	0.800	3

Order by EDP Number

List No.925

Fractional & Machine Screw Sizes

HIGH SPEED STEEL



Spiral Pointed

Plug Style

.005 Oversized

Bright Finish



Nominal Tap Size	Threads		Pitch Dia. Limits	Number of Flutes	E.D.P. Number	Dimensions			Std. Pack.
	UNC	UNF				Overall Length	Thread Length	Shank Dia.	
6	32		H13	2	67612	2	11/16	0.141	12
8	32		H13	2	67614	2 1/8	3/4	0.168	12
10	24		H13	2	67616	2 3/8	7/8	0.194	12
10		32	H13	2	67617	2 3/8	7/8	0.194	12
1/4	20		H13	2	67621	2 1/2	1	0.255	12
1/4		28	H13	2	67622	2 1/2	1	0.255	12
5/16	18		H13	2	67623	2 23/32	1 1/8	0.318	12
5/16		24	H13	2	67624	2 23/32	1 1/8	0.318	12
3/8	16		H13	3	67625	2 15/16	1 1/4	0.381	12
3/8		24	H13	3	67626	2 15/16	1 1/4	0.381	12
7/16	14		H13	3	67627	3 5/32	1 7/16	0.323	12
7/16		20	H13	3	67628	3 5/32	1 7/16	0.323	12
1/2	13		H13	3	67629	3 3/8	1 21/32	0.367	12
1/2		20	H13	3	67630	3 3/8	1 21/32	0.367	12
9/16	12		H13	3	67631	3 19/32	1 21/32	0.429	6
5/8	11		H13	3	67633	3 13/16	1 13/16	0.480	6
3/4	10		H13	3	67637	4 1/4	2	0.590	6

TAPER PIPE TAPS / STRAIGHT FLUTED TAPER PIPE TAPS / INTERRUPTED

List No.941 (NPT)

Taper Pipe Taps
Bright Finish

HIGH SPEED STEEL**List No.941P** (NPT)

Taper Pipe Taps
Titanium Nitride

HIGH SPEED STEEL-TIN COATED**List No.941D** (NPTF)

Dry Seal Taper Pipe Taps
Bright Finish

HIGH SPEED STEEL

Nominal Tap Size	Threads per Inch	Number of Flutes	E.D.P. Number			Dimensions					Std. Pack
			L941	L941D	L941P	Overall Length	Thread Length	Shank Dia.	Square Length	Size of Square	
1/16	27	4	74051	74062	34062	2.1260	0.6890	0.3125	0.3740	0.2339	6
1/8	27	4	74052	74063	34063	2.1260	0.7520	0.4375	0.3740	0.3280	6
1/8SS	27	4	74053	74064	34064	2.1260	0.7520	0.3125	0.3740	0.2339	6
1/4	18	4	74054	74065	34065	2.4370	1.0630	0.5625	0.4370	0.4209	6
3/8	18	4	74055	74066	34066	2.5630	1.0630	0.7	0.5	0.5307	6
1/2	14	4	74056	74067	34067	3.1260	1.3740	0.6875	0.626	0.5150	6
3/4	14	5	74057	74068	34068	3.2520	1.3740	0.9063	0.689	0.6787	3
1	11 1/2	5	74058	74069	34069	3.7520	1.7520	1.125	0.811	0.8429	3
1 1/4	11 1/2	5	74059	74070		4	1.7520	1.3125	0.9370	0.9839	1
1 1/2	11 1/2	7	74060	74071		4.2520	1.7520	1.5	1	1.1248	1
2	11 1/2	7	74061	74072		4.5	1.7520	1.875	1.126	1.4059	1

List No.943 (NPT)

Interrupted Pipe Taps
Bright Finish

HIGH SPEED STEEL

Nominal Tap Size	Threads per Inch	Number of Flutes	E.D.P. Number	Dimensions					Std. Pack
				Overall Length	Thread Length	Shank Dia.	Square Length	Size of Square	
1/8	27	5	74073	2.126	0.752	0.4375	0.3740	0.3280	6
1/4	18	5	74075	2.437	1.063	0.5625	0.4370	0.4209	6
3/8	18	5	74076	2.563	1.063	0.7	0.5	0.5307	6
1/2	14	5	74077	3.126	1.374	0.6875	0.626	0.5150	6
3/4	14	5	74078	3.252	1.374	0.9063	0.689	0.6787	3
1	11 1/2	5	74079	3.752	1.752	1.125	0.811	0.8429	3
1 1/4	11 1/2	5	74080	4	1.752	1.3125	0.9370	0.9839	1
1 1/2	11 1/2	7	74081	4.252	1.752	1.5	1	1.1248	1
2	11 1/2	7	74082	4.5	1.752	1.875	1.126	1.4059	1

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

TAPER PIPE TAPS / SPIRAL FLUTED STRAIGHT PIPE TAPS / STRAIGHT FLUTED

List No.947 (NPT)



Taper Pipe-Spiral Fluted
Surface Treated

PREMIUM TYPE STEEL



List No.947D (NPTF)



Dry Seal Taper Pipe-Spiral Fluted
Surface Treated

PREMIUM TYPE STEEL



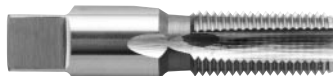
Nominal Tap Size	Thread Per Inch	Number of Flutes	E.D.P. Numbers		Dimensions					Std. Pack.
			L947	L947D	Overall Length	Thread Length	Shank Dia.	Square Length	Size of Square	
1/16	27	4	84051	84062	2.126	0.689	0.3125	0.374	0.2339	6
1/8	27	4	84052	84063	2.126	0.752	0.4375	0.374	0.3280	6
1/8SS	27	4	84053	84064	2.126	0.752	0.3125	0.374	0.2339	6
1/4	18	4	84054	84065	2.437	1.063	0.5625	0.437	0.4209	6
3/8	18	4	84055	84066	2.563	1.063	0.7	0.5	0.5307	6
1/2	14	4	84056	84067	3.126	1.374	0.6875	0.626	0.5150	6
3/4	14	5	84057	84068	3.252	1.374	0.9063	0.689	0.6787	3
1	11 1/2	5	84058	84069	3.752	1.752	1.125	0.811	0.8429	3

List No.945 (NPS)



Straight Pipe Taps
Bright Finish

HIGH SPEED STEEL



List No.945D (NPSF)



Dry Seal Straight Pipe Taps
Bright Finish

HIGH SPEED STEEL



Nominal Tap Size	Thread Per Inch	Number of Flutes	E.D.P. Numbers		Dimensions					Std. Pack.
			L945	L945D	Overall Length	Thread Length	Shank Dia.	Square Length	Size of Square	
1/8	27	4	74083	74090	2.126	0.752	0.4375	0.3740	0.3280	6
1/8SS	27	4	74084	74091	2.126	0.752	0.3125	0.3740	0.2339	6
1/4	18	4	74085	74092	2.437	1.063	0.5625	0.4370	0.4209	6
3/8	18	4	74086	74093	2.563	1.063	0.7	0.5	0.5307	6
1/2	14	4	74087	74094	3.126	1.374	0.6875	0.626	0.5150	6
3/4	14	5	74088	74095	3.252	1.374	0.9063	0.689	0.6787	3
1	11 1/2	5	74089		3.752	1.752	1.125	0.811	0.8429	3

Order by EDP Number

* **List No.L963** Fast Spiral Fluted

HIGH SPEED STEEL



STI Taps
Bottoming Style
Bright Finish



Size	Threads		Number of Flutes	E.D.P.			Dimensions			Std. Pack.
	UNC	UNF		H2	H3	H4	Overall Length	Thread Length	Shank Dia.	
2	56		2	74700			1 3/4	7/16	0.141	12
4	40		2	74704	74720	74736	1 7/8	9/16	0.141	12
6	32		3	74708	74724	74740	2	11/16	0.141	12
8	32		3	74710	74726	74742	2 1/8	3/4	0.168	12
10	24		3	74712	74728		2 3/8	7/8	0.194	12
		32	3	74713	74729	74745	2 3/8	7/8	0.194	12
1/4	20		3	74748	74758		2 1/2	1	0.255	12
		28	3	74749	74759	74769	2 1/2	1	0.255	12
5/16	18		3		74760		2 23/32	1 1/8	0.318	12
		24	3		74761	74771	2 23/32	1 1/8	0.318	12
3/8	16		3		74762	74772	2 15/16	1 1/4	0.381	12
		24	3	74753	74763		2 15/16	1 1/4	0.381	12
7/16	14		3		74764		3 5/32	1 7/16	0.323	12
		20	3		74765	74775	3 5/32	1 7/16	0.323	12
1/2	13		3		74766		3 3/8	1 21/32	0.367	12
		20	3		74767		3 3/8	1 21/32	0.367	12

* item will be discontinued, after stock has been depleted.

* **List No.L965** Spiral Pointed Taps

HIGH SPEED STEEL



STI Taps
Plug Style
Bright Finish



Size	Threads		Number of Flutes	E.D.P.			Dimensions			Std. Pack.
	UNC	UNF		H2	H3	H4	Overall Length	Thread Length	Shank Dia.	
2	56		2		72716		1 3/4	7/16	0.141	12
4	40		2	72704	72720		1 7/8	9/16	0.141	12
6	32		2		72724	72740	2	11/16	0.141	12
8	32		2		72726	72742	2 1/8	3/4	0.168	12
10	24		2		72728		2 3/8	7/8	0.194	12
		32	2		72729		2 3/8	7/8	0.194	12
1/4	20		2		72758	72768	2 1/2	1	0.255	12
		28	2		72759	72769	2 1/2	1	0.255	12
5/16	24		2		72761		2 23/32	1 1/8	0.318	12

* item will be discontinued, after stock has been depleted.

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

STI TAPS (SCREW THREAD INSERT TAPS)

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

* **List No.L967** Hand TapsSTI Taps
Bright Finish

HIGH SPEED STEEL



Size	Threads		Thread Limit	Number of Flutes	E.D.P.		Dimensions			Std. Pack.
	UNC	UNF			Plug*	Bottom*	Overall Length	Thread Length	Shank Dia.	
2	56		H2	3	70780	70781	1 3/4	7/16	0.141	12
4	40		H2	3	70784	70785	1 7/8	9/16	0.141	12
6	32		H3	3	70816	70817	2	11/16	0.141	12
8	32		H3	3	70820	70821	2 1/8	3/4	0.168	12
10	24		H2	3	70800	70801	2 3/8	7/8	0.194	12
		32	H2	3	70802	70803	2 3/8	7/8	0.194	12
		32	H3	3	70826	70827	2 3/8	7/8	0.194	12
1/4	20		H3	3	71880	71881	2 1/2	1	0.255	12
		28	H2	3	71862	71863	2 1/2	1	0.255	12
5/16	18		H3	4	71884	71885	2 23/32	1 1/8	0.318	12
		24	H2	4	71866	71867	2 23/32	1 1/8	0.318	12
3/8	16		H3	4	71888	71889	2 15/16	1 1/4	0.381	12
7/16	14		H3	4	71892		3 5/32	1 7/16	0.323	12
		20	H3	4	71894		3 5/32	1 7/16	0.323	12
			H4	4	71901		3 5/32	1 7/16	0.323	12
1/2	13		H3	4	71896		3 3/8	1 21/32	0.367	12
		20	H3	4	71898		3 3/8	1 21/32	0.367	12

* item will be discontinued, after stock has been depleted.

* **List No.951** (NPT) Pipe Sizes

For Prehardened Mold Steels
Straight Flutes
Surface Treated

VANADIUM HIGH SPEED STEEL HSSE-V



Nominal Size	Threads Per Inch	Number of Flutes	E.D.P. Numbers N.P.T.	Dimensions			Std. Pack.
				Overall Length	Length of Thread	Shank Dia	
1/8	27	4	99641	2 1/8	3/4	0.4375	6
1/4	18	4	99643	2 7/16	1 1/16	0.5625	6
3/8	18	4	99644	2 9/16	1 1/16	0.7000	6
1/2	14	4	99645	3 1/8	1 3/8	0.6875	3
3/4	14	5	99646	3 1/4	1 3/8	0.9063	3

* item will be discontinued, after stock has been depleted.

* **List No.7953** Fractional Sizes

Plug Style, 4 To 5 Thread Lead
Surface Treated

VANADIUM HIGH SPEED STEEL HSSE-V



Nominal Size	Threads Per Inch	Number of Flutes	E.D.P. Numbers N.P.T.	Dimensions			Std. Pack.
				Overall Length	Length of Thread	Shank Dia	
1/4	20	3	99613	2 1/2	0.591	0.255	12
1/4	28	3	99614	2 1/2	0.591	0.255	12
5/16	18	4	99615	2 23/32	0.669	0.318	12
5/16	24	4	99616	2 23/32	0.669	0.318	12
3/8	16	4	99617	2 15/16	0.748	0.381	12
3/8	24	4	99618	2 15/16	0.748	0.381	12
7/16	14	4	99619	3 5/32	0.866	0.323	12
7/16	20	4	99620	3 5/32	0.866	0.323	12
1/2	13	4	99621	3 3/8	0.984	0.367	12
1/2	20	4	99622	3 3/8	0.984	0.367	12
5/8	11	4	99625	3 13/16	1.102	0.480	6
5/8	18	4	99626	3 13/16	1.102	0.480	6
3/4	10	4	99627	4 1/4	1.181	0.590	6
3/4	16	4	99628	4 1/4	1.181	0.590	6

* item will be discontinued, after stock has been depleted.

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

STANDARD METRIC HAND TAPS

STANDARD METRIC TAPS / SPIRAL POINTED

List No.910



Bright Finish

HIGH SPEED STEEL



Nominal Tap Size (mm)	Millimeter Pitch (mm)	Pitch Dia. Limits	Number of Flutes	E.D.P. Numbers			Dimensions			Std. Pack.
				Taper	Plug	Bottom	Overall Length	Thread Length	Shank Dia.	
M2	0.4	D3	3	54056	54057	54058	1 3/4	7/16	0.141	12
M3	0.5	D3	3	54071	54072	54073	1 15/16	5/8	0.141	12
M3.5	0.6	D4	3	54074	54075	54076	2	11/16	0.141	12
M4	0.7	D4	4	54080	54081	54082	2 1/8	3/4	0.168	12
M5	0.8	D4	4	54095	54096	54097	2 3/8	7/8	0.194	12
M6	1.0	D5	4	54107	54108	54109	2 1/2	1	0.255	12
M7	1.0	D5	4	54113	54114	54115	2 23/32	1 1/8	0.318	12
M8	1.25	D5	4	54125	54126	54127	2 23/32	1 1/8	0.318	12
M10	1.5	D6	4	54140	54141	54142	2 15/16	1 1/4	0.381	12
M12	1.75	D6	4	54155	54156	54157	3 3/8	1 21/32	0.367	12
M14	1.25	D5	4	54161	54162	54163	3 19/32	1 21/32	0.429	6
M14	2.0	D7	4	54167	54168	54169	3 19/32	1 21/32	0.429	6
M16	2.0	D7	4	54176	54177	54178	3 13/16	1 13/16	0.480	6
M18	1.5	D7	4	54182	54183	54184	4 1/32	1 13/16	0.542	6
M18	2.5	D7	4	54188	54189	54190	4 1/32	1 13/16	0.542	6
M20	2.5	D7	4	54200	54201	54202	4 15/32	2	0.652	6
M22	2.5	D7	4	54212	54213	54214	4 11/16	2 7/32	0.697	3
M24	3.0	D8	4	54224	54225	54226	4 29/32	2 7/32	0.760	3
M27	3.0	D8	4	54239	54240	54241	5 1/8	2 1/2	0.896	3
M30	3.5	D9	4	54251	54252	54253	5 7/16	2 9/16	1.021	1

Order by EDP Number

List No.920



Bright Finish

HIGH SPEED STEEL



Nominal Tap Size (mm)	Pitch (mm)	Pitch Diameter Limits	Number of Flutes	E.D.P. Numbers	Dimensions			Std. Pack.
					Overall Length	Thread Length	Shank Dia.	
M2.5	0.45	D3	2	57054	1 13/16	1/2	0.141	12
M3	0.50	D3	2	57055	1 15/16	5/8	0.141	12
M4	0.70	D4	2	57058	2 1/8	3/4	0.168	12
M5	0.80	D4	2	57061	2 3/8	7/8	0.194	12
M6	1.00	D5	2	57063	2 1/2	1	0.255	12
M8	1.25	D5	2	57068	2 23/32	1 1/8	0.318	12
M10	1.50	D6	3	57082	2 15/16	1 1/4	0.381	12
M12	1.75	D6	3	57073	3 3/8	1 21/32	0.367	12
M14	2.00	D7	3	57076	3 19/32	1 21/32	0.429	6
M16	2.00	D7	3	57078	3 13/16	1 13/16	0.480	6

Order by EDP Number

SFM : Surface Feet per Minutes SG LOW SPIRAL TAPS List No. 6958, 6959

Work Materials	Tapping Speed SFM
Structural Steels	15 - 30
Low Carbon Steels (1010, 1018)	25 - 50
Carbon Steels (1045, 1055)	15 - 30
Alloy Steels (4140, 4130)	15 - 30
Hardened Steels (20~40HRC)	15 - 30
Stainless Steels	13 - 26
Cast Irons	30 - 65
Aluminium Alloys	70 - 100

DLC TAFLET THREAD FORMING TAPS List No. 6955, 6956, 6957

Work Materials	Tapping Speed SFM
Aluminium Alloys	70 - 130

Other TAPS

Material	Tapping Speed SFM
Aluminum Alloys	90-100
Brass	60-100
Bronze	40-60
Copper	40-60
High Temperature Alloys, Cobalt Base	5-10
Iron Base	10-15
Nickel Base	5-10
Iron, Ductile, Annealed	60
as Cast	30
Tempered	15-20
Gray, Annealed	80
as Cast	35-60
Malleable	60
Heat Treated	25-50
Magnesium Alloys, Annealed	175
Manganese	20
Molybdenum Alloys, Stress Relieved	50
Monel, Annealed	20
Nickel Alloys, Annealed	25
Plastics, Reinforced	25
Thermoplastics	50
Thermosetting Plastics	50
Steels, Alloys, Annealed or Cold Drawn	40-60
Quenched & Tempered	15-35
Armor Plate	10

Material	Tapping Speed SFM
(Steels, Cont.)	
Carbon Steel, Plain, Annealed	40-80
Tempered	15-40
Cast, Carbon, Annealed	40-50
Tempered	30
Cast, Corrosion Resistant, Annealed	20-30
Heat Resistant, as Cast	20-25
Low Alloy, Annealed	30-45
Tempered	15-25
Precipitation Hardening, Treated	10-15
Stainless, Annealed	15-45
Tempered	15-75
Free Machining, Annealed	45-75
Tool Steels, High Speed, Annealed	15-25
Water Hardening, Annealed	50
Ultra High Strength Steels, Annealed	35
Normalized	20
Tempered	3-7
Maraging Steels, Annealed	20-15
Maraged	5-10
Tantalum Alloys, Stress Relieved	3
Titanium Alloys, Commercial Pure, Annealed	40-60
Alpha & Alpha Beta Alloys, Annealed	10-25
Tungsten Alloys, Pressed & Sintered	50
Zinc Alloys, Die Cast	150

The material being tapped is the primary factor in determining the most effective **TAPPING SPEED**. However there are a number of other factors which may require consideration. Among these are: thread pitch, thread length, percent of thread, lubrication, tap flute style and chamfer, equipment and method of tapping. The best speed is determined by experiment on the job. The table below lists speeds which have proven satisfactory under average conditions.

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

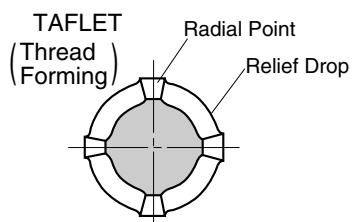
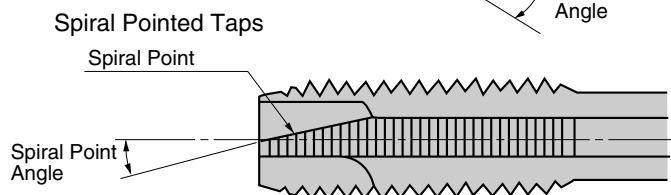
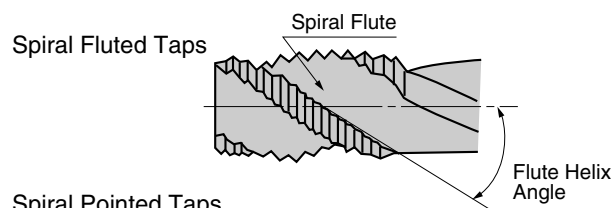
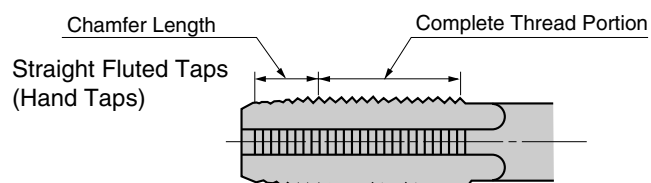
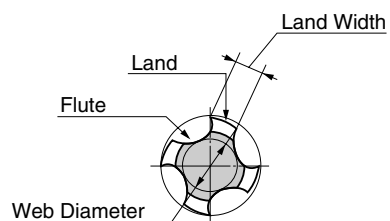
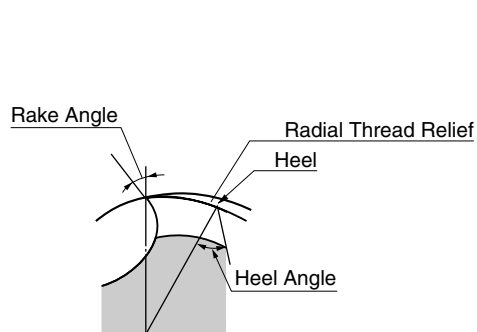
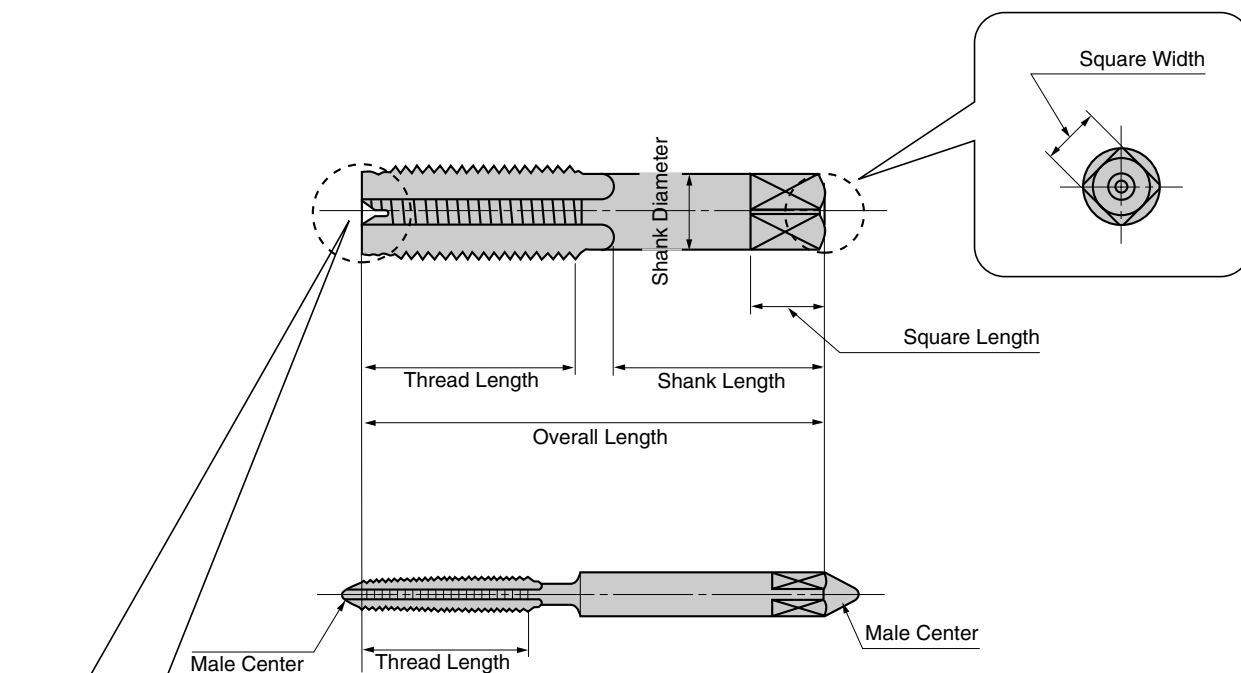
END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

TAP NOMENCLATURE



STANDARDS & DIMENSIONS

Standard System of Marking

General

Taps, dies, and other threading tools will be marked with the nominal size, number of threads per inch, and the proper symbol to identify the thread form. These symbols are in agreement with the ANSIB94.9 1979 Standard on Nomenclature, Definitions and Letter Symbols for Screw Threads.

Symbols used for American Threads are: Symbol Reference

NC	American National Coarse Thread Series
NF	American National Fine Thread Series
NEF	American National Extra Fine Thread Series
N	American National 8,12 and 16 Thread Series (8N, 12N, i6N)
NH	American (National) Hose Coupling and Fire Hose Coupling Threads
NM	National Miniature Screw Thread
NGO	American (National) Gas Outlet Thread
NS	American Special Thread
NPT	American (National) Taper Pipe Thread
NPTF	Dryseal American (National) Taper Pipe Thread
ANPT	Military Aeronautical Pipe Thread Specification MIL-P-71 05
NPS	American (National) Straight Pipe Thread
NPSC	American (National) Straight Pipe Thread in Pipe Couplings
NPSF	Dryseal American (National) Fuel Internal Straight Pipe Thread
NPSH	American (Standard) Straight Pipe Thread for Hose Couplings and Nipples
NPSI	Dryseal American (National) Intermediate Internal Straight Pipe Thread
NPSL	American (National) Internal Straight Pipe Thread for Locknut Connections (Loose Fitting Mechanical Joints)
NPSM	American (National) Internal Straight Pipe Thread for Mechanical Joints (Free Fitting)
NPTR	American (National) Internal Taper Pipe Thread for Railing Joints (Mechanical Joints)
AMO	American Standard Microscope Objective Thread
ACME C	Acme Screw Thread — Centralizing Type
ACME G	Acme Screw Thread — General Purpose Type
STUB ACME	Stub Acme Threads

NBUTT	National Buttress Screw Thread
V	A 60° "V" Thread with Truncated Crests and Roots. The Theoretical "V" Form is usually flattened several thousandths of an inch to the user's specifications.
SB	Manufacturers Stovebolt Standard Thread
STI	Special Threads for Helical Coil Wire Screw Thread Inserts.

Group Thread Taps — Limit Numbers

All standard Ground Thread Taps will be marked with the letter G to designate Ground Thread. The letter G will be followed by the letter H to designate above basic (L below basic) and a numeral to designate the Pitch Diameter limits.

Example: GH3 indicates a Group thread Tap with Pitch Diameter limits .0010 to .0015 over basic.

Pitch Diameter limits for Taps to 1" diameter inclusive.

L1	= Basic to Basic minus .0005
H1	= Basic to Basic plus .0005
H2	= Basic plus .0005 to Basic plus .0010
H3	= Basic plus .0010 to Basic plus .0015
H4	= Basic plus .0015 to Basic plus .0020
H5	= Basic plus .0020 to Basic plus .0025
H6	= Basic plus .0025 to Basic plus .0030

Pitch Diameter limits for Taps over 1" diameter to 1 1/2" diameter inclusive.

H4	= Basic plus .0010 to Basic plus .0020
----	--

American National 8, 12, 16 and NEF Thread Series

National 8 pitch Series	1" to 2 1/4" by 1/8ths 2 1/4" to 6" by 1/4ths
National 12 pitch Series	1/2" to 1 1/2" 1/16ths 1 1/2" to 4" by 1/8ths 4" to 6" by 1/4ths
National 16 pitch Series	3/4" to 2 1/2" by 1/16ths 2 1/2" to 4" by 1/8ths 4" to 6" by 1/4ths

National Extra Fine Thread Series

#12	—32	1 1/6"	—18
1/4"	—32	1 1/16"	—18
5/16"	—32	1 1/8"	—18
3/8"	—32	1 3/16"	—18
7/16"	—28	1 1/4"	—18
1/2"	—28	1 5/16"	—18
9/16"	—24	1 3/8"	—18
5/8"	—24	1 7/16"	—18
11/16"	—24	1 1/2"	—18
3/4"	—20	1 9/16"	—18
13/16"	—20	1 5/8"	—18
7/8"	—20	1 11/16"	—18
15/16"	—20	1 3/4"	—16
1"	—20	2"	—16

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

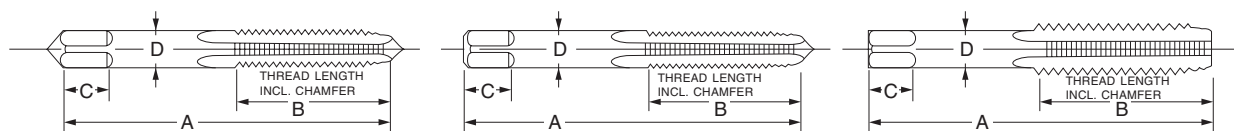
END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

STANDARD TAP BLANK DIMENSIONS



STYLE 1

STYLE 2

STYLE 3

TABLE 302 — GENERAL DIMENSIONS

Nominal Diameter Range - Inches		Mach. Screw 5size No.	Nominal Fractional Diameter Inches	Nominal Metric Diameter Mill.	Style*	Tap Dimensions — Inches				
						Overall Length A	Thread Length B	Square Length C	Shank Diameter D	Size of Square
Over	To (Incl)									
.052	.065	0	1/16	M1.6	1	1-5/8	5/16	3/16	.141	.110
.065	.078	1		M1.8	1	1-11/16	3/8	3/16	.141	.110
.078	.091	2		M2, M2.2	1	1-3/4	7/16	3/16	.141	.110
.091	.104	3	3/32	M2.5	1	1-13/16	1/2	3/16	.141	.110
.104	.117	4			1	1-7/8	9/16	3/16	.141	.110
.117	.130	5	1/8	M3, M3.15	1	1-15/16	5/8	3/16	.141	.110
.130	.145	6		M3.5	1	2	11/16	3/16	.141	.110
.145	.171	8	5/32	M4	1	2-1/8	3/4	1/4	.168	.131
.171	.197	10	3/16	M4.5, M5	1	2-3/8	7/8	1/4	.194	.152
.197	.223	12	7/32		1	2-3/8	15/16	9/32	.220	.165
.223	.260	14	1/4	M6, M6.3	2	2-1/2	1	5/16	.255	.191
.260	.323		5/16	M7, M8	2	2-23/32	1 1/8	3/8	.318	.238
.323	.385		3/8	M10	2	2-15/16	1 1/4	7/16	.381	.286
.385	.448		7/16		3	3-5/32	1 7/16	13/32	.323	.242
.448	.510		1/2	M12, M12.5	3	3-3/8	1 21/32	7/16	.367	.275
.510	.573		9/16	M14	3	3-19/32	1 21/32	1/2	.429	.322
.573	.635		5/8	M16	3	3-13/16	1 13/16	9/16	.480	.360
.635	.709		11/16	M18	3	4-1/32	1 13/16	5/8	.542	.406
.709	.760		3/4		3	4-1/4	2	11/16	.590	.442
.760	.823		13/16	M20	3	4-15/32	2	11/16	.652	.489
.823	.885		7/8	M22	3	4-11/16	2 7/32	3/4	.697	.523
.885	.948		15/16	M24	3	4-29/32	2 7/32	3/4	.760	.570
.948	1.010		1	M25	3	5-1/8	2 1/2	13/16	.800	.600
1.010	1.073		1 1/16	M27	3	5-1/8	2 1/2	7/8	.896	.672
1.073	1.135		1 1/8		3	5-7/16	2 9/16	7/8	.896	.672
1.135	1.198		1 3/16	M30	3	5-7/16	2 9/16	1	1.021	.766
1.198	1.260		1 1/4		3	5-3/4	2 9/16	1	1.021	.766
1.260	1.323		1 5/16	M33	3	5-3/4	2 9/16	1 1/16	1.108	.831
1.323	1.385		1 3/8		3	6-1/16	3	1 1/16	1.108	.831
1.385	1.448		1 7/16	M36	3	6-1/16	3	1 1/8	1.233	.925
1.448	1.510		1 1/2		3	6-3/8	3	1 1/8	1.233	.925
1.510	1.635		1 5/8	M39	3	6-11/16	3 3/16	1 1/8	1.305	.979
1.635	1.760		1 3/4	M42	3	7	3 3/16	1 1/4	1.430	1.072
1.760	1.885		1 7/8		3	7-5/16	3 9/16	1 1/4	1.519	1.139
1.885	2.010		2	M48	3	7-5/8	3 9/16	1 3/8	1.644	1.233
2.010	2.135		2 1/8		3	8	3 9/16	1 3/8	1.769	1.327
2.135	2.260		2 1/4	M56	3	8 1/4	3 9/16	1 7/16	1.894	1.420
2.260	2.385		2 3/8		3	8 1/2	4	1 7/16	2.019	1.514
2.385	2.510		2 1/2		3	8 3/4	4	1 1/2	2.100	1.575
2.510	2.635		2 5/8	M64	3	8 3/4	4	1 1/2	2.225	1.669
2.635	2.760		2 3/4		3	9 1/4	4	1 9/16	2.350	1.762
2.760	2.885		2 7/8	M72	3	9 1/4	4	1 9/16	2.475	1.856
2.885	3.010		3		3	9 3/4	4 9/16	1 5/8	2.543	1.907
3.010	3.135		3 1/8		3	9 3/4	4 9/16	1 5/8	2.668	2.001
3.135	3.260		3 1/4	M80	3	10	4 9/16	1 3/4	2.793	2.095
3.260	3.385		3 3/8		3	10	4 9/16	1 3/4	2.883	2.162
3.385	3.510		3 1/2		3	10 1/4	4 15/16	2	3.008	2.256
3.510	3.635		3 5/8	M90	3	10 1/4	4 15/16	2	3.133	2.350
3.635	3.760		3 3/4		3	10 1/2	5 5/16	2 1/8	3.217	2.413
3.760	3.885		3 7/8		3	10 1/2	5 5/16	2 1/8	3.342	2.506
3.885	4.010		4	M100	3	10 3/4	5 5/16	2 1/4	3.467	2.600

* Styles shown are for ground thread taps

TAP RECOMMENDATION FOR CLASSES 2B & 3B UNIFIED INCH SCREW THREADS

Size	Threads Per Inch		Recommended Tap Limits		Internal Thread Pitch Diameter Units		
	NC UNC	NF UNF	Class 2B	Class 3B	Min. All Classes (BASIC)	Max. Class 2B	Max. Class 3B
0	—	80	H2	H1	.0519	.0542	.0536
1	64	—	H2	H1	.0629	.0655	.0648
1	—	72	H2	H1	.0640	.0665	.0659
2	56	—	H2	H1	.0744	.0772	.0765
2	—	64	H2	H1	.0759	.0786	.0779
3	48	—	H2	H1	.0855	.0885	.0877
3	—	56	H2	H1	.0874	.0902	.0895
4	40	—	H2	H2	.0958	.0991	.0982
4	—	48	H2	H1	.0985	.1016	.1008
5	40	—	H2	H2	.1088	.1121	.1113
5	—	44	H2	H1	.1102	.1134	.1126
6	32	—	H3	H2	.1177	.1214	.1204
6	—	40	H2	H2	.1218	.1252	.1243
8	32	—	H3	H2	.1437	.1475	.1465
8	—	36	H2	H2	.1460	.1496	.1487
10	24	—	H3	H3	.1629	.1672	.1661
10	—	32	H3	H2	.1697	.1736	.1726
12	24	—	H3	H3	.1889	.1933	.1922
12	—	28	H3	H3	.1928	.1970	.1959
1/4	20	—	H5	H3	.2175	.2223	.2211
1/4	—	28	H4	H3	.2268	.2311	.2300
5/16	18	—	H5	H3	.2764	.2817	.2803
5/16	—	24	H4	H3	.2854	.2902	.2890
3/8	16	—	H5	H3	.3344	.3401	.3387
3/8	—	24	H4	H3	.3479	.3528	.3516
7/16	14	—	H5	H3	.3911	.3972	.3957
7/16	—	20	H5	H3	.4050	.4104	.4091
1/2	13	—	H5	H3	.4500	.4565	.4548
1/2	—	20	H5	H3	.4675	.4731	.4717
9/16	12	—	H5	H3	.5084	.5152	.5135
9/16	—	18	H5	H3	.5264	.5323	.5308
5/8	11	—	H5	H3	.5660	.5732	.5714
5/8	—	18	H5	H3	.5889	.5949	.5934
3/4	10	—	H5	H5	.6850	.6927	.6907
3/4	—	16	H5	H3	.7094	.7159	.7143
7/8	9	—	H6	H4	.8028	.8110	.8089
7/8	—	14	H6	H4	.8286	.8356	.8339
1	8	—	H6	H4	.9188	.9276	.9254
1	—	12	H6	H4	.9459	.9535	.9516
1	14 NS		H6	H4	.9536	.9609	.9590
1 1/8	7	—	H8	H4	1.0332	1.0416	1.0393
1 1/8	—	12	H6	H4	1.0709	1.0787	1.0768
1 1/4	7	—	H8	H4	1.1572	1.1668	1.1644
1 1/4	—	12	H6	H4	1.1959	1.2039	1.2019
1 3/8	6	—	H8	H4	1.2667	1.2771	1.2745
1 3/8	—	12	H6	H4	1.3209	1.3291	1.3270
1 1/2	6	—	H8	H4	1.3917	1.4022	1.3996
1 1/2	—	12	H6	H4	1.4459	1.4542	1.4522

The above recommended taps normally produce the Class of Thread indicated average materials when used with reasonable care. However, if the tap specified does not give a satisfactory gage fit in the work, a choice of some other limit tap will be necessary.

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

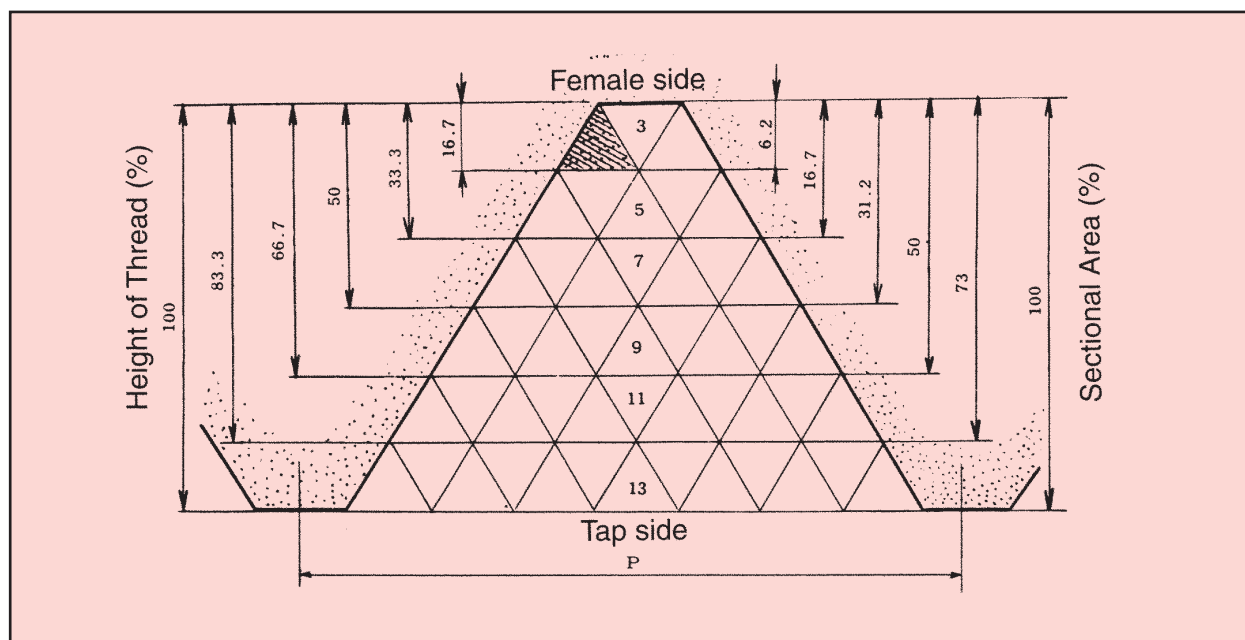
TAPS

TAPS
Cutting Condition

Others

PRE-TAPPING DRILLING SIZES

Drilling size is strictly concerned Percent of Thread. The following picture shows the relations between the height of the female thread and its sectional area. Here, it's very important to choose the minimized Percent of Thread as possible the thread needs. Because too much Percent of Thread brings increased cutting torque which causes excess wear and breakage of the taps.



$$\text{Percent of Thread} = \frac{\text{Basic thread OD.} \times \text{Pre-Tapping Diameter}}{2 \times (\text{Basic Height of Thread})} \times 100\%$$

- Pre-tapping diameter for Cutting Taps

$$\text{Pre-tapping Diameter} = \text{Basic thread OD.} - \frac{.01299 \times \text{Percent of Thread}}{\text{No. of threads per inch}}$$

- Pre-tapping Diameter for Roll Forming Taps

$$\text{Pre-tapping Diameter} = \text{Basic thread OD.} - \frac{.0068 \times \text{Percent of Thread}}{\text{No. of threads per inch}}$$

TAP DRILL SIZES

The following tables show the Theoretical Percentage of Thread obtained from stock sizes of drills and also the Probable Percentage after allowance for oversize drilling.

Tap	Tap Drill	Decimal Equiv. of Tap Drill	Probable Hole Size	Percent of Thread	Tap	Tap Drill	Decimal Equiv. of Tap Drill	Probable Hole Size	Percent of Thread	Tap	Tap Drill	Decimal Equiv. of Tap Drill	Probable Hole Size	Percent of Thread
0-80	56	.0465	.0480	74	8-32	29	.1360	.1389	62	3/8-16	5/16	.3125	.3160	72
	3/64	.0469	.0484	71		28	.1405	.1434	51		O	.3160	.3204	68
1-64	54	.0550	.0565	81	8-36	29	.1360	.1389	70		P	.3230	.3274	59
	53	.0595	.0610	59		28	.1405	.1434	57	3/8-24	21/64	.3281	.3325	79
1-72	53	.0595	.0610	67		9/64	.1406	.1435	57		Q	.3320	.3364	71
	1/16	.0625	.0640	50	10-24	27	.1440	.1472	79		R	.3390	.3434	58
2-56	51	.0670	.0687	74		26	.1470	.1502	74	7/16-14	T	.3580	.3626	81
	50	.0700	.0717	62		25	.1495	.1527	69		23/64	.3594	.3640	79
	49	.0730	.0747	49		24	.1520	.1552	64		U	.3680	.3726	70
2-64	50	.0700	.0717	70		23	.1540	.1572	61		3/18	.3750	.3796	62
	49	.0730	.0747	56		5/32	.1563	.1595	56		V	.3770	.3816	60
3-48	48	.0760	.0779	78		22	.1570	.1602	55	7/16-20	W	.3860	.3906	72
	5/64	.0781	.0800	70	10-32	5/32	.1563	.1595	75		25/64	.3906	.3952	65
	47	.0785	.0804	69		22	.1570	.1602	73		X	.3970	.4016	55
	46	.0810	.0829	60		21	.1590	.1622	68	1/2-13	27/64	.4219	.4216	73
	45	.0820	.0839	56		20	.1610	.1642	64		7/16	.4375	.4422	58
3-56	46	.0810	.0829	69		19	.1660	.1692	51	1/2-20	29/64	.4531	.4578	65
	45	.0820	.0839	65	12-24	11/64	.1719	.1754	75	9/16-12	15/32	.4688	.4736	82
	44	.0860	.0879	48		17	.1730	.1765	73		31/64	.4844	.4892	68
4-40	44	.0860	.0880	74		16	.1770	.1805	66	9/16-18	1/2	.5000	.5048	80
	43	.0890	.0910	65		15	.1800	.1835	60		33/64	.5156	.5204	58
	42	.0935	.0955	55		14	.1820	.1855	56	5/8-11	17/32	.5313	.5362	75
	3/32	.0938	.0958	50	12-28	16	.1770	.1805	77		35/64	.5469	.5518	62
4-48	42	.0935	.0955	61		15	.1800	.1835	70	5/8-18	9/16	.5625	.5674	80
	3/32	.0938	.0958	60		14	.1820	.1855	66		37/64	.5781	.5831	58
	41	.0960	.0980	52		13	.1850	.1885	59	3/4-10	41/64	.6406	.6456	80
5-40	40	.0980	.1003	76		3/16	.1875	.1910	54		21/32	.6563	.6613	68
	39	.0995	.1018	71	1/4-20	9	.1960	.1998	77	3/4-16	11/16	.6875	.6925	71
	38	.1015	.1038	65		8	.1990	.2028	73	7/8-9	49/64	.7656	.7708	72
	37	.1040	.1063	58		7	.2010	.2048	70		25/32	.7812	.7864	61
5-44	38	.1015	.1038	72		13/64	.2031	.2069	66	7/8-14	51/64	.7969	.8021	79
	37	.1040	.1063	63		6	.2040	.2078	65		13/16	.8125	.8177	62
	36	.1065	.1088	55		5	.2055	.2093	63	1"-8	55/64	.8594	.8653	83
6-32	37	.1040	.1063	78		4	.2090	.2128	57		7/8	.8750	.8809	73
	36	.1065	.1091	71	1/4-28	3	.2130	.2168	72		57/64	.8906	.8965	64
	7/64	.1094	.1120	64		7/32	.2188	.2226	59		29/32	.9063	.9122	54
	35	.1100	.1126	63		2	.2210	.2248	55	1"-12	29/32	.9063	.9123	81
	34	.1110	.1136	60	5/16-18	F	.2570	.2608	72		59/64	.9219	.9279	67
	33	.1130	.1156	55		G	.2610	.2651	66		15/16	.9375	.9435	52
6-40	34	.1110	.1136	75		17/64	.2656	.2697	59	1"-14	59/64	.9219	.9279	78
	33	.1130	.1156	69		H	.2660	.2701	59		15/16	.9375	.9435	61
	32	.1160	.1186	60	5/16-24	H	.2660	.2701	78					
						I	.2720	.2761	67					

FORMULA FOR OBTAINING TAP DRILL SIZES

(Select nearest commercial stock drill)

$$\left\{ \begin{array}{l} \text{Outside Diam.} \\ \text{of Thread} \end{array} \right\} \text{ minus } \left\{ \frac{.01299 \times \text{Amount of percentage of full thread}}{\text{Number of threads per inch}} \right\} = \text{Drilled Hole Size}$$

$$\left\{ \begin{array}{l} \text{No. of Threads} \\ \text{per inch} \end{array} \right\} \times \left\{ \frac{\text{Outside Diam. of thread-Selected Drill Diam}}{.01299} \right\} = \text{Percentage of full Thread}$$

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

TAP DRILL SIZES

For Thread Forming Taps

Nominal Size	Threads per Inch		75% THREAD			70% THREAD			65% THREAD			60% THREAD		
			Theor. Hole Core Size	Nearest Drill Size	Dec. Equiv.	Theor. Hole Core Size	Nearest Drill Size	Dec. Equiv.	Theor. Hole Core Size	Nearest Drill Size	Dec. Equiv.	Theor. Hole Core Size	Nearest Drill Size	Dec. Equiv.
	NC UNC	NF UNF												
0	—	80	.0536	1.35mm	.0531	.0540	1.35mm	.0531	.0545	—	—	.0549	54	.0550
1	64	—	.0650	1.65mm	.0650	.0655	1.65mm	.0650	.0661	—	—	.0666	—	—
1	—	72	.0659	1.65mm	.0650	.0663	—	—	.0669	1.7mm	.0669	.0673	51	.0670
2	56	—	.0769	1.95mm	.0768	.0774	1.95mm	.0768	.0781	3/64	.0781	.0787	47	.0785
2	—	64	.0780	5/64	.0781	.0785	47	.0785	.0791	2.0mm	.0787	.0796	2.0mm	.0787
3	48	—	.0884	2.25mm	.0886	.0890	43	.0890	.0898	43	.0890	.0905	2.3mm	.0906
3	—	56	.0899	43	.0890	.0904	—	—	.0911	2.3mm	.0906	.0917	2.3mm	.0906
4	40	—	.0993	2.5mm	.0984	.1000	39	.0995	.1010	39	.0995	.1018	38	.1015
4	—	48	.1014	38	.1015	.1020	38	.1015	.1028	2.6mm	.1024	.1035	2.6mm	.1024
5	40	—	.1123	34	.1110	.1130	33	.1130	.1140	33	.1130	.1148	2.9mm	.1142
5	—	44	.1134	33	.1130	.1141	2.9mm	.1142	.1150	2.9mm	.1142	.1157	—	—
6	32	—	.1221	2.1mm	.1220	.1230	3.1mm	.1220	.1243	—	—	.1252	1/8	.1250
6	—	40	.1253	1/8	.1250	.1260	3.2mm	.1260	.1270	3.2mm	.1260	.1278	3.25mm	.1280
8	32	—	.1481	3.75mm	.1476	.1490	—	—	.1503	25	.1495	.1512	3.8mm	.1496
8	—	36	.1498	25	.1495	.1507	3.8mm	.1496	.1518	24	.1520	.1526	24	.1520
10	24	—	.1688	—	—	.1700	18	.1695	.1717	11/64	.1719	.1729	11/64	.1719
10	—	32	.1741	17	.1730	.1750	—	—	.1763	—	—	.1772	16	.1770
12	24	—	.1948	10	.1935	.1960	9	.1960	.1977	5.0mm	.1968	.1989	8	.1990
12	—	28	.1978	5.0mm	.1968	.1989	8	.1990	.2003	8	.1990	.2014	7	.2010
1/4	20	—	.2245	5.7mm	.2244	.2260	—	—	.2280	1	.2280	.2295	1	.2280
1/4	—	28	.2318	—	—	.2329	5.9mm	.2323	.2343	A	.2340	.2354	15/64	.2344
5/16	18	—	.2842	7.2mm	.2835	.2861	7.25mm	.2854	.2879	7.3mm	.2874	.2898	L	.2900
5/16	—	24	.2912	7.4mm	.2913	.2927	—	—	.2941	M	.2950	.2955	7.5mm	.2953
3/8	16	—	.3431	11/32	.3437	.3452	8.75mm	.3445	.3474	S	.3480	.3495	8.9mm	.3504
3/8	—	24	.3537	9.0mm	.3543	.3552	9.0mm	.3543	.3566	—	—	.3580	T	.3580
7/16	14	—	.4011	—	—	.4035	Y	—	.4059	13/32	—	.4084	—	—
7/16	—	20	.4120	Z	—	.4137	10.5mm	—	.4154	—	—	.4171	—	—
1/2	13	—	.4608	—	—	.4634	—	—	.4660	—	—	.4686	15/32	—
1/2	—	20	.4745	—	—	.4762	—	—	.4779	—	—	.4796	—	—
9/16	12	—	.5200	—	—	.5229	—	—	.5257	—	—	.5285	—	—
9/16	—	18	.5342	13.5mm	.5315	.5361	—	—	.5380	—	—	.5398	—	—
5/8	11	—	.5787	37/64	.5781	.5817	37/64	.5781	.5848	—	—	.5879	—	—
5/8	—	18	.5967	19/32	.5937	.5986	—	—	.6004	—	—	.6023	—	—
3/4	10	—	.6990	—	—	.7024	—	—	.7058	45/64	.7031	.7092	18.0mm	.7087
3/4	—	16	.7181	23/32	.7187	.7202	23/32	.7187	.7224	—	—	.7245	—	—

For Pipe Taps

Nominal Pipe Size	Threads Per Inch	NPT–NPTF (When Drilled Only)		NPT–NPTF–ANPT (When Taper Reamed)		NPS–NPSF	
		Dr. Size	Dec. Equiv.	Dr. Size	Dec. Equiv.	Dr. Size	Dec. Equiv.
1/16	27	D	.2460	15/64	.2344	1/4	.2500
1/8	27	R	.3390	21/64	.3281	11/32	.3438
1/4	18	7/16	.4375	27/64	.4219	7/16	.4375
3/8	18	37/64	.5781	9/16	.5625	37/64	.5781
1/2	14	45/64	.7031	11/16	.6875	23/32	.7188
3/4	14	59/64	.9219	57/64	.8906	59/64	.9218
1	11-1/2	1 5/32	1.1562	1 1/8	1.1250	1 5/32	1.1562
1 1/4	11-1/2	1 1/2	1.5000	1 15/32	1.4688		
1 1/2	11-1/2	1 47/64	1.7344	1 45/64	1.7031		
2	11-1/2	2 7/32	2.2188	2 3/16	2.1875		

THE MANY ADVANTAGES OF NACHI TDT VIPER T-SERIES TAPS

These taps are made of high vanadium E grade high speed steel (HSSEV), which is primarily used for heavy duty taps. The taps are heat treated, followed by a special steam oxide treatment that prevents adhesion. This results in the ability to obtain suitable internal threads from the start, which also extends tap life to more than double that of other taps!

The Specific Advantages

1. Less Oversizing

Taflet Relief reforms cut threads and controls the thrust of the tap completely. Even if tapped material is mild steel, cutting stops within one thread! High precision uniformity of the tapped limit is obtainable with little oversizing, regardless of the rigidity of the tapping mechanism. Even when slight oversizing occurs, the chip-bite between taps and internal threads gets hard so tap breakage and/or torn threads are reduced.

2. Ideal Flute Shape

All cutting edges on the chamfered portion are at exactly the same angle, so the chip shape is consistent. Smaller than conventional curvature on the bottom flute stretching from the cutting face results in small curled chips. In addition, Nachi Viper T-Series Taps release chips smoothly, thanks to their specially designed helix angle.

3. Shorter Thread Length

Shorter than conventional thread lengths prevent chips from clogging the flutes; reduce bite, twine-round and breakage of the cutting edge. Flute length also provides for excellent chip ejection.

4. GT System For Thread Limit

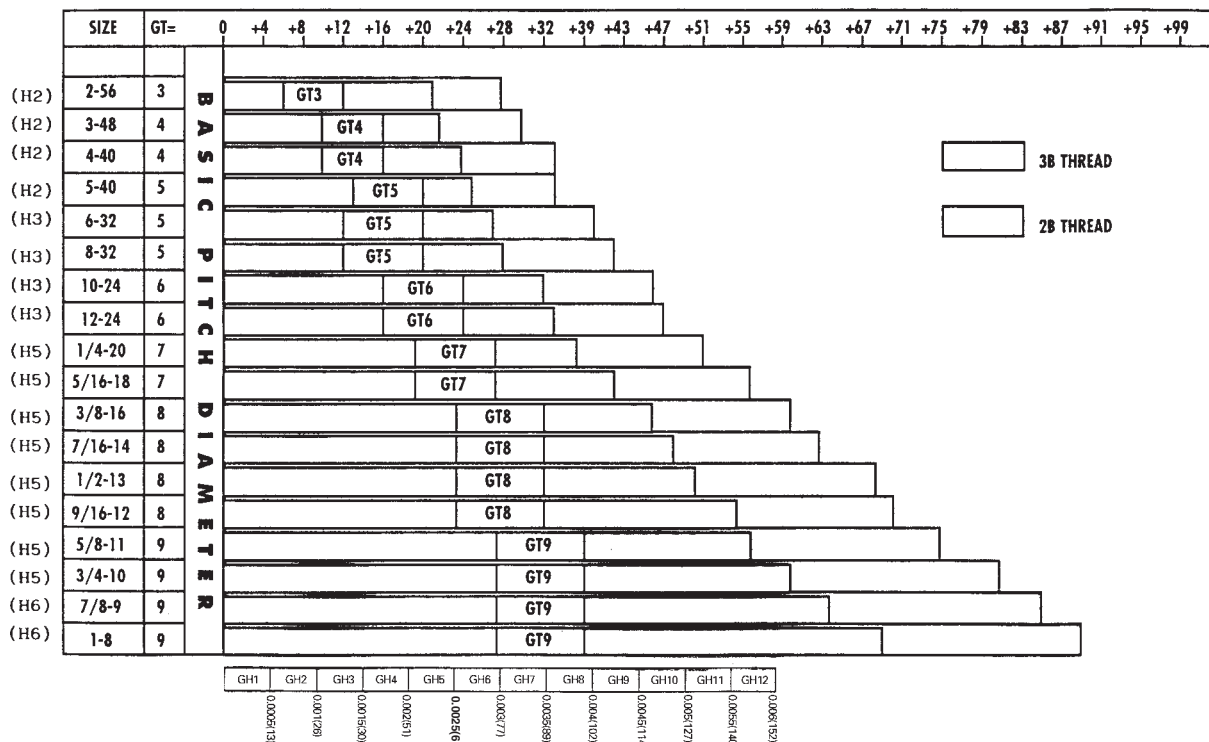
Instead of the usual GH limits, GT limits are applied to Nachi Viper T-Series Taps. Each top has just one GT number instead of several GH numbers, eliminating troublesome limit selection (see Comparison Chart, below, for details).

COMPARISON OF NACHI GT AND ANSI GH NUMBERS

THREAD TOLERANCE IN TEN THOUSANDTHS OF AN INCH (.0001")

COMPARISON OF NACHI GT AND ANSI GH NUMBERS

THREAD TOLERANCE IN TEN THOUSANDTHS OF AN INCH (.0001")



TAP TOLERANCE TABLE

GT Limits Table

Fractional, Machine screw, and Metric Taps
Over 42 TPI, or less than 0.6mm pitch

Class	MIN	MAX
GT2	0.0002	0.0008
GT3	0.0006	0.0012
GT4	0.0010	0.0016
GT5	0.0014	0.0020
GT6	0.0018	0.0024
GT7	0.0022	0.0028

Fractional, Machine screw, and Metric Taps
Less than 42 TPI, or over 0.6mm pitch

Class	MIN	MAX
GT2	0.0000	0.0008
GT3	0.0004	0.0012
GT4	0.0008	0.0016
GT5	0.0012	0.0020
GT6	0.0016	0.0024
GT7	0.0020	0.0028
GT8	0.0024	0.0031
GT9	0.0028	0.0035
GT10	0.0031	0.0039

GT LIMITS
CONVERSION CHART

Recommended tap limits for 2B and 3B

TAP SIZE	CLASS 2B		CLASS 3B	
	H LIMITS	GT LIMITS	H LIMITS	GT LIMITS
2-56	H2	GT3	H1	-
2-64	H2	GT3	H1	-
3-48	H2	GT4	H1	-
3-56	H2	GT3	H1	-
4-40	H2	GT5	H2	-
4-48	H2	GT4	H1	-
5-40	H2	GT5	H2	-
5-44	H2	GT5	H2	-
6-32	H3	GT5	H2	-
6-40	H2	GT5	H2	-
8-32	H3	GT5	H2	-
8-36	H2	GT5	H2	-
10-24	H3	GT6	H3	-
10-32	H3	GT5	H2	-
12-24	H3	GT6	H3	-
12-28	H3	GT6	H3	-
1/4-20	H5	GT7	H3	GT4
1/4-28	H4	GT6	H3	GT4
5/16-18	H5	GT7	H3	GT4
5/16-24	H4	GT7	H3	GT4
3/8-16	H5	GT8	H3	GT4
3/8-24	H4	GT7	H3	GT4
7/16-14	H5	GT8	H3	GT4
7/16-20	H5	GT8	H3	GT4
1/2-13	H5	GT8	H3	GT4
1/2-20	H5	GT8	H3	GT4
9/16-12	H5	GT8	H3	GT4
9/16-18	H5	GT8	H3	GT4
5/8-11	H5	GT9	H3	GT4
5/8-18	H5	GT8	H3	GT4
3/4-10	H5	GT9	H5	GT4
3/4-16	H5	GT8	H3	GT4
7/8-9	H6	GT9	H4	GT5
7/8-14	H6	GT9	H4	GT5
1-8	H6	GT9	H4	GT5
1-12	H6	GT9	H4	GT5

TAP TOLERANCE TABLE

H Limits Table

Fractional and Machine screw types

Class	MIN	MAX
H1	0.0000	0.0005
H2	0.0005	0.0010
H3	0.0010	0.0015
H4	0.0015	0.0020
H5	0.0020	0.0025
H6	0.0025	0.0030
H7	0.0030	0.0035
H8	0.0035	0.0040
H9	0.0040	0.0045
H10	0.0045	0.0050
H11	0.0050	0.0055
H12	0.0055	0.0060

D Limits Table

Metric Taps

Tap Size	D Class	MIN	MAX
M2X0.4	D3	0.0009	0.0015
M2.5X0.45	D3	0.0009	0.0015
M3X0.5	D3	0.0009	0.0015
M3.5X0.6	D4	0.0012	0.0020
M4X0.7	D4	0.0012	0.0020
M5X0.8	D4	0.0012	0.0020
M6X1	D5	0.0015	0.0025
M7X1	D5	0.0015	0.0025
M8X1	D5	0.0015	0.0025
M8X1.25	D5	0.0013	0.0025
M10X1.25	D5	0.0013	0.0025
M10X1.5	D6	0.0018	0.0030
M12X1.25	D5	0.0013	0.0025
M12X1.75	D6	0.0018	0.0030
M14X1.5	D6	0.0018	0.0030
M14X2	D7	0.0019	0.0035
M16X1.5	D6	0.0018	0.0030
M16X2.0	D7	0.0019	0.0035
M18X1.50	D6	0.0018	0.0030
M18X2.5	D7	0.0019	0.0035
M20X2.5	D7	0.0019	0.0035
M22X2.5	D7	0.0019	0.0035
M24X3.0	D8	0.0024	0.0040
M27X3.0	D8	0.0024	0.0040
M30X3.5	D9	0.0025	0.0045

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

RESHARPENING OF TAPS

When to Resharpen Taps

1. When the taps get or appear to be damaged.
2. When the dimensions of the tapped threads begin to get out of tolerance.
3. When the surface roughness on threads decreases.
4. When the cutting torque starts to increase.
5. When the taps start to make a squealing noise.
6. When the shape of the tapping chips begin to change.

A. Flute Grinding Way

1. The following table shows the common grinding condition for resharpening the taps.

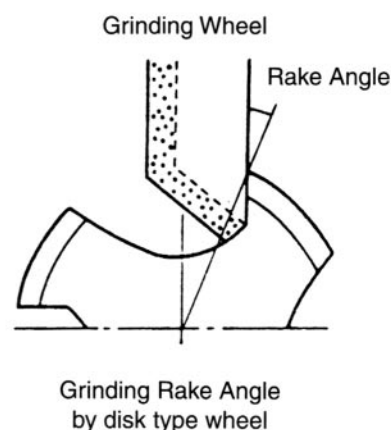
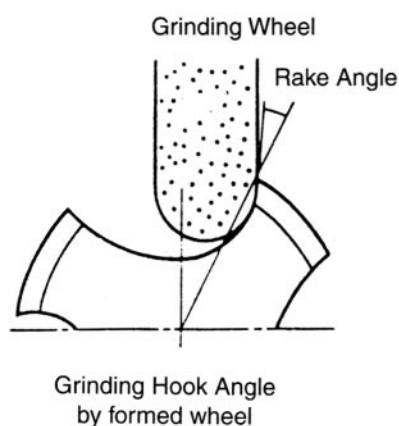
Item	General	Mass Production
Wheel Dimension	WA 60–80K	CBN 120–170
Wheel Speed	1970 ft/mm	4,900–5,900 ft/mm
Depth of Grinding	.0012"	.0004–.002"
Feed Rate	3.3 ft/mm	3.3–10.0 ft/min
Coolant	Wet	Wet

The depth of regrind can be 2–3 times the thread height; it is not necessary to regrind full depth of the flute. However, it must be as smooth as possible from the ground rake face position to the root radius.

2. Setting the rake angle

To grind the rake face is to remove wear and the damaged portion.

It is very important to set the rake angle very carefully, otherwise it brings unstable accuracy of female thread, bad surface roughness, short tool life and chipping. The following picture indicates two types of resharpening, which are Grinding Hook Angle by Formed wheel and Grinding Rake Angle by Disk Type wheel.

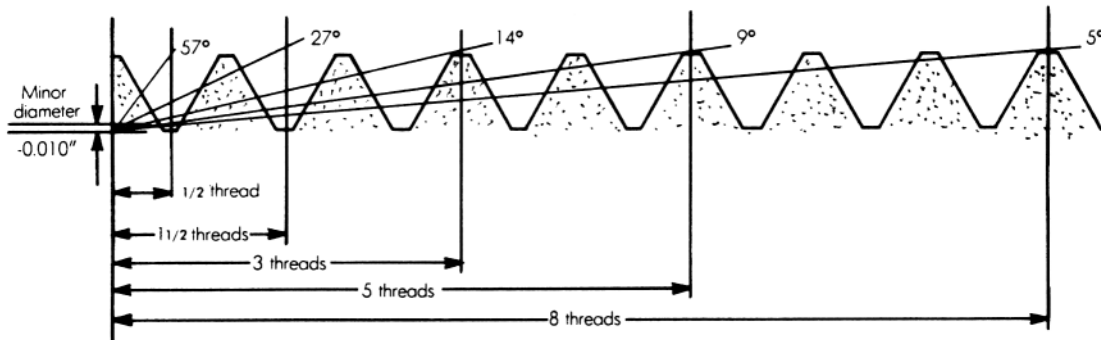


RESHARPENING OF TAPS

B. Chamfer Grinding Way

The Chamfer Grinding is carried out by some chamfer grinding machines with being held by collet or between centers. Chamfer length and angle are specified as follows:

Kind of Taps	Chamfer Length	Chamfer Angle
hand taps (Taper)	8~9 threads	$\approx 4^{\circ} \sim 5^{\circ}$
hand taps (Plug)	5 threads	$\approx 7.5^{\circ}$
hand taps (Bottoming)	1.5 threads	$\approx 24^{\circ}$
taper pipe taps	2.5 threads	$\approx 15^{\circ}$
parallel pipe taps	4 threads	$\approx 11^{\circ}$
spiral fluted taps	2.5 threads	$\approx 15^{\circ}$
spiral pointed taps	4 threads	$\approx 9.5^{\circ}$



Relation between length and angle of taper

Relief Angle (α) is calculated as next.

$$\alpha = \tan^{-1} (P \times \tan \lambda / \pi d) \cong \alpha_0$$

α : relief angle on taper

P : pitch

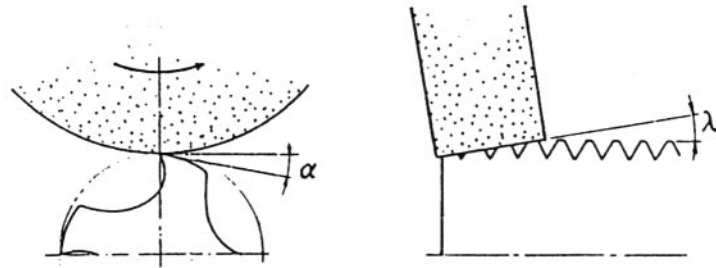
λ : taper angle

d : basic minor diameter

α_0 : effective minimum relief angle

α_0 is decided as table

Material	Relief Angle
steel	4 ~ 5
hard steel	2 ~ 3
stainless steel	5°
cast iron	3°
aluminum	6°



Resharpening of taper

TROUBLE-SHOOTING GUIDE FOR TAPPING PROBLEMS

	Troubles	Factors	Countermeasures
Surface Roughness	Torn or Rough Thread	Chamfer length too short	• Increase chamfer length
		Wrong cutting angle	• Apply proper cutting angle
		Galling	• Use thread relieved taps • Reduce land width • Apply surface treatment such as steam oxide or chrome • Use proper cutting lubricant • Reduce tapping speed • Use larger drill size • Obtain proper alignment between tap and work
			• Use spiral pointed or spiral fluted taps • Use larger drill size
	Chattering on Tapped Thread	Too free cutting	• Avoid too narrow land width • Reduce amount of thread relief
		Tool condition	• Reduce cutting angle • Do not grind the bottom of the flute
Dimensional Error	Oversize Pitch Diameter	Incorrect Taps	• Use proper GH limits • Use longer chamfered taps
		Chip Packing	• Use spiral point or spiral fluted taps • Reduce number of flutes to provide extra chip room • Use National fine pitch, if applicable • Use larger drill size • If tapping a blind hole, allow deeper hole where applicable or shorten the thread length of the parts • Use proper lubricant
			• Apply proper surface treatment such as steamoxide • Use proper cutting lubricant • Reduce tapping speed • Use proper cutting angle in accordance with material being tapped. • Use larger drill size
		Operating Conditions	• Apply proper tapping speed • Correct alignment of tap and drill hole • Free cutting either tap or workpiece • Use proper tapping speed to avoid torn or rough thread • Use lead screw tapper • Use proper tapping machine with suitable power • Avoid misalignment of tap and drill hole from loose spindle or worn holder
			• Obtain proper indexing angle for the flutes at the cutting edge • Grind proper indexing angle and chamfer angle • Avoid too narrow land width • Remove burrs from reground edge
	Oversize Internal Diameter	Drill Hole Size	• Use minimum size drill hole • Avoid tapered hole • Use proper chamfered taps
		Galling	• Galling solutions 1 through 4 above can be applied to this specific problem

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

	Troubles	Factors	Countermeasures
Dimensional Error	Undersize Pitch Diameter	Incorrect Tap Selection	• Use one oversize taps 1) Use for cuffing materials such as copper alloy, aluminum alloy, and cast iron 2) Use for cuffing tubing which will have "spring back" action after tapping • Apply proper chamfer angle • Increase cutting angle
		Damaged Thread	• Use proper reversing speed to avoid damaging tapped thread on the way out of the hole
		Left over Chips	• Increase cutting performance to avoid any leftover chip in the hole • Remove leftover chip from the hole for gauge checking
	Undersize Internal Diameter	Drill Hole size	• Use maximum drill size
Tool Life	Breakage	Incorrect Tap Selection	• Use high speed steel taps • Avoid chip packing in the flutes or the bottom of hole • Use spiral pointed or spiral fluted taps or Roll Taps • Apply correct surface treatment such as steam oxide or other coating
		Excessive Tapping Torque	• Use larger drill size • Try to shorten thread length • Apply National Fine Pitch if applicable • Increase cutting angle • Apply a tap with more thread relief and reduced land width • Use spiral pointed or spiral fluted taps
		Operating Conditions	• Reduce tapping speed • Avoid misalignment between tap and the hole and tapered hole • Use floating type of tapping holder • Use tapping holder with torque adjustment • Avoid hitting bottom of the hole with tap
		Tool Condition	• Do not grind the bottom of the flutes • Avoid too narrow a land width • Do not leave sections on the reground flutes which tapping wear still remains • Regrind tool more frequently
	Chipping	Incorrect Tap Selection	• Reduce cutting angle • Use a different kind of high speed steel taps • Reduce hardness of the taps • Increase chamfer length • Avoid chip packing in the flutes or the bottom of the hole by using spiral pointed or fluted taps
		Operating Conditions	• Reduce tapping speed • Avoid misalignment between tap and hole • Avoid sudden return or reverse in blind hole tapping • Avoid galling • Use larger drill size
	Wear	Incorrect Tap Selection	• Apply specially designed taps for tapping heat treated material • Change to a type of high speed steel material contained vanadium • Apply special surface treatment such as nitriding or TiN • Increase chamfer length
		Operating Conditions	• Reduce tapping speed • Apply proper cutting lubricants • Avoid work hardened hole • Use larger drill size
		Tool Condition	• Grind proper cutting angle • Avoid hardness reduction from grind process

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

MATERIAL SYMBOL CHART BY STANDARD

Technical
Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

Description	U.S.A.		Japan	Germany	ISO
	ASTM	AISI	JIS	DIN	
General structural Steel	C		SM490A SM490B SM570 SS400 SS330	St33	
	A				
	B				
	C				
	30				
	33				
	36				
	40				
	70		SS490 SS540	St52-3	
	C		SM490A SM490B SM490C SM490Y SM520 SV330 SV400	Ust36	
Carbon Steel		1015	S15C	CK15	C15E4
		1025	S25C	C15 CK25	C25
		1045	S45C	C25 CK45	C25E4
		1046		C45	C45
		1050	S50C	C45 CK50	C45E4
				C50	C50
	60		SB410	C50E4	C50E4
	65		SB450	P7	P7
	A		SB450M	P11	P11
	70		SB480	P28	P28
Alloy Steel			SCM415 SCM415H SCM415TK SCM418 SCM418H SCM418TK SCM420 SCM420H SCM420TK SCM421 SCM430 SCM430TK SCM432 SCM435		18CrMo4 18CrMo4
		4130			
		4135		34CrMo4	34CrMo4
		4137			
		4135H	SCM435H	34CrMo4	34CrMo4
		4137H			
		4140	SCM435TK	42CrMo4	
		4142			
		4140H	SCM440H	42CrMo4	42CrMo4
		4142H			
		4145	SCM440TK SCM445		
		4147			
		4145H	SCM445H SCM822 SCM822H		
		4147H	SCR415 SCR415H SCR420 SCR420H SCR420TK SCR430	16MnCr5 16MnCr5 16MnCr5 16MnCr5	
		5130		34Cr4	34Cr4
		5132			
		5130H	SCR430H	34Cr4	34Cr4
		5132H			
		5135	SCR435	34Cr4	34Cr4
		5135H	SCR435H	34Cr4	34Cr4
		5140	SCR440	37Cr4	37Cr4
				37Cr4	37Cr4
		5140H	SCR440H	41Cr4	41Cr4
				37Cr4	37Cr4
		5147	SCR445	41Cr4	41Cr4
		1522	SMn420		22Mn6
		1522H	SMn420H		22Mn6
			SMn433		
		1541H	SMn433H		36Mn6
		1541	SMn438		36Mn6
		1541H	SMn438H		36Mn6

Description	U.S.A.		Japan	Germany	ISO
	ASTM	AISI	JIS	DIN	
Alloy Steel		1541H	SMn443 SMn443H SNC326 SNC415 SNC415H SNC631 SNC631H SNC815 SNC815H SNC836 SNCM220		42Mn6
		8615 8617 8620 8622 8617H 8620H 8622H			15NiCr13
		8637 8640	SNCM220H		20NiCrMo2
		4320 4320H	SNCM240		20NiCrMo2
		4340	SNCM415 SNCM420 SNCM420H SNCM431 SNCM439 SNCM447 SNCM616 SNCM625 SNCM630 SNCM815		41CrNiMo2
Carbon Tool Steel	W1-111/2 W1-10 W1-9 W1-8		SK1 SK2 SK3 SK4 SK5 SK6	C105W1 C80W1 C80W1	TC140 TC120 TC105 TC90 TC90 TC80 TC70
			SK7 SKS2 SKS3 SKS4 SKS5 SKS6 SKS7 SKS8 SKS11 SKS21 SKS31 SKS41 SKS43 SKS44 SKS51 SKS93 SKS94 SKS95 SUJ2	C70W2 105WCr6	105WCr1
	F2			105WCr6	105WCr1
	W2-91/2 W2-81/2 L6				TCV105
	52100			100Cr6	1
Die Steel	D2 H13		SKD11 SKD61	X40CrMoV51	40CrMoV5
Tool Steel			SKT3 SKT4	55NiCrMoV6	55NiCrMoV2
Pipe Steel	TypeF 1008 A		STAM290GB SGP STKM11A STPT370 STB340	St28 St33 St34-2 St35.8 St35.8 St37.8 St37.0	
	E-A A		STPG370		
	B C A-1 E-B B		STS370 STPT410 STB410	St37.4 St42.8 St42.8 St45.8 St44.0 St44.0 St44.2 St44.2 St44.2 St44.2 St44.4 St45 St45 St52 St52 St52 St52-3 St52-3	TS9
			STPG410		
			STK400 STKM12B STKR400 STAM390G STS410 STKM14A STKM13C STKM18C STKM19A STKM19C STK490 STKR490		
	1020				TS18

Description	U.S.A.		Japan	Germany	ISO
	ASTM	AISI	JIS	DIN	
Pipe Steel	1026 1025 1026		STK480 STKM12A STKM12C STKM13B STKM14B	St52.4	R33
	1050		STKM14C STKM15A STKM15C STKM16A STKM16C STKM17A STKM17C STKM18A STKM18B STKM20A		R50
Heat Resistant steel	S65007		SUH1 SUH3 SUH4 SUH11 SUH21 SUH31 SUH35 SUH36 SUH37 SUH38 SUH309 SUH310 SUH330 SUH409 SUH409L SUH446 SUH600 SUH616 SUH660 SUH661		
	S63008 S63017 S30900 S31000 N08330 S40900 S44600 S42200 S66286 R30155			X6CrTi12	1Ti H7
Free cutting steel		1110 1108 1212 1213	SUM11 SUM12 SUM21 SUM22 SUM22L SUM23 SUM23L		9S20 11SMn28 11SMnPb
		1215 12L14 1117 1137 1141 1144	SUM24L SUM25 SUM31 SUM31L SUM32 SUM41 SUM42 SUM43	9SMn28 9SMnPb28 9SMnPb28 9SMn36 15S10	
Spring steel		1075 1078	SUP3		
		9260 5155 5160 6150 51B60 4161	SUP6 SUP7 SUP9 SUP9A SUP10 SUP11A SUP12 SUP13	55Cr3 50CrV4 54SiCr6	1 1 5 9 7 4 8
Stainless steel	S30400 S40500 S42020 S43000 S44002 S17400 S17700 S41000		SUS304 SUS405 SUS420F SUS430 SUS440A SUS630 SUS631 SUS410	X5CrNi1810 X6CrAl13 X6Cr17 X7CrNiAl177 X10Cr13	11 2 8 1 2 3
Cast steel	HT		SCH15		
Cast Iron	40 45		FC250 FC300		
	60-40-18 80-55-06		FCD400 FCD600	GGG-60	
Aluminum Alloy			A1080 A1070 A1050 A1100 A1200 A2014 A2017 A2017 A2024BD A2024BE A2024 P	Al99.8 Al99.7 Al99.5 Al99 AlCuSiMn AlCuMg1 AlCuSiMn AlCuMg2 AlCuMg2 EN AW-2024	Al99.5 Al99.0Cu Al99.0 AlCu4MgSi AlCu4Mg AlCu4Mg1 AlCu4Mg1 AlCu4Mg1

Description	U.S.A.		Japan	Germany	ISO
	ASTM	AISI	JIS	DIN	
Aluminum Alloy	2024 2024 2024 2024 3003 5052 5052		A2024 S A2024 TD A2024 TE A2024 W A3003 A5052 BD A5052 BE A5052 FH A5052 P A5052 S A5052 TD A5052 TE A5052 W A5056 A5083 A6061 A6063	AlCuMg2 AlCuMg2 AlCuMg2 AlCuMg2 AlMg2.5 EN AW-5052 AlMg2.5 AlMg5 AlMg4.5Mn	AlCu4Mg1 AlCu4Mg1 AlCu4Mg1 AlMg2.5 AlMg2.5 Al-Mg4.5Mn0.7 Al-Mg1SiCu Al-Mg0.7Si
	5083 6061 6063 7075 7075 7075 7075 7075 7075 7075 7075 7075		A7075 BD A7075 BE A7075 FD A7075 FH A7075 P A7075 S A7075 TD A7075 TE	AlZnMgCu1.5 AlZnMgCu1.5 AlZnMgCu1.5 AlZnMgCu1.5 EN AW-7075 AlZnMgCu1.5 AlZnMgCu1.5 AlZnMgCu1.5 AlZnMgCu1.5	AlZn5.5MgCu AlZn5.5MgCu AlZn5.5MgCu AlZn5.5MgCu AlZn5.5MgCu AlZn5.5MgCu AlZn5.5MgCu
Aluminum Alloy Casting	295.0 204.0 319.0		AC1A AC1B AC2A AC2B AC3A AC4A AC4B AC4C AC4CH AC4D AC5A AC7A AC7B AC8A AC8B AC8C AC9A AC9B ADC1 ADC3 ADC5 ADC6 ADC10 ADC10Z ADC12 ADC12Z ADC14	G(GK)-AlCu4Ti G(GK)-AlCu4TiMg G(GK)AlSi2 G(GK)-AlSi10Mg G(GK)-AlSiCu3 G(GK)AlSi7Mg G(GK)-AlMg5	Al-Cu4MgTi Al-Si5Cu3 Al-Si6Cu4 Al-Si12 Al-Si10Mg Al-Si7Mg Al-Si7Mg Al-Si5Cu1Mg Al-Cu4Ni2Mg2 Al-Mg10
	333.0 356.0 A356.0 355.0 242.0 514.0 520.0 336.0 A413.0 A360.0 518.0 A380.0 A380.0 383.0 383.0 A390.0		AC9B ADC1 ADC3 ADC5 ADC6 ADC10 ADC10Z ADC12 ADC12Z ADC14	GD-AlSi12(Cu) GD-AlSi10Mg GD-AlMg9 GD-AlSi9Cu3 GD-AlSi9Cu3	Al-Si12CuFe Al-Si8Cu3Fe Al-Si9Cu3Fe
Magnesium Alloy	AZ91A AZ91B AZ91D AZ60A AZ60B AZ41A AZ80A AM20A AM50A AM60B AS22A AS41B AE42A		MD1A MD1B MD1D MB3 MD2B	DG-MgAl9Zn1 DG-MgAl9Zn1 MgAl8Zn	Mg-Al8Zn
Copper, Copper Casting	C10200(B187:94) C10200(B152:94) C10200(B152:94)		C1020 B C1020 P C1020 R	OF-Cu OF-Cu OF-Cu	Cu-OF Cu-OF Cu-OF
Brass, Brass Casting	C26000(B36:95) C26000(B36:95) C26000(B36:95)		C2600 B C2600 P C2600 R	CuZn30 17660:83 CuZn30 17660:83 CuZn30 17660:83 CuZn30 17670:83	426/183 CuZn30 426/183 CuZn30 426/183 CuZn30 426/183 CuZn30
	C26000(B135:95) C26000(B134:93)		C2600 T C2600 W	CuZn30 CuZn30	CuZn30 CuZn30
Bronze, Bronze Casting	C61400(B169:95)		C6140 P		428/83 CuAl 8Fe3

Technical Data

DRILLS

DRILLS
Cutting Condition

END MILLS

END MILLS
Cutting Condition

TAPS

TAPS
Cutting Condition

Others

COMPARISON CHART SCALE FOR HARDNESS

Approximate relationship between various hardness scales

(HRC) Rockwell hardness C scale 150kg Braley	(HV) Diamond Pyramid hardness number, Vickers	(HB) Brinell hardness 29.42kN			Rockwell hardness			Rockwell hardness			(Hs) Shore scleroscope hardness number	Approx. tensile strength N/mm ²	(HRC) Rockwell hardness C scale 150kg Braley
		Standard 10mm ball	Hultgren 10mm ball	Tungsten carbide 10mm	(HRA) A scale 588.4N (60kg) Braley	(HRB) B scale 980.7N (100kg) 1/16" in Ball	(HRD) D scale 980.7N (100kg) Braley	15N Superficial Load 147.1N	30N Superficial Load 294.2N	45N Superficial Load 441.3N			
68	940	—	—	—	85.6	—	76.9	93.2	84.4	75.4	97	—	68
67	900	—	—	—	85.0	—	76.1	92.9	83.6	74.2	95	—	67
66	865	—	—	—	84.5	—	75.4	92.5	82.8	73.3	92	—	66
65	832	—	—	739	83.9	—	74.5	92.2	81.9	72.0	91	—	65
64	800	—	—	722	83.4	—	73.8	91.8	81.1	71.0	88	—	64
63	772	—	—	705	82.8	—	73.0	91.4	80.1	69.9	87	—	63
62	746	—	—	688	82.3	—	72.2	91.1	79.3	68.8	85	—	62
61	720	—	—	670	81.8	—	71.5	90.7	78.4	67.7	83	—	61
60	697	—	613	654	81.2	—	70.7	90.2	77.5	66.6	81	—	60
59	674	—	599	634	80.7	—	69.9	89.8	76.6	65.5	80	—	59
58	653	—	587	615	80.1	—	69.2	89.3	75.7	64.3	78	—	58
57	633	—	575	595	79.6	—	68.5	88.9	74.8	63.2	76	—	57
56	613	—	561	577	79.0	—	67.7	88.3	73.9	62.0	75	—	56
55	595	—	546	560	78.5	—	66.9	87.9	73.0	60.9	74	2079	55
54	577	—	534	543	78.0	—	66.1	87.4	72.0	59.8	72	2010	54
53	560	—	519	525	77.4	—	65.4	86.9	71.2	58.6	71	1952	53
52	544	500	508	512	76.8	—	64.6	86.4	70.2	57.4	69	1883	52
51	528	487	494	496	76.3	—	63.8	85.9	69.4	56.1	68	1824	51
50	513	475	481	481	75.9	—	63.1	85.5	68.5	55.0	67	1755	50
49	498	464	469	469	75.2	—	62.1	85.0	67.6	53.8	66	1687	49
48	484	451	455	455	74.7	—	61.4	84.5	66.7	52.5	64	1638	48
47	471	442	443	443	74.1	—	60.8	83.9	65.8	51.4	63	1579	47
46	458	432	432	432	73.6	—	60.0	83.5	64.8	50.3	62	1530	46
45	446	421	421	421	73.1	—	59.2	83.0	64.0	49.0	60	1481	45
44	434	409	409	409	72.5	—	58.5	82.5	63.1	47.8	58	1432	44
43	423	400	400	400	72.0	—	57.7	82.0	62.2	46.7	57	1383	43
42	412	390	390	390	71.5	—	56.9	81.5	61.3	45.5	56	1334	42
41	402	381	381	381	70.9	—	56.2	80.9	60.4	44.3	55	1294	41
40	392	371	371	371	70.4	—	55.4	80.4	59.5	43.1	54	1245	40
39	382	362	362	362	69.9	—	54.6	79.9	58.6	41.9	52	1216	39
38	372	353	353	353	69.4	—	53.8	79.4	57.7	40.8	51	1177	38
37	363	344	344	344	68.9	—	53.1	78.8	56.8	39.6	50	1157	37
36	354	336	336	336	68.4	(109.0)	52.3	78.3	55.9	38.4	49	1118	36
35	345	327	327	327	67.9	(108.5)	51.5	77.7	55.0	37.2	48	1079	35
34	336	319	319	319	67.4	(108.0)	50.8	77.2	54.2	36.1	47	1059	34
33	327	311	311	311	66.8	(107.5)	50.0	76.6	53.3	34.9	46	1030	33
32	318	301	301	301	66.3	(107.0)	49.2	76.1	52.1	33.7	44	1000	32
31	310	294	294	294	65.8	(106.0)	48.4	75.6	51.3	32.5	43	981	31
30	302	286	286	286	65.3	(105.5)	47.7	75.0	50.4	31.3	42	951	30
29	294	279	279	279	64.7	(104.5)	47.0	74.5	49.5	30.1	41	932	29
28	286	271	271	271	64.3	(104.0)	46.1	73.9	48.6	28.9	41	912	28
27	279	264	264	264	63.8	(103.0)	45.2	73.3	47.7	27.8	40	883	27
26	272	258	258	258	63.3	(102.5)	44.6	72.8	46.8	26.7	38	863	26
25	266	253	253	253	62.8	(101.5)	43.8	72.2	45.9	25.5	38	843	25
24	260	247	247	247	62.4	(101.0)	43.1	71.6	45.0	24.3	37	824	24
23	254	243	243	243	62.0	100.0	42.1	71.0	44.0	23.1	36	804	23
22	248	237	237	237	61.5	99.0	41.6	70.5	43.2	22.0	35	785	22
21	243	231	231	231	61.0	98.5	40.9	69.9	42.3	20.7	35	775	21
20	238	226	226	226	60.5	97.8	40.1	69.4	41.5	19.6	34	755	20
(18)	230	219	219	219	—	96.7	—	—	—	—	33	736	(18)
(16)	222	212	212	212	—	95.5	—	—	—	—	32	706	(16)
(14)	213	203	203	203	—	93.9	—	—	—	—	31	677	(14)
(12)	204	194	194	194	—	92.3	—	—	—	—	29	647	(12)
(10)	196	187	187	187	—	90.7	—	—	—	—	28	618	(10)
(8)	188	179	179	179	—	89.5	—	—	—	—	27	598	(8)
(6)	180	171	171	171	—	87.1	—	—	—	—	26	579	(6)
(4)	173	165	165	165	—	85.5	—	—	—	—	25	549	(4)
(2)	166	158	158	158	—	83.5	—	—	—	—	24	530	(2)
(0)	160	152	152	152	—	81.7	—	—	—	—	24	520	(0)

In the above chart, figures with () are not commonly used.

METRIC CONVERSION TABLE

Decimal	Fraction	Wire	mm	Tap Sizes	To be used with drill as indicated	Decimal	Fraction	Wire	mm	Tap Sizes	To be used with drill as indicated	Decimal	Fraction	Wire	mm	Tap Sizes	To be used with drill as indicated	Decimal	Fraction	Wire	mm	Tap Sizes	To be used with drill as indicated	Decimal	Fraction	Wire	mm	Tap Sizes	To be used with drill as indicated	Decimal	Fraction	Wire	mm	Tap Sizes	To be used with drill as indicated
.0059	97	.15				.0610		1.55				.1614		4.1				.3071		7.8		M9x1.25		.5781	37/64			5/8-18							
.0063	96	.16				.0625	1/16					.1654		4.2		M5x0.8		.3110		7.9				.5807		14.75		5/8-20							
.0067	95	.17				.0630		1.6		M2x0.4		.1660		19				.3125	5/16			3/8-16		.5906		15.									
.0071	94	.18				.0635		52				.1693		4.3				.3150		8.								5/8-24							
.0075	93	.19				.0650		1.65				.1695		18				.3160	O					.5938	19/32			5/8-28							
.0079	92	.2				.0669		1.7				.1719	11/64					.3189		8.1							5/8-32								
.0083	91					.0670		51				.1730		17				.3228		8.2				.6004		15.25									
.0087	90	.22				.0689		1.75		M2.2x0.45		.1732		4.4				.3230	P					.6094	39/64			1 1/16-12							
.0091	89					.0700		50		No.2-56 No.2-64		.1770		16		No.12-24		.3268		8.3				.6102		15.5		M18x2.5							
.0095	88					.0709		1.8				.1772		4.5				.3307		8.4		3/8-20		.6201		15.75									
.0098		.25				.0728		1.85				.1800		15				.3320	Q					.6250	5/8			1 1/16-16							
.0100	87					.0730		49				.1811		4.6				.3346		8.5		M10x1.5		.6299		16.									
.0105	86					.0748		1.9				.1820		14		No.12-28		.3386		8.6				.6398		16.25									
.0110	85	.28				.0760		48				.1850		13		No.12-32		.3390	R			3/8-24		.6406	41/64			1 1/16-20							
.0115	84					.0768		1.95				.1875	3/16					.3425		8.7				.6496		16.5									
.0118		.3				.0781	5/64					.1890		12		4.8		.3438	11/32			3/8-28 3/8-32		.6562	21/32			1 1/16-24 1 1/16-28 3/4-10							
.0120	83					.0785		47		No.3-48		.1929		4.9				.3465		8.8				.6594		16.75									
.0125	82					.0787		2.				.1935		10				.3480	S					.6693		17.									
.0126		.32				.0807		2.05		M2.5x0.45		.1960		9				.3504		8.9				.6719	43/64			3/8-12							
.0130	81					.0810		46				.1969		5.		M6x1		.3543		9.				.6791		17.25		3/4-16							
.0135	80					.0820		45		No.3-56		.1990		8				.3580	T					.6875	11/16			3/4-16							
.0138		.35				.0827		2.1				.2008		5.1				.3622		9.1				.6890		17.5		M20x2.5							
.0145	79					.0846		2.15				.2010		7		1/4-20		.3661		9.2				.7031	45/64			3/4-20							
.0150		.38				.0860		44				.2031	13/64					.3680	U			7/16-14		.7087		18.		3/4-28 3/4-32							
.0156	1/64					.0866		2.2				.2040		6				.3701		9.4				.7188	23/32			3/4-28 3/4-32							
.0157		.4				.0886		2.25				.2047		5.2				.3740		9.5		7/16-16		.7283		18.5									
.0160	78					.0890		43		No.4-40		.2055		5				.3770	V					.7344	47/64			1 3/16-12							
.0177		.45				.0906		2.3				.2087		5.3				.3780		9.6				.7480		19.		1 3/16-16							
.0180	77					.0925		2.35				.2090		4				.3819		9.7				.7500	3/4			1 3/16-20							
.0197		.5				.0935		42		No.4-48		.2126		5.4				.3858		9.8				.7656	49/64			M22x2.5							
.0200	76					.0938	3/32					.2130		3				.3888		9.9		7/16-20		.7677		19.5		1 3/16-32							
.0210	75					.0945		2.4				.2165		5.5		1/4-28 1/4-32		.3906	25/64				.7712	25/32			7/8-12								
.0217		.55				.0960		41				.2188	7/32					.3937		10.				.7874		20.		7/8-12							
.0225	74					.0965		2.45				.2205		5.6				.3970	X					.7969	51/64			7/8-12							
.0236		.6				.0980		40				.2210		2				.4016		10.2		M12x1.75		.8071		20.5		7/8-14 7/8-16							
.0240	73					.0984		2.5		M3x0.5		.2244		5.7				.4040	Y			7/16-28 7/16-32		.8125	13/16			M24x3							
.0250	72					.0995		39				.2280		1				.4062	13/32					.8268		21.		M24x3							
.0256		.65				.1015		38		No.5-40		.2323		5.8				.4130	Z					.8281	53/64			7/8-20							
.0260	71					.1024		2.6				.2344	15/64					.4134		10.5		1/2-13		.8438	27/32			7/8-28 7/8-32							
.0276		.7				.1040		37		No.5-44		.2362		6.		M7x1		.4219	27/64					.8465		21.5		1 5/16-12							
.0280	70					.1063		2.7		No.6-32		.2380		8				.4252		10.8				.8594	55/64			1 5/16-16							
.0292	69					.1094	7/64					.2402		6.1				.4331		11.		1/2-16		.8661		22.		1 5/16-20							
.0295		.75		M1x0.25		.1100		35				.2420		6.2				.4375	7/16					.8750	7/8			1 5/16-16 1-8							
.0310	68					.1102		2.8				.2441		6.3				.4409		11.2				.8858		22.5		1 5/16-28 1 5/16-32							
.0312	1/32					.1110		34		No.6-40		.2460		6.4				.4458		11.5		1/2-20		.8906	57/64			1 5/16-20							
.0315		.8				.1120		33		M3.5x0.6		.2480		6.5				.4531	29/64					.9055		23.		1 5/16-28 1 5/16-32							
.0320	67					.1142		2.9				.2500	1/4	E				.4580		11.8		1/2-28 1/2-32		.9062	29/32			1 5/16-28 1 5/16-32							
.0330	66					.1160		32				.2520		6.6				.4646		11.9				.9197		23.5		1 5/16-28 1 5/16-32							
.0335		.85		M1.1x0.25		.1181		3.				.2559		6.7				.4688	15/32					.9219	59/64			1-12							
.0350	65					.1188		3.1				.2570		6.8		M8x1.25		.4724		12.		M14x2		.9252		24.5		1-16 1 1/16-8							
.0354		.9				.1200		3.				.2598		6.9				.4803		12.2				.9375	15/16			1 1/16-8							
.0360	64					.1220		3.1				.2610		7.				.4844	31/64			5/16-12		.9449		24.		M27x3							
.0370	63					.1250	1/8					.2638		7.1				.4921		12.5		5/16-16		.9531	61/64			1-20							
.0374		.95		M1.2x0.25		.1260		3.2				.2656	17/64					.5000	1/2					.9646		24.5		1-28 1-32							
.0380	62					.1285		30				.2677		7.2				.5039		12.8				.9688	31/32			1 1/16-12 1 1/8-7							
.0390	61					.1299		3.3		M4x0.7		.2717		7.3				.5118		13.		5/16-18 5/16-20		.9843		25.		1 1/16-16 1 1/8-8							
.0394		1.				.1309		3.4		No.8-32 No.8-36		.2756		7.				.5156	33/64					.9844	63/64			1 1/16-16 1 1/8-8							
.0400	60					.1339		3.5				.2770		7.1				.5197		13.2				.9844		24.5		1-28 1-32							