2002

VERMONT TAP & DIE

PRODUCT CATALOG

TAPS

DIES

DRILLS

REAMERS

ISO-9002 Registered Facilities

Table of Contents

VERMONT TAP & DIE
P. O. Box 2587
Augusta, GA 30909-2587

The VERMONT TAP & DIE Tradition

At VERMONT TAP & DIE it is a tradition to maintain a high level of quality in our products and services. We are proud to continue this tradition with the introduction of the new VERMONT TAP & DIE Product Catalog.

New Products

There are many products new to this catalog, among them:

- Cobalt Silver & Deming 1/2" reduced shank drills
- Regular spiral masonry bits in fractional sizes
- Intermediate diameter reamers in taper pin and chucking styles
- New jobber, taper length, and S & D drill sets
- Expanded line of high performance taps

Quick Delivery

For quick delivery, remember our *"Fast Tap"* service. VTD can custom engineer and manufacture in the same time it takes others to select "ready made" specials off the shelf, finish and ship. VTD has the unique capability of manufacturing a special tap and then VERTANIUM® coating it in house.

Customer Service
Telephone: 800-451-4357
Fax: 800-433-1235

WARNING: Cutting tools may shatter when broken. Wearing eye protection in the vicinity of their use is strongly advised.

VERMONT TAP & DIE

High Performance Taps

Hand Taps

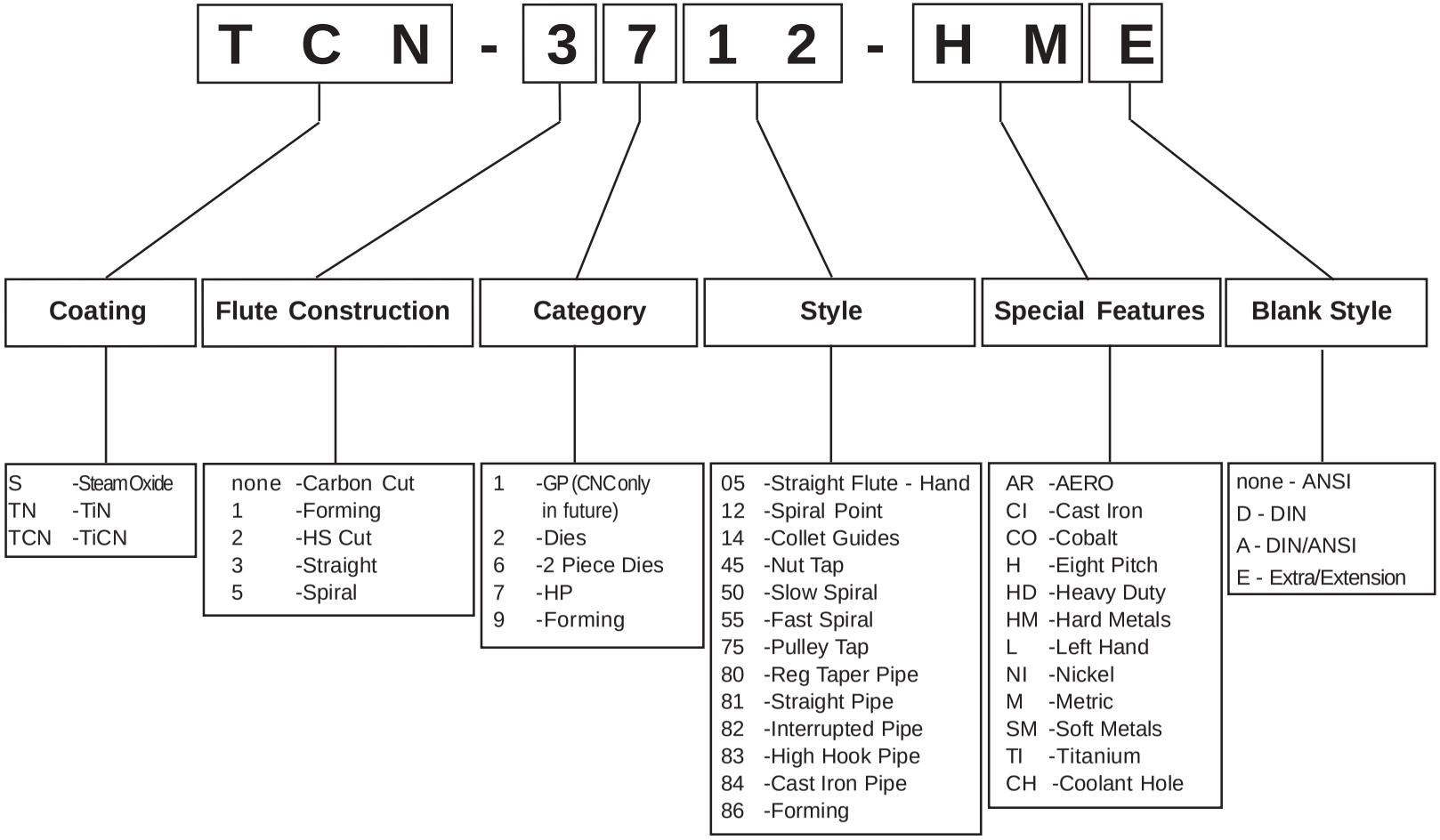
Spiral Pointed Taps

Spiral Fluted Taps

continued on next page

Vermont Tap List Number Codes

Example: TiCN Coated HP-CNC Spiral Point Tap for Hard Metals Extension Length



Introducing ...

VERMONT TAP & DIE's NEW HP-CNC High Performance Tap Offering

VTD's engineers have designed a series of tools to handle your toughest tapping applications. Materials such as hard and soft steel alloys, stainless steel, nickel alloys, titanium and cast iron can be tapped with ease using these specifically engineered tools.

Joining our successful VERTANIUM® AERO for stainless steel alloys and HD-CO for high strength materials up to 45Rc series taps in the new HP-CNC line are:

- HP-CNC SM series for tapping soft metals and stainless steel up to 346 BHN
- HP-CNC NI series for nickel and nickel based alloys
- HP-CNC TI series for titanium and titanium alloys
- HP-CNC HM series for tapping hard materials up to 45 Rc
- HP-CNC HDCI for high production in cast iron materials

Each tap is manufactured from premium PM powdered metal high speed steel for long tool life and abrasion resistance. In addition, each tap is coated with black oxide (X10), black oxide and nitride (X20), VERTANIUM® (TiN), or VERTANIUM-ULTRA titanium carbonitride (TiCN) for optimal tool life and performance, even at elevated tapping speeds. In addition to abrasion and heat resistance, coatings combined with a lubricant reduces tapping torque and improves the surface finish on the part for improved quality.

Specifically engineered geometry . . .

Spiral point taps for through hole tapping. Spiral fluted taps with a special modified bottoming for the optimal tool life in those tough blind hole applications!

Metric sizes available in most styles!

ALL HP-CNC taps are manufactured in the United States in ISO9002 certified facilities!

Special HP CNC taps can be manufactured on VTD's FAST TAP service. Contact customer service for details: call 800-451-4357, fax 800-433-1235.

High Performance Tap Selector

Select tap based on material to be threaded.
Select high performance coated taps for additional tool life.

	Material	Tap Style	Page	Steels		Cast Iron		Stainless Steels	Nickel Base Alloys	Titanium, Titanium Alloys		Aluminum, Copper, Magnesium	Cast Aluminum, Copper Alloy	Plastic		Plastic, Fiberglass, Bakelite	
	MATERIAL			Carbon	Tool, Mold	Gray	Ductile		(Inconel, Waspalloy, Hastelloy, etc.)					Soft, stringy chips	Broken chips		Broken chips
	HARDNESS BHN			<275	>275	<250	<275	<275	<275	<275		–	–	–	–	–	–
	HARDNESS Rc			<29	>29	<25	<29	<29	<29	<29		–	–	–	–	–	–
THROUGH HOLE	Stainless Softer metal	3712SM TN3712SM	7	❖			❖	❖				❖	❖	❖			
	Nickel	3712NI	9		❖				❖	❖	❖						
	Titanium	3712TI	11														
	Harder metal	3712HM TCN3712HM	13		❖	❖			❖								
	Cast iron	3705HDCI	17			❖	❖									❖	
	Aerospace metal	TN3712AR	6	❖				❖	❖								
	High strength metal	3712CO TN3712CO	15		❖	❖			❖								
	Speed SFM (Bright)			45-75	15-35	45-70	25-50	30-50	15-30	20-30 10-20		20-30 10-20	75-115	40-100		40-50	40-50
BLIND HOLE	Stainless Softer metal	5750SM TN5750SM	8	❖			❖	❖				❖	❖	❖			
	Nickel	5750NI	10		❖				❖	❖	❖						
	Titanium	5750TI	12														
	Harder metal	5750HM TCN5750HM	14		❖	❖			❖								
	Cast iron	3705HDCI	17			❖	❖									❖	
	High strength metal	5750CO TN5750CO	16		❖	❖			❖								
	Speed SFM (Bright)			24-40	10-25	15-40	10-25	15-30	10-20	5-10 5-10		5-10 5-10	45-75	30-60		20-35	20-35

HP CNC

AERO SPIRAL POINT TAPS

Ground Thread / Premium HSS

List No. TN-3712-AR VERTANIUM® Coated

Machine Screw and Fractional Sizes

- Designed for tapping heat resisting stainless steel alloys such as A286 at 275 BHN
- Recommended for through hole tapping
- Manufactured from HSS premium material
- TiN coated to improve performance
- Spiral point pushes chips forward
- Plug chamfer

Tap Size	TPI	Pitch Dia.	# of Flutes	TN-3712-AR Plug
6	32 NC	H3	3	**285057**
8	32 NC	H3	3	**285107**
10	24 NC	H3	3	**285156**
10	32 NF	H3	3	**285206**
10	32 NF	H5	3	**285222**
1/4	20 NC	H3	3	**285255**
1/4	20 NC	H5	3	**285305**
1/4	28 NF	H3	3	**285354**
1/4	28 NF	H5	3	**285370**
5/16	18 NC	H3	3	**285404**
5/16	18 NC	H5	3	**285420**
5/16	24 NF	H3	3	**285453**
5/16	24 NF	H5	3	**285479**
3/8	16 NC	H3	3	**285503**
3/8	16 NC	H5	3	**285552**
3/8	24 NF	H3	3	**285602**
3/8	24 NF	H5	3	**285628**
7/16	14 NC	H3	3	**285651**
7/16	20 NF	H3	3	**285701**
1/2	13 NC	H3	3	**285750**
1/2	13 NC	H5	3	**285801**
1/2	20 NF	H3	3	**285859**

Package Quantities: No 6-10, 1/4", = 12/pkg; 5/16" to 1/2" = 6/pkg

HPCNC SPIRAL POINT TAPS SOFT METALS & STAINLESS

Ground Thread / Premium HSS

List No. 3712-SM X-10 Treated
List No. TN-3712-SM VERTANIUM® Coated

Machine Screw, Fractional and Metric Sizes

- Designed for tapping soft to medium hard steel and stainless at 346 BHN or less
- Recommended for through hole tapping
- Spiral point pushes chips forward
- Manufactured from PM-M4 HSS
- Black oxide reduces galling & chip welding
- TiN coated for higher speeds and wear resistance
- Plug chamfer

Tap Size	TPI NC	TPI NF	# of Flutes	3712-SM H2	3712-SM H3	3712-SM H4	3712-SM H5	TN-3712-SM H2	TN-3712-SM H3	TN-3712-SM H4
4	40		2	330302				330714		
6	32		2	330303	330309		330332	330715	330716	
8	32		3	330304	330310		330333		330717	
10	24		3	330305	330311		330334		330718	
10		32	3	330306	330312		330335		330719	
1/4	20		3	330307	330313		330336		330720	330721
1/4		28	3	330308	330314	330329			330722	
5/16	18		3		330315		330337		330723	
5/16		24	3		330316	330330			330724	
3/8	16		3		330317		330338		330725	
3/8		24	3		330318	330331			330951	
7/16	14		3		330319		330339		330726	
7/16		20	3		330320		330340		330727	
1/2	13		3		330321		330341		330728	
1/2		20	3		330322		330342		330729	
9/16	12		3		330323				330730	
9/16		18	3		330324				330731	
5/8	11		3		330325		330343		330732	
5/8		18	3		330326				330733	
3/4	10		3		330327				330734	
3/4		16	3		330328				330735	

Package Quantities: No. 4 - 10, 1/4" = 12/pkg; 5/16" to 1/2" = 6/pkg; 9/16" to 3/4" = 3/pkg

Tap Size	Pitch (mm)	# of Flutes	3712-SM D3	3712-SM D4	3712-SM D5	3712-SM D6
M3	0.5	2	330344			
M4	0.7	3		330345		
M5	0.8	3		330346		
M6	1	3			330347	
M8	1.25	3			330348	
M10	1.5	3				330349
M12	1.75	3				330350
M14	1.5	3				330351
M18	1.5	3				330352

Package Quantities: M3 to M6 = 12/pkg; M8 to M12 = 6/pkg; M14 to M18 = 3/pkg

HPCNC

SPIRAL FLUTED TAPS
SOFT METALS & STAINLESS

Ground Thread / Premium HSS

List No. 5750-SM X-10 Treated
List No. TN-5750-SM VERTANIUM® Coated

Machine Screw, Fractional and Metric Sizes

- ■Designed for tapping soft to medium hard steel at 346 BHN or less
- ■Spiral flute design recommended for blind holes
- ■2.5 thread modified bottoming chamfer
- ■Manufactured from PM-M4 premium material
- ■Black oxide reduces gallling & chip welding
- ■TiN coated for higher speeds & wear resistance

Tap	TPI		# of	5750-SM	5750-SM	5750-SM	5750-SM	TN-5750-SM		
Size	NC	NF	Flutes	H2	H3	H4	H5	H2	H3	H4
4	40		2	330455				330758		
6	32		3	330456	330462		330485	330759	330760	
8	32		3	330457	330463		330486		330761	
10	24		3	330458	330464		330487		330762	
10		32	3	330459	330465		330488		330763	
1/4	20		3	330460	330466		330489		330764	330765
1/4		28	3	330461	330467	330482			330766	
5/16	18		3		330468		330490		330767	
5/16		24	3		330469	330483			330768	
3/8	16		3		330470		330491		330769	
3/8		24	3		330471	330484			330770	
7/16	14		3		330472		330492		330771	
7/16		20	3		330473		330493		330772	
1/2	13		3		330474		330494		330773	
1/2		20	3		330475		330495		330774	
9/16	12		3		330476				330775	
9/16		18	3		330477				330776	
5/8	11		4		330478		330496		330777	
5/8		18	4		330479				330778	
3/4	10		4		330480				330779	
3/4		16	4		330481				330780	

Package Quantities: No. 4 - 10, 1/4" = 12/pkg; 5/16" to 1/2" = 6/pkg; 9/16" to 3/4" = 3/pkg

Tap	Pitch	# of	5750-SM	5750-SM	5750-SM	5750-SM
Size	(mm)	Flutes	D3	D4	D5	D6
M3	0.5	2	330497			
M4	0.7	3		330498		
M5	0.8	3		330499		
M6	1	3			330502	
M8	1.25	3			330503	
M10	1.5	3				330504
M12	1.75	3				330505
M14	1.5	3				330506
M18	1.5	4				330507

Package Quantities: M3 to M6 = 12/pkg; M8 to M12 = 6/pkg; M14 to M18 = 3/pkg

HP CNC SPIRAL POINT TAPS - NICKEL

Ground Thread / Premium HSS

List No. 3712-NI

Machine Screw, Fractional and Metric Sizes

- Designed for tapping nickel and nickel base alloys at 275 BHN or less
- Recommend for through hole tapping
- Spiral point pushes chips forward
- Manufactured from vanadium cobalt PM HSS
- Bright finish
- Plug chamfer

Tap Size	TPI NC	TPI NF	# of Flutes	3712-NI H2	3712-NI H3	3712-NI H4	3712-NI H5
4	40		2	**330559**			
6	32		2	**330560**	**330566**		**330589**
8	32		3	**330561**	**330567**		**330590**
10	24		3	**330562**	**330568**		**330591**
10		32	3	**330563**	**330569**		**330592**
1/4	20		3	**330564**	**330570**		**330593**
1/4		28	3	**330565**	**330571**	**330586**	
5/16	18		3		**330572**		**330594**
5/16		24	3		**330573**	**330587**	
3/8	16		3		**330574**		**330595**
3/8		24	3		**330575**	**330588**	
7/16	14		4		**330576**		**330596**
7/16		20	4		**330577**		**330597**
1/2	13		4		**330578**		**330598**
1/2		20	4		**330579**		**330599**
9/16	12		4		**330580**		
9/16		18	4		**330581**		
5/8	11		4		**330582**		**330600**
5/8		18	4		**330583**		
3/4	10		4		**330584**		
3/4		16	4		**330585**		

Package Quantities: No. 4 - 10, 1/4" = 12/pkg; 5/16" to 1/2" = 6/pkg; 9/16" to 3/4" = 3/pkg

Tap Size	Pitch (mm)	# of Flutes	3712-NI D3	3712-NI D4	3712-NI D5	3712-NI D6
M3	0.5	2	**330601**			
M4	0.7	3		**330603**		
M5	0.8	3		**330604**		
M6	1	3			**330605**	
M8	1.25	3			**330606**	
M10	1.5	3				**330607**
M12	1.75	4				**330608**
M14	1.5	4				**330609**
M18	1.5	4				**330610**

Package Quantities: M3 to M6 = 12/pkg; M8 to M12 = 6/pkg; M14 to M18 = 3/pkg

HPCNC

SPIRAL FLUTED TAPS - NICKEL

Ground Thread / Premium HSS

List No. 5750-NI

Machine Screw, Fractional and Metric Sizes

- Designed for tapping nickel and nickel base alloys at 275 BHN or less
- Spiral flute design recommended for blind holes
- 2.5 thread modified bottoming chamfer
- Manufactured from vanadium cobalt PM HSS
- Bright finish

Tap Size	TPI NC	TPI NF	# of Flutes	5750-NI H2	5750-NI H3	5750-NI H4	5750-NI H5
4	40		2	330611			
6	32		2	330612	330618		330641
8	32		2	330613	330619		330642
10	24		3	330614	330620		330643
10		32	3	330615	330621		330644
1/4	20		3	330616	330622		330645
1/4		28	3	330617	330623	330638	
5/16	18		3		330624		330646
5/16		24	3		330625	330639	
3/8	16		3		330626		330647
3/8		24	3		330627	330640	
7/16	14		3		330628		330648
7/16		20	3		330629		330649
1/2	13		4		330630		330650
1/2		20	4		330631		330651
9/16	12		4		330632		
9/16		18	4		330633		
5/8	11		4		330634		330652
5/8		18	4		330635		
3/4	10		4		330636		
3/4		16	4		330637		

Package Quantities: No. 4 - 10, 1/4" = 12/pkg; 5/16" to 1/2" = 6/pkg; 9/16" to 3/4" = 3/pkg

Tap Size	Pitch (mm)	# of Flutes	5750-NI D3	5750-NI D4	5750-NI D5	5750-NI D6
M3	0.5	2	330653			
M4	0.7	2		330654		
M5	0.8	3		330655		
M6	1	3			330656	
M8	1.25	3			330657	
M10	1.5	3				330658
M12	1.75	4				330659
M14	1.5	4				330660
M18	1.5	4				330661

Package Quantities: M3 to M6 = 12/pkg; M8 to M12 = 6/pkg; M14 to M18 = 3/pkg

HP CNC

SPIRAL POINT TAPS - TITANIUM

Ground Thread / Premium HSS

List No. 3712-TI Treated

Machine Screw, Fractional and Metric Sizes

- Designed for tapping Titanium and Titanium alloys
- Recommended for through hole tapping
- Spiral point pushes chips forward
- Manufactured from vanadium cobalt PM HSS
- Plug chamfer

Tap Size	TPI NC	TPI NF	# of Flutes	3712-TI H2	3712-TI H3	3712-TI H4	3712-TI H5
4	40		2	330404			
6	32		3	330405	330411		330434
8	32		3	330406	330412		330435
10	24		3	330407	330413		330436
10		32	3	330408	330414		330437
1/4	20		3	330409	330415		330438
1/4		28	3	330410	330416	330431	
5/16	18		3		330417		330439
5/16		24	3		330418	330432	
3/8	16		3		330419		330440
3/8		24	3		330420	330433	
7/16	14		4		330421		330441
7/16		20	4		330422		330442
1/2	13		4		330423		330443
1/2		20	4		330424		330444
9/16	12		4		330425		
9/16		18	4		330426		
5/8	11		4		330427		330445
5/8		18	4		330428		
3/4	10		4		330429		
3/4		16	4		330430		

Package Quantities: No. 4 - 10, 1/4" = 12/pkg; 5/16" to 1/2" = 6/pkg; 9/16" to 3/4" = 3/pkg

Tap Size	Pitch (mm)	# of Flutes	3712-TI D3	3712-TI D4	3712-TI D5	3712-TI D6
M3	0.5	2	330446			
M4	0.7	3		330447		
M5	0.8	3		330448		
M6	1	3			330449	
M8	1.25	3			330450	
M10	1.5	3				330451
M12	1.75	4				330452
M14	1.5	4				330453
M18	1.5	4				330454

Package Quantities: M3 to M6 = 12/pkg; M8 to M12 = 6/pkg; M14 to M18 = 3/pkg

HP CNC SPIRAL FLUTED TAPS TITANIUM

Ground Thread / Premium HSS

List No. 5750-TI Treated

Machine Screw, Fractional and Metric Sizes

- Designed for tapping titanium and titanium alloys
- Spiral flute design recommended for blind holes
- 2.5 thread modified bottoming chamfer
- Manufactured from vanadum cobalt PM HSS

Tap Size	TPI NC	TPI NF	# of Flutes	5750-TI H2	5750-TI H3	5750-TI H4	5750-TI H5
4	40		2	**330662**			
6	32		2	**330663**	**330669**		**330692**
8	32		2	**330664**	**330670**		**330693**
10	24		3	**330665**	**330671**		**330694**
10		32	3	**330666**	**330672**		**330695**
1/4	20		3	**330667**	**330673**		**330696**
1/4		28	3	**330668**	**330674**	**330689**	
5/16	18		3		**330675**		**330697**
5/16		24	3		**330676**	**330690**	
3/8	16		3		**330677**		**330698**
3/8		24	3		**330678**	**330691**	
7/16	14		3		**330679**		**330699**
7/16		20	3		**330680**		**330700**
1/2	13		3		**330681**		**330701**
1/2		20	3		**330682**		**330703**
9/16	12		3		**330683**		
9/16		18	3		**330684**		
5/8	11		4		**330685**		**330704**
5/8		18	4		**330686**		
3/4	10		4		**330687**		
3/4		16	4		**330688**		

Package Quantities: No. 4 - 10, 1/4" = 12/pkg; 5/16" to 1/2" = 6/pkg; 9/16" to 3/4" = 3/pkg

Tap Size	Pitch (mm)	# of Flutes	5750-TI D3	5750-TI D4	5750-TI D5	5750-TI D6
M3	0.5	2	**330705**			
M4	0.7	2		**330706**		
M5	0.8	3		**330707**		
M6	1	3			**330708**	
M8	1.25	3			**330709**	
M10	1.5	3				**330710**
M12	1.75	3				**330711**
M14	1.5	3				**330712**
M18	1.5	4				**330713**

Package Quantities: M3 to M6 = 12/pkg; M8 to M12 = 6/pkg; M14 to M18 = 3/pkg

HPCNC SPIRAL POINT TAPS HARD METALS

Ground Thread / Premium HSS

List No. 3712-HM X-10 Treated
List No. TCN-3712-HM TiCN Coated

Machine Screw, Fractional and Metric Sizes

- Designed for tapping harder materials up to 45 Rc
- Recommended for through hole tapping
- Spiral point pushes chips forward
- Plug chamfer
- Manufactured from PM M-4
- Black oxide reduces chip welding
- TiCN coated to increase tap life

Tap Size	TPI NC	TPI NF	# of Flutes	3712-HM H2	3712-HM H3	3712-HM H4	3712-HM H5	TCN-3712-HM H2	TCN-3712-HM H3	TCN-3712-HM H4
4	40		2	330353				330736		
6	32		2	330354	330360		330383	330737	330738	
8	32		3	330355	330361		330384		330739	
10	24		3	330356	330362		330385		330740	
10		32	3	330357	330363		330386		330952	
1/4	20		3	330358	330364		330387		330741	330742
1/4		28	3	330359	330365	330380			330743	
5/16	18		3		330366		330388		330744	
5/16		24	3		330367	330381			330745	
3/8	16		3		330368		330389		330746	
3/8		24	3		330369	330382			330747	
7/16	14		4		330370		330390		330748	
7/16		20	4		330371		330391		330749	
1/2	13		4		330372		330392		330750	
1/2		20	4		330373		330393		330751	
9/16	12		4		330374				330752	
9/16		18	4		330375				330753	
5/8	11		4		330376		330394		330754	
5/8		18	4		330377				330755	
3/4	10		4		330378				330756	
3/4		16	4		330379				330757	

Package Quantities: No. 4 - 10, 1/4" = 12/pkg; 5/16" to 1/2" = 6/pkg; 9/16" to 3/4" = 3/pkg

Tap Size	Pitch (mm)	# of Flutes	3712-HM D3	3712-HM D4	3712-HM D5	3712-HM D6
M3	0.5	2	330395			
M4	0.7	3		330396		
M5	0.8	3		330397		
M6	1	3			330398	
M8	1.25	3			330399	
M10	1.5	3				330400
M12	1.75	4				330401
M14	1.5	4				330402
M18	1.5	4				330403

Package Quantities: M3 to M6 = 12/pkg; M8 to M12 = 6/pkg; M14 to M18 = 3/pkg

HP CNC

SPIRAL FLUTED TAPS HARD METALS

Ground Thread / Premium HSS

List No. 5750-HM X-10 Treated
List No. TCN-5750-HM TiCN Coated

Machine Screw, Fractional and Metric Sizes

- Designed for tapping harder materials up to 45 Rc
- Spiral flute design recommended for blind holes
- 2.5 thread modified bottoming chamfer
- Manufactured from PM M-4
- Black oxide reduces chip welding
- TiCN coated to increase tap life

Tap Size	TPI NC	TPI NF	# of Flutes	5750-HM H2	5750-HM H3	5750-HM H4	5750-HM H5	TCN-5750-HM H2	TCN-5750-HM H3	TCN-5750-HM H4
4	40		2	330508				330781		
6	32		2	330509	330515		330538	330782	330783	
8	32		2	330510	330516		330539		330784	
10	24		3	330511	330517		330540		330785	
10		32	3	330512	330518		330541		330786	
1/4	20		3	330513	330519		330542		330787	330788
1/4		28	3	330514	330520	330535			330789	
5/16	18		3		330521		330543		330790	
5/16		24	3		330522	330536			330791	
3/8	16		3		330523		330544		330792	
3/8		24	3		330524	330537			330793	
7/16	14		3		330525		330545		330794	
7/16		20	3		330526		330546		330795	
1/2	13		4		330527		330547		330796	
1/2		20	4		330528		330548		330797	
9/16	12		4		330529				330798	
9/16		18	4		330530				330799	
5/8	11		4		330531		330549		330802	
5/8		18	4		330532				330803	
3/4	10		4		330533				330804	
3/4		16	4		330534				330805	

Package Quantities: No. 4 - 10, 1/4" = 12/pkg; 5/16" to 1/2" = 6/pkg; 9/16" to 3/4" = 3/pkg

Tap Size	Pitch (mm)	# of Flutes	5750-HM D3	5750-HM D4	5750-HM D5	5750-HM D6
M3	0.5	2	330550			
M4	0.7	2		330551		
M5	0.8	3		330552		
M6	1	3			330553	
M8	1.25	3			330554	
M10	1.5	3				330555
M12	1.75	4				330556
M14	1.5	4				330557
M18	1.5	4				330558

Package Quantities: M3 to M6 = 12/pkg; M8 to M12 = 6/pkg; M14 to M18 = 3/pkg

HP CNC COBALT SPIRAL POINT TAPS

Ground Thread / Premium HSS

List No. 3712-CO

List No. TN-3712-CO VERTANIUM® Coated

Machine Screw and Fractional Sizes

- Designed for tapping high strength material up to 45 Rc
- Recommend for through hole tappping
- Spiral point pushes chips forward
- Manufactured from vanadium cobalt PM HSS
- Plug chamfer
- Bright finish
- TiN coated for wear resistance

Tap Size	TPI	#. of Flutes	Pitch Dia.	3712-CO Plug	TN-3712-CO Plug
6	32 NC	3	H3	272004	292004
6	32 NC	3	H5	272020	292020
8	32 NC	3	H3	272046	292046
8	32 NC	3	H5	272061	292061
10	24 NC	3	H3	272087	292087
10	24 NC	3	H5	272103	292103
10	32 NF	3	H3	272129	292129
10	32 NF	3	H5	272145	292145
1/4	20 NC	3	H3	272160	292160
1/4	20 NC	3	H5	272186	292186
1/4	28 NF	3	H3	272202	292202
1/4	28 NF	3	H5	272228	292228
5/16	18 NC	3	H3	272244	292244
5/16	18 NC	3	H5	272269	292269
5/16	24 NF	3	H3	272285	292285
5/16	24 NF	3	H5	272301	292301
3/8	16 NC	3	H3	272328	292328
3/8	16 NC	3	H5	272343	292343
3/8	24 NF	3	H3	272368	292368
3/8	24 NF	3	H5	272384	292384
7/16	14 NC	3	H3	272402	292401
7/16	14 NC	3	H5	272426	292426
7/16	20 NF	3	H3	272446	292442
7/16	20 NF	3	H5	272467	292467
1/2	13 NC	3	H3	272483	292483
1/2	13 NC	3	H5	272509	292509
1/2	20 NF	3	H3	272525	292525
1/2	20 NF	3	H5	272541	292541

Package Quantities: No 6-10, 1/4" = 12/pkg; 5/16" to 1/2" = 6/pkg

HP-CNC COBALT SPIRAL FLUTED TAPS

Ground Thread / Premium HSS

List No. 5750-CO

List No. TN-5750-CO VERTANIUM® Coated

- ■Designed for tapping high strength material up to 45 Rc
- ■Spiral flute design recommended for blind holes
- ■2.5 thread modified bottoming chamfer
- ■Manufactured from vanadium cobalt PM HSS
- ■Bright finish
- ■TiN coated for wear resistance

Tap Size	TPI	#. of Flutes	Pitch Dia.	5750-CO	TN-5750-CO
6	32 NC	3	H3	295001	295007
6	32 NC	3	H5	295027	295023
8	32 NC	3	H3	295043	295049
8	32 NC	3	H5	295068	295064
10	24 NC	3	H3	295084	295080
10	24 NC	3	H5	295101	295106
10	32 NF	3	H3	295126	295122
10	32 NF	3	H5	295142	295148
1/4	20 NC	3	H3	295167	295163
1/4	20 NC	3	H5	295183	295189
1/4	28 NF	3	H3	295209	295205
1/4	28 NF	3	H5	295225	295221
5/16	18 NC	3	H3	295241	295247
5/16	18 NC	3	H5	295266	295262
5/16	24 NF	3	H3	295282	295288
5/16	24 NF	3	H5	295308	295304
3/8	16 NC	3	H3	295324	295320
3/8	16 NC	3	H5	295340	295346
3/8	24 NF	4	H3	295365	295361
3/8	24 NF	4	H5	295381	295387
7/16	14 NC	4	H3	295407	295403
7/16	14 NC	4	H5	295423	295429
7/16	20 NF	4	H3	295449	295445
7/16	20 NF	4	H5	295464	295460
1/2	13 NC	4	H3	295480	295486
1/2	13 NC	4	H5	298506	295502
1/2	20 NF	4	H3	295522	295528
1/2	20 NF	4	H5	295548	295544

Package Quantities: No 6-10, 1/4" = 12/pkg; 5/16" to 1/2" = 6/pkg

HP-CNC STRAIGHT FLUTED HAND TAPS CAST IRON

Ground Thread / Premium HSS

List No. 3705-HDCI X-20 Treated

Machine Screw, Fractional and Metric Sizes

- Straight fluted tap design for "Cast Iron" materials
- Manufactured from PM M-4 premium material
- Semi-bottom chamfer (2 to 2-1/2 threads) for through and blind holes
- X-20 treatment (oxide over nitride)
- Titanium Carbonitride (TiCN) available upon request

Tap Size	TPI NC	TPI NF	# of Flutes	3705-HDCI H3	3705-HDCI H5
10	24		4	**330259**	**330277**
10		32	4	**330260**	
1/4	20		4	**330261**	**330278**
1/4		28	4	**330262**	
5/16	18		4	**330263**	**330279**
5/16		24	4	**330264**	
3/8	16		4	**330265**	**330280**
3/8		24	4	**330266**	
7/16	14		4	**330267**	**330281**
7/16		20	4	**330268**	**330282**
1/2	13		4	**330269**	**330283**
1/2		20	4	**330270**	**330284**
9/16	12		4	**330271**	**330285**
9/16		18	4	**330272**	**330286**
5/8	11		6	**330273**	**330287**
5/8		18	6	**330274**	**330288**
3/4	10		6	**330275**	**330289**
3/4		16	6	**330276**	**330290**

Package Quantities: No.10, 1/4" = 12/pkg; 5/16" to 1/2" = 6/pkg; 9/16" to 3/4" = 3/pkg

Tap Size	Pitch (mm)	# of Flutes	3705-HDCI D4	3705-HDCI D5	3705-HDCI D6
M5	0.8	4	**330291**		
M6	1	4		**330292**	
M8	1.25	4		**330293**	
M10	1.5	4			**330294**
M12	1.25	4			**330295**
M12	1.75	4			**330296**
M14	1.25	4			**330297**
M14	1.5	4			**330298**
M18	1.5	6			**330299**

Package Quantities: M3 to M6 = 12/pkg; M8 to M12 = 6/pkg; M14 to M18 = 3/pkg

STRAIGHT FLUTED HAND TAPS

Ground Thread / High Speed Steel

List No. 3105

List No. TN-3105 VERTANIUM® Coated

Machine Screw and Fractional Sizes
including oversize and optional number of flutes

- ■Taper chamfer generally for starting or hand operations
- ■Plug chamfer for through holes (4 - 5 threads)
- ■Bottoming chamfer for blind holes (1 -2 threads)
- ■Ground threads
- ■Optional number of flutes to optimize tapping operation
- ■Optional “H” limit tolerance to meet individual customer requirements
- ■TiN coating for higher tapping speeds & wear resistance reduces tapping torque and tap breakage

Tap Size	TPI	Pitch Dia	# F l	Overall Length	Thread Length	3105 Taper	3105 Plug	3105 Bottoming	TN-3105 Taper	TN-3105 Plug	TN-3105 Bottoming
0	80 NC	H1	2	1-5/8	5/16	—	300017	300025			
0	80 NC	H2	2	1-5/8	5/16	—	300041	300058	—	300047	300054
1	64 NC	H1	2	1-11/16	3/8	300066	300074	300082			
1	64 NC	H2	2	1-11/16	3/8	—	300108	—			
1	72 NF	H1	2	1-11/16	3/8	300124	300133	300140			
1	72 NF	H2	2	1-11/16	3/8	—	300165	300173			
2	56 NC	H1	2	1-3/4	7/16	—	300199	300207			
2	56 NC	H1	3	1-3/4	7/16	300249	300256	300264			
2	56 NC	H2	3	1-3/4	7/16	300272	300280	300299	300278	300286	300294
2	64 NF	H2	3	1-3/4	7/16	300397	300405	300413	300393	300402	300419
3	48 NC	H2	3	1-13/16	1/2	300512	300520	300538	339044	300526	339045
3	56 NF	H2	3	1-13/16	1/2	300637	300645	300652	339046	339047	339048
4	36 NS	H2	3	1-7/8	9/16	—	300702	300710			
4	40 NC	H1	3	1-7/8	9/16	—	300793	—			
4	40 NC	H2	2	1-7/8	9/16	—	300769	300778			
4	40 NC	H2	3	1-7/8	9/16	300819	300827	300835	300815	300823	300831
4	48 NF	H1	3	1-7/8	9/16	—	300918	—			
4	48 NF	H2	3	1-7/8	9/16	300934	300942	300959	300930	300948	300955
5	40 NC	H2	2	1-15/16	5/8	—	301007	301015			
5	40 NC	H2	3	1-15/16	5/8	301056	301064	301072	301052	301060	301078
5	44 NF	H2	3	1-15/16	5/8	301171	301189	301197	301177	301185	301193
6	32 NC	H1	3	2	11/16	301296	301304	301312			
6	32 NC	H2	2	2	11/16	—	301247	301254			
6	32 NC	H2	3	2	11/16	301320	301338	301346			
6	32 NC	H3	2	2	11/16	—	301270	301288			
6	32 NC	H3	3	2	11/16	301353	301361	301379	301359	301367	301375
6	32 NC	H7	3	2	11/16	—	323506	323514			
6	40 NF	H2	2	2	11/16	—	301429	—			
6	40 NF	H2	3	2	11/16	301478	301486	301494	301474	301482	301490
8	32 NC	H1	4	2-1/8	3/4	—	301692	301702			
8	32 NC	H2	2	2-1/8	3/4	—	301544	301551			
8	32 NC	H2	3	2-1/8	3/4	—	301635	301643			
8	32 NC	H2	4	2-1/8	3/4	301718	301726	301734			

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List No. 3105
List No. TN-3105 VERTANIUM® Coated . . . *continued*

Tap Size	TPI	Pitch Dia	# F l	Overall Length	Thread Length	3105 Taper	3105 Plug	3105 Bottoming	TN-3105 Taper	TN-3105 Plug	TN-3105 Bottoming
8	32 NC	H3	2	2-1/8	3/4	—	301577	301585			
8	32 NC	H3	3	2-1/8	3/4	—	301668	301676			
8	32 NC	H3	4	2-1/8	3/4	301742	301759	301767	301748	301755	301763
8	32 NC	H7	4	2-1/8	3/4	—	323563	—			
8	36 NF	H1	4	2-1/8	3/4	—	301908	—			
8	36 NF	H2	4	2-1/8	3/4	301924	301933	301940	301920	301938	301946
10	24 NC	H1	4	2-3/8	7/8	—	302146	—			
10	24 NC	H2	2	2-3/8	7/8	—	301999	—			
10	24 NC	H2	3	2-3/8	7/8	302161	302179	302187			
10	24 NC	H3	2	2-3/8	7/8	—	302021	302039			
10	24 NC	H3	3	2-3/8	7/8	—	302112	302120			
10	24 NC	H3	4	2-3/8	7/8	302195	302203	302211	302191	302209	302217
10	32 NF	H1	4	2-3/8	7/8	302402	302419	302427			
10	32 NF	H2	2	2-3/8	7/8	—	302260	302278			
10	32 NF	H2	4	2-3/8	7/8	302435	302443	302450			
10	32 NF	H3	2	2-3/8	7/8	—	302294	302302			
10	32 NF	H3	3	2-3/8	7/8	—	302385	302393			
10	32 NF	H3	4	2-3/8	7/8	302468	302476	302484	302464	302472	302480
10	32 NF	H7	4	2-3/8	7/8	—	323688	—			
12	24 NC	H3	4	2-3/8	15/16	302526	302534	302542	302522	302530	302548
12	28 NF	H1	4	2-3/8	15/16	—	302567	—			
12	28 NF	H3	4	2-3/8	15/16	302583	302591	302609			
1/4	20 NC	H1	4	2-1/2	1	305008	305016	305024			
1/4	20 NC	H2	4	2-1/2	1	305033	305040	305057			
1/4	20 NC	H3	2	2-1/2	1	—	326004	326012	—	326002	326018
1/4	20 NC	H3	3	2-1/2	1	—	326160	326178	—	326166	326174
1/4	20 NC	H3	4	2-1/2	1	305065	305073	305081	305061	305079	305087
1/4	20 NC	H5	4	2-1/2	1	—	305107	305115	—	305103	305111
1/4	20 NC	H13	4	2-1/2	1	—	325006	—			
1/4	28 NF	H1	4	2-1/2	1	—	305164	—			
1/4	28 NF	H2	4	2-1/2	1	—	305198	305206			305209
1/4	28 NF	H3	2	2-1/2	1	—	326087	326095			
1/4	28 NF	H3	3	2-1/2	1	—	326244	326251	—	326240	—
1/4	28 NF	H3	4	2-1/2	1	305214	305222	305230	305210	305228	305236
1/4	28 NF	H4	4	2-1/2	1	—	305255	305263			
5/16	18 NC	H1	4	2-23/32	1-1/8	—	305347	305354			
5/16	18 NC	H2	4	2-23/32	1-1/8	—	305370	305388			
5/16	18 NC	H3	2	2-23/32	1-1/8	—	326285	326293			
5/16	18 NC	H3	3	2-23/32	1-1/8	—	326368	326376	—	326364	—
5/16	18 NC	H3	4	2-23/32	1-1/8	305396	305404	305412	305392	305403	305418
5/16	18 NC	H5	4	2-23/32	1-1/8	—	305438	305446	—	305434	305442
5/16	18 NC	H13	4	2-23/32	1-1/8	—	325048	—			
5/16	24 NF	H1	4	2-23/32	1-1/8	—	305461	305479			
5/16	24 NF	H2	4	2-23/32	1-1/8	—	305495	305503			
5/16	24 NF	H3	3	2-23/32	1-1/8	—	326442	326459			
5/16	24 NF	H3	4	2-23/32	1-1/8	305511	305529	305537	305517	305525	305533

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List No. 3105
List No. TN-3105 VERTANIUM® Coated . . . *continued*

Tap Size	TPI	Pitch Dia	# F l	Overall Length	Thread Length	3105 Taper	3105 Plug	3105 Bottoming	TN-3105 Taper	TN-3105 Plug	TN-3105 Bottoming
5/16	24 NF	H4	4	2-23/32	1-1/8	—	305552	305560			305563
3/8	16 NC	H1	4	2-15/16	1-1/4	—	305644	305651			
3/8	16 NC	H2	4	2-15/16	1-1/4	—	305677	305685			
3/8	16 NC	H3	3	2-15/16	1-1/4	—	326525	326533	—	326521	326539
3/8	16 NC	H3	4	2-15/16	1-1/4	305693	305701	305719	305699	305707	305715
3/8	16 NC	H5	4	2-15/16	1-1/4	—	305735	305743	—	305731	305749
3/8	16 NC	H13	4	2-15/16	1-1/4	—	325089	—			
3/8	24 NF	H1	4	2-15/16	1-1/4	—	305768	305776			
3/8	24 NF	H2	4	2-15/16	1-1/4	—	305792	305802			
3/8	24 NF	H3	3	2-15/16	1-1/4	—	326608	326616	—	326604	—
3/8	24 NF	H3	4	2-15/16	1-1/4	305818	305826	305834	305814	305822	305830
3/8	24 NF	H4	4	2-15/16	1-1/4	—	305859	305867			
7/16	14 NC	H3	3	3-5/32	1-7/16	—	326640	—			
7/16	14 NC	H3	4	3-5/32	1-7/16	305990	306006	306014	305996	306002	306010
7/16	14 NC	H5	4	3-5/32	1-7/16	—	306030	306048	—	306036	306044
7/16	14 NC	H13	4	3-5/32	1-7/16	—	325121	—			
7/16	20 NF	H3	4	3-5/32	1-7/16	306113	306121	306139	306119	306127	306135
7/16	20 NF	H5	4	3-5/32	1-7/16	—	306154	306162		306157	306165
1/2	13 NC	H1	4	3-3/8	1-21/32	—	306246	306253			
1/2	13 NC	H3	3	3-3/8	1-21/32	—	326681	326699	—	326687	326692
1/2	13 NC	H3	4	3-3/8	1-21/32	306295	306303	306311	306291	306309	306317
1/2	13 NC	H5	4	3-3/8	1-21/32	—	306337	306345	—	306333	306341
1/2	13 NC	H13	4	3-3/8	1-21/32	—	325162	—			
1/2	20 NF	H1	4	3-3/8	1-21/32	—	306394	—			
1/2	20 NF	H3	3	3-3/8	1-21/32	—	326707	—			
1/2	20 NF	H3	4	3-3/8	1-21/32	306444	306451	306469	306440	306457	306465
1/2	20 NF	H5	4	3-3/8	1-21/32	—	306485	—	—	306481	—
9/16	12 NC	H3	4	3-19/32	1-21/32	306626	306634	306642	306622	306630	306648
9/16	18 NF	H2	4	3-19/32	1-21/32	—	306725	—			
9/16	18 NF	H3	4	3-19/32	1-21/32	306741	306758	306766	306747	306754	306762
9/16	18 NF	H5	4	3-19/32	1-21/32	—	306782	—	—	306788	—
5/8	11 NC	H3	4	3-13/16	1-13/16	306923	306931	306949	306929	306937	306945
5/8	11 NC	H5	4	3-13/16	1-13/16	—	306964	306972	—	306960	306978
5/8	11 NC	H13	4	3-13/16	1-13/16	—	325204	—			
5/8	18 NF	H2	4	3-13/16	1-13/16	—	307020	—			
5/8	18 NF	H3	4	3-13/16	1-13/16	307046	307053	307061	307042	307059	307067
5/8	18 NF	H5	4	3-13/16	1-13/16	—	307087	307095	—	307083	307091
11/16	11 NC	H3	4	4-1/32	1-13/16	307160	307178	307186			
11/16	16 NF	H3	4	4-1/32	1-13/16	307194	307202	307210			
3/4	10 NC	H2	4	4-1/4	2	—	307327	—			
3/4	10 NC	H3	4	4-1/4	2	307343	307350	307368	307349	307356	307364
3/4	10 NC	H5	4	4-1/4	2	—	307384	307392	—	307380	307398
3/4	16 NF	H1	4	4-1/4	2	—	307418	—			
3/4	16 NF	H2	4	4-1/4	2	—	307442	—			
3/4	16 NF	H3	4	4-1/4	2	307467	307475	307483	307463	307471	307489
3/4	16 NF	H5	4	4-1/4	2	—	307509	307517	—	307505	307513

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List No. 3105
List No. TN-3105 VERTANIUM® Coated . . . *continued*

Tap Size	TPI	Pitch Dia	# F l	Overall Length	Thread Length	3105 Taper	3105 Plug	3105 Bottoming	TN-3105 Taper	TN-3105 Plug	TN-3105 Bottoming
7/8	9 NC	H4	4	4-11/16	2-7/32	307707	307715	307723	307703	307711	307729
7/8	9 NC	H6	4	4-11/16	2-7/32	—	307749	—	—	307745	—
7/8	14 NF	H2	4	4-11/16	2-7/32	—	307806	—			
7/8	14 NF	H4	4	4-11/16	2-7/32	307822	307830	307848	307828	307836	307844
7/8	14 NF	H6	4	4-11/16	2-7/32	—	307863	—	—	307869	—
1	8 NC	H4	4	5-1/8	2-1/2	308069	308077	308085	308065	308073	308081
1	8 NC	H6	4	5-1/8	2-1/2	—	308101	—	—	308107	—
1	12 NF	H4	4	5-1/8	2-1/2	308184	308192	308200	339049	339050	339051
1	14 NS	H4	4	5-1/8	2-1/2	308275	308283	308291			
1-1/8	7 NC	H4	4	5-7/16	2-9/16	308424	308432	308440	339052	339053	339054
1-1/8	12 NF	H4	4	5-7/16	2-9/16	308457	308465	308473	339055	339056	339057
1-1/4	7 NC	H4	4	5-3/4	2-9/16	308549	308556	308564	339058	339059	339060
1-1/4	12 NF	H4	6	5-3/4	2-9/16	308572	308580	308598	339061	339062	339063
1-3/8	6 NC	H4	4	6-1/16	3	308663	308671	308689			
1-3/8	12 NF	H4	6	6-1/16	3	308697	308705	308713			
1-1/2	6 NC	H4	4	6-3/8	3	308788	308796	308804			
1-1/2	12 NF	H4	6	6-3/8	3	308812	308820	308838			

Package Quantities: No 0-12, 1/4", = 12/pkg; 5/16" to 1/2" = 6/pkg; 9/16" to 1" = 3/pkg; 1-1/8" to 1-1/2" = 1/pkg

STRAIGHT FLUTED HAND TAP SETS

Ground Thread / High Speed Steel

List No. 3105- Sets
List No. TN-3105-Sets VERTANIUM® Coated

Machine Screw and Fractional Sizes
One each taper, plug, bottoming in each size

Tap Size	TPI	Pitch Dia	# of Flutes	3105 Set EDP No.	TN-3105-Sets EDP No.
1	64 NC	H1	2	341524	
1	72 NC	H1	2	341540	
2	56 NC	H2	3	341573	174511
2	64 NF	H2	3	341581	174512
3	48 NC	H2	3	341599	355802
3	56 NF	H2	3	341607	355803
4	40 NC	H2	3	341623	174530
4	48 NC	H2	3	341649	174531
5	40 NC	H2	3	341664	174536
5	44 NF	H2	3	341672	174537

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List No. 3105- Sets
List No. TN-3105-Sets VERTANIUM® Coated . . . *continued*

Tap Size	TPI	Pitch Dia	# of Flutes	3105 Set EDP No.	TN-3105-Sets EDP No.
6	32 NC	H2	3	341698	
6	32 NC	H3	3	341706	174538
6	40 NF	H2	3	341714	174539
8	32 NC	H2	4	341730	
8	32 NC	H3	4	341748	174544
8	36 NF	H2	4	341755	174545
10	24 NC	H2	4	341771	
10	24 NC	H3	4	341789	174508
10	32 NF	H2	4	341805	
10	32 NF	H3	4	341813	174509
12	24 NC	H3	4	341821	174510
12	28 NF	H3	4	341839	
1/4	20 NC	H2	4	342514	
1/4	20 NC	H3	4	342522	174506
1/4	28 NF	H3	4	342530	174507
5/16	18 NC	H3	4	342555	174532
5/16	24 NF	H3	4	342563	174533
3/8	16 NC	H3	4	342589	174528
3/8	24 NF	H3	4	342597	174529
7/16	14 NC	H3	4	342605	174540
7/16	20 NF	H3	4	342613	174541
1/2	13 NC	H3	4	342621	174504
1/2	20 NF	H3	4	342639	174505
9/16	12 NC	H3	4	342647	174546
9/16	18 NF	H3	4	342654	174547
5/8	11 NC	H3	4	342662	174534
5/8	18 NF	H3	4	342670	174535
11/16	11 NC	H3	4	342688	
11/16	16 NF	H3	4	342696	
3/4	10 NC	H3	4	342704	174513
3/4	16 NF	H3	4	342712	174514
7/8	9 NC	H4	4	342720	174543
7/8	14 NF	H4	4	342738	174542
1	8 NC	H4	4	342746	174503
1	12 NF	H4	4	342753	355804
1	14 NS	H4	4	342761	
1-1/8	7 NC	H4	4	342779	355805
1-1/8	12 NF	H4	4	342787	355807
1-1/4	7 NC	H4	4	342795	355808
1-1/4	12 NF	H4	6	342803	355809
1-3/8	6 NC	H4	4	342811	
1-3/8	12 NF	H4	6	342829	
1-1/2	6 NC	H4	4	342837	
1-1/2	12 NF	H4	6	342845	

Package Quantities: 1 set/pkg

METRIC STRAIGHT FLUTED HAND TAPS

Ground Thread / High Speed Steel

List No. 3105-M

List No. TN-3105-M VERTANIUM® Coated

Metric Sizes

- Taper chamfer generally for starting or hand operations
- Plug chamfer for through holes (4 - 5 threads)
- Bottoming chamfer for blind holes (1 - 2 threads)
- Ground threads
- TiN coating for higher tapping speeds & wear resistance
- Pitch diameter limits for ISO Class 6H (medium fit)

Tap Size	Pitch (mm)	Pitch Dia.	# of Flutes	Overall Length	Thread Length	3105-M Taper	3105-M Plug	3105-M Bottoming	TN-3105-M Plug	TN-3105-M Bottoming
M1.6	0.35	D3	2	1-5/8	5/16	—	**328018**	—		
M2	0.4	D3	3	1-3/4	7/16	**328067**	**328075**	**328083**	**328685**	**328686**
M2.5	0.45	D3	3	1-13/16	1/2	—	**328166**	—	**328689**	
M3	0.5	D3	3	1-15/16	5/8	**328182**	**328190**	**328208**	**328188**	**328205**
M3.5	0.6	D4	3	2	11/16	—	**328257**	—	**328693**	
M4	0.7	D4	4	2-1/8	3/4	**328273**	**328281**	**328299**	**328287**	**328295**
M4.5	0.75	D4	4	2-3/8	7/8	—	**328349**	—	**328697**	
M5	0.8	D4	4	2-3/8	7/8	**328364**	**328372**	**328380**	**328378**	**328386**
M6	1	D5	4	2-1/2	1	**328422**	**328430**	**328448**	**328436**	**328444**
M6.3	1	D5	4	2-1/2	1	—	**328463**	—		
M7	1	D5	4	2-23/32	1-1/8	**328489**	**328497**	**328505**		
M8	1.25	D5	4	2-23/32	1-1/8	**328547**	**328554**	**328562**	**328550**	**328568**
M10	1.5	D6	4	2-15/16	1-1/4	**328604**	**328612**	**328620**	**328618**	**328626**
M12	1.75	D6	4	3-3/8	1-21/32	**328661**	**328679**	**328687**	**328675**	**328683**
M14	2	D7	4	3-19/32	1-21/32	**328752**	**328760**	**328778**	**328707**	**328708**
M16	2	D7	4	3-13/16	1-13/16	**328810**	**328828**	**328836**	**328710**	**328711**
M18	2.5	D7	4	4-1/32	1-13/16	**328877**	**328885**	**328893**	**328713**	**328714**
M20	2.5	D7	4	4-15/32	2	**328935**	**328943**	**328950**	**328716**	**328717**
M24	3	D8	4	4-29/32	2-7/32	**329057**	**329065**	**329073**	**328719**	**328720**
M30	3.5	D9	4	5-7/16	2-9/16	**329172**	**329180**	**329198**		
M36	4	D9	4	6-1/16	3	**329297**	**329305**	**329313**		

Package Quantities: M1.6 to M6.3 = 12/pkg; M7 to M12 = 6/pkg; M14 to M24 = 3/pkg; M30 to M36 = 1/pkg

METRIC STRAIGHT FLUTED HAND TAP SETS

1 Each Taper, Plug, Bottoming

List No. 3105-M-Sets
List No. TN-3105-M-Sets VERTANIUM® Coated

Tap Size	Pitch (m/m)	Pitch Dia.	# of Flutes	3105-M Sets	TN-3105-M Sets
M2	0.4	D3	3	174516	343502
M2.5	0.45	D3	4	174559	343503
M3	0.5	D3	4	174519	343504
M3.5	0.6	D4	4	174560	343505
M4	0.7	D4	4	174520	343506
M4.5	0.75	D4	4	174561	343507
M5	0.8	D4	4	174521	343508
M6	1	D5	4	174522	343509
M7	1	D5	4	174523	343510
M8	1.25	D5	4	174524	343511
M10	1.5	D6	4	174548	343512
M12	1.75	D6	4	174549	343513
M14	2	D7	4	174550	343514
M16	2	D7	4	174551	343515
M18	2.5	D7	4	174552	343516
M20	2.5	D7	4	174553	343517
M24	3	D8	4	174515	343518
M30	3.5	D9	4	174517	
M36	4	D9	4	174518	

Package Quantities: 1 set/pkg

EIGHT PITCH HAND TAPS

Ground Thread / High Speed Steel / Straight Flute

List No. 3105-H
List No. 3105-H Sets

Fractional Sizes

- ■Taper chamfer generally for starting or hand operations
- ■Plug chamfer for through holes (4 - 5 threads)
- ■Bottoming chamfer for blind holes (1 - 2 threads)
- ■Ground threads
- ■Bright finish

Tap Size	TPI	Pitch Dia.	# of Flutes	Overall Length	Thread Length	3105-H Taper	3105-H Plug	3105-H Bottoming	3105-H Set
1-1/8	8	H5	4	5-7/16	2-9/16	327710	327712	327714	327716
1-1/4	8	H5	4	5-3/4	2-9/16	327720	327722	327724	327726
1-3/8	8	H5	4	6-1/16	3	327730	327732	327734	327736
1-1/2	8	H5	6	6-3/8	3	327740	327742	327744	327746
1-5/8	8	H6	6	6-11/16	3-3/16	—	327752	327754	
1-3/4	8	H6	6	7	3-3/16	327760	327762	327764	327766
1-7/8	8	H6	6	7-5/16	3-9/16	—	327772	327774	
2	8	H6	6	7-5/8	3-9/16	327780	327782	327784	327786
2-1/8	8	H6	6	8	3-9/16	—	327792	327794	
2-1/4	8	H6	6	8-1/4	3-9/16	—	327802	327804	
2-3/8	8	H6	6	8-1/2	4	—	327812	327814	
2-1/2	8	H6	6	8-3/4	4	—	327822	327824	

Package Quantities: 1/pkg Sets contain one each: taper, plug and bottoming.

6” EXTENSION HAND TAPS

Ground Thread / High Speed Steel / Straight Flute

List No. 3105-E

Machine Screw & Fractional Sizes

- Plug chamfer for through holes
- Ground threads
- Bottom chamfer for blind holes
- General purpose straight flute design
- Overall lengths are all 6”

Tap Size	TPI	Pitch Dia.	# of Flutes	Overall Length	Thead Length	3105-E Plug	3105-E Bottoming
6	32 NC	H3	3	6	11/16	**918827**	**918828**
8	32 NC	H3	4	6	3/4	**918891**	**918892**
10	24 NC	H3	4	6	7/8	**918833**	**918834**
10	32 NF	H3	4	6	7/8	**918836**	**918837**
1/4	20 NC	H3	4	6	1	**918839**	**918840**
1/4	28 NF	H3	4	6	1	**918842**	**918843**
5/16	18 NC	H3	4	6	1-1/8	**918845**	**918846**
5/16	24 NF	H3	4	6	1-1/8	**918848**	**918849**
3/8	16 NC	H3	4	6	1-1/4	**918851**	**918852**
3/8	24 NF	H3	4	6	1-1/4	**918854**	**918855**

Package Quantities: 1/pkg

General Dimension Tolerances - see Table #2, page 147

STRAIGHT FLUTED HAND TAPS for CAST IRON

Ground Thread / High Speed Steel / Straight Flute

List No. 3105-CI

Machine Screw and Fractional Sizes

- Specially designed cutting face and nitride surface treated for tapping highly abrasive materials
- Plug chamfer for through holes
- Ground threads
- Bottom chamfer for blind holes
- Semi-bottom (2 - 2.5 threads) offered to alleviate problem of “bell mouthing”

Tap Size	TPI	Pitch Dia.	# of Flutes	Overall Length	Thread Length	3105-CI Plug	3105-CI Semi-Bott	3105-CI Bottoming
6	32 NC	H3	3	2	11/16	**327139**	**327147**	**327155**
8	32 NC	H3	4	2-1/8	3/4	**327163**	**327171**	**327179**
10	24 NC	H3	4	2-3/8	7/8	**327187**	**327195**	**327203**
10	32 NF	H3	4	2-3/8	7/8	**327211**	**327219**	**327227**
12	24 NC	H3	4	2-3/8	15/16	**327235**	**327243**	**327251**
1/4	20 NC	H3	4	2-1/2	1	**327259**	**327267**	**327275**
1/4	20 NC	H5	4	2-1/2	1	**327283**	**327291**	**327309**
1/4	28 NF	H3	4	2-1/2	1	**327311**	**327315**	**327316**
5/16	18 NC	H3	4	2-23/32	1-1/8	**327317**	**327325**	**327333**
5/16	18 NC	H5	4	2-23/32	1-1/8	**327341**	**327358**	**327366**
5/16	24 NF	H3	4	2-23/32	1-1/8	**327368**	**327371**	**327372**

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List No. 3105CI . . . *continued*

Tap Size	TPI	Pitch Dia.	#. of Flutes	Overall Length	Thread Length	3105-CI Plug	3105-CI Semi-Bott	3105-CI Bottoming
3/8	16 NC	H3	4	2-15/16	1-1/4	**327374**	**327382**	**327390**
3/8	16 NC	H5	4	2-15/16	1-1/4	**327408**	**327416**	**327424**
3/8	24 NF	H3	4	2-15/16	1-1/4	**327426**	**327428**	**327430**
7/16	14 NC	H3	4	3-5/32	1-7/16	**327432**	**327440**	**327457**
7/16	14 NC	H5	4	3-5/32	1-7/16	**327465**	**327473**	**327481**
7/16	20 NF	H3	4	3-5/32	1-7/16	**327483**	**327485**	**327487**
1/2	13 NC	H3	4	3-3/8	1-21/32	**327499**	**327507**	**327515**
1/2	13 NC	H5	4	3-3/8	1-21/32	**327523**	**327531**	**327549**
1/2	20 NF	H3	4	3-3/8	1-21/32	**327551**	**327553**	**327555**
1/2	20 NF	H5	4	3-3/8	1-21/32	**327557**	**327559**	**327561**
9/16	12 NC	H3	4	3-19/32	1-21/32	**327563**	**327565**	**327567**
9/16	12 NC	H5	4	3-19/32	1-21/32	**327569**	**327571**	**327573**
9/16	18 NF	H3	4	3-19/32	1-21/32	**327575**	**327577**	**327579**
9/16	18 NF	H5	4	3-19/32	1-21/32	**327581**	**327583**	**327585**
5/8	11 NC	H3	4	3-13/16	1-13/16	**327587**	**327589**	**327591**
5/8	11 NC	H5	4	3-13/16	1-13/16	**327593**	**327595**	**327597**
5/8	18 NF	H3	4	3-13/16	1-13/16	**327599**	**327601**	**327603**
5/8	18 NF	H5	4	3-13/16	1-13/16	**327605**	**327607**	**327609**
3/4	10 NC	H3	4	4-1/4	2	**327611**	**327613**	**327615**
3/4	16 NF	H3	4	4-1/4	2	**327617**	**327619**	**327621**

Package Quantities: No 6-12, 1/4", = 12/pkg; 5/16" to 1/2" = 6/pkg; 9/16" to 3/4" = 3/pkg

METRIC STRAIGHT FLUTED HAND TAPS for CAST IRON

Ground Thread / High Speed Steel / Straight Flute

List No. 3105-CIM

Metric Sizes

- Specially designed cutting face and nitride surface treated for tapping highly abrasive materials
- Plug chamfer for through holes
- Bottom chamfer for blind holes
- Pitch diameter limits for ISO class 6H (medium fit)
- Semi-bottom (2 - 2.5 threads) offered to alleviate problem of "bell mouthing"

Tap Size	Pitch (mm)	Pitch Dia.	# of Flutes	Overall Length	Thread Length	3105-CIM Plug	3105-CIM Semi-Bott	3105-CIM Bottoming
M6	1	D5	4	2-1/2	1	**327652**	**327650**	**327654**
M8	1.25	D5	4	2-23/32	1-1/8	**327658**	**327656**	**327660**
M10	1.5	D6	4	2-15/16	1-1/4	**327664**	**327662**	**327666**
M12	1.75	D6	4	3-3/8	1-21/32	**327670**	**327668**	**327672**

Package Quantities: M6 = 12/pkg; M8 to M12 = 6/pkg

STRAIGHT FLUTED HAND TAPS

Ground Thread / High Speed Steel / Left Hand

List No. 3105-L

List No. 3105-L Sets

Machine Screw and Fractional Sizes

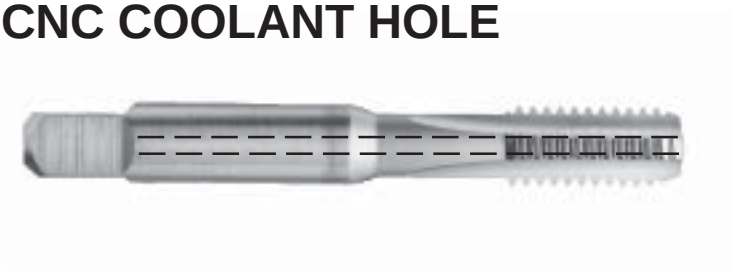
- Taper chamfer generally for starting or hand operations
- Plug for through holes
- Bottoming for blind holes
- Ground threads for better surface finish & tighter tolerances
- General purpose straight flute design
- Left hand cut for left hand threads

Tap Size	TPI	Pitch Dia	# of Flutes	Overall Length	Thread Length	3105-L Taper	3105-L Plug	3105-L Bottoming	3105-L Set EDP No.
10	32 NC	H3	4	2-3/8	7/8	—	313102	313119	
1/4	20 NC	H3	4	2-1/2	1	317508	317516	317524	174562
1/4	28 NF	H3	4	2-1/2	1	—	317540	—	
5/16	18 NC	H3	4	2-23/32	1-1/8	317565	317573	317581	174563
5/16	24 NF	H3	4	2-23/32	1-1/8	317599	317607	317615	174564
3/8	16 NC	H3	4	2-15/16	1-1/4	317623	317631	317649	174565
3/8	24 NF	H3	4	2-15/16	1-1/4	317656	317664	317672	174566
7/16	14 NC	H3	4	3-5/32	1-7/16	317680	317698	317706	174567
7/16	20 NF	H3	4	3-5/32	1-7/16	317714	317722	317730	174568
1/2	13 NC	H3	4	3-3/8	1-21/32	317748	317755	317763	174569
1/2	20 NF	H3	4	3-3/8	1-21/32	317771	317789	317797	174570
9/16	12 NC	H3	4	3-19/32	1-21/32	317805	317813	317821	174571
9/16	18 NF	H3	4	3-19/32	1-21/32	—	317847	—	
5/8	11 NC	H3	4	3-13/16	1-13/16	317862	317870	317888	174572
5/8	18 NF	H3	4	3-13/16	1-13/16	317896	317904	317912	174573
3/4	10 NC	H3	4	4-1/4	2	317987	317995	318001	174574
3/4	16 NF	H3	4	4-1/4	2	318019	318027	318035	174575
7/8	9 NC	H4	4	4-11/16	2-7/32	—	318050	318068	
7/8	14 NF	H4	4	4-11/16	2-7/32	318076	318084	318092	174576
1	8 NC	H4	4	5-1/8	2-1/2	318100	318118	318126	174577
1	12 NF	H4	4	5-1/8	2-1/2	318134	318142	318159	174578
1	14 NS	H4	4	5-1/8	2-1/2	318167	318175	318183	174579

Package Quantities: No 10, 1/4", = 12/pkg; 5/16" to 1/2" = 6/pkg; 9/16" to 1" = 3/pkg

STRAIGHT FLUTED HAND TAPS

List No. TN-3105-CH VERTANIUM® Coated CNC COOLANT HOLE



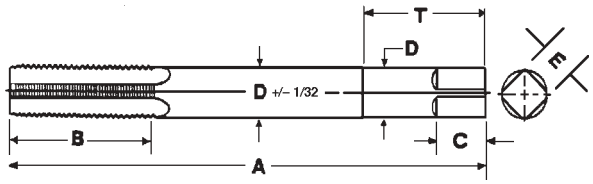
- Best performance in blind holes
- Require "through the spindle" coolant source
- High pressure coolant forces chips back out flutes
- Semi-bottoming (2 - 2-1/2 threads) for blind hole tapping
- TiN coated for wear resistance

Tap Size	TPI	#. of Flutes	Pitch Dia.	TN-3105-CH Semi-Bott
3/8	16 NC	3	H3	**298526**
3/8	24 NF	3	H3	**298527**
7/16	14 NC	4	H3	**298528**
7/16	20 NF	4	H3	**298529**
1/2	13 NC	4	H3	**298530**
1/2	20 NF	4	H3	**298531**
9/16	12 NC	4	H3	**298532**
5/8	11 NC	4	H3	**298533**
3/4	10 NC	4	H3	**298534**
7/8	9 NC	4	H4	**298535**
1	8 NC	4	H4	**298536**

Package Quantities: 3/8" to 1/2" = 6/pkg; 9/16" to 1" = 3/pkg

EXTRA LENGTH PULLEY TAPS
List No. 3175

Fractional Sizes (National Coarse Only)



- Plug chamfer for general purpose applications
- Ground threads for better surface finish & tighter tolerances
- General purpose straight flute design
- Shank diameter is the same as the major diameter
- Longer overall lengths for extended reach applications
- Overall lengths as indicated

Tap Size	TPI	# of Flutes	Pitch Dia.	Overall* Length	Thread Length	Shank Dia.	3175 EDP No
1/4	20 NC	4	H3	6	1	.255	**373931**
1/4	20 NC	4	H3	8	1	.255	**373949**
5/16	18 NC	4	H3	6	1-1/8	.318	**373956**
5/16	18 NC	4	H3	8	1-1/8	.318	**373964**
3/8	16 NC	4	H3	6	1-1/4	.381	**373972**
3/8	16 NC	4	H3	8	1-1/4	.381	**373980**
3/8	16 NC	4	H3	10	1-1/4	.381	**373998**
7/16	14 NC	4	H3	6	1-7/16	.444	**384003**
7/16	14 NC	4	H3	8	1-7/16	.444	**384011**
1/2	13 NC	4	H3	6	1-23/32	.507	**384037**
1/2	13 NC	4	H3	8	1-23/32	.507	**384045**
1/2	13 NC	4	H3	10	1-23/32	.507	**384052**
1/2	13 NC	4	H3	12	1-23/32	.507	**384060**
5/8	11 NC	4	H3	6	1-13/16	.633	**384078**
5/8	11 NC	4	H3	8	1-13/16	.633	**384086**
5/8	11 NC	4	H3	10	1-13/16	.633	**384094**
5/8	11 NC	4	H3	12	1-13/16	.633	**384102**
3/4	10 NC	4	H3	10	2	.759	**384110**
3/4	10 NC	4	H3	12	2	.759	**384128**

** Special extra length pulley taps can be manufactured upon request.*
Package Quantities: 1/pkg

SPIRAL POINT TAPS

Ground Thread / High Speed Steel

List No. 3112

List No. TN-3112 VERTANIUM® Coated

Machine Screw and Fractional Sizes including oversize H7 (H3+.002) and H13 (H3+.005)

- Ground threads
- Spiral point pushes chips forward for through hole applications
- Over size for pre-plate threads included as GH-7 and GH-13
- TiN coated for higher speeds & wear resistance
- Reduces tapping torque and tap breakage

Tap Size	TPI	Pitch Dia.	# of Flutes	Overall Length	Thread Length	3112 Plug	3112 Bottoming	TN-3112 Plug	TN-3112 Bottoming
0	80 NC	H1	2	1-5/8	5/16	356002	356019		
0	80 NC	H2	2	1-5/8	5/16	356027	356035	356023	—
1	64 NC	H1	2	1-11/16	3/8	356043	—		
1	64 NC	H2	2	1-11/16	3/8	356068	—	356061	
1	72 NF	H1	2	1-11/16	3/8	356084	—		
1	72 NF	H2	2	1-11/16	3/8	356102	—	356106	—
2	56 NC	H1	2	1-3/4	7/16	356126	356134		
2	56 NC	H2	2	1-3/4	7/16	356142	356159	356148	—
2	64 NF	H2	2	1-3/4	7/16	356183	—	356189	—
3	48 NC	H2	2	1-13/16	1/2	356225	356233	356221	—
3	56 NF	H1	2	1-13/16	1/2	356241	—		
3	56 NF	H2	2	1-13/16	1/2	356266	—	356262	—
4	36 NS	H2	2	1-7/8	9/16	356282	—		
4	40 NC	H1	2	1-7/8	9/16	356308	—		
4	40 NC	H2	2	1-7/8	9/16	356324	356332	356320	356338
4	48 NF	H2	2	1-7/8	9/16	356365	—	356361	—
5	40 NC	H1	2	1-15/16	5/8	356381	—		
5	40 NC	H2	2	1-15/16	5/8	356407	356415	356403	—
5	44 NF	H2	2	1-15/16	5/8	356419	—	356402	—
6	32 NC	H1	2	2	11/16	356421	—	356420	—
6	32 NC	H2	2	2	11/16	356422	356498	356486	—
6	32 NC	H3	2	2	11/16	356506	356514	356502	356510
6	32 NC	H7	2	2	11/16	359005	359013		
6	40 NF	H2	2	2	11/16	356548	356555	356544	—
8	32 NC	H1	2	2-1/8	3/4	356563	—	356569	—
8	32 NC	H2	2	2-1/8	3/4	356589	356597	356585	—
8	32 NC	H3	2	2-1/8	3/4	356633	356634	356602	356635
8	32 NC	H7	2	2-1/8	3/4	359047	359054		
8	36 NF	H2	2	2-1/8	3/4	356647	—		
10	24 NC	H1	2	2-3/8	7/8	356662	—	356668	—
10	24 NC	H2	2	2-3/8	7/8	356688	356696	356684	—
10	24 NC	H3	2	2-3/8	7/8	356704	356712	356703	356718
10	24 NC	H7	2	2-3/8	7/8	359088	—	359084	—
10	32 NF	H1	2	2-3/8	7/8	356720	356738	356726	—
10	32 NF	H2	2	2-3/8	7/8	356746	356753	356742	—
10	32 NF	H3	2	2-3/8	7/8	356761	356779	356767	356775

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List No. 3112

List No. TN-3112 VERTANIUM® Coated . . . *continued*

Tap Size	TPI	Pitch Dia.	# of Flutes	Overall Length	Thread Length	3112 Plug	3112 Bottoming	TN-3112 Plug	TN-3112 Bottoming
10	32 NF	H7	2	2-3/8	7/8	359120	—	359123	
12	24 NC	H3	2	2-3/8	15/16	356803	—	356809	—
12	28 NF	H3	2	2-3/8	15/16	356845	—	356841	—
1/4	20 NC	H1	2	2-1/2	1	357009	—		
1/4	20 NC	H2	2	2-1/2	1	357025	—	357021	—
1/4	20 NC	H3	2	2-1/2	1	357041	357058	357047	357054
1/4	20 NC	H3	3	2-1/2	1	357082	—	357088	—
1/4	20 NC	H5	2	2-1/2	1	357066	—	357062	—
1/4	20 NC	H5	3	2-1/2	1	357108	—	357101	
1/4	20 NC	H13	2	2-1/2	1	358494	—	358490	—
1/4	28 NF	H1	2	2-1/2	1	357124	—		
1/4	28 NF	H2	2	2-1/2	1	357140	—		
1/4	28 NF	H3	3	2-1/2	1	357207	357215		
1/4	28 NF	H3	2	2-1/2	1	357165	357173	357161	357179
1/4	28 NF	H4	2	2-1/2	1	357181	—		
1/4	28 NF	H4	3	2-1/2	1	357223	—	357226	
5/16	18 NC	H1	2	2-23/32	1-1/8	357249	—		
5/16	18 NC	H2	2	2-23/32	1-1/8	357264	—		
5/16	18 NC	H3	2	2-23/32	1-1/8	357280	357298	357286	357294
5/16	18 NC	H3	3	2-23/32	1-1/8	357322	—	357328	—
5/16	18 NC	H5	2	2-23/32	1-1/8	357306	—	357302	—
5/16	18 NC	H5	3	2-23/32	1-1/8	357348	—	357344	—
5/16	18 NC	H13	2	2-23/32	1-1/8	358510	—	358516	—
5/16	24 NF	H1	2	2-23/32	1-1/8	357363	—		
5/16	24 NF	H2	2	2-23/32	1-1/8	357389	—		
5/16	24 NF	H3	2	2-23/32	1-1/8	357405	357413	357401	357419
5/16	24 NF	H3	3	2-23/32	1-1/8	357447	—		
5/16	24 NF	H4	2	2-23/32	1-1/8	357421	—	357427	—
5/16	24 NF	H4	3	2-23/32	1-1/8	357462	—		
3/8	16 NC	H1	3	2-15/16	1-1/4	357488	—		
3/8	16 NC	H2	3	2-15/16	1-1/4	357504	—		
3/8	16 NC	H3	3	2-15/16	1-1/4	357520	—	357526	—
3/8	16 NC	H5	3	2-15/16	1-1/4	357546	—	357542	—
3/8	16 NC	H13	3	2-15/16	1-1/4	358536	—	358532	—
3/8	24 NF	H1	3	2-15/16	1-1/4	357561	—		
3/8	24 NF	H2	3	2-15/16	1-1/4	357587	—		
3/8	24 NF	H3	3	2-15/16	1-1/4	357603	—	357609	—
3/8	24 NF	H4	3	2-15/16	1-1/4	357629	—		
7/16	14 NC	H2	3	3-5/32	1-7/16	357660	—		
7/16	14 NC	H3	3	3-5/32	1-7/16	357686	—	357682	—
7/16	14 NC	H5	3	3-5/32	1-7/16	357702	—		
7/16	14 NC	H13	3	3-5/32	1-7/16	358551	—		
7/16	20 NF	H3	3	3-5/32	1-7/16	357769	—	357765	—
7/16	20 NF	H5	3	3-5/32	1-7/16	357785	—		
1/2	13 NC	H2	3	3-3/8	1-21/32	357819	—		
1/2	13 NC	H3	3	3-3/8	1-21/32	357827	—	357823	—
1/2	13 NC	H5	3	3-3/8	1-21/32	357835	—	357831	—

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List No. 3112
List No. TN-3112 VERTANIUM® Coated . . . *continued*

Tap Size	TPI	Pitch Dia.	# of Flutes	Overall Length	Thread Length	3112 Plug	3112 Bottoming	TN-3112 Plug	TN-3112 Bottoming
1/2	13 NC	H13	3	3-3/8	1-21/32	**358569**	—	**358565**	—
1/2	20 NF	H1	3	3-3/8	1-21/32	**357843**	—		
1/2	20 NF	H2	3	3-3/8	1-21/32	**357850**	—		
1/2	20 NF	H3	3	3-3/8	1-21/32	**357868**	—	**357864**	—
1/2	20 NF	H5	3	3-3/8	1-21/32	**357876**	—	**357879**	
5/8	11 NC	H3	3	3-13/16	1-13/16	**357926**	—	**357922**	—
5/8	11 NC	H5	3	3-13/16	1-13/16	**357934**	—	**357930**	—
5/8	11 NC	H13	3	3-13/16	1-13/16	**358585**	—		
5/8	18 NF	H3	3	3-13/16	1-13/16	**357942**	—		
3/4	10 NC	H3	3	4-1/4	2	**357967**	—	**357963**	—
3/4	10 NC	H5	3	4-1/4	2	**357975**	—	**357971**	—

Package Quantities: No 0-12, 1/4" = 12/pkg; 5/16" to 1/2" = 6/pkg; 5/8" to 1" = 3/pkg

SPIRAL POINT METRIC TAPS

Ground Thread / High Speed Steel

List No. 3112-M
List No. TN-3112-M VERTANIUM® Coated

Metric Sizes

- Ground threads
- Spiral point pushes chips forward for through hole applications
- TiN coated for higher speeds & wear resistance

Tap Size	Pitch (mm)	Pitch Dia.	# of Flutes	OA Length.	Thread Length	3112-M Plug	TN-3112-M Plug
M1.6	0.35	D3	2	1-5/8	5/16	**360755**	
M2	0.4	D3	2	1-3/4	7/16	**360771**	**360774**
M2.5	0.45	D3	2	1-13/16	1/2	**360797**	
M3	0.5	D3	2	1-15/16	5/8	**360805**	**360801**
M3.5	0.6	D4	2	2	11/16	**360821**	
M4	0.7	D4	2	2-1/8	3/4	**360839**	**360835**
M4.5	0.75	D4	2	2-3/8	7/8	**360854**	
M5	0.8	D4	2	2-3/8	7/8	**360862**	**360868**
M6	1	D5	2	2-1/2	1	**360888**	**360884**
M6.3	1	D5	2	2-1/2	1	**360896**	
M7	1	D5	2	2-23/32	1-1/8	**360904**	
M8	1.25	D5	2	2-23/32	1-1/8	**360920**	**360926**
M10	1.5	D6	3	2-15/16	1-1/4	**360946**	**360942**
M12	1.75	D6	3	3-3/8	1-21/32	**360961**	**360967**
M14	2	D7	3	3-19/32	1-21/32	**360995**	
M16	2	D7	3	3-13/16	1-13/16	**361019**	
M18	2.5	D7	3	4-1/32	1-13/16	**361035**	
M20	2.5	D7	3	4-15/32	2	**361050**	

Package Quantities: M1.6 to M6.3 = 12/pkg; M7 to M12 = 6/pkg; M14 to M20 = 3/pkg

SPIRAL POINT TAPS

6” Extension

List No. 3112-E

Machine Screw and Fractional Sizes

- Plug chamfer for general purpose applications
- Ground threads
- Spiral point pushes chips forward for through hole application
- Overall lengths are all 6” for additional reach

Tap Size	TPI	Pitch Dia.	# of Flutes	Overall Length	Thread Length	3112-E Plug
6	32 NC	H3	2	6	11/16	**918930**
8	32 NC	H3	2	6	3/4	**918932**
10	24 NC	H3	2	6	7/8	**918934**
10	32 NF	H3	2	6	7/8	**918935**
1/4	20 NC	H3	2	6	1	**918936**
1/4	28 NF	H3	2	6	1	**918937**
5/16	18 NC	H3	2	6	1-1/8	**918938**
5/16	24 NF	H3	2	6	1-1/8	**918939**
3/8	16 NC	H3	3	6	1-1/4	**918940**
3/8	24 NF	H3	3	6	1-1/4	**918941**

Package Quantities: 1/pkg

SPIRAL POINT TAPS

CNC / Heavy Duty / Premium HSS

List No. 3112-HD

List No. TN-3112-HD VERTANIUM® Coated

Machine Screw and Fractional Sizes

- Designed to tap hard materials up to 30Rc
- Recommended for through hole tapping
- Manufactured with premium HSS
- TiN coated for higher speeds and wear resistance
- Plug chamfer

Tap Size	TPI	Pitch Dia.	#. of Flutes	Overall Length	Thread Length	3112-HD Plug	TN-3112-HD Plug
6	32 NC	H3	3	2	3/8	**282108**	**280108**
8	32 NC	H3	3	2-1/8	3/8	**282157**	**280157**
10	24 NC	H3	3	2-3/8	1/2	**282207**	**280207**
10	32 NF	H3	3	2-3/8	1/2	**282256**	**280256**
10	32 NF	H5	3	2-3/8	1/2	**282272**	**280272**
1/4	20 NC	H3	3	2-1/2	5/8	**282306**	**280306**
1/4	20 NC	H5	3	2-1/2	5/8	**282355**	**280355**
1/4	28 NF	H3	3	2-1/2	5/8	**282405**	**280405**
1/4	28 NF	H5	3	2-1/2	5/8	**282421**	**280421**
5/16	18 NC	H3	3	2-23/32	11/16	**282454**	**280454**
5/16	18 NC	H5	3	2-23/32	11/16	**282470**	**280470**
5/16	24 NF	H3	3	2-23/32	11/16	**282504**	**280504**
5/16	24 NF	H5	3	2-23/32	11/16	**282520**	**280520**
3/8	16 NC	H3	3	2-15/16	3/4	**282553**	**280553**

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List No. 3112-HD
List No. TN-3112-HD VERTANIUM® Coated . . . *continued*

Tap Size	TPI	Pitch Dia.	# of Flutes	Overall Length	Thread Length	3112-HD Plug	TN-3112-HD Plug
3/8	16 NC	H5	3	2-15/16	3/4	**282603**	**280603**
3/8	24 NF	H3	3	2-15/16	3/4	**282652**	**280652**
3/8	24 NF	H5	3	2-15/16	3/4	**282678**	**280678**
7/16	14 NC	H3	3	3-5/32	7/8	**282702**	**280702**
7/16	20 NF	H3	3	3-5/32	7/8	**282751**	**280751**
1/2	13 NC	H3	3	3-3/8	15/16	**282801**	**280801**
1/2	13 NC	H5	3	3-3/8	15/16	**282850**	**280850**
1/2	20 NF	H3	3	3-3/8	15/16	**282901**	**280901**
5/8	11 NC	H3	3	3-13/16	1-1/8	**282959**	**280959**
5/8	11 NC	H5	3	3-13/16	1-1/8	**282975**	**280975**
3/4	10 NC	H5	3	4-1/4	1-1/4	**282056**	**281056**

Package Quantities: No 6-10, 1/4" = 12/pkg; 5/16" to 1/2" = 6/pkg; 5/8" to 3/4" = 3/pkg

CNC HEAVY DUTY SPIRAL POINT METRIC TAPS
List No. 3112-MHD
Metric Sizes

Tap Size	Pitch (mm)	# of Flutes	Pitch Dia.	Overall Length	Thread Length	3112-MHD Plug
M3	0.5	2	D3	2	3/8	**272544**
M4	0.7	3	D4	2-1/8	3/8	**272546**
M5	0.8	3	D4	2-3/8	1/2	**272548**
M6	1	3	D5	2-1/2	5/8	**272550**
M8	1.25	3	D5	2-23/32	11/16	**272552**
M10	1.5	3	D6	2-15/16	3/4	**272554**
M12	1.75	3	D6	3-3/8	15/16	**272556**

Package Quantities: M3 to M6 = 12/pkg; M8 to M12 = 6/pkg

SPIRAL FLUTED HAND TAPS

Ground Thread / High Speed Steel / Regular Helix 30°

List No. 5150*

List No. TN-5150** VERTANIUM® Coated

Machine Screw and Fractional Sizes

- ■Plug chamfer for through hole applications
- ■Bottoming chamfer to thread close to an obstruction or blind hole
- ■Ground threads
- ■Slow spiral for maximum chip space & chip evacuation in blind holes

Tap Size	TPI	Pitch Dia.	# of Flutes	Overall Length	Thread Length	5150 Plug	5150 Bottoming	TN-5150 Plug	TN-5150 Bottoming
4	40 NC	H2	2	1-7/8	9/16	365676	365678	365675	365677
6	32 NC	H3	2	2	11/16	365648	365655	365679	365680
8	32 NC	H3	2	2-1/8	3/4	365689	365697	365685	365693
10	24 NC	H3	2	2-3/8	7/8	365721	365739	365727	365735
10	32 NF	H3	2	2-3/8	7/8	365747	365754	365743	365750
1/4	20 NC	H3	2	2-1/2	1	366307	366315		
1/4	20 NC	H3	3	2-1/2	1	366323	366331	366329	366337
1/4	28 NF	H3	3	2-1/2	1	366364	366372	366360	366378
5/16	18 NC	H3	3	2-23/32	1- 1/8	366406	366414	366402	366410
5/16	24 NF	H3	3	2-23/32	1- 1/8	366448	366455	366444	366451
3/8	16 NC	H3	3	2-15/16	1- 1/4	366463	366471	366469	366477
3/8	24 NF	H3	3	2-15/16	1- 1/4	366489	366497	366485	366493
7/16	14 NC	H3	3	3-5/32	1- 7/16	366505	366513	366501	366519
7/16	20 NF	H3	3	3-5/32	1- 7/16	366521	366538	366527	366535
1/2	13 NC	H3	3	3-3/8	1- 21/32	366547	366554	366543	366550
1/2	20 NF	H3	3	3-3/8	1- 21/32	366562	366570	366568	366576

**Formerly List No. 5105*
***Formerly List No. TN-5105*

SPIRAL FLUTED HAND TAPS

Ground Thread / High Speed Steel / High Helix 49°

List No. 5155

List No. TN-5155 VERTANIUM® Coated

Machine Screw and Fractional Sizes

- ■Plug chamfer for through hole applications
- ■Bottoming chamfer to thread close to an obstruction or blind hole
- ■Ground threads
- ■ High spiral for maximum shearing action
- ■Spiral flute for better chip evacuation in blind holes & for interrupted conditions
- ■TiN coated for higher speeds & wear resistance

Tap Size	TPI	Pitch Dia.	# of Flutes	Overall Length	Thread Length	5155 Plug	5155 Bottoming	TN-5155 Plug	TN-5155 Bottoming
3	48 NC	H2	2	1-13/16	1/2	367107	367115		
4	40 NC	H2	2	1-7/8	9/16	367149	367156	367145	367152
5	40 NC	H2	2	1-15/16	5/8	367180	367198		
6	32 NC	H3	3	2	11/16	367222	367230	367228	367236
8	32 NC	H3	3	2-1/8	3/4	367263	367271	367269	367278
10	24 NC	H3	3	2-3/8	7/8	367305	367313	367302	367320
10	32 NF	H3	3	2-3/8	7/8	367321	367339	367327	367335

List No. 5155
List No. TN-5155 VERTANIUM® Coated . . . *continued*

Tap Size	TPI	Pitch Dia.	# of Flutes	Overall Length	Thread Length	5155 Plug	5155 Bottoming	TN-5155 Plug	TN-5155 Bottoming
12	24 NC	H3	3	2-3/8	15/16	367347	367354		
1/4	20 NC	H3	3	2-1/2	1	367909	367917	367905	367913
1/4	28 NF	H3	3	2-1/2	1	367925	367933	367921	367939
5/16	18 NC	H3	3	2-23/32	1- 1/8	367941	367958	367947	367954
5/16	24 NF	H3	3	2-23/32	1- 1/8	367966	367974	367962	367970
3/8	16 NC	H3	3	2-15/16	1- 1/4	367982	367990	367988	367996
3/8	16 NC	H5	3	2-15/16	1- 1/4	-	-	368341	368358
3/8	24 NF	H3	3	2-15/16	1- 1/4	368006	368014	368038	368039
7/16	14 NC	H3	3	3-5/32	1- 7/16	368022	368030	368043	368036
7/16	20 NF	H3	3	3-5/32	1- 7/16	368048	368055	-	-
1/2	13 NC	H3	3	3-3/8	1- 21/32	368063	368071	368069	368077
1/2	20 NF	H3	3	3-3/8	1- 21/32	368089	368097	-	-
5/8	11 NC	H3	4	3-13/16	1- 13/16	368147	368154	368145	368091

Package Quantities: No 3-10, 1/4" = 12/pkg; 5/16" to 1/2" = 6/pkg; 5/8" = 3/pkg

METRIC SPIRAL FLUTED TAPS

Ground Thread / High Speed Steel / High Helix 49°

List No. 5155-M

Metric Sizes

- Plug chamfer for through hole applications
- Bottoming chamfer to thread close to an obstruction or blind hole
- Ground threads
- High spiral for maximum shearing action
- Spiral flute for better chip evacuation in blind holes & for interrupted conditions
- Pitch diameter limits for ISO Class 6H (medium fit)

Tap Size	Pitch (mm)	Pitch Dia	# of Flutes	Overall Length	Thread Length	5155-M Plug	5155-M Bottoming
M3	0.5	D3	2	1-15/16	5/8	366110	366112
M3.5	0.6	D4	3	2	11/16	366120	366122
M4	0.7	D4	3	2-1/8	3/4	366130	366132
M5	0.8	D4	3	2-3/8	7/8	366140	366142
M6	1	D5	3	2-1/2	1	366150	366152
M8	1.25	D5	3	2-23/32	1-1/8	366160	366162
M10	1.5	D6	3	2-15/16	1-1/4	366170	366172
M12	1.75	D6	3	3-3/8	1-21/32	366180	366182

Package Quantities: M3 to M6 = 12/pkg; M8 to M12 = 6/pkg

CNC SPIRAL FLUTED TAPS

Ground Thread / Premium HSS / Heavy Duty

List No. 5155-HD

List No. TN-5155-HD VERTANIUM® Coated

Machine Screw and Fractional Sizes

- Designed to tap blind holes in hard materials up to 30 Rc
- Manufactured with premium HSS
- TiN coated for higher speeds and wear resistance
- Plug chamfer for through hole applications
- Bottoming chamfer to thread close to an obstruction or blind hole

Tap Size	TPI	Pitch Dia.	# of Flutes	Overall Length	Thread Length	5155-HD Plug	5155-HD Bottoming	TN-5155-HD Plug	TN-5155-HD Bottoming
6	32 NC	H3	3	2	3/8	272957	272005	281957	282005
8	32 NC	H3	3	2-1/8	3/8	272054	272104	282054	282104
10	24 NC	H3	3	2-3/8	1/2	272062	272120	282062	282120
10	32 NF	H3	3	2-3/8	1/2	272153	272203	282153	282203
10	32 NF	H5	3	2-3/8	1/2	272179	272229	282179	282229
1/4	20 NC	H3	3	2-1/2	5/8	272252	272302	282252	282302
1/4	20 NC	H5	3	2-1/2	5/8	272278	272329	282278	282328
1/4	28 NF	H3	3	2-1/2	5/8	272351	272401	282351	282401
5/16	18 NC	H3	3	2-23/32	11/16	272450	272501	282450	282501
5/16	18 NC	H5	3	2-23/32	11/16	272542	272518	282542	282518
5/16	24 NF	H3	3	2-23/32	11/16	272568	272526	282468	282526
3/8	16 NC	H3	3	2-15/16	3/4	272559	272609	282559	282609
3/8	16 NC	H5	3	2-15/16	3/4	272641	272617	282641	282617
3/8	24 NF	H3	3	2-15/16	3/4	272567	272625	282567	282625
7/16	14 NC	H3	3	3-5/32	7/8	272658	272708	282658	282708
1/2	13 NC	H3	3	3-3/8	15/16	272557	272807	282757	282807
1/2	13 NC	H5	3	3-3/8	15/16	272799	272815	282799	282815
1/2	20 NF	H3	3	3-3/8	15/16	272765	272823	282765	282823
5/8	11 NC	H3	4	3-13/16	1-1/8	272856	272906	282856	282906
5/8	11 NC	H5	4	3-13/16	1-1/8	272872	272922	282872	282922

Package Quantities: No 6-10, 1/4" = 12/pkg; 5/16" to 1/2" = 6/pkg; 5/8" 3/pkg

CNC FORMING TAPS

Ground Thread / High Speed Steel

List No. 1986

List No. TN-1986 VERTANIUM® Coated

Machine Screw and Fractional Sizes

- ■Plug chamfer for through hole applications (4 threads)
- ■Bottoming chamfer to thread close to an obstruction or blind hole (2 threads)
- ■Ground threads
- ■Form tap style eliminates chips, increases thread strength & enables higher tapping speeds
- ■Lube grooves No. 5 and larger ensure maximum lubrication during tapping
- ■TiN coated for higher speeds & wear resistance
- ■Tap requires larger pre tap drill hole sizes, see table 10 on page 150

Tap Size	TPI	Pitch Dia	OA Length	Thread Length	1986 Plug	1986 Bottoming	TN-1986 Plug	TN-1986 Bottoming
4	40 NC	H3	1-7/8	9/16	289004	289012		
4	40 NC	H5	1-7/8	9/16	289020	289038		
4	48 NF	H3	1-7/8	9/16	289046	289053		
5	40 NC	H3	1-15/16	5/8	289087	289095		
5	40 NC	H5	1-15/16	5/8	—	289111		
6	32 NC	H3	2	3/8	289202	289210	287004	287053
6	32 NC	H5	2	3/8	289228	289236	287103	287152
6	32 NC	H10	2	3/8	289244	289251		
6	40 NF	H3	2	3/8	289160	289178		
6	40 NF	H5	2	3/8	289186	289194		
8	32 NC	H3	2-1/8	3/8	289269	289277	287202	287251
8	32 NC	H5	2-1/8	3/8	289285	289293	287301	287350
8	32 NC	H10	2-1/8	3/8	289301	289319		
8	36 NF	H3	2-1/8	3/8	—	289335		
8	36 NF	H5	2-1/8	3/8	289343	289350		
10	24 NC	H4	2-3/8	1/2	289368	289376	287400	287459
10	24 NC	H6	2-3/8	1/2	289384	289392	287509	287558
10	32 NF	H4	2-3/8	1/2	289426	289434		
10	32 NF	H6	2-3/8	1/2	289442	289459	287608	287657
10	32 NF	H10	2-3/8	1/2	289467	—		
1/4	20 NC	H4	2-1/2	5/8	289525	289533	287665	287634
1/4	20 NC	H6	2-1/2	5/8	289541	289558	287707	287756
1/4	20 NC	H10	2-1/2	5/8	289566	—		
1/4	28 NF	H4	2-1/2	5/8	289582	289590		
1/4	28 NF	H6	2-1/2	5/8	289608	289616	287806	287855
5/16	18 NC	H5	2-23/32	11/16	289640	289657		
5/16	18 NC	H7	2-23/32	11/16	289665	289673	287905	287954
5/16	18 NC	H10	2-23/32	11/16	—	289699		
5/16	24 NF	H5	2-23/32	11/16	289707	289715		
5/16	24 NF	H7	2-23/32	11/16	289723	289731	288002	288051

continued on next page

List No. 1986
List No. TN-1986 VERTANIUM® Coated . . . *continued*

Tap Size	TPI	Pitch Dia	OA Length	Thread Length	1986 Plug	1986 Bottoming	TN-1986 Plug	TN-1986 Bottoming
3/8	16 NC	H5	2-15/16	3/4	289764	289772		
3/8	16 NC	H7	2-15/16	3/4	289780	289798	288101	288150
3/8	24 NF	H5	2-15/16	3/4	289822	289830		
3/8	24 NF	H7	2-15/16	3/4	—	289855	288200	288259
7/16	14 NC	H5	3-5/32	7/8	289889	289897		
7/16	14 NC	H8	3-5/32	7/8	—	289913	288309	288358
7/16	20 NF	H5	3-5/32	7/8	289921	289939		
7/16	20 NF	H8	3-5/32	7/8	—	289954		
1/2	13 NC	H5	3-3/8	15/16	289962	289970		
1/2	13 NC	H8	3-3/8	15/16	289988	289996	288408	288457
1/2	20 NF	H5	3-3/8	15/16	290002	290010		

Package Quantities: No 4-10, 1/4" = 12/pkg; 5/16" to 1/2" = 6/pkg
See technical pages for tap/drill sizes.

CNC FORMING METRIC TAPS

Ground Thread / High Speed Steel

List No. 1986-M
List No. TN-1986-M VERTANIUM®

Metric Sizes

- Plug chamfer for through hole applications (4 threads)
- Bottoming chamfer to thread close to an obstruction or blind hole (2 threads)
- Ground threads
- Form tap style eliminates chips, increases thread strength & enables higher tapping speeds
- Lube grooves ensure maximum lubrication during tapping
- TiN coated for higher speeds & wear resistance
- Pitch diameter limits for ISO Class 6H (medium fit)

Tap Size	Pitch (mm)	Pitch Dia	OA Length	Thread Length	1986-M Plug	1986-M Bottoming	TN-1986-M Plug	TN-1986-M Bottoming
M3	0.5	D5	1-15/16	5/8	291001	291018	291006	291014
M4	0.7	D6	2-1/8	3/8	291083	291091	291089	291097
M5	0.8	D7	2-3/8	1/2	291125	291133	291123	291139
M6	1	D8	2-1/2	5/8	291166	291174	291162	291170
M8	1.25	D9	2-23/32	11/16	291240	291257	291246	291253
M10	1.5	D10	2-15/16	3/4	291176	291178	291287	291295
M12	1.75	D11	3-3/8	15/16	291179	291181	291180	291182

Package Quantities: M3 to M6 = 12/pkg; M8 to M12 = 6/pkg
See technical pages for tap/drill sizes.

TAPER PIPE TAPS

Ground Thread / High Speed Steel / Regular Full Thread

List No. 3180

List No. TN-3180 VERTANIUM® Coated

NPT, NPTF

- Medium hook for general purpose
- Ground threads
- Small shank available 1/8”
- NPT/NPTF thread design
- TiN coated for higher speeds & wear resistance
- NPT can be used in ANPT applications

TECHNICAL DATA
Thread limits - see Table#19, page157

Tap Size	TPI	# of Flutes	Overall Length	Thread Length	3180 NPT	3180 NPTF	TN-3180 NPT	TN-3180 NPTF
1/16	27	4	2-1/8	11/16	385307	385323	385328	385329
1/8*	27	4	2-1/8	3/4	385331	385356	385357	385359
1/8	27	4	2-1/8	3/4	385364	385380	385385	385386
1/4	18	4	2-7/16	1-1/16	385398	385413	385409	385410
3/8	18	4	2-9/16	1-1/16	385422	385448	385443	385444
1/2	14	4	3-1/8	1-3/8	385455	385471	385458	385477
3/4	14	5	3-1/4	1-3/8	385489	385505	385500	385501
1	11-1/2	5	3-3/4	1-3/4	385513	385539	385534	385536
1-1/4	11-1/2	5	4	1-3/4	385547	385562	385680	385685
1-1/2	11-1/2	7	4-1/4	1-3/4	385570	385596	385681	385686
2	11-1/2	7	4-1/2	1-3/4	385604	385620	385682	385687

Package Quantities: 1/16” to 3/8” = 6/pkg; 1/2” to 3/4” = 3/pkg; 1” and over 1/pkg
**Small shank diameter*

CNC EXTRA LENGTH TAPER PIPE TAPS

Ground Thread / High Speed Steel (w/Hand Tap Shanks)
Regular Full Thread

List No. 3180-E

List No. TN-3180-E VERTANIUM® Coated

NPTF

- Medium hook design for general purpose applications
- Ground threads
- Extra length permits access to recessed areas
- Standard hand tap shank dimensions

TECHNICAL DATA
Thread limits - see Table#19, page157

Tap Size	TPI	# of Flutes	Overall Length	Thread Length	Shank Diameter	3180-E NPTF	3180-E NPT	TN-3180-E NPTF
1/8	27	4	3	3/4	0.318	386008	384524	386129
1/4	18	4	3-1/2	1-1/16	0.480	386024	384525	386152
3/8	18	4	3-3/4	1-1/16	0.480	386040	384526	386186
1/2	14	4	4-3/8	1-3/8	0.480	386065	384527	386210
3/4	14	5	4-5/8	1-3/8	0.800		384528	
1-11	1/2	5	5-1/4	1-3/4	0.800		384529	

Package Quantities: 1/8” = 6/pkg; 1/4” to 1/2” = 3/pkg; 3/4” and over = 1/pkg

TAPER PIPE TAP

Ground Thread / High Speed Steel / Interrupted Thread

List No. 3182

List No. TN-3182 VERTANIUM® Coated

NPT, NPTF

- Medium hook design for general purpose applications
- Ground threads
- Interrupted thread for improved thread finish and reducing drag
- Small shank available 1/8”
- NPT/NPTF thread design
- TiN coated for higher speeds & wear resistance

TECHNICAL DATA
Thread limits - see Table #19, page 157
General dimension tolerances - see Table # 14, page 156

Tap Size	TPI	# of Flutes	Overall Length	Thread Length	3182 NPT	3182 NPTF	TN-3182 NPTF
1/8*	27	5	2-1/8	3/4	**385703**	**385729**	
1/8	27	5	2-1/8	3/4	**385737**	**385752**	**385755**
1/4	18	5	2-7/16	1-1/16	**385760**	**385786**	**385789**
3/8	18	5	2-9/16	1-1/16	**385794**	**385810**	**385813**
1/2	14	5	3-1/8	1-3/8	**385828**	**385844**	**385847**
3/4	14	5	3-1/4	1-3/8	**385851**	**385877**	**385870**
1	11-1/2	5	3-3/4	1-3/4	**385885**	**385901**	**385904**
1-1/4	11-1/2	5	4	1-3/4	**385919**	—	
1-1/2	11-1/2	7	4-1/4	1-3/4	**385943**	—	

Package Quantities: 1/16” to 3/8” = 6/pkg; 1/2” to 3/4” = 3/pkg; 1” and over 1/pkg
**Small shank diameter*

TAPER PIPE TAPS

Ground Thread / High Speed Steel / High Hook / Regular Full Thread

List No. 3183 Bright Finish

List No. S-3183 Surface Treated

NPT, NPTF

- High hook design for soft material applications
- Ground threads
- NPT/NPTF thread design
- Surface treated with steam oxide to prevent galling while tapping ductile materials
- NPT can be used in ANPT applications

TECHNICAL DATA:
Thread limits - see Table #14, page 156
General dimension - see Table #14, page 156

Tap Size	TPI	# of Flutes	OA Length	Thread Length	3183 NPT	3183 NPTF	3183-S NPT	3183-S NPTF
1/8	27	4	2-1/8	3/4	**916206**	**916211**	**919700**	**919705**
1/4	18	4	2-7/16	1-1/16	**916213**	**916216**	**919715**	**919725**
3/8	18	4	2-9/16	1-1/16	**916218**	**916221**	**919735**	**919727**
1/2	14	4	3-1/8	1-3/8	**916223**	**916226**	**919745**	**919750**
3/4	14	5	3-1/4	1-3/8	**916228**	**916231**	**919765**	**919755**
1	11-1/2	5	3-3/4	1-3/4	**916233**	**916236**		

Package Quantities: 1/8” to 3/8” = 6/pkg; 1/2” to 3/4” = 3/pkg; 1” and over 1/pkg

TAPER PIPE TAPS FOR CAST IRON

Ground Thread / High Speed Steel / Surface Treated
Regular Full Thread

List No. 3184

NPT, NPTF

- Low Hook design for highly abrasive materials
- Ground threads
- Small shank available 1/8”
- NPT/NPTF thread design
- Surface treated with steam oxide to reduce wear
- NPT can be used in ANPT applications

TECHNICAL DATA
Thread limits - see Table #19, page 157
General dimension - see Table #14, page 156
Note: for 1/8” tap size small shank: diameter = .3125, square size = .234

Tap Size	TPI	# of Flutes	OA Length	Thread Length	3184 NPT	3184 NPTF
1/8*	27	4	2-1/8	3/4	**916261**	**916263**
1/8	27	4	2-1/8	3/4	**916262**	**916264**
1/4	18	4	2-7/16	1-1/16	**916265**	**916266**
3/8	18	4	2-9/16	1-1/16	**916267**	**916268**
1/2	14	4	3-1/8	1-3/8	**916269**	**916270**
3/4	14	5	3-1/4	1-3/8	**916271**	**916272**
1	11-1/2	5	3-3/4	1-3/4	**916273**	**916274**
1-1/4	11-1/2	5	4	1-3/4	**916275**	**916276**
1-1/2	11-1/2	7	4-1/4	1-3/4	**916277**	—
2	11-1/2	7	4-1/2	1-3/4	**916279**	—

Package Quantities: 1/8” to 3/8” = 6/pkg; 1/2” to 3/4” = 3/pkg; 1” and over 1/pkg
**Small shank diameter*

STRAIGHT PIPE TAPS

Ground Thread / High Speed Steel

List No. 3181

NPS, NPSM, NPSC

- Medium hook design for general purpose applications
- Gound threads
- Straight flutes
- Use for NPSC and NPSM applications

TECHNICAL DATA
Thread limits see Tables #15, #16, #17, pages 156-157
General dimension - see Table #14, page 156

Tap Size	TPI	# of Flutes	OA Length	Thread Length	3181 NPS / NPSM NPSC
1/8*	27	4	2-1/8	3/4	**387105**
1/8	27	4	2-1/8	3/4	**387113**
1/4	18	4	2-7/16	1-1/16	**387121**
3/8	18	4	2-9/16	1-1/16	**387139**
1/2	14	4	3-1/8	1-3/8	**387147**
3/4	14	5	3-1/4	1-3/8	**387154**
1	11-1/2	5	3-3/4	1-3/4	**387162**

Package Quantities: 1/8” to 3/8” = 6/pkg; 1/2” to 3/4” = 3/pkg; 1” and over 1/pkg
** Small shank diameter*

STRAIGHT DRYSEAL PIPE TAPS

Ground Thread / High Speed Steel

List No. 3181-D

NPSF

- Medium hook design for general purpose applications
- Gound threads
- Straight flutes
- NPSF dryseal thread design

TECHNICAL DATA
Thread limits see Tables #15, #16, #17, pages 156-157
General dimension - see Table #14, page 156

Tap Size	TPI	# of Flutes	OA Length	Thread Length	3181-D NPSF
1/8*	27	4	2-1/8	3/4	**387212**
1/8	27	4	2-1/8	3/4	**387220**
1/4	18	4	2-7/16	1-1/16	**387238**
3/8	18	4	2-9/16	1-1/16	**387246**
1/2	14	4	3-1/8	1-3/8	**387253**
3/4	14	5	3-1/4	1-3/8	**387261**
1	11-1/2	5	3-3/4	1-3/4	**387279**

Package Quantities: 1/8” to 3/8” = 6/pkg; 1/2” to 3/4” = 3/pkg; 1” and over 1/pkg
**Small shank diameter*

STRAIGHT FLUTED TAPS

Cut Thread / Carbon Steel / General Purpose

List No. 105

Machine Screw and Fractional Sizes

- Cut threads for economical tapping
- Taper chamfer generally for hand operations
- Plug chamfer for general purpose applications
- Bottoming chamfer to thread close to an obstruction or blind hole

Tap Size	TPI	# of Flutes	105 Taper	105 Plug	105 Bottoming
0	80 NC	2	—	339308	—
1	72 NC	2	—	339309	—
2	56 NC	3	339302	339310	339318
3	48 NC	3	339303	339311	339319
4	40 NC	3	339304	339312	339320
6	32 NC	3	339429	339437	339445
8	32 NC	4	339510	339528	339536
10	24 NC	4	339601	339619	339627
10	32 NF	4	339668	339676	339684
12	24 NC	4	339692	339700	339718
12	28 NF	4	340270	340280	340288
1/8	40 NS	3	340274	340283	340292
3/16	24 NS	4	340276	340284	340293
1/4	20 NC	4	340278	340286	340294
1/4	28 NF	4	340336	340344	340351
5/16	18 NC	4	340393	340401	340419
5/16	24 NF	4	340427	340435	340443
3/8	16 NC	4	340484	340492	340502
3/8	24 NF	4	340518	340526	340534
7/16	14 NC	4	340542	340559	340567
7/16	20 NF	4	340575	340583	340591
1/2	13 NC	4	340609	340617	340625
1/2	20 NF	4	360633	340641	340658
9/16	12 NC	4	340666	340674	340682
9/16	18 NF	4	340690	340708	340716
5/8	11 NC	4	340724	340732	340740
5/8	18 NF	4	340757	340765	340773
3/4	10 NC	4	340849	340856	340864
3/4	16 NF	4	340872	340880	340898
7/8	9 NC	4	340906	340914	340922
7/8	14 NF	4	340930	340948	340955
1	8 NC	4	340963	340971	340989
1	12 NF	4	340997	341003	341011
1	14 NS	4	339000	339001	339002
1-1/8	7 NC	4	339003	339004	339005
1-1/8	12 NF	4	339006	339007	339008
1-1/4	7 NC	4	339009	339010	339011
1-1/4	12 NF	6	339012	339013	339014
1-3/8	6 NC	4	339015	339016	339017
1-3/8	12 NF	6	339018	339019	339020
1-1/2	6 NC	4	339021	339022	339023

continued on next page

List No. 105 . . . *continued*

Tap Size	TPI	# of Flutes	105 Taper	105 Plug	105 Bottoming
1-3/4	5 NC	6	**339027**	**339028**	**339029**
2	4-1/2 NC	6	**339030**	**339031**	**339032**

Package Quantities: No 0-12, 1/16" to 1/4" = 12/pkg; 5/16" to 1/2" = 6/pkg; 9/16" to 1" = 3/pkg; 1-1/8" to 2" = 1 /pkg

STRAIGHT FLUTED TAPS

Cut Thread / Carbon Steel / General Purpose

List No. 105-Sets

Machine Screw and Fractional Sizes

- Cut threads for economical tapping
- Taper chamfer generally for hand operations
- Plug chamfer for general purpose applications
- Bottoming chamfer to thread close to an obstruction or blind hole

Tap Size	TPI	# of Flutes	105 Set
2	56 NC	2	**354067**
3	48 NC	2	**354068**
4	40 NC	3	**354089**
6	32 NC	3	**354147**
6	40 NC	3	**354168**
8	32 NC	3	**354170**
10	24 NC	3	**354196**
10	32 NF	3	**354204**
12	24 NC	4	**354220**
12	28 NF	4	**355572**
1/8	40 NC	4	**355576**
3/16	24 NC	4	**355578**
1/4	20 NC	4	**355581**
1/4	28 NF	2	**355599**
5/16	18 NC	3	**355607**
5/16	24 NF	4	**355615**
3/8	16 NC	4	**355623**
3/8	24 NC	4	**355631**
7/16	14 NC	4	**355649**
7/16	20 NC	4	**355656**
1/2	13 NC	4	**355664**

Tap Size	TPI	# of Flutes	105 Set
1/2	20 NF	4	**355672**
9/16	12 NC	4	**355680**
9/16	18 NF	4	**355698**
5/8	11 NC	4	**355706**
5/8	18 NF	4	**355714**
3/4	10 NC	4	**355748**
3/4	16 NF	4	**355755**
7/8	9 NC	4	**355763**
7/8	14 NF	4	**355771**
1	8 NC	4	**355789**
1	12 NF	4	**355797**
1	14 NS	4	**339033**
1-1/8	7 NC	4	**339034**
1-1/8	12 NF	4	**339035**
1-1/4	7 NC	4	**339036**
1-1/4	12 NC	6	**339037**
1-3/8	6 NC	4	**339038**
1-3/8	12 NF	6	**339039**
1-1/2	6 NC	4	**339040**
1-3/4	5 NC	6	**339042**
2	4-1/2 NC	6	**339043**

TAP SETS: Tap sets consist of one each taper, plug, and bottoming tap of the same pitch and major diameter for each size indicated. These sets are furnished in attractive, durable packages that provide handy, permanent storage. Package Quantities: 1 set/pkg

TAPER PIPE TAPS

Cut Thread / High Speed Steel

List No. 2180

NPT

- Cut threads for economical tapping
- NPT thread design
- Medium hook design

TECHNICAL DATA:
Thread limits - see Table #19, page 157.

Tap Size	TPI	# of Flutes	Overall Length	Thread Length	2180 EDP No.
1/8*	27	4	2-1/8	3/4	**386701**
1/8	27	4	2-1/8	3/4	**386719**
1/4	18	4	2-7/16	1-1/16	**386727**
3/8	18	4	2-9/16	1-1/16	**386735**
1/2	14	4	3-1/8	1-3/8	**386743**
3/4	14	5	3-1/4	1-3/8	**386750**
1	11-1/2	5	3-3/4	1-3/4	**386768**
1-1/4	11-1/2	5	4	1-3/4	**386776**
1-1/2	11-1/2	7	4-1/4	1-3/4	**386784**
2	11-1/2	7	4-1/2	1-3/4	**386792**

Package Quantities: 1/8" to 3/8" = 6/pkg; 1/2" to 3/4" = 3/pkg; 1" and over 1/pkg
** Small shank diameter*

TAPER PIPE TAPS

Cut Thread / Carbon Steel

List No. 180

NPT

- Cut threads for economical tapping
- NPT thread design
- Medium hook design

TECHNICAL DATA:
Thread limits - see Table #19, pg. 155
General dimension tolerances - see Table #14, p. 156

Tap Size	TPI	# of Flutes	Overall Length	Thread Length	180 EDP No.
1/8	27	4	2-1/8	3/4	**386909**
1/4	18	4	2-7/16	1-1/16	**386917**
3/8	18	4	2-9/16	1-1/16	**386925**
1/2	14	4	3-1/8	1-3/8	**386933**
3/4	14	5	3-1/4	1-3/8	**386941**
1	11-1/2	5	3-3/4	1-3/4	**386958**
1-1/4	11-1/2	5	4	1-3/4	**386966**
1-1/2	11-1/2	7	4-1/4	1-3/4	**386974**
2	11-1/2	7	4-1/2	1-3/4	**386982**
2-1/2	8	8	5-1/2	2-9/16	**386990**
3	8	8	6	2-5/8	**387006**

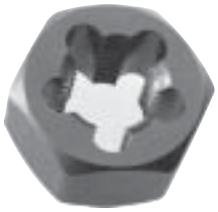
Package Quantities: 1/8" to 3/8" = 6/pkg; 1/2" to 3/4" = 3/pkg; 1" and over 1/pkg

HEXAGON RETHREADING DIES

Carbon Steel

List No. 280

Fractional Sizes



- Used in repair work for dressing over bruised and rusty threads
- Can be used in free machining materials

Die Size	TPI	Hex Size Across Flat	Die Thickness	280 EDP No.
1/4	20 NC	19/32	1/4	**404108**
1/4	28 NF	19/32	1/4	**403116**
5/16	18 NC	11/16	5/16	**403124**
5/16	24 NF	11/16	5/16	**403132**
3/8	16 NC	25/32	3/8	**403140**
3/8	24 NF	25/32	3/8	**403157**
7/16	14 NC	7/8	7/16	**403165**
7/16	20 NF	7/8	7/16	**403173**
1/2	13 NC	1-1/16	1/2	**403181**
1/2	20 NF	1-1/16	1/2	**403199**
9/16	12 NC	1-1/16	1/2	**403207**
9/16	18 NF	1-1/16	1/2	**403215**
5/8	11 NC	1-1/4	5/8	**403223**
5/8	18 NF	1-1/4	5/8	**403231**
11/16	11 NS	1-7/16	3/4	**403249**
11/16	16 NS	1-7/16	3/4	**403256**
3/4	10 NC	1-7/16	3/4	**403264**
3/4	16 NF	1-7/16	3/4	**403272**
7/8	9 NC	1-5/8	7/8	**403280**
7/8	14 NF	1-5/8	7/8	**403298**
1	8 NC	1-13/16	1	**403306**
1	12 NF	1-13/16	1	**403314**
1	14 NS	1-13/16	1	**403322**
1-1/8	7 NC	2	1	**403330**
1-1/8	12 NF	2	1	**403348**
1-1/4	7 NC	2-3/16	1	**403355**
1-1/4	12 NF	2-3/16	1	**403363**
1-3/8	6 NC	2-3/8	1	**403371**
1-3/8	12 NF	2-3/8	1	**403389**
1-1/2	6 NC	2-9/16	1	**403397**
1-1/2	12 NF	2-9/16	1	**403405**

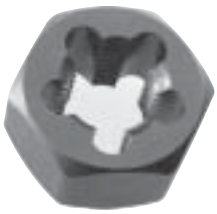
Also available as special in left hand, special thread pitch, special sizes, and in high speed steel.
Package Quantities: all dies = 1/pkg

HEXAGON RETHREADING DIES

Carbon Steel

List No. 280-M

Metric Sizes



- Used in repair work for dressing over bruised and rusty threads
- Can be used in free machining materials

Die Size	Pitch	Hex Size Across Flat	Die Thickness	280-M EDP No
M6	1	19/32	1/4	**404809**
M8	1.25	25/32	3/8	**404833**
M10	1.15	25/32	7/16	**404858**
M12	1.75	1-1/16	1/2	**404882**
M14	2	1-1/16	1/2	**404916**
M16	2	1-1/4	1/2	**404932**
M20	2.5	1-7/16	3/4	**404973**

Also available as special in left hand, special thread pitch, special sizes, and in high speed steel.
Package Quantities: all dies = 1/pkg

ROUND ADJUSTABLE DIES

Carbon Steel

List No. 290

Machine Screw and Fractional Sizes

- Will produce (UN) thread form
- Adjustable for wear & size
- Will cut external threads when held in a die stock
- One side of the die has a 2 to 3 thread chamfer for threading, the other side has a 1 to 1-1/2 thread chamfer for threading close to a shoulder

Die Size	TPI	O.D. x Thickness	290 EDP No.
0	80 NF	13/16" O.D. x 1/4" thick	**401003**
1	64 NC	13/16" O.D. x 1/4" thick	**401029**
1	72 NF	13/16" O.D. x 1/4" thick	**401037**
2	56 NC	13/16" O.D. x 1/4" thick	**401045**
2	64 NF	13/16" O.D. x 1/4" thick	**401052**
3	48 NC	13/16" O.D. x 1/4" thick	**401060**
3	56 NF	13/16" O.D. x 1/4" thick	**401078**
4	40 NC	13/16" O.D. x 1/4" thick	**401102**
4	48 NF	13/16" O.D. x 1/4" thick	**401110**
5	40 NC	13/16" O.D. x 1/4" thick	**401128**
6	32 NC	13/16" O.D. x 1/4" thick	**401144**
6	40 NF	13/16" O.D. x 1/4" thick	**401169**
8	32 NC	13/16" O.D. x 1/4" thick	**401177**
8	36 NF	13/16" O.D. x 1/4" thick	**401185**
10	24 NC	13/16" O.D. x 1/4" thick	**401201**
10	32 NF	13/16" O.D. x 1/4" thick	**401227**
12	24 NC	13/16" O.D. x 1/4" thick	**401235**
12	28 NF	13/16" O.D. x 1/4" thick	**401243**
6	32 NC	1" O.D. x 3/8" thick	**401409**
8	32 NC	1" O.D. x 3/8" thick	**401433**
10	24 NC	1" O.D. x 3/8" thick	**401466**
10	32 NF	1" O.D. x 3/8" thick	**401482**
12	24 NC	1" O.D. x 3/8" thick	**401490**
1/4	20 NC	1" O.D. x 3/8" thick	**401979**
1/4	28 NF	1" O.D. x 3/8" thick	**401995**
1/4	32 NS	1" O.D. x 3/8" thick	**402001**
5/16	18 NC	1" O.D. x 3/8" thick	**402019**
5/16	24 NF	1" O.D. x 3/8" thick	**402027**
5/16	32 NS	1" O.D. x 3/8" thick	**402035**
3/8	16 NC	1" O.D. x 3/8" thick	**402043**
3/8	24 NF	1" O.D. x 3/8" thick	**402050**
7/16	14 NC	1" O.D. x 3/8" thick	**402068**
7/16	20 NF	1" O.D. x 3/8" thick	**402076**
1/4	20 NC	1-1/2" O.D. x 1/2" thick	**402209**
1/4	28 NF	1-1/2" O.D. x 1/2" thick	**402225**
5/16	18 NC	1-1/2" O.D. x 1/2" thick	**402241**
5/16	24 NF	1-1/2" O.D. x 1/2" thick	**402258**
3/8	16 NC	1-1/2" O.D. x 1/2" thick	**402274**
3/8	24 NF	1-1/2" O.D. x 1/2" thick	**402282**
7/16	14 NC	1-1/2" O.D. x 1/2" thick	**402290**

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List No. 290 . . . *continued*

Die Size	TPI	O.D. x Thickness	290 EDP No.
7/16	20 NF	1-1/2" O.D. x 1/2" thick	**402308**
1/2	13 NC	1-1/2" O.D. x 1/2" thick	**402316**
1/2	20 NF	1-1/2" O.D. x 1/2" thick	**402324**
9/16	12 NC	1-1/2" O.D. x 1/2" thick	**402332**
9/16	18 NF	1-1/2" O.D. x 1/2" thick	**402340**
5/8	11 NC	1-1/2" O.D. x 1/2" thick	**402357**
5/8	18 NF	1-1/2" O.D. x 1/2" thick	**402365**
1/4	20 NC	2" O.D. x 5/8" thick	**402407**
1/4	28 NF	2" O.D. x 5/8" thick	**402423**
5/16	18 NC	2" O.D. x 5/8" thick	**402449**
5/16	24 NF	2" O.D. x 5/8" thick	**402456**
3/8	16 NC	2" O.D. x 5/8" thick	**402472**
3/8	24 NF	2" O.D. x 5/8" thick	**402480**
7/16	14 NC	2" O.D. x 5/8" thick	**402498**
7/16	20 NF	2" O.D. x 5/8" thick	**402506**
1/2	13 NC	2" O.D. x 5/8" thick	**402514**
1/2	20 NF	2" O.D. x 5/8" thick	**402522**
9/16	12 NC	2" O.D. x 5/8" thick	**402530**
9/16	18 NF	2" O.D. x 5/8" thick	**402548**
5/8	11 NC	2" O.D. x 5/8" thick	**402555**
5/8	18 NF	2" O.D. x 5/8" thick	**402563**
11/16	11 NS	2" O.D. x 5/8" thick	**402571**
11/16	16 NS	2" O.D. x 5/8" thick	**402589**
3/4	10 NC	2" O.D. x 5/8" thick	**402597**
3/4	16 NF	2" O.D. x 5/8" thick	**402605**
7/8	9 NC	2" O.D. x 5/8" thick	**402613**
7/8	14 NF	2" O.D. x 5/8" thick	**402621**
5/8	11 NC	2-1/2" O.D. x 3/4" thick	**402746**
3/4	10 NC	2-1/2" O.D. x 3/4" thick	**402787**
3/4	16 NF	2-1/2" O.D. x 3/4" thick	**402795**
7/8	9 NC	2-1/2" O.D. x 3/4" thick	**402803**
7/8	14 NF	2-1/2" O.D. x 3/4" thick	**402811**
1	8 NC	2-1/2" O.D. x 3/4" thick	**402829**
1	12 NF	2-1/2" O.D. x 3/4" thick	**402837**
1	14 NS	2-1/2" O.D. x 3/4" thick	**402845**
1	8 NC	3" O.D. x 1" thick	**402902**
1	12 NF	3" O.D. x 1" thick	**402910**
1	14 NS	3" O.D. x 1" thick	**402928**
1-1/8	7 NC	3" O.D. x 1" thick	**402936**
1-1/8	12 NF	3" O.D. x 1" thick	**402944**
1-1/4	7 NC	3" O.D. x 1" thick	**402951**
1-1/4	12 NF	3" O.D. x 1" thick	**402969**
1-3/8	6 NC	3" O.D. x 1" thick	**402977**
1-3/8	12 NF	3" O.D. x 1" thick	**402985**
1-1/2	6 NC	3" O.D. x 1" thick	**402993**
1-1/2	12 NF	3" O.D. x 1" thick	**403009**

Packaging Quantities: all dies = 1/pkg

SOLID ROUND DIES FOR TAPER PIPE

Carbon Steel

List No. 290

NPT Sizes

- ■Will cut external pipe threads when held in a die stock
- ■Will produce NPT thread form

Die Size	TPI	O.D. x Thickness	290 NPT
1/8	27	1” O.D. x 3/8” thick	**405202**
1/8	27	1-1/2” O.D. x 1/2” thick	**405251**
1/4	18	1-1/2” O.D. x 1/2” thick	**405269**
3/8	18	1-1/2” O.D. x 1/2” thick	**405277**
1/4	18	2” O.D. x 5/8” thick	**405301**
3/8	18	2” O.D. x 5/8” thick	**405319**
1/2	14	2” O.D. x 5/8” thick	**405327**

Sizes other than shown are available as special. Pipe dies with straight threads for garden hose threads, etc., are available as special. Dies for all pipe sizes manufactured from high speed steel are available as special.
Packaging Quantities: all dies = 1/pkg

ROUND ADJUSTABLE DIES

Carbon Steel

List No. 290-M

Metric Sizes

- ■Will produce (UN) thread form
- ■Adjustable for wear & size
- ■Will cut external threads when held in a die stock
- ■Chamfer on both sides to extend life

Die Size	Pitch m/m	O.D. x Thickness	290-M EDP No.
M2.5	0.45	13/16" O.D. x 1/4" thick	**404122**
M3	0.5	13/16" O.D. x 1/4" thick	**404130**
M3.5	0.6	13/16" O.D. x 1/4" thick	**404148**
M4	0.7	13/16" O.D. x 1/4" thick	**404155**
M4.5	0.75	13/16" O.D. x 1/4" thick	**404163**
M5	0.8	13/16" O.D. x 1/4" thick	**404171**
M6	1	13/16" O.D. x 1/4" thick	**404189**
M6	1	1" O.D. x 3/8" thick	**404346**
M7	1	1" O.D. x 3/8" thick	**404361**
M8	1.25	1" O.D. x 3/8" thick	**404387**
M10	1.5	1" O.D. x 3/8" thick	**404403**
M12	1.75	1-1/2" O.D. x 1/2" thick	**404569**
M14	2	1-1/2" O.D. x 1/2" thick	**404593**
M16	2	1-1/2" O.D. x 1/2" thick	**404619**
M18	2.5	2" O.D. x 5/8" thick	**404734**
M20	2.5	2" O.D. x 5/8" thick	**404759**

Packaging Quantities: all dies = 1/pkg

ROUND ADJUSTABLE DIES

High Speed Steel

List No. 2290

Machine Screw and Fractional Sizes

- Will cut external threads when held in a die stock
- Will produce (UN) thread form
- Adjustable for wear & size
- One side of the die has a 2 to 3 thread chamfer for threading, the other side has a 1 to 1-1/2 thread chamfer for threading close to a shoulder
- Can be used for close to shoulder work

Die Size	TPI	O.D. x Thickness	2290 EDP No.
5	40	13/16" O.D. x 1/4" thick	**400013**
5	44	13/16" O.D. x 1/4" thick	**400021**
6	32	13/16" O.D. x 1/4" thick	**400039**
6	40	13/16" O.D. x 1/4" thick	**400047**
8	32	13/16" O.D. x 1/4" thick	**400054**
8	36	13/16" O.D. x 1/4" thick	**400062**
10	24	13/16" O.D. x 1/4" thick	**400070**
10	32	13/16" O.D. x 1/4" thick	**400088**
12	24	13/16" O.D. x 1/4" thick	**400096**
12	28	13/16" O.D. x 1/4" thick	**400104**
1/4	20	13/16" O.D. x 1/4" thick	**400211**
1/4	28	13/16" O.D. x 1/4" thick	**400229**
5/16	18	13/16" O.D. x 1/4" thick	**400237**
5/16	24	13/16" O.D. x 1/4" thick	**400245**
6	32	1" O.D. x 3/8" thick	**400138**
10	24	1" O.D. x 3/8" thick	**400179**
10	32	1" O.D. x 3/8" thick	**400187**
12	24	1" O.D. x 3/8" thick	**400195**
1/4	20	1" O.D. x 3/8" thick	**400302**
1/4	28	1" O.D. x 3/8" thick	**400310**
5/16	18	1" O.D. x 3/8" thick	**400328**
5/16	24	1" O.D. x 3/8" thick	**400336**
3/8	16	1" O.D. x 3/8" thick	**400344**
3/8	24	1" O.D. x 3/8" thick	**400351**
7/16	14	1" O.D. x 3/8" thick	**400369**
7/16	20	1" O.D. x 3/8" thick	**400377**
1/4	20	1-1/2" O.D. x 1/2" thick	**400401**
1/4	28	1-1/2" O.D. x 1/2" thick	**400419**
5/16	18	1-1/2" O.D. x 1/2" thick	**400427**
5/16	24	1-1/2" O.D. x 1/2" thick	**400435**
3/8	16	1-1/2" O.D. x 1/2" thick	**400443**
3/8	24	1-1/2" O.D. x 1/2" thick	**400450**
7/16	14	1-1/2" O.D. x 1/2" thick	**400468**
7/16	20	1-1/2" O.D. x 1/2" thick	**400476**

continued on next page

List No. 2290 . . . *continued*

Die Size	TPI	O.D. x Thickness	2290 EDP No.
1/2	13	1-1/2" O.D. x 1/2" thick	**400484**
1/2	20	1-1/2" O.D. x 1/2" thick	**400492**
9/16	12	1-1/2" O.D. x 1/2" thick	**400500**
9/16	18	1-1/2" O.D. x 1/2" thick	**400518**
5/8	11	1-1/2" O.D. x 1/2" thick	**400526**
5/8	18	1-1/2" O.D. x 1/2" thick	**400534**
5/8	11	2" O.D. x 5/8" thick	**400609**
5/8	18	2" O.D. x 5/8" thick	**400617**
3/4	10	2" O.D. x 5/8" thick	**400625**
3/4	16	2" O.D. x 5/8" thick	**400633**
7/8	9	2" O.D. x 5/8" thick	**400641**
7/8	14	2" O.D. x 5/8" thick	**400658**

Packaging Quantities: all dies = 1/pkg

2-PIECE DIE COLLET CAP

Carbon Steel

List No. 612

■Dies mount into the cap

Collet Cap	Width of Slot	O.D.	Die Sizes	612 EDP No.
VI	23/64	1-1/4	2 thru 14, 1/16 thru 1/4	**407701**
1/4 No. 1	1/2	2	3/16, 1/4, 5/16	**407719**
3/8 No. 1	19/32	2	3/8, 7/16, 1/2	**407727**
1/4 No. 5	1/2	2-3/4	3/16, 1/4, 5/16	**407735**
3/8 No. 5	19/32	2-3/4	3/8 and 7/16	**407743**
1/2 No. 5	27/32	2-3/4	1/2, 9/16, 5/8, 11/16, 3/4	**407750**
7/8 No. 5	1- 1/32	2-3/4	7/8 and 1	**407768**

See page 169 for details

2-PIECE DIES

Carbon Steel

List No. 609

Machine Screw and Fractional Sizes
(Matched pairs only, right hand)

■For cutting external threads
■ Can be used in free machining materials

Die Size	TPI	Width of Die A	To Fit Collect Number	609 EDP No.
4	40 NC	23/64	V-1	**406044**
6	32 NC	23/64	V-1	**406101**
8	32 NC	23/64	V-1	**406135**
10	24 NC	23/64	V-1	**406168**
10	32 NF	23/64	V-1	**406176**

continued on next page

List No. 609 . . . *continued*

Die Size	TPI	Width of Die A	To Fit Collect Number	609 EDP No.
12	24 NC	23/64	V-1	**406192**
1/4	20 NC	23/64	V-1	**406416**
1/4	28 NF	23/64	V-1	**406424**
1/4	20 NC	1/2	1, 5	**406457**
1/4	28 NF	1/2	1, 5	**406465**
5/16	18 NC	1/2	1, 5	**406499**
5/16	24 NF	1/2	1, 5	**406507**
3/8	16 NC	19/32	1, 5	**406523**
3/8	24 NF	19/32	1, 5	**406531**
7/16	14 NC	19/32	1, 5	**406549**
7/16	20 NF	19/32	1, 5	**496556**
1/2	13 NC	19/32	1	**406564**
1/2	20 NF	19/32	1	**406572**
1/2	13 NC	27/32	5	**406580**
1/2	20 NF	27/32	5	**406598**
9/16	12 NC	27/32	5	**406606**
9/16	18 NF	27/32	5	**406614**
5/8	11 NC	27/32	5	**406622**
5/8	18 NF	27/32	5	**406630**
11/16	11 NS	27/32	5	**406648**
11/16	16 NS	27/32	5	**406655**
3/4	10 NC	27/32	5	**406663**
3/4	16 NF	27/32	5	**406671**
7/8	9 NC	1-1/32	5	**406689**
7/8	14 NF	1-1/32	5	**406697**
1	8 NC	1-1/32	5	**406705**
1	12 NF	1-1/32	5	**406713**
1	14 NC	1-1/32	5	**406721**

See page 169 for details

COLLET GUIDES

Carbon Steel

List No. 614

■Screws into cap to hold the die halves firmly in place

Collet Guide	Thread Size	Cap O.D.	614 EDP No.
V1	4	1-1/4	**407925**
V1	6	1-1/4	**407941**
V1	8	1-1/4	**407958**
V1	10	1-1/4	**407966**
V1	12	1-1/4	**407974**
V1	1/16	1-1/4	**407990**
V1	3/32	1-1/4	**408006**
V1	1/8	1-1/4	**408014**
V1	5/32	1-1/4	**408022**
V1	3/16	1-1/4	**408030**

continued on next page

List No. 614 . . . *continued*

Collet Guide	Thread Size	Cap O.D.	614 EDP No.
V1	7/32	1-1/4	**408048**
V1	1/4	1-1/4	**408055**
1/4 No. 1	3/16	2	**408063**
1/4 No. 1	1/4	2	**408071**
1/4 No. 1	5/16	2	**408089**
3/8 No. 1	3/8	2	**408097**
3/8 No. 1	7/16	2	**408105**
3/8 No. 1	1/2	2	**408113**
1/4 No 5	3/16	2-3/4	**408121**
1/4 No 5	1/4	2-3/4	**408139**
1/4 No 5	5/16	2-3/4	**408147**
3/8 No. 5	3/8	2-3/4	**408154**
3/8 No. 5	7/16	2-3/4	**408162**
1/2 No. 5	1/2	2-3/4	**408170**
1/2 No. 5	9/16	2-3/4	**408188**
1/2 No. 5	5/8	2-3/4	**408196**
1/2 No. 5	11/16	2-3/4	**408204**
1/2 No. 5	3/4	2-3/4	**408212**
7/8 No. 5	7/8	2-3/4	**408220**
7/8 No. 5	1	2-3/4	**408238**

DIE STOCKS

For Round Adjustable Dies

■Made from steels for added toughness

Die Stock #	Capacity Die O.D.	OA Length	EDP No.
1851	13/16	6-1/4	**420514**
1852	1	9	**420522**
1853	1-1/2	14	**420548**
1857	2	23	**420555**
1858	2-1/2	29	**420563**
1859	3	40	**420571**

DIE STOCKS

For 2-Piece Dies

■Made from steels for added toughness

Die Stock #	Takes Collet #	Collet Diameter	OA Length	EDP No.
V1	V1	1-1/4	7-1/2	**420605**
1	1	2	14-1/2	**420613**
5	5	2-3/4	23	**420621**
7	5	2-3/4	26	**420639**
9	5	2-3/4	29	**420647**

T-HANDLE TAP WRENCHES

■Made from steels for added toughness

Tap Wrench #	Type of Handle	Capacity - Tap Size Fract.	Mach.Sc.	Body Length	EDP No.
328	Sliding	1/16 - 1/4	0-14	2-3/4	**420803**
332	Sliding	7/32 - 1/2	12-14	3-5/8	**420829**
336	Stationary	1/16 - 1/4	0-14	8-3/4	**420845**
337	Stationary	7/32 - 1/2	12-14	10-5/8	**420852**
338	Ratchet	1/16 - 1/4	0-14	3-3/4	**420860**
339	Ratchet	7/32 - 1/2	12-14	5	**420878**

ADJUSTABLE TAP and REAMER WRENCHES

Wrench Number	Capacity - Tap Size Fract	Machine Screw	Pipe	Hand Reamer	Body Length	EDP No.
0	1/16 - 1/4	0-14	–	1/8 - 21/64	7	**420910**
4	1/16 - 3/8	0-14	–	1/8 - 25/64	9	**420928**
5	5/32 - 1/2	7-14	1/8	11/64 - 7/16	11	**420936**
6	5/32 - 3/4	7-14	1/8 - 1/4	11/64 - 41/64	15	**420944**
7	1/4 - 1-1/8	–	1/8 - 3/4	9/32 - 29/32	19	**420951**
8	3/4 - 1-5/8	–	3/8 - 1-1/4	37/64 - 1-11/32	40	**420977**

TAP AND DIE SETS

with Round Adjustable Dies

Set Number	Range of Cutting Sizes and Threads Per Inch	Die Stock Number	Die Stock Length	Tap Wrench Number	EDP No.
T-1	NC 6-32, 8-32, 10-24, 12-24, 1/4-20	18	10"	**328**	**420308**
T-2	NC 1/4-20, 5/16-18, 3/8-16, 7/16-14, 1/2-13	18	10"	**332**	**420316**
T-3	NC 1/4-20, 1/4-28, 5/16-18, 5/16-24, 3/8-16, 3/8-24	18	10"	**332**	**420340**
	NF 7/16-14, 7/16-20, 1/2-13, 1/2-20, 1/8-27 NPT (PIPE)				
MT-6	M2.5 x 0.45, M3 x 0.5, M3.5 x 0.6, M4 x 0.7	18	10"	**328**	**420365**
	M4.5 x 0.75, M5 x 0.8, M6x1				
MT-2	M6 x 1, M7 x 1, M8 x 1.25, M10 x 1.5, M12 x 1.75	18	10"	**332**	**420357**

TAP AND DIE SETS

With 2-Piece Dies

Set Number		Range of Cutting Sizes and Threads Per Inch	Die Collect	Die O.D.	Stock #	Die Stock Length	Tap Wrench #	EDP No.
VV-4		4-40, 6-32, 8-32, 10-24, 10-32 12-24, 1/4-20	1-1/4		V-1	7-1/2"	0	**420035**
535-1/2	NF	1/4-28, 5/16-24, 3/8-24, 7/16-20, 1/2-20 9/16-18, 5/8-18, 3/4-16	2-3/4		5	23"	6	**420142**
537-1/2	NF	1/4-28, 5/16-24, 3/8-24, 7/16-20, 1/2-20 9/16-18, 5/8-18, 3/4-16, 7/8-14, 1-12	2-3/4		7	26"	5 7	**420167**
501	NC	1/4-20, 5/16-18, 3/8-16, 7/16-14, 1/2-13	2		1	14-1/2"	5	**420050**
505-1/2	NC	1/4-20, 5/16-18, 3/8-16, 7/16-14 1/2-13, 9/16-12, 5/8-11, 3/4-10	2-3/4		5	23"	6	**420092**
507-1/2	NC	1/4-20, 5/16-18, 3/8-16, 7/16-14, 1/2-13 9/16-12, 5/8-11, 3/4-10, 7/8-9, 1-8	2-3/4		7	26"	5 7	**420118**
5310		1/4-20, 1/4-28, 5/16-18, 5/16-24, 3/8-16 3/8-24, 7/16-14, 7/16-20, 1/2-13, 1/2-20	2		1	14-1/2"	5	**420191**
5312		1/4-20, 1/4-28, 5/16-18, 5/16-24, 3/8-16 3/8-24, 7/16-14, 7/16-20, 1/2-13, 1/2-20 9/16-12, 9/16-18, 5/8-11, 5/8-18, 3/4-10 3/4-16, 7/8-9, 7/8-14, 1-8, 1-12	2 2-3/4		1 9	14-1/2" 29"	5 7	**420217**

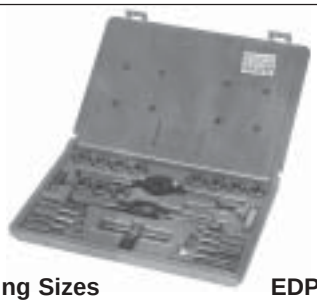
DIE SETS

Carbon Steel Hexagon Die Sets

Set Number		Range of Cutting Sizes and Threads Per Inch	EDP No.
52	NC	1/4-20, 5/16-18, 3/8-16, 7/16-14, 1/2-13, 9/16-12, 5/8-11, 3/4-10	**403512**
52A	NF	1/4-28, 5/16-24, 3/8-24, 7/16-20, 1/2-20, 9/16-18, 5/8-18, 3/4-16	**403553**
54	NC	1/4-20, 5/16-18, 3/8-16, 7/16-14, 1/2-13, 9/16-12, 5/8-11, 3/4-10, 7/8-9, 1-8	**403520**
54A	NF	1/4-28, 5/16-24, 3/8-24, 7/16-20, 1/2-20, 9/16-18, 5/8-18, 3/4-16, 7/8-14, 1-12	**403561**
56	NC	1/4-20, 5/16-18, 3/8-16, 7/16-14, 1/2-13, 9/16-12, 5/8-11, 3/4-10, 7/8-9, 1-8, 1-1/8-7, 1-1/4-7, 1-3/8-6, 1-1/2-6	**403538**
56A	NF	1/4-28, 5/16-24, 3/8-24, 7/16-20, 1/2-20, 9/16-18, 5/8-18, 3/4-16, 7/8-14, 1-12, 1-1/8-12, 1-1/4-12, 1-3/8-12, 1-1/2-12	**403579**
60C	NC & NF	1/4-20, 1/4-28, 5/16-18, 5/16-24, 3/8-16, 3/8-24, 7/16-14, 7/16-20, 1/2-13, 1/2-20, 9/16-12, 9/16-18, 5/8-11, 5/8-18, 3/4-10, 3/4-16	**403595**

TAP AND DIE SETS

Carbon Steel Tap and Hexagon Die Sets



Set Number		Range of Cutting Sizes and Threads Per Inch	EDP Ordering Number
1076-S	NC	4-40, 6-32, 8-32, 10-24, 12-24, 1/4-20, 5/16-18, 3/8-16, 7/16-14, 1/2-13 9/16-12, 5/8-11, 3/4-10, 7/8-9, 1-8	**410085**
	NF	10-32, 1/4-28, 5/16-24, 3/8-24, 7/16-20, 1/2-20, 9/16-18, 5/8-18, 3/4-16, 7/8-14, 1-12	
	NPT	1/8-27, 1/4-18, 3/8-18, 1/2-14	
1058-S	NC	6-32, 8-32, 10-24, 12-24, 1/4-20 5/16-18, 3/8-16, 7/16-14, 1/2-13 9/16-12, 5/8-11, 3/4-10	**410044**
	NF	10-32, 1/4-28, 5/16-24, 3/8-24, 7/16-20, 1/2-20, 9/16-18, 5/8-18, 3/4-16,	
	NPT	1/8-27, 1/4-18	
1040-S	NC	4-40, 6-32, 8-32, 10-24, 12-24, 1/4-20 5/16-18, 3/8-16, 7/16-14, 1/2-13	**410036**
	NF	10-32, 1/4-28, 5/16-24, 3/8-24, 7/16-20, 1/2-20	
	NPT	1/8-27	
1027-S	NC	1/4-20, 5/16-18, 3/8-16, 7/16-14, 1/2-13 1/4-28, 5/16-24, 3/8-24, 7/16-20, 1/2-20	**410101**
	NPT	1/8-27	

TAP AND DRILL SETS

Set Number	Tap Sizes	Drill Sizes	EDP No.
TD-118	6-32, 8-32, 10-24, 10-32, 1/4-20, 5/16-18, 3/8-16, 7/16-14, 1/2-13	36, 29, 25, 21, 7, F, 5/16, U, 27/64	**174676**
TD-118M	2.5 x 0.45, 3 x 0.5, 3.5 x 0.6, 4 x 0.7 5 x 0.8, 6 x 1.0 8 x 1.25, 10 x 1.5, 12 x 1.75	20.5, 2.5, 2.9, 3.3 4.2, 5.0, 6.7, 8.5 10.2	**174684**

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JOBBER LENGTH DRILLS

General Purpose / Straight Shank / 118° Point / High Speed Steel

List No. D320S Black Oxide Treated
List No. D320P Bright Finish
List No. D320TN VERTANIUM® Coated

Fractional Sizes

- 118° point geometry
- General purpose flute construction for use in a wide variety of materials
- Black oxide finish improves lubricity, reducing chip welding and galling
- Bright is excellent for non-ferrous materials & low tensile steels
- TiN coated for higher feeds & speeds with reduced heat at the cutting edge for added lubricity and added tool life

Drill Size	Decimal Equivalent	Overall Length	Flute Length	D320S EDP No.	D320P EDP No.	D320TN EDP No.
1/64	.0156	3/4	3/16	110001	111008	
1/32	.0312	1-3/8	1/2	110019	111016	
3/64	.0469	1-3/4	3/4	110027	111024	
1/16	.0625	1-/78	7/8	110035	111032	111038
5/64	.0781	2	1	110043	111040	111046
3/32	.0938	2-1/4	1-1/4	110050	111057	111053
7/64	.1094	2-5/8	1-1/2	110068	111065	111061
1/8	.1250	2-3/4	1-5/8	110076	111073	111079
9/64	.1406	2-7/8	1-3/4	110084	111081	111087
5/32	.1562	3-1/8	2	110092	111099	111095
11/64	.1719	3-1/4	2-1/8	110099	111107	111103
3/16	.1875	3-1/2	2-5/16	110118	111115	111111
13/64	.2031	3-5/8	2-7/16	110126	111123	111129
7/32	.2188	3-3/4	2-1/2	110134	111131	111137
15/64	.2344	3-7/8	2-5/8	110142	111149	111145
1/4,E	.2500	4	2-3/4	110159	111156	111152
17/64	.2656	4-1/8	2-7/8	110167	111164	111160
9/32	.2812	4-1/4	2-15/16	110175	111172	111178
19/64	.2969	4-3/8	3-1/16	110183	111180	111186
5/16	.3125	4-1/2	3-3/16	110191	111198	111194
21/64	.3281	4-5/8	3-5/16	110209	111206	111202
11/32	.3438	4-3/4	3-7/16	110217	111214	111210
23/64	.3594	4-7/8	3-1/2	110225	111222	111228
3/8	.3750	5	3-5/8	110233	111230	111236
25/64	.3906	5-1/8	3-3/4	110241	111248	111244
13/32	.4062	5-1/4	3-7/8	110258	111255	111251
27/64	.4219	5-3/8	3-15/16	110266	111263	111269
7/16	.4375	5-1/2	4-1/16	110274	111271	111277
29/64	.4531	5-5/8	4-3/16	110282	111289	111285
15/32	.4688	5-3/4	4-5/16	110290	111297	111293
31/64	.4844	5-7/8	4-3/8	110308	111305	111302
1/2	.5000	6	4-1/2	110316	111313	111319
33/64	.5156	6-5/8	4-13/16	110324	111321	111327
17/32	.5312	6-5/8	4-13/16	110332	111339	111335
35/64	.5469	6-5/8	4-13/16	110340	111347	111343

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List No. D320S Black Oxide Treated . . . *continued*
List No. D320P Bright Finish
List No. D320TN VERTANIUM® Coated

Drill Size	Decimal Equivalent	Overall Length	Flute Length	D320S EDP No.	D320P EDP No.	D320TN EDP No.
9/16	.5625	6-5/8	4-13/16	110357	111354	111350
37/64	.5781	6-5/8	4-13/16	110365	111362	111368
19/32	.5938	7-1/8	5-3/16	110373	111370	111376
39/64	.6094	7-1/8	5-3/16	110381	111388	111384
5/8	.6250	7-1/8	5-3/16	110399	111396	111392
41/64	.6406	7-1/8	5-3/16	110407	111404	111399
21/32	.6562	7-1/8	5-3/16	110415	111412	111418
43/64	.6719	7-5/8	5-5/8	110423	111420	111426
11/16	.6875	7-5/8	5-5/8	110431	111438	111434

Package Quantities: 1/64" to 9/32" = 12/pkg; 19/64" to 1/2" = 6/pkg; 33/64" to 11/16" = 1/pkg.

JOBBER LENGTH DRILLS

General Purpose / Straight Shank / 118° Point / High Speed Steel

List No. D340S Black Oxide Treated
List No. D340P Bright Finish
List No. D340TN VERTANIUM® Coated

Letter Sizes

- ■118° point geometry
- ■General purpose flute construction for use in a wide variety of materials
- ■Black oxide finish improves lubricity, reducing chip welding and galling
- ■Bright is excellent for non-ferrous materials & low tensile steels
- ■TiN coated for higher feeds & speeds with reduced heat at the cutting edge for added lubricity and added tool life

Drill Size	Decimal Equivalent	Overall Length	Flute Length	D340S EDP No.	D340P EDP No.	D340TN EDP No.
A	.2340	3-7/8	2-5/8	116008	116403	116409
B	.2380	4	2-3/4	116016	116411	116417
C	.2420	4	2-3/4	116024	116429	116425
D	.2460	4	2-3/4	116032	116437	116433
F	.2570	4-1/8	2-7/8	116057	116452	116458
G	.2610	4-1/8	2-7/8	116065	116460	116466
H	.2660	4-1/8	2-7/8	116073	116478	116474
I	.2720	4-1/8	2-7/8	116081	116486	116482
J	.2770	4-1/8	2-7/8	116099	116494	116490
K	.2810	4-1/4	2-15/16	116107	116502	116508
L	.2900	4-1/4	2-15/16	116115	116510	116516
M	.2950	4-3/8	3-1/16	116123	116528	116524
N	.3020	4-3/8	3-1/16	116131	116536	116532
O	.3160	4-1/2	3-3/16	116149	116544	116540
P	.3230	4-5/8	3-5/16	116156	116551	116557
Q	.3320	4-3/4	3-7/16	116164	116569	116565
R	.3390	4-3/4	3-7/16	116172	116577	116573
S	.3480	4-7/8	3-1/2	116180	116585	116581

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List No. D340S Black Oxide Treated . . . *continued*
List No. D340P Bright Finish
List No. D340TN VERTANIUM® Coated

Drill Size	Decimal Equivalent	Overall Length	Flute Length	D340S EDP No.	D340P EDP No.	D340TN EDP No.
T	.3580	4-7/8	3-1/2	116198	116593	116599
U	.3680	5	3-5/8	116206	116601	116607
V	.3770	5	3-5/8	116214	116619	116615
W	.3860	5-1/8	3-3/4	116222	116627	116623
X	.3970	5-1/8	3-3/4	116230	116635	116631
Y	.4040	5-1/4	3-7/8	116248	116643	116649
Z	.4130	5-1/4	3-7/8	116255	116650	116656

Package Quantities: A to L= 12/ pkg; M to Z= 6/ pkg.

JOBBER LENGTH DRILLS

General Purpose / Straight Shank / 118° Point / High Speed Steel

List No. D300S Black Oxide Treated
List No. D300P Bright Finish
List No. D300TN VERTANIUM® Coated

Wire Sizes

- ■118° point geometry
- ■General purpose flute construction for use in a wide variety of materials
- ■Black oxide finish improves lubricity, reducing chip welding and galling
- ■Bright is excellent for non-ferrous materials & low tensile steels
- ■TiN coated for higher feeds & speeds with reduced heat at the cutting edge for added lubricity and added tool life

Drill Size	Decimal Equivalent	Overall Length	Flute Length	D300S EDP No.	D300P EDP No.	D300TN EDP No.
1	.2280	3-7/8	2-5/8	113799	114796	114792
2	.2210	3-7/8	2-5/8	113781	114788	114784
3	.2130	3-3/4	2-1/2	113773	114770	114776
4	.2090	3-3/4	2-1/2	113765	114762	114768
5	.2055	3-3/4	2-1/2	113757	114754	114750
6	.2040	3-3/4	2-1/2	113740	114747	114743
7	.2010	3-5/8	2-7/16	113732	114739	114735
8	.1990	3-5/8	2-7/16	113724	114721	114727
9	.1960	3-5/8	2-7/16	113716	114713	114719
10	.1935	3-5/8	2-7/16	113708	114705	114701
11	.1910	3-1/2	2-5/16	113690	114697	114693
12	.1890	3-1/2	2-5/16	113682	114689	114685
13	.1850	3-1/2	2-5/16	113674	114671	114677
14	.1820	3-3/8	2-3/16	113666	114663	114669
15	.1800	3-3/8	2-3/16	113658	114655	114651
16	.1770	3-3/8	2-3/16	113641	114648	114644
17	.1730	3-3/8	2-3/16	113633	114630	114636
18	.1695	3-1/4	2-1/8	113625	114622	114628
19	.1660	3-1/4	2-1/8	113617	114614	114610
20	.1610	3-1/4	2-1/8	113609	114606	114602
21	.1590	3-1/4	2-1/8	113591	114598	114594
22	.1570	3-1/8	2	113583	114580	114586
23	.1540	3-1/8	2	113575	114572	114578

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List No. D300S Black Oxide Treated . . . *continued*
List No. D300P Bright Finish
List No. D300TN VERTANIUM® Coated

Drill Size	Decimal Equivalent	Overall Length	Flute Length	D300S EDP No.	D300P EDP No.	D300TN EDP No.
24	.1520	3-1/8	2	113567	114564	114560
25	.1495	3	1-7/8	113559	114556	114552
26	.1470	3	1-7/8	113542	114549	114545
27	.1440	3	1-7/8	113534	114531	114537
28	.1405	2-7/8	1-3/4	113526	114523	114529
29	.1360	2-7/8	1-3/4	113518	114515	114511
30	.1285	2-3/4	1-5/8	113500	114507	114503
31	.1200	2-3/4	1-5/8	113499	114499	114495
32	.1160	2-3/4	1-5/8	113484	114481	114487
33	.1130	2-5/8	1-1/2	113476	114473	114479
34	.1110	2-5/8	1-1/2	113468	114465	114461
35	.1100	2-5/8	1-1/2	113450	114457	114453
36	.1065	2-1/2	1-7/16	113443	114440	114446
37	.1040	2-1/2	1-7/16	113435	114432	114438
38	.1015	2-1/2	1-7/16	113427	114424	114420
39	.0995	2-3/8	1-3/8	113419	114416	114412
40	.0980	2-3/8	1-3/8	113401	114408	114404
41	.0960	2-3/8	1-3/8	113393	114390	114396
42	.0935	2-1/4	1-1/4	113385	114382	114388
43	.0890	2-1/4	1-1/4	113377	114374	114370
44	.0860	2-1/8	1-1/8	113369	114366	114362
45	.0820	2-1/8	1-1/8	113351	114358	114354
46	.0810	2-1/8	1-1/8	113344	114341	114347
47	.0785	2	1	113336	114333	114339
48	.0760	2	1	113328	114325	114321
49	.0730	2	1	113310	114317	114313
50	.0700	2	1	113302	114309	114305
51	.0670	2	1	113294	114291	114297
52	.0635	1-7/8	7/8	113286	114283	114289
53	.0595	1-7/8	7/8	113278	114275	114271
54	.0550	1-7/8	7/8	113260	114267	114263
55	.0520	1-7/8	7/8	113252	114259	114255
56	.0465	1-3/4	3/4	113245	114242	114248
57	.0430	1-3/4	3/4	113237	114234	114230
58	.0420	1-5/8	11/16	113229	114226	114222
59	.0410	1-5/8	11/16	113211	114218	114214
60	.0400	1-5/8	11/16	113203	114199	114206
61	.0390	1-5/8	11/16		113195	114198
62	.0380	1-1/2	5/8		113187	114190
63	.0370	1-1/2	5/8		113179	114182
64	.0360	1-1/2	5/8		113161	114174
65	.0350	1-1/2	5/8		113153	114166
66	.0330	1-3/8	1/2		113146	114158
67	.0320	1-3/8	1/2		113138	114150
68	.0310	1-3/8	1/2		113120	114142

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List No. D300S Black Oxide Treated . . . *continued*
List No. D300P Bright Finish
List No. D300TN VERTANIUM® Coated

Drill Size	Decimal Equivalent	Overall Length	Flute Length	D300S EDP No.	D300P EDP No.	D300TN EDP No.
69	.0292	1-3/8	1/2		**113112**	**114134**
70	.0280	1-1/4	3/8		**113104**	**114126**
71	.0260	1-1/4	3/8		**113096**	**114118**
72	.0250	1-1/8	5/16		**113088**	**114110**
73	.0240	1-1/8	5/16		**113070**	**114102**
74	.0225	1	1/4		**113062**	**114094**
75	.0210	1	1/4		**113054**	**114086**
76	.0200	7/8	3/16		**113047**	**114078**
77	.0180	7/8	3/16		**113039**	**114070**
78	.0160	7/8	3/16		**113021**	**114062**
79	.0145	3/4	3/16		**113013**	**114054**
80	.0135	3/4	3/16		**113005**	**114046**
81	.0130	3/4	3/32		**117295**	
82	.0125	3/4	3/32		**117287**	
83	.0120	3/4	3/32		**117279**	
84	.0115	3/4	3/32		**117261**	
85	.0110	3/4	5/64		**117253**	
86	.0105	3/4	5/64		**117246**	
87	.0100	3/4	5/64		**117238**	
88	.0095	3/4	5/64		**117220**	
89	.0094	3/4	1/16		**117212**	
90	.0087	3/4	1/16		**117204**	

Package Quantities: Nos. 1-90 = 12/ pkg.

JOBBER LENGTH DRILLS

General Purpose / Straight Shank / 118° Point / High Speed Steel

List No. D360P Bright Finish
List No. D360TN VERTANIUM® Coated

Metric Sizes

- ■118° point geometry
- ■General purpose flute construction for use in a wide variety of materials
- ■Bright is excellent for non-ferrous materials & low tensile steels
- ■TiN coated for higher feeds & speeds with reduced heat at the cutting edge for added lubricity and added tool life

Drill Size	Decimal Equivalent	OAL (in)	OAL (m/m)	Flute Length	D360P EDP No.	D360TN EDP No.
0.35	.0138	3/4	19	4	**117388**	
0.4	.0157	3/4	20	5	**117389**	
0.45	.0177	7/8	20	5	**117390**	
0.5	.0197	7/8	22	6	**117391**	
0.55	.0217	1	24	7	**117392**	
0.6	.0236	1-1/8	24	7	**117393**	
0.65	.0256	1-1/4	26	8	**117394**	
0.7	.0276	1-1/4	28	9	**117395**	
0.75	.0295	1-3/8	28	9	**117396**	

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List No. D360P Bright Finish . . . *continued*
List No. D360TN VERTANIUM® Coated

Drill Size	Decimal Equivalent	OAL (in)	OAL (m/m)	Flute Length	D360P EDP No.	D360TN EDP No.
0.8	.0315	1-3/8	30	10	**117397**	
0.85	.0335	1-5/8	30	10	**117398**	
0.9	.0354	1-5/8	32	11	**117399**	
0.95	.0374	1-3/4	32	11	**117401**	
1	.0394	1-3/4	34	12	**117402**	
1.05	.0413	1-7/8	34	12	**117410**	
1.1	.0433	1-7/8	36	14	**117428**	
1.15	.0453	1-7/8	36	14	**117436**	
1.2	.0472	1-7/8	38	16	**117444**	
1.25	.0492	1-7/8	38	16	**117451**	
1.3	.0512	1-7/8	38	16	**117469**	
1.35	.0531	1-7/8	40	18	**117477**	
1.4	.0551	1-7/8	40	18	**117485**	
1.45	.0571	1-7/8	40	18	**117493**	
1.5	.0591	2	40	18	**117501**	
1.55	.0610	2	43	20	**117519**	
1.6	.0630	2	43	20	**117527**	
1.65	.0650	2	43	20	**117535**	
1.7	.0669	2	43	20	**117543**	
1.75	.0689	2	46	22	**117550**	
1.8	.0709	2	46	22	**117568**	
1.85	.0728	2-1/8	46	22	**117576**	
1.9	.0748	2-1/8	46	22	**117584**	
1.95	.0768	2-1/8	49	24	**117592**	
2	.0787	2-1/8	49	24	**117600**	
2.05	.0807	2-1/4	49	24	**117618**	
2.1	.0827	2-1/4	49	24	**117626**	
2.15	.0846	2-1/4	53	27	**117634**	
2.2	.0866	2-1/4	53	27	**117642**	
2.25	.0886	2-3/8	53	27	**117659**	
2.3	.0906	2-3/8	53	27	**117667**	
2.35	.0925	2-3/8	53	27	**117675**	
2.4	.0945	2-1/2	57	30	**117683**	
2.45	.0965	2-1/2	57	30	**117691**	
2.5	.0984	2-1/2	57	30	**117709**	
2.6	.1024	2-9/16	57	30	**117717**	
2.7	.1063	2-9/16	61	33	**117725**	
2.8	.1102	2-5/8	61	33	**117741**	
2.9	.1142	2-3/4	61	33	**117758**	
3	.1181	2-3/4	61	33	**117766**	**117762**
3.1	.1220	2-3/4	65	36	**117774**	
3.2	.1260	2-3/4	65	36	**117782**	
3.3	.1299	2-7/8	65	36	**117808**	**117804**
3.4	.1339	2-7/8	70	39	**117816**	
3.5	.1378	2-7/8	70	39	**117824**	
3.6	.1417	3	70	39	**117832**	

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List No. D360P Bright Finish . . . *continued*

List No. D360TN VERTANIUM® Coated

Drill Size	Decimal Equivalent	OAL (in)	Overall (m/m)	Flute Length	D360P EDP No.	D360TN EDP No.
3.7	.1457	3	70	39	117840	
3.8	.1496	3	75	43	117865	
3.9	.1535	3-1/8	75	43	117873	
4	.1575	3-1/4	75	43	117881	117887
4.1	.1614	3-1/4	75	43	117899	
4.2	.1654	3-1/4	75	43	117907	117903
4.3	.1693	3-1/4	80	47	117923	
4.4	.1732	3-3/8	80	47	117931	
4.5	.1772	3-3/8	80	47	117949	
4.6	.1811	3-3/8	80	47	117956	
4.7	.1850	3-1/2	80	47	117964	
4.8	.1890	3-1/2	86	52	117980	
4.9	.1929	3-1/2	86	52	117998	
5	.1969	3-1/2	86	52	118004	118000
5.1	.2008	3-1/2	86	52	118012	
5.2	.2047	3-3/4	86	52	118020	
5.3	.2087	3-3/4	86	52	118046	
5.4	.2126	3-3/4	93	57	118053	
5.5	.2165	3-3/4	93	57	118061	
5.6	.2205	3-7/8	93	57	118079	
5.7	.2244	3-7/8	93	57	118103	
5.8	.2283	3-7/8	93	57	118111	
5.9	.2323	3-7/8	93	57	118129	
6	.2362	4	93	57	118137	118125
6.1	.2402	4	101	63	118145	
6.2	.2441	4	101	63	118160	
6.3	.2480	4	101	63	118178	
6.4	.2520	4-1/8	101	63	118186	
6.5	.2559	4-1/8	101	63	118194	
6.6	.2598	4-1/8	101	63	118202	
6.7	.2638	4-1/8	101	63	118228	
6.8	.2677	4-1/8	109	69	118236	
6.9	.2717	4-1/8	109	69	118244	
7	.2756	4-1/8	109	69	118251	118240
7.1	.2795	4-1/4	109	69	118269	
7.2	.2835	4-1/4	109	69	118277	
7.3	.2874	4-1/4	109	69	118285	
7.4	.2913	4-3/8	109	69	118293	
7.5	.2953	4-3/8	109	69	118301	
7.6	.2992	4-3/8	117	75	118319	
7.7	.3031	4-1/2	117	75	118327	
7.8	.3071	4-1/2	117	75	118343	
7.9	.3110	4-1/2	117	75	118350	
8	.3150	4-1/2	117	75	118368	118364
8.1	.3189	4-5/8	117	75	118376	
8.2	.3228	4-5/8	117	75	118384	
8.3	.3268	4-5/8	117	75	118400	

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List No. D360P Bright Finish . . . *continued*
List No. D360TN VERTANIUM® Coated

Drill Size	Decimal Equivalent	OAL (in)	OAL (m/m)	Flute Length	D360P EDP No.	D360TN EDP No.
8.4	.3307	4-3/4	117	75	**118418**	
8.5	.3346	4-3/4	117	75	**118426**	**118422**
8.6	.3386	4-3/4	125	81	**118434**	
8.7	.3425	4-3/4	125	81	**118442**	
8.8	.3465	4-7/8	125	81	**118467**	
8.9	.3504	4-7/8	125	81	**118475**	
9	.3543	4-7/8	125	81	**118483**	**118489**
9.1	.3583	4-7/8	125	81	**118491**	
9.2	.3622	5	125	81	**118509**	
9.3	.3661	5	125	81	**118525**	
9.4	.3701	5	125	81	**118533**	
9.5	.3740	5	125	81	**118541**	
9.6	.3780	5-1/8	133	87	**118558**	
9.7	.3819	5-1/8	133	87	**118566**	
9.8	.3858	5-1/8	133	87	**118582**	
9.9	.3898	5-1/8	133	87	**118590**	
10	.3937	5-1/8	133	87	**118608**	**118604**
10.2	.4016	5-1/8	133	87	**118610**	
10.5	.4134	5-3/8	133	87	**118616**	**118612**
10.8	.4252	5-1/2	142	94	**118620**	
11	.4331	5-1/2	142	94	**118624**	
11.2	.4409	5-1/2	142	94	**118628**	
11.5	.4528	5-5/8	142	94	**118632**	
11.8	.4646	5-3/4	142	94	**118636**	
12	.4724	5-7/8	151	101	**118640**	**118646**
12.2	.4803	5-7/8	151	101	**118645**	
12.5	.4921	6	151	101	**118657**	
12.8	.5039	6	151	101	**118660**	
13	.5118	6	151	101	**118665**	
13.2	.5197	6-5/8	151	101	**118670**	
13.5	.5315	6-5/8	160	108	**118674**	
13.8	.5433	6-5/8	160	108	**118678**	
14	.5512	6-5/8	160	108	**118680**	
14.25	.5610	6-5/8	169	114	**118682**	
14.5	.5709	6-5/8	169	114	**118684**	
14.75	.5807	7-1/8	169	114	**118686**	
15	.5906	7-1/8	169	114	**118688**	
15.25	.6004	7-1/8	178	120	**118690**	
15.5	.6102	7-1/8	178	120	**118692**	
15.75	.6201	7-1/8	178	120	**118694**	
16	.6299	7-1/8	178	120	**118696**	
16.25	.6398	7-1/8	184	125	**118698**	
16.5	.6496	7-1/8	184	125	**118700**	
16.75	.6594	7-5/8	184	125	**118702**	
17	.6693	7-5/8	184	125	**118704**	
17.5	.6890	7-5/8	191	130	**118708**	

Package Quantities: .35mm to 7.1mm = 12/pkg; 7.2mm to 13 mm= 6/pkg; 13.2 mm and up= 1/pkg.

JOBBER LENGTH DRILLS

Automotive Series / 118° Point / Straight Shank / High Speed Steel

List No. D300A, Tanged Black Oxide Finish

Fractional, Letter, Wire, and Metric Sizes

- 118° point geometry
- General purpose flute construction for use in a wide variety of materials
- Tanged for use with an ASA split sleeve drill driver - see page 175 for dimensions.
- Black oxide finish improves lubricity, reducing chip welding & galling

Drill Size	Decimal Equivalent	Overall Length	Flute Length	D300A EDP No.
1/8	.1250	2-3/4	1-5/8	142004
30	.1285	2-3/4	1-5/8	142012
3.3mm	.1299	2-7/8	1-3/4	142020
3.4mm	.1339	2-7/8	1-3/4	142038
29	.1360	2-7/8	1-3/4	142046
3.5mm	.1378	2-7/8	1-3/4	142053
9/64	.1406	2-7/8	1-3/4	142061
27	.1440	3	1-7/8	142079
26	.1470	3	1-7/8	142087
24	.1520	3-1/8	2	142095
5/32	.1562	3-1/8	2	142103
20	.1610	3-1/4	2-1/8	142111
19	.1660	3-1/4	2-1/8	142129
18	.1695	3-1/4	2-1/8	142137
11/64	.1719	3-1/4	2-1/8	142145
17	.1730	3-3/8	2-3/16	142152
16	.1770	3-3/8	2-3/16	142160
15	.1800	3-3/8	2-3/16	142178
13	.1850	3-1/2	2-5/16	142186
3/16	.1875	3-1/2	2-5/16	142194
11	.1910	3-1/2	2-5/16	142202
10	.1935	3-5/8	2-7/16	142210
9	.1960	3-5/8	2-7/16	142228
8	.1990	3-5/8	2-7/16	142236
13/64	.2031	3-5/8	2-7/16	142244
4	.2090	3-3/4	2-1/2	142251
3	.2130	3-3/4	2-1/2	142269
7/32	.2188	3-3/4	2-1/2	142277
1	.2280	3-7/8	2-5/8	142293
15/64	.2344	3-7/8	2-5/8	142301
6.1mm	.2402	4	2-3/4	142319
D	.2460	4	2-3/4	142327
E & 1/4	.2500	4	2-3/4	142335
6.4mm	.2520	4-1/8	2-7/8	142343
F	.2570	4-1/8	2-7/8	142350
G	.2610	4-1/8	2-7/8	142368
17/64	.2656	4-1/8	2-7/8	142376
I	.2720	4-1/8	2-7/8	142384
J	.2770	4-1/8	2-7/8	142392
9/32	.2812	4-1/4	2-15/16	142401

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List No. D300A Black Oxide Finish . . . *continued*

Drill Size	Decimal Equivalent	Overall Length	Flute Length	D300A EDP No.
7.25mm	.2854	4-1/4	2-15/16	**142410**
7.40mm	.2913	4-1/4	2-15/16	**142426**
19/64	.2969	4-3/8	3-1/16	**142434**
N	.3020	4-3/8	3-1/16	**142442**
7.8mm	.3071	4-1/2	3-1/16	**142459**
5/16	.3125	4-1/2	3-3/16	**142467**
O	.3160	4-1/2	3-3/16	**142475**
P	.3230	4-5/8	3-5/16	**142483**
Q	.3320	4-3/4	3-7/16	**142491**
R	.3390	4-3/4	3-7/16	**142509**
11/32	.3438	4-3/4	3-7/16	**142517**
S	.3480	4-7/8	3-1/2	**142525**
9mm	.3543	4-7/8	3-1/2	**142533**
23/64	.3594	4-7/8	3-1/2	**142541**
U	.3680	5	3-5/8	**142558**
3/8	.3750	5	3-5/8	**142566**
W	.3860	5-1/8	3-3/4	**142574**
25/64	.3906	5-1/8	3-3/4	**142582**
X	.3970	5-1/8	3-3/4	**142590**
13/32	.4062	5-1/4	3-7/8	**142608**
27/64	.4219	5-3/8	3-15/16	**142616**
7/16	.4375	5-1/2	4-1/16	**142624**
29/64	.4531	5-5/8	4-3/16	**142632**
15/32	.4688	5-3/4	4-5/16	**142640**
31/64	.4844	5-7/8	4-3/8	**142657**
1/2	.5000	6	4-1/2	**142665**
33/64	.5156	6-5/8	4-13/16	**142673**
17/32	.5312	6-5/8	4-13/16	**142681**
35/64	.5469	6-5/8	4-13/16	**142699**
9/16	.5625	6-5/8	4-13/16	**142707**
37/64	.5781	6-5/8	4-13/16	**142715**
19/32	.5938	7-1/8	5-3/16	**142723**
39/64	.6094	7-1/8	5-3/16	**142731**
5/8	.6250	7-1/8	5-3/16	**142749**
41/64	.6406	7-1/8	5-3/16	**142756**
21/32	.6562	7-1/8	5-3/16	**142764**
43/64	.6719	7-5/8	5-5/8	**142772**
11/16	.6875	7-5/8	5-5/8	**142780**

Package Quantities: 3/64" to 9/32", A to L, 3 mm to 6.1 mm = 12/pkg; 19/64" to 1/2", M to Z = 6 pkg, 33/64" and up= 1/pkg.

JOBBER LENGTH DRILLS

Heavy Duty / 135° Split Point* / Straight Shank / High Speed Steel

List No. D420S Black Oxide Finish

List No. D420TN VERTANIUM® Coated

Fractional Sizes

- Heavy duty construction to increase tool strength
- AIA NAS-907 (Type B) for hard materials & approved for aircraft applications
- 135° split point is self centering reducing thrust for ease of penetration & the preferred point for stainless steel
- Black oxide finish improves lubricity, reducing chip welding & galling
- TiN coated for higher feeds & speeds with reduced heat at the cutting edge for added lubricity and added tool life

Drill Size	Decimal Equivalent	Overall Length	Flute Length	D420S EDP No.	D420TN EDP No.
3/64	.0469	1-3/4	3/4	**119002**	
1/16	.0625	1-7/8	7/8	**119010**	**119016**
5/64	.0781	2	1	**119028**	**119024**
3/32	.0938	2-1/4	1-1/4	**119036**	**119032**
7/64	.1094	2-5/8	1-1/2	**119044**	**119040**
1/8	.1250	2-3/4	1-5/8	**119051**	**119057**
9/64	.1406	2-7/8	1-3/4	**119069**	**119065**
5/32	.1562	3-1/8	2	**119077**	**119073**
11/64	.1719	3-1/4	2-1/8	**119085**	**119081**
3/16	.1875	3-1/2	2-5/16	**119093**	**119099**
13/64	.2031	3-5/8	2-7/16	**119101**	**119107**
7/32	.2188	3-3/4	2-1/2	**119119**	**119115**
15/64	.2344	3-7/8	2-5/8	**119127**	**119123**
1/4,E	.2500	4	2-3/4	**119135**	**119131**
17/64	.2656	4-1/8	2-7/8	**119143**	**119149**
9/32	.2812	4-1/4	2-15/16	**119150**	**119156**
19/64	.2969	4-3/8	3-1/16	**119168**	**119164**
5/16	.3125	4-1/2	3-3/16	**119176**	**119172**
21/64	.3281	4-5/8	3-5/16	**119184**	**119180**
11/32	.3438	4-3/4	3-7/16	**119192**	**119198**
23/64	.3594	4-7/8	3-1/2	**119200**	**119206**
3/8	.3750	5	3-5/8	**119218**	**119214**
25/64	.3906	5-1/8	3-3/5	**119226**	**119222**
13/32	.4062	5-1/4	3-7/8	**119234**	**119230**
27/64	.4219	5-3/8	3-15/16	**119242**	**119248**
7/16	.4375	5-1/2	4-1/16	**119259**	**119255**
29/64	.4531	5-5/8	4-3/16	**119267**	**119263**
15/32	.4688	5-3/4	4-5/16	**119275**	**119271**
31/64	.4844	5-7/8	4-3/8	**119283**	**119289**
1/2	.5000	6	4-1/2	**119291**	**119297**

Package Quantities: 3/64" to 9/32"=12/pkg; 19/64" to 1/2"= 6 pkg.

** 135° split point on 1/16" and larger*

JOBBER LENGTH DRILLS

Heavy Duty / 135° Split Point / Straight Shank / High Speed Steel

List No. D440S Black Oxide Finish

List No. D440TN VERTANIUM® Coated

Letter Sizes

- Heavy duty construction to increase tool strength
- AIA NAS-907 (Type B) for hard materials & approved for aircraft applications
- 135° split point is self centering reducing thrust for ease of penetration & the preferred point for stainless steels
- Black oxide finish improves lubricity, reducing chip welding & galling

Drill Size	Decimal Equivalent	Overall Length	Flute Length	D440S EDP No	D440TN EDP No.
A	.2340	3-7/8	2-5/8	119408	120600
B	.2380	4	2-3/4	119416	120601
C	.2420	4	2-3/4	119424	120602
D	.2460	4	2-3/4	119432	120603
F	.2570	4-1/8	2-7/8	119457	120605
G	.2610	4-1/8	2-7/8	119465	120606
H	.2660	4-1/8	2-7/8	119473	120607
I	.2720	4-1/8	2-7/8	119481	120608
J	.2770	4-1/8	2-7/8	119499	120609
K	.2810	4-1/4	2-15/16	119507	120610
L	.2900	4-1/4	2-15/16	119515	120611
M	.2950	4-3/8	3-1/16	119523	120612
N	.3020	4-3/8	3-1/16	119531	120613
O	.3160	4-1/2	3-3/16	119549	120614
P	.3230	4-5/8	3-5/16	119556	120615
Q	.3320	4-3/4	3-7/16	119564	120616
R	.3390	4-3/4	3-7/16	119572	120617
S	.3480	4-7/8	3-1/2	119580	120618
T	.3580	4-7/8	3-1/2	119598	120619
U	.3680	5	3-5/8	119606	120620
V	.3770	5	3-5/8	119614	120621
W	.3860	5-1/8	3-3/4	119622	120622
X	.3970	5-1/8	3-3/4	119630	120623
Y	.4040	5-1/4	3-7/8	119648	120624
Z	.4130	5-1/4	3-7/8	119655	120625

Package Quantities: A to L = 12 pkg; M to Z = 6 pkg.

JOBBER LENGTH DRILLS

Heavy Duty / 135° Split Point* / Straight Shank / High Speed Steel

List No. D400S Black Oxide Finish

List No. D400TN VERTANIUM® Coated

Wire Sizes

- Heavy duty construction to increase tool strength
- AIA NAS-907 (Type B) for hard materials & approved for aircraft applications
- 135° split point is self centering reducing thrust for ease of penetration & the preferred point for stainless steels

Drill Size	Decimal Equivalent	Overall Length	Flute Length	D400S EDP No.	D400TN EDP No
1	.2280	3-7/8	2-5/8	120596	120592
2	.2210	3-7/8	2-5/8	120588	120584
3	.2130	3-3/4	2-1/2	120570	120576
4	.2090	3-3/4	2-1/2	120562	120568
5	.2055	3-3/4	2-1/2	120554	120550
6	.2040	3-3/4	2-1/2	120547	120543
7	.2010	3-5/8	2-7/16	120539	120535
8	.1990	3-5/8	2-7/16	120521	120527
9	.1960	3-5/8	2-7/16	120513	120519
10	.1935	3-5/8	2-7/16	120505	120501
11	.1910	3-1/2	2-5/16	120497	120493
12	.1890	3-1/2	2-5/16	120489	120485
13	.1850	3-1/2	2-5/16	120471	120477
14	.1820	3-3/8	2-5/16	120463	120469
15	.1800	3-3/8	2-3/16	120455	120451
16	.1770	3-3/8	2-3/16	120448	120444
17	.1730	3-3/8	2-3/16	120430	120436
18	.1695	3-1/4	2-1/8	120422	120428
19	.1660	3-1/4	2-1/8	120414	120410
20	.1610	3-1/4	2-1/8	120406	120402
21	.1590	3-1/4	2-1/8	120398	120394
22	.1570	3-1/8	2	120380	120386
23	.1540	3-1/8	2	120372	120378
24	.1520	3-1/8	2	120364	120360
25	.1495	3	1-7/8	120356	120352
26	.1470	3	1-7/8	120349	120345
27	.1440	3	1-7/8	120331	120337
28	.1405	2-7/8	1-3/4	120323	120329
29	.1360	2-7/8	1-3/4	120315	120311
30	.1285	2-3/4	1-5/8	120307	120303
31	.1200	2-3/4	1-5/8	120299	120295
32	.1160	2-3/4	1-5/8	120281	120287
33	.1130	2-5/8	1-1/2	120273	120279
34	.1110	2-5/8	1-1/2	120265	120261
35	.1100	2-5/8	1-1/2	120257	120253
36	.1065	2-1/2	1-7/16	120240	120246
37	.1040	2-1/2	1-7/16	120232	120238
38	.1015	2-1/2	1-7/16	120224	120220

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List No. D400S Black Oxide Finish . . . *continued*
List No. D400TN VERTANIUM® Coat

Drill Size	Decimal Equivalent	Overall Length	Flute Length	D400S EDP No.	D400TN EDP No.
39	.0995	2-3/8	1-3/8	120216	120212
40	.0980	2-3/8	1-3/8	120208	120204
41	.0960	2-3/8	1-3/8	120190	120196
42	.0935	2-1/4	1-1/4	120182	120188
43	.0890	2-1/4	1-1/4	120174	120170
44	.0860	2-1/8	1-1/8	120166	120162
45	.0820	2-1/8	1-1/8	120158	120154
46	.0810	2-1/8	1-1/8	120141	120147
47	.0785	2	1	120133	120139
48	.0760	2	1	120125	120121
49	.0730	2	1	120117	120113
50	.0700	2	1	120109	120105
51	.0670	2	1	120091	120097
52	.0635	1-7/8	7/8	120083	120089
53	.0595	1-7/8	7/8	120075	120630
54	.0550	1-7/8	7/8	120067	120631
55	.0520	1-7/8	7/8	120059	120632
56	.0465	1-3/4	3/4	120042	120633
57	.0430	1-3/4	3/4	120034	120634
58	.0420	1-5/8	11/16	120026	120635
59	.0410	1-5/8	11/16	120018	120636
60	.0400	1-5/8	11/16	120000	120637
61	.0390	1-5/8	11/16	120001	120638
62	.0380	1-1/2	5/8	120002	120639
63	.0370	1-1/2	5/8	120003	120640
64	.0360	1-1/2	5/8	120004	120641
65	.0350	1-1/2	5/8	120005	120642
66	.0330	1-3/8	1/2	120006	120643
67	.0320	1-3/8	1/2	120007	120644
68	.0310	1-3/8	1/2	120008	120645
69	.0292	1-3/8	1/2	120009	120646
70	.0280	1-1/4	3/8	120010	120647
71	.0260	1-1/4	3/8	120011	120648
72	.0250	1-1/8	5/16	120012	120649
73	.0240	1-1/8	5/16	120013	120650
74	.0225	1	1/4	120014	120651
75	.0210	1	1/4	120015	120652
76	.0200	7/8	3/16	120016	120653
77	.0180	7/8	3/16	120017	120654
78	.0160	7/8	3/16	120019	120655
79	.0145	3/4	1/8	120020	120656
80	.0135	3/4	1/8	120021	120657

Package Quantities: Nos. 1-80 = 12/pkg.
** 135° split point on No. 52 and larger*

JOBBER LENGTH DRILLS

Fast Spiral / Straight Shank / 118° Point / High Speed Steel

List No. D520P Bright Finish

Fractional Sizes

- 118° point geometry
- High helix for more efficient chip removal, particularly in deep hole non-ferrous applications
- Bright finish excellent for non-ferrous applications & low tensile steels

Drill Size	Decimal Equivalent	Overall Length	Flute Length	D520P EDP No.
3/64	.0469	1-3/4	3/4	**121602**
1/16	.0625	1-7/8	7/8	**121610**
5/64	.0781	2	1	**121628**
3/32	.0938	2-1/4	1-1/4	**121636**
7/64	.1094	2-5/8	1-1/2	**121644**
1/8	.1250	2-3/4	1-5/8	**121651**
9/64	.1406	2-7/8	1-3/4	**121669**
5/32	.1562	3-1/8	2	**121677**
11/64	.1719	3-1/4	2-1/8	**121685**
3/16	.1875	3-1/2	2-5/16	**121693**
13/64	.2031	3-5/8	2-7/16	**121702**
7/32	.2188	3-3/4	2-1/2	**121719**
15/64	.2344	3-7/8	2-5/8	**121727**
1/4,E	.2500	4	2-3/4	**121735**
17/64	.2656	4-1/8	2-7/8	**121743**
9/32	.2812	4-1/4	2-15/16	**121750**
19/64	.2969	4-3/8	3-1/16	**121768**
5/16	.3125	4-1/2	3-3/16	**121776**
21/64	.3281	4-5/8	3-5/16	**121784**
11/32	.3438	4-3/4	3-7/16	**121792**
23/64	.3594	4-7/8	3-1/2	**121799**
3/8	.3750	5	3-5/8	**121818**
25/64	.3906	5-1/8	3-3/4	**121826**
13/32	.4062	5-1/4	3-7/8	**121834**
27/64	.4219	5-3/8	3-15/16	**121842**
7/16	.4375	5-1/2	4-1/16	**121859**
29/64	.4531	5-5/8	4-3/16	**121867**
15/32	.4688	5-3/4	4-5/16	**121875**
31/64	.4844	5-7/8	4-3/8	**121883**
1/2	.5000	6	4-1/2	**121891**

Package Quantities: 3/64" to 9/32" = 12/pkg; 19/64" to 1/2" = 6 pkg.

JOBBER LENGTH DRILLS

Fast Spiral / Straight Shank / 118° Point / High Speed Steel

List No. D540P Bright Finish

Letter Sizes

- ■118° point geometry
- ■High helix for more efficient chip removal, particularly in deep hole non-ferrous applications
- ■Bright finish excellent for non-ferrous applications & low tensile steels

Drill Size	Decimal Equivalent	Overall Length	Flute Length	D540P EDP No.
A	.2340	3-7/8	2-5/8	**121502**
B	.2380	4	2-3/4	**121503**
C	.2420	4	2-3/4	**121504**
D	.2460	4	2-3/4	**121505**
F	.2570	4-1/8	2-7/8	**121507**
G	.2610	4-1/8	2-7/8	**121508**
H	.2660	4-1/8	2-7/8	**121509**
I	.2720	4-1/8	2-7/8	**121510**
J	.2770	4-1/8	2-7/8	**121511**
K	.2810	4-1/4	2-15/16	**121512**
L	.2900	4-1/4	2-15/16	**121513**
M	.2950	4-3/8	3-1/16	**121514**
N	.3020	4-3/8	3-1/16	**121515**
O	.3160	4-1/2	3-3/16	**121516**
P	.3230	4-5/8	3-5/16	**121517**
Q	.3320	4-3/4	3-7/16	**121518**
R	.3390	4-3/4	3-7/16	**121519**
S	.3480	4-7/8	3-1/2	**121520**
T	.3580	4-7/8	3-1/2	**121521**
U	.3680	5	3-5/8	**121522**
V	.3770	5	3-5/8	**121523**
W	.3860	5-1/8	3-3/4	**121524**
X	.3970	5-1/8	3-3/4	**121525**
Y	.4040	5-1/4	3-7/8	**121526**
Z	.4130	5-1/4	3-7/8	**121527**

Package Quantities: A to L = 12/pkg; M to Z = 6/pkg.

JOBBER LENGTH DRILLS

Fast spiral / Straight Shank / 118° Point / High Speed Steel

List No. D500P Bright Finish

Wire Sizes

- 118° point geometry
- High helix for more efficient chip removal, particularly in deep hole non-ferrous applications
- Bright finish excellent for non-ferrous applications & low tensile steels

Drill Size	Decimal Equivalent	Overall Length	Flute Length	D500P EDP No
1	.2280	3-7/8	2-5/8	121902
2	.2210	3-7/8	2-5/8	121903
3	.2130	3-3/4	2-1/2	121904
4	.2090	3-3/4	2-1/2	121905
5	.2055	3-3/4	2-1/2	121906
6	.2040	3-3/4	2-1/2	121907
7	.2010	3-5/8	2-7/16	121908
8	.1990	3-5/8	2-7/16	121909
9	.1960	3-5/8	2-7/16	121910
10	.1935	3-5/8	2-7/16	121911
11	.1910	3-1/2	2-5/16	121912
12	.1890	3-1/2	2-5/16	121913
13	.1850	3-1/2	2-5/16	121914
14	.1820	3-3/8	2-3/16	121915
15	.1800	3-3/8	2-3/16	121916
16	.1770	3-3/8	2-3/16	121917
17	.1730	3-3/8	2-3/16	121918
18	.1695	3-1/4	2-1/8	121919
19	.1660	3-1/4	2-1/8	121920
20	.1610	3-1/4	2-1/8	121921
21	.1590	3-1/4	2-1/8	121922
22	.1570	3-1/8	2	121923
23	.1540	3-1/8	2	121924
24	.1520	3-1/8	2	121925
25	.1495	3	1-7/8	121926
26	.1470	3	1-7/8	121927
27	.1440	3	1-7/8	121928
28	.1405	2-7/8	1-3/4	121929
29	.1360	2-7/8	1-3/4	121930
30	.1285	2-3/4	1-5/8	121931
31	.1200	2-3/4	1-5/8	121932
32	.1160	2-3/4	1-5/8	121933
33	.1130	2-5/8	1-1/2	121934
34	.1110	2-5/8	1-1/2	121935
35	.1100	2-5/8	1-1/2	121936
36	.1065	2-1/2	1-7/16	121937
37	.1040	2-1/2	1-7/16	121938
38	.1015	2-1/2	1-7/16	121939
39	.0995	2-3/8	1-3/8	121940

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List No. D500P Bright Finish . . . *continued*

Drill Size	Decimal Equivalent	Overall Length	Flute Length	D500P EDP No.
40	.0980	2-3/8	1-3/8	**121941**
41	.0960	2-3/8	1-3/8	**121942**
42	.0935	2-1/4	1-1/4	**121943**
43	.0890	2-1/4	1-1/4	**121944**
44	.0860	2-1/8	1-1/8	**121945**
45	.0820	2-1/8	1-1/8	**121946**
46	.0810	2-1/8	1-1/8	**121947**
47	.0785	2	1	**121948**
48	.0760	2	1	**121949**
49	.0730	2	1	**121950**
50	.0700	2	1	**121951**
51	.0670	2	1	**121952**
52	.0635	1-7/8	7/8	**121953**
53	.0595	1-7/8	7/8	**121954**
54	.0550	1-7/8	7/8	**121955**
55	.0520	1-7/8	7/8	**121956**
56	.0465	1-3/4	3/4	**121957**
57	.0430	1-3/4	3/4	**121958**
58	.0420	1-5/8	11/16	**121959**
59	.0410	1-5/8	11/16	**121960**
60	.0400	1-5/8	11/16	**121961**
61	.0390	1-5/8	11/16	**121962**
62	.0380	1-1/2	5/8	**121963**
63	.0370	1-1/2	5/8	**121964**
64	.0360	1-1/2	5/8	**121965**
65	.0350	1-1/2	5/8	**121966**
66	.0330	1-3/8	1/2	**121967**
67	.0320	1-3/8	1/2	**121968**
68	.0310	1-3/8	1/2	**121969**
69	.0292	1-3/8	1/2	**121970**
70	.0280	1-1/4	3/8	**121971**
71	.0260	1-1/4	3/8	**121972**
72	.0250	1-1/8	5/16	**121973**
73	.0240	1-1/8	5/16	**121974**
74	.0225	1	1/4	**121975**
75	.0210	1	1/4	**121976**
76	.0200	7/8	3/16	**121977**
77	.0180	7/8	3/16	**121978**
78	.0160	7/8	3/16	**121979**
79	.0145	3/4	1/8	**121980**
80	.0135	3/4	1/8	**121981**

Package Quantities: Nos. 1-80 = 12/pkg.

JOBBER LENGTH DRILLS

Cobalt / 135° Split Point* / Straight Shank / High Speed Steel

List No. C420S Straw Finish

Fractional Sizes

- Cobalt provides heavy duty construction to increase tool strength
- 135° split point is self centering reducing thrust for ease of penetration & the preferred point for stainless steels
- AIA NAS-907 (Type J) drill specification approved for aircraft applications

Drill Size	Decimal Equivalent	Overall Length	Flute Length	C420S EDP No.
1/64	.0156	3/4	3/16	**130616**
1/32	.0312	1-3/8	1/2	**130623**
3/64	.0469	1-3/4	3/4	**130612**
1/16	.0625	1-7/8	7/8	**130637**
5/64	.0781	2	1	**130645**
3/32	.0938	2-1/4	1-1/4	**130652**
7/64	.1094	2-5/8	1-1/2	**130660**
1/8	.1250	2-3/4	1-5/8	**130678**
9/64	.1406	2-7/8	1-3/4	**130686**
5/32	.1562	3-1/8	2	**130694**
11/64	.1719	3-1/4	2-1/8	**130702**
3/16	.1875	3-1/2	2-5/16	**130710**
13/64	.2031	3-5/8	2-7/16	**130728**
7/32	.2188	3-3/4	2-1/2	**130736**
15/64	.2344	3-7/8	2-5/8	**130744**
1/4,E	.2500	4	2-3/4	**130751**
17/64	.2656	4-1/8	2-7/8	**130769**
9/32	.2812	4-1/4	2-15/16	**130777**
19/64	.2969	4-3/8	3-1/16	**130785**
5/16	.3125	4-1/2	3-3/16	**130793**
21/64	.3281	4-5/8	3-5/16	**130802**
11/32	.3438	4-3/4	3-7/16	**130819**
23/64	.3594	4-7/8	3-1/2	**130827**
3/8	.3750	5	3-5/8	**130835**
25/64	.3906	5-1/8	3-3/4	**130843**
13/32	.4062	5-1/4	3-7/8	**130850**
27/64	.4219	5-3/8	3-15/16	**130868**
7/16	.4375	5-1/2	4-1/16	**130876**
29/64	.4531	5-5/8	4-3/16	**130884**
15/32	.4688	5-3/4	4-5/16	**130892**
31/64	.4844	5-7/8	4-3/8	**130899**
1/2	.5000	6	4-1/2	**130918**

Package Quantities: 3/64" to 9/32" = 12/pkg; 19/64" to 1/2" = 6 pkg.

** 135° split point on sizes 1/16" and larger*

JOBBER LENGTH DRILLS

Cobalt / 135° Split Point / Straight Shank / High Speed Steel

List No. C440S Straw Finish

Letter Sizes

- Cobalt provides heavy duty construction to increase tool strength
- 135° split point is self centering reducing thrust for ease of penetration & the preferred point for stainless steels
- AIA NAS-907 (Type J) drill specification approved for aircraft applications

Drill Size	Decimal Equivalent	Overall Length	Flute Length	C440S EDP No.
A	.2340	3-7/8	2-5/8	132005
B	.2380	4	2-3/4	132013
C	.2420	4	2-3/4	132021
D	.2460	4	2-3/4	132039
F	.2570	4-1/8	2-7/8	132054
G	.2610	4-1/8	2-7/8	132062
H	.2660	4-1/8	2-7/8	132070
I	.2720	4-1/8	2-7/8	132088
J	.2770	4-1/8	2-7/8	132096
K	.2810	4-1/4	2-15/16	132104
L	.2900	4-1/4	2-15/16	132112
M	.2950	4-3/8	3-1/16	132120
N	.3020	4-3/8	3-1/16	132138
O	.3160	4-1/2	3-3/16	132146
P	.3230	4-5/8	3-5/16	132153
Q	.3320	4-3/4	3-7/16	132161
R	.3390	4-3/4	3-7/16	132179
S	.3480	4-7/8	3-1/2	132187
T	.3580	4-7/8	3-1/2	132195
U	.3680	5	3-5/8	132203
V	.3770	5	3-5/8	132211
W	.3860	5-1/8	3-3/4	132229
X	.3970	5-1/8	3-3/4	132237
Y	.4040	5-1/4	3-7/8	132245
Z	.4130	5-1/4	3-7/8	132252

Package Quantities: A to L = 12/pkg; M to Z = 6 pkg.

JOBBER LENGTH DRILLS

Cobalt / 135° Split Point* / Straight Shank / High Speed Steel

List No. C400S Straw Finish

Wire Sizes

- Cobalt provides heavy duty construction to increase tool strength
- 135° split point is self centering reducing thrust for ease of penetration & the preferred point for stainless steels
- AIA NAS-907 (Type J) drill specification approved for aircraft applications

Drill Size	Decimal Equivalent	Overall Length	Flute Length	C400S EDP No.
1	.2280	3-7/8	2-5/8	131593
2	.2210	3-7/8	2-5/8	131585
3	.2130	3-3/4	2-1/2	131577
4	.2090	3-3/4	2-1/2	131569
5	.2055	3-3/4	2-1/2	131551
6	.2040	3-3/4	2-1/2	131544
7	.2010	3-5/8	2-7/16	131536
8	.1990	3-5/8	2-7/16	131528
9	.1960	3-5/8	2-7/16	131510
10	.1935	3-5/8	2-7/16	131502
11	.1910	3-1/2	2-5/16	131494
12	.1890	3-1/2	2-5/16	131486
13	.1850	3-1/2	2-5/16	131478
14	.1820	3-3/8	2-5/16	131460
15	.1800	3-3/8	2-3/16	131452
16	.1770	3-3/8	2-3/16	131445
17	.1730	3-3/8	2-3/16	131437
18	.1695	3-1/4	2-1/8	131429
19	.1660	3-1/4	2-1/8	131411
20	.1610	3-1/4	2-1/8	131403
21	.1590	3-1/4	2-1/8	131395
22	.1570	3-1/8	2	131387
23	.1540	3-1/8	2	131379
24	.1520	3-1/8	2	131361
25	.1495	3	1-7/8	131353
26	.1470	3	1-7/8	131346
27	.1440	3	1-7/8	131338
28	.1405	2-7/8	1-3/4	131320
29	.1360	2-7/8	1-3/4	131312
30	.1285	2-3/4	1-5/8	131304
31	.1200	2-3/4	1-5/8	131296
32	.1160	2-3/4	1-5/8	131288
33	.1130	2-5/8	1-1/2	131270
34	.1110	2-5/8	1-1/2	131262
35	.1100	2-5/8	1-1/2	131254
36	.1065	2-1/2	1-7/16	131247
37	.1040	2-1/2	1-7/16	131239
38	.1015	2-1/2	1-7/16	131221
39	.0995	2-3/8	1-3/8	131213

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List No. C400S Straw Finish . . . *continued*

Drill Size	Decimal Equivalent	Overall Length	Flute Length	C400S EDP No
40	.0980	2-3/8	1-3/8	**131205**
41	.0960	2-3/8	1-3/8	**131197**
42	.0935	2-1/4	1-1/4	**131189**
43	.0890	2-1/4	1-1/4	**131171**
44	.0860	2-1/8	1-1/8	**131163**
45	.0820	2-1/8	1-1/8	**131155**
46	.0810	2-1/8	1-1/8	**131148**
47	.0785	2	1	**131130**
48	.0760	2	1	**131122**
49	.0730	2	1	**131114**
50	.0700	2	1	**131106**
51	.0670	2	1	**131098**
52	.0635	1-7/8	7/8	**131080**
53	.0595	1-7/8	7/8	**131072**
54	.0550	1-7/8	7/8	**131064**
55	.0520	1-7/8	7/8	**131056**
56	.0465	1-3/4	3/4	**131049**
57	.0430	1-3/4	3/4	**131037**
58	.0420	1-5/8	11/16	**131035**
59	.0410	1-5/8	11/16	**131033**
60	.0400	1-5/8	11/16	**131003**
61	.0390	1-5/8	11/16	**131002**
62	.0380	1-1/2	5/8	**130995**
63	.0370	1-1/2	5/8	**130987**
64	.0360	1-1/2	5/8	**130979**
65	.0350	1-1/2	5/8	**130971**
66	.0330	1-3/8	1/2	**130963**
67	.0320	1-3/8	1/2	**130955**
68	.0310	1-3/8	1/2	**130947**
69	.0292	1-3/8	1/2	**130939**
70	.0280	1-1/4	3/8	**130931**
71	.0260	1-1/4	3/8	**130923**
72	.0250	1-1/8	5/16	**130915**
73	.0240	1-1/8	5/16	**130907**
74	.0225	1	1/4	**130898**
75	.0210	1	1/4	**130891**
76	.0200	7/8	3/16	**130883**
77	.0180	7/8	3/16	**130875**
78	.0160	7/8	3/16	**130867**
79	.0145	3/4	3/16	**130859**
80	.0135	3/4	3/16	**130851**

Package Quantities: Nos. 1-80 = 12 / pkg.

** 135° split point on sizes No. 52 and larger*

JOBBER LENGTH DRILLS

Parabolic / 135° Split Point / Straight Shank / High Speed Steel

List No. D372 Bright Finish

List No. D372TN VERTANIUM® Coated

Fractional Sizes

- 135° split point geometry
- High spiral parabolic flute design for superior chip ejection in deep hole drilling
- Design allows drilling to 10x diameter without pecking
- TiN coating for higher feeds & speeds, reduced heat at the cutting edge, added lubricity & longer tool life

Drill Size	Decimal Equivalent	Overall Length	Flute Length	D372 EDP No.	D372TN EDP No.
1/8	.1250	2-3/4	1-5/8	245302	245308
9/64	.1406	2-7/8	1-3/4	245310	245316
5/32	.1562	3-1/8	2	245328	245324
11/64	.1719	3-1/4	2-1/8	245336	245332
3/16	.1875	3-1/2	2-5/16	245344	245340
13/64	.2031	3-5/8	2-7/16	245351	245357
7/32	.2188	3-3/4	2-1/2	245369	245365
15/64	.2344	3-7/8	2-5/8	245377	245373
1/4,E	.2500	4	2-3/4	245385	245381
17/64	.2656	4-1/8	2-7/8	245393	245399
9/32	.2812	4-1/4	2-15/16	245401	245407
19/64	.2969	4-3/8	3-1/16	245419	245415
5/16	.3125	4-1/2	3-3/16	245427	245423
21/64	.3281	4-5/8	3-5/16	245435	245431
11/32	.3438	4-3/4	3-7/16	245443	245449
23/64	.3594	4-7/8	3-1/2	245450	245456
3/8	.3750	5	3-5/8	245468	245464
25/64	.3906	5-1/8	3-3/4	245476	245472
13/32	.4062	5-1/4	3-7/8	245484	245480
27/64	.4219	5-3/8	3-15/16	245492	245498
7/16	.4375	5-1/2	4-1/16	245501	245506
29/64	.4531	5-5/8	4-3/16	245518	245514
15/32	.4688	5-3/4	4-5/16	245527	245522
31/64	.4844	5-7/8	4-3/8	245534	245530
1/2	.5000	6	4-1/2	245542	245548

Package Quantities: 1/8" to 9/32" = 12/pkg; 19/64" to 1/2" = 6/pkg.

JOBBER LENGTH DRILLS

Parabolic / 135° Split Point / Straight Shank / High Speed Steel

List No. D376 Bright Finish

Letter Sizes

- 135° split point geometry
- High spiral parabolic flute design for superior chip ejection in deep hole drilling
- Design allows drilling to 10x diameter without pecking

Drill Size	Decimal Equivalent	Overall Length	Flute Length	D376 EDP No
A	.2340	3-7/8	2-5/8	969250
B	.2380	4	2-3/4	969251

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List No. D376 Bright Finish . . . *continued*

Drill Size	Decimal Equivalent	Overall Length	Flute Length	D376 EDP No.
C	.2420	4	2-3/4	969252
D	.2460	4	2-3/4	969253
F	.2570	4-1/8	2-7/8	969255
G	.2610	4-1/8	2-7/8	969256
H	.2660	4-1/8	2-7/8	969257
I	.2720	4-1/8	2-7/8	969258
J	.2770	4-1/8	2-7/8	969259
K	.2810	4-1/4	2-15/16	969118
L	.2900	4-1/4	2-15/16	969260
M	.2950	4-3/8	3-1/16	969261
N	.3020	4-3/8	3-1/16	969262
O	.3160	4-1/2	3-3/16	969263
P	.3230	4-5/8	3-5/16	969264
Q	.3320	4-3/4	3-7/16	969265
R	.3390	4-3/4	3-7/16	969266
S	.3480	4-7/8	3-1/2	969267
T	.3580	4-7/8	3-1/2	969268
U	.3680	5	3-5/8	969269
V	.3770	5	3-5/8	969270
W	.3860	5-1/8	3-3/4	969271
X	.3970	5-1/8	3-3/4	969272
Y	.4040	5-1/4	3-7/8	969273
Z	.4130	5-1/4	3-7/8	969274

Package Quantities: A to L = 12/pkg; M to Z = 6/pkg.

JOBBER LENGTH DRILLS

Parabolic / 135° Split Point / Straight Shank / High Speed Steel

List No. D374 Bright Finish

Wire Sizes

- 135° split point geometry
- High spiral parabolic flute design for superior chip ejection in deep hole drilling
- Design allows drilling to 10x diameter without pecking

Drill Size	Decimal Equivalent	Overall Length	Flute Length	D374 EDP No.
1	.2280	3-7/8	2-5/8	969141
2	.2210	3-7/8	2-5/8	969142
3	.2130	3-3/4	2-1/2	969143
4	.2090	3-3/4	2-1/2	969144
5	.2055	3-3/4	2-1/2	969145
6	.2040	3-3/4	2-1/2	969146
7	.2010	3-5/8	2-7/16	969147
8	.1990	3-5/8	2-7/16	969148
9	.1960	3-5/8	2-7/16	969149
10	.1935	3-5/8	2-7/16	969150

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List No. D374 Bright Finish . . . *continued*

Drill Size	Decimal Equivalent	Overall Length	Flute Length	D374 EDP No
11	.1910	3-1/2	2-5/16	**969151**
12	.1890	3-1/2	2-5/16	**969152**
13	.1850	3-1/2	2-5/16	**969153**
14	.1820	3-3/8	2-3/16	**969154**
15	.1800	3-3/8	2-3/16	**969155**
16	.1770	3-3/8	2-3/16	**969156**
17	.1730	3-3/8	2-3/16	**969157**
18	.1695	3-1/4	2-1/8	**969158**
19	.1660	3-1/4	2-1/8	**969159**
20	.1610	3-1/4	2-1/8	**969160**
21	.1590	3-1/4	2-1/8	**969161**
22	.1570	3-1/8	2	**969162**
23	.1540	3-1/8	2	**969163**
24	.1520	3-1/8	2	**969164**
25	.1495	3	1-7/8	**969165**
26	.1470	3	1-7/8	**969166**
27	.1440	3	1-7/8	**969167**
28	.1405	2-7/8	1-3/4	**969168**
29	.1360	2-7/8	1-3/4	**969169**
30	.1285	2-3/4	1-5/8	**969170**
31	.1200	2-3/4	1-5/8	**969171**
32	.1160	2-3/4	1-5/8	**969172**
33	.1130	2-5/8	1-1/2	**969173**
34	.1110	2-5/8	1-1/2	**969174**
35	.1100	2-5/8	1-1/2	**969175**
36	.1065	2-1/2	1-7/16	**969176**
37	.1040	2-1/2	1-7/16	**969177**
38	.1015	2-1/2	1-7/16	**969178**
39	.0995	2-3/8	1-3/8	**969179**
40	.0980	2-3/8	1-3/8	**969180**
41	.0960	2-3/8	1-3/8	**969181**
42	.0935	2-1/4	1-1/4	**969182**
43	.0890	2-1/4	1-1/4	**969183**
44	.0860	2-1/8	1-1/8	**969184**
45	.0820	2-1/8	1-1/8	**969185**
46	.0810	2-1/8	1-1/8	**969186**
47	.0785	2	1	**969187**
48	.0760	2	1	**969188**
49	.0730	2	1	**969189**
50	.0700	2	1	**969190**
51	.0670	2	1	**969191**
52	.0635	1-7/8	7/8	**969192**

Package Quantities: Nos. 1 to 52 = 12/pkg.

SCREW MACHINE LENGTH DRILLS

General Purpose / Straight Shank / 118° Point / High Speed Steel

List No. S920P Bright Finish

List No. S920TN VERTANIUM® Coated

Fractional Sizes

- 118° point geometry
- Short length for enhanced rigidity
- Bright finish, excellent for non-ferrous applications & low tensile steels
- TiN coating for higher feeds & speeds, reduced heat at the cutting edge, added lubricity & longer tool life

Drill Size	Decimal Equivalent	Overall Length	Flute Length	Shank Dia.	Shank Length	S920P EDP No.	S920TN EDP No.
3/64	.0469	1-3/8	1/2			136402	
1/16	.0625	1-5/8	5/8			136410	136416
5/64	.0781	1-11/16	11/16			136428	136424
3/32	.0938	1-3/4	3/4			136436	136432
7/64	.1094	1-13/16	13/16			136444	136440
1/8	.1250	1-7/8	7/8			136451	136457
9/64	.1406	1-15/16	15/16			136469	136465
5/32	.1562	2-1/16	1			136477	136473
11/64	.1719	2-1/8	1-1/16			136485	136481
3/16	.1875	2-3/16	1-1/8			136493	136499
13/64	.2031	2-1/4	1-3/16			136502	136507
7/32	.2188	2-3/8	1-1/4			136519	136515
15/64	.2344	2-7/16	1-5/16			136527	136523
1/4,E	.2500	2-1/2	1-3/8			136535	136531
17/64	.2656	2-5/8	1-7/16			136543	136549
9/32	.2812	2-11/16	1-1/2			136550	136556
19/64	.2969	2-3/4	1-9/16			136568	136564
5/16	.3125	2-13/16	1-5/8			136576	136572
21/64	.3281	2-15/16	1-11/16			136584	136580
11/32	.3438	3	1-11/16			136592	136598
23/64	.3594	3-1/16	1-3/4			136599	136606
3/8	.3750	3-1/8	1-13/16			136618	136614
25/64	.3906	3-1/4	1-7/8			136626	136622
13/32	.4062	3-5/16	1-15/16			136634	136630
27/64	.4219	3-3/8	2			136642	136648
7/16	.4375	3-7/16	2-1/16			136659	136655
29/64	.4531	3-9/16	2-1/8			136667	136663
15/32	.4688	3-5/8	2-1/8			136675	136671
31/64	.4844	3-11/16	2-3/16			136683	136689
1/2	.5000	3-3/4	2-1/4			136691	136697
33/64	.5156	3-7/8	2-3/8	33/64	1-1/2	138804	
17/32	.5312	3-7/8	2-3/8	17/32	1-1/2	138812	
35/64	.5469	4	2-1/2	35/64	1-1/2	138820	
9/16	.5625	4	2-1/2	9/16	1-1/2	138838	
37/64	.5781	4-1/8	2-5/8	37/64	1-1/2	138846	
19/32	.5938	4-1/8	2-5/8	19/32	1-1/2	138853	
39/64	.6094	4-1/4	2-3/4	39/64	1-1/2	138861	
5/8	.6250	4-1/4	2-3/4	5/8	1-1/2	138879	

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List No. S920P Bright Finish . . . *continued*
List No. S920TN VERTANIUM® Coated

Drill Size	Decimal Equivalent	Overall Length	Flute Length	Shank Dia.	Shank Length	S920P EDP No.	S920TN EDP No.
41/64	.6406	4-1/2	2-7/8	41/64	1-5/8	**138887**	
21/32	.6562	4-1/2	2-7/8	21/32	1-5/8	**138895**	
43/64	.6719	4-5/8	2-7/8	43/64	1-3/4	**138903**	
11/16	.6875	4-5/8	2-7/8	11/16	1-3/4	**138911**	
45/64	.7031	4-3/4	3	45/64	1-3/4	**138929**	
23/32	.7188	4-3/4	3	23/32	1-3/4	**138937**	
47/64	.7344	5	3-1/8	47/64	1-7/8	**138945**	
3/4	.7500	5	3-1/8	3/4	1-7/8	**138952**	
49/64	.7656	5-1/8	3-1/4	49/64	1-7/8	**138960**	
25/32	.7812	5-1/8	3-1/4	25/32	1-7/8	**138978**	
51/64	.7969	5-1/4	3-3/8	51/64	1-7/8	**138986**	
13/16	.8125	5-1/4	3-3/8	13/16	1-7/8	**138994**	
53/64	.8281	5-3/8	3-1/2	53/64	1-7/8	**139000**	
27/32	.8438	5-3/8	3-1/2	27/32	1-7/8	**139018**	
55/64	.8594	5-1/2	3-1/2	55/64	2	**139026**	
7/8	.8750	5-1/2	3-1/2	7/8	2	**139034**	
57/64	.8906	5-5/8	3-5/8	57/64	2	**139042**	
29/32	.9062	5-5/8	3-5/8	29/32	2	**139059**	
59/64	.9219	5-3/4	3-3/4	59/64	2	**139067**	
15/16	.9375	5-3/4	3-3/4	15/16	2	**139075**	
61/64	.9531	5-7/8	3-7/8	61/64	2	**139083**	
31/32	.9688	5-7/8	3-7/8	31/32	2	**139091**	
63/64	.9844	6	4	63/64	2	**139109**	
1	1.0000	6	4	1	2	**139117**	
1-1/16	1.0625	6-1/4	4	1	2-1/4	**139125**	
1-1/8	1.1250	6-3/8	4	1	2-1/4	**139133**	
1-3/16	1.1875	6-5/8	4-1/4	1	2-1/4	**139141**	
1-1/4	1.2500	6-3/4	4-3/8	1	2-1/4	**139158**	
1-5/16	1.3125	7	4-3/8	1-1/4	2-1/2	**139169**	
1-3/8	1.3750	7-1/8	4-1/2	1-1/4	2-1/2	**139174**	
1-7/16	1.4375	7-3/8	4-3/4	1-1/4	2-1/2	**139185**	
1-1/2	1.5000	7-1/2	4-7/8	1-1/4	2-1/2	**139196**	
1-9/16	1.5625	7-3/4	4-7/8	1-1/2	2-3/4	**139207**	
1-5/8	1.6250	7-3/4	4-7/8	1-1/2	2-3/4	**139218**	
1-11/16	1.6875	8	5-1/8	1-1/2	2-3/4	**139229**	
1-3/4	1.7500	8	5-1/8	1-1/2	2-3/4	**139230**	
1-13/16	1.8125	8-1/4	5-3/8	1-1/2	2-3/4	**139241**	
1-7/8	1.8750	8-1/4	5-3/8	1-1/2	2-3/4	**139252**	
1-15/16	1.9375	8-1/2	5-5/8	1-1/2	2-3/4	**139263**	
2	2.0000	8-1/2	5-5/8	1-1/2	2-3/4	**139274**	

Package Quantities: 3/64" - 9/32" =12/pkg; 19/64" - 1/2" = 6/pkg; 33/64" - larger = 1/pkg.

SCREW MACHINE LENGTH DRILLS

General Purpose / Straight Shank / 118° Point / High Speed Steel

List No. S940P Bright Finish

Letter Sizes

- 118° point geometry
- Short length for enhanced rigidity
- Bright finish, excellent for non-ferrous applications & low tensile steels

Drill Size	Decimal Equivalent	Overall Length	Flute Length	S940P EDP No.
A	.2340	2-7/16	15/16	**138002**
B	.2380	2-1/2	1-3/8	**138010**
C	.2420	2-1/2	1-3/8	**138028**
D	.2460	2-1/2	1-3/8	**138036**
F	.2570	2-5/8	1-7/16	**138051**
G	.2610	2-5/8	1-7/16	**138069**
H	.2660	2-11/16	1-1/2	**138077**
I	.2720	2-11/16	1-1/2	**138085**
J	.2770	2-11/16	1-1/2	**138093**
K	.2810	2-11/16	1-1/2	**138101**
L	.2900	2-3/4	1-9/16	**138119**
M	.2950	2-3/4	1-9/16	**138127**
N	.3020	2-13/16	1-5/8	**138135**
O	.3160	2-15/16	1-11/16	**138143**
P	.3230	2-15/16	1-11/16	**138150**
Q	.3320	3	1-11/16	**138168**
R	.3390	3	1-11/16	**138176**
S	.3480	3-1/16	1-3/4	**138184**
T	.3580	3-1/16	1-3/4	**138192**
U	.3680	3-1/8	1-13/16	**138200**
V	.3770	3-1/4	1-7/8	**138218**
W	.3860	3-1/4	1-7/8	**138226**
X	.3970	3-5/16	1-15/16	**138234**
Y	.4040	3-5/16	1-15/16	**138242**
Z	.4130	3-3/8	2	**138259**

Package Quantities: A to L = 12/pkg; M to Z = 6/pkg.

SCREW MACHINE LENGTH DRILLS

General Purpose / Straight Shank / 118° Point / High Speed Steel

List No. S900P Bright Finish

List No. S900TN VERTANIUM® Coated

Wire Sizes

- 118° point geometry
- Short length for enhanced rigidity
- Bright finish, excellent for non-ferrous applications & low tensile steels
- TiN coating for higher feeds & speeds, reduced heat at the cutting edge, added lubricity & longer tool life

Drill Size	Decimal Equivalent	Overall Length	Flute Length	S900P EDP No.	S900TN EDP No.
1	.2280	2-7/16	1-5/16	134597	134593
2	.2210	2-7/16	1-5/16	134589	134585
3	.2130	2-3/8	1-1/4	134571	134577
4	.2090	2-3/8	1-1/4	134563	134569
5	.2055	2-3/8	1-1/4	134555	134551
6	.2040	2-3/8	1-1/4	134548	134544
7	.2010	2-1/4	1-3/16	134530	134536
8	.1990	2-1/4	1-3/16	134522	134528
9	.1960	2-1/4	1-3/16	134514	134510
10	.1935	2-1/4	1-3/16	134506	134502
11	.1910	2-1/4	1-3/16	134498	134494
12	.1890	2-1/4	1-3/16	134480	134486
13	.1850	2-3/16	1-1/8	134472	134478
14	.1820	2-3/16	1-1/8	134464	134460
15	.1800	2-3/16	1-1/8	134456	134452
16	.1770	2-3/16	1-1/8	134449	134445
17	.1730	2-3/16	1-1/8	134431	134437
18	.1695	2-1/8	1-1/16	134423	134429
19	.1660	2-1/8	1-1/16	134415	134411
20	.1610	2-1/8	1-1/16	134407	134403
21	.1590	2-1/8	1-1/16	134399	134395
22	.1570	2-1/8	1-1/16	134381	134387
23	.1540	2-1/16	1	134373	134379
24	.1520	2-1/16	1	134365	134361
25	.1495	2-1/16	1	134357	134353
26	.1470	2-1/16	1	134340	134346
27	.1440	2-1/16	1	134332	134338
28	.1405	1-15/16	15/16	134324	134320
29	.1360	1-15/16	15/16	134316	134312
30	.1285	1-15/16	15/16	134308	134304
31	.1200	1-7/8	7/8	134290	134296
32	.1160	1-7/8	7/8	134282	134288
33	.1130	1-7/8	7/8	134274	134270
34	.1110	1-7/8	7/8	134266	134262
35	.1100	1-7/8	7/8	134258	134254
36	.1065	1-13/16	13/16	134241	134247
37	.1040	1-13/16	13/16	134233	134239

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List No. S900P Bright Finish . . . *continued*
List No. S900TN VERTANIUM® Coated

Drill Size	Decimal Equivalent	Overall Length	Flute Length	S900P EDP No.	S900TN EDP No.
38	.1015	1-13/16	13/16	134225	134221
39	.0995	1-13/16	13/16	134217	134213
40	.0980	1-13/16	13/16	134209	134205
41	.0960	1-13/16	13/16	134191	134197
42	.0935	1-3/4	3/4	134183	134189
43	.0890	1-3/4	3/4	134175	134171
44	.0860	1-3/4	3/4	134167	134163
45	.0820	1-3/4	3/4	134159	134155
46	.0810	1-3/4	3/4	134142	134148
47	.0785	1-3/4	3/4	134134	134130
48	.0760	1-11/16	11/16	134126	134122
49	.0730	1-11/16	11/16	134118	134114
50	.0700	1-11/16	11/16	134099	134106
51	.0670	1-11/16	11/16	134092	134098
52	.0635	1-11/16	11/16	134084	134080
53	.0595	1-5/8	5/8	134076	134072
54	.0550	1-5/8	5/8	134068	134064
55	.0520	1-5/8	5/8	134050	134056
56	.0465	1-3/8	1/2	134043	134049
57	.0430	1-3/8	1/2	134035	134031
58	.0420	1-3/8	1/2	134027	134023
59	.0410	1-3/8	1/2	134019	134015
60	.0400	1-3/8	1/2	134002	134007

Package Quantities: Nos. 1 to 60 = 12/pkg.

SCREW MACHINE LENGTH DRILLS

Heavy Duty / Straight Shank / 135° Split Point / High Speed Steel

List No. H920 Black Oxide
List No. H920TN VERTANIUM® Coated

Fractional Sizes

- 135° split point geometry
- AIA NAS 907 (Type C) approved for aircraft applications
- Black oxide finish for increased wear resistance & improved lubricity reducing chip welding & galling
- Short length for added rigidity
- Excellent choice for portable applications

Drill Size	Decimal Equivalent	Overall Length	Flute Length	H920 EDP No.	H920TN EDP No.
1/16	.0625	1-5/8	5/8	135602	137602
5/64	.0781	1-11/16	11/16	135603	137603
3/32	.0938	1-3/4	3/4	135604	137604
7/64	.1094	1-13/16	13/16	135605	137605
1/8	.1250	1-7/8	7/8	135606	137606
9/64	.1406	1-15/16	15/16	135607	137607
5/32	.1562	2-1/16	1	135608	137608
11/64	.1719	2-1/8	1-1/16	135609	137609
3/16	.1875	2-3/16	1-1/8	135610	137610
13/64	.2031	2-1/4	1-3/16	135611	137611

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List No. H-920 Black Oxide . . . *continued*
List No. H0920TN VERTANIUM® Coated

Drill Size	Decimal Equivalent	Overall Length	Flute Length	H920 EDP No.	H920TN EDP No.
7/32	.2188	2-3/8	1-1/4	135612	137612
15/64	.2344	2-7/16	1-5/16	135613	137613
1/4	.2500	2-1/2	1-3/8	135614	137614
17/64	.2656	2-5/8	1-7/16	135615	137615
9/32	.2812	2-11/16	1-1/2	135616	137616
19/64	.2969	2-3/4	1-9/16	135617	137617
5/16	.3125	2-13/16	1-5/8	135618	137618
21/64	.3281	2-15/16	1-11/16	135619	137619
11/32	.3438	3	1-11/16	135620	137620
23/64	.3594	3-1/16	1-3/4	135621	137621
3/8	.3750	3-1/8	1-13/16	135622	137622
25/64	.3906	3-1/4	1-7/8	135623	137623
13/32	.4062	3-5/16	1-15/16	135624	137624
27/64	.4219	3-3/8	2	135625	137625
7/16	.4375	3-7/16	2-1/16	135626	137626
29/64	.4531	3-9/16	2-1/8	135627	137627
15/32	.4688	3-5/8	2-1/8	135628	137628
31/64	.4844	3-11/16	2-3/16	135629	137629
1/2	.5000	3-3/4	2-1/4	135630	137630

Package Quantities: 1/16" to 9/32" = 12/pkg; 19/64" to 1/2" = 6/pkg.

SCREW MACHINE LENGTH DRILLS

Heavy Duty / Straight Shank / 135° Split Point* / High Speed Steel

List No. H-900 Black Oxide
List No. H-900TN VERTANIUM® Coated

Wire Sizes

- 135° split point geometry
- AIA NAS 907 (Type C) approved for aircraft applications
- Black oxide finish for improved lubricity reducing chip welding & galling
- Short length for added rigidity
- Excellent choice for portable applications

Drill Size	Decimal Equivalent	Overall Length	Flute Length	H900 EDP No.	H900TN EDP No.
1	.2280	2-7/16	1-5/16	135631	137631
2	.2210	2-7/16	1-5/16	135632	137632
3	.2130	2-3/8	1-1/4	135633	137633
4	.2090	2-3/8	1-1/4	135634	137634
5	.2055	2-3/8	1-1/4	135635	137635
6	.2040	2-3/8	1-1/4	135636	137636
7	.2010	2-1/4	1-3/16	135637	137637
8	.1990	2-1/4	1-3/16	135638	137638
9	.1960	2-1/4	1-3/16	135639	137639
10	.1935	2-1/4	1-3/16	135640	137640
11	.1910	2-1/4	1-3/16	135641	137641
12	.1890	2-1/4	1-3/16	135642	137642
13	.1850	2-3/16	1-1/8	135643	137643
14	.1820	2-3/16	1-1/8	135644	137644
15	.1800	2-3/16	1-1/8	135645	137645

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List No. H-900 Black Oxide . . . *continued*
List No. H-900TN VERTANIUM® Coated

Drill Size	Decimal Equivalent	Overall Length	Flute Length	H900 EDP No.	H900TN EDP No.
16	.1770	2-3/16	1-1/8	135646	137646
17	.1730	2-3/16	1-1/8	135647	137647
18	.1695	2-1/8	1-1/16	135648	137648
19	.1660	2-1/8	1-1/16	135649	137649
20	.1610	2-1/8	1-1/16	135650	137650
21	.1590	2-1/8	1-1/16	135651	137651
22	.1570	2-1/8	1-1/16	135652	137652
23	.1540	2-1/16	1	135653	137653
24	.1520	2-1/16	1	135654	137654
25	.1495	2-1/16	1	135655	137655
26	.1470	2-1/16	1	135656	137656
27	.1440	2-1/16	1	135657	137657
28	.1405	1-15/16	15/16	135658	137658
29	.1360	1-15/16	15/16	135659	137659
30	.1285	1-15/16	15/16	135660	137660
31	.1200	1-7/8	7/8	135661	137661
32	.1160	1-7/8	7/8	135662	137662
33	.1130	1-7/8	7/8	135663	137663
34	.1110	1-7/8	7/8	135664	137664
35	.1100	1-7/8	7/8	135665	137665
36	.1065	1-13/16	13/16	135666	137666
37	.1040	1-13/16	13/16	135667	137667
38	.1015	1-13/16	13/16	135668	137668
39	.0995	1-13/16	13/16	135669	137669
40	.0980	1-13/16	13/16	135670	137670
41	.0960	1-13/16	13/16	135671	137671
42	.0935	1-3/4	3/4	135672	137672
43	.0890	1-3/4	3/4	135673	137673
44	.0860	1-3/4	3/4	135674	137674
45	.0820	1-3/4	3/4	135675	137675
46	.0810	1-3/4	3/4	135676	137676
47	.0785	1-3/4	3/4	135677	137677
48	.0760	1-11/16	11/16	135678	137678
49	.0730	1-11/16	11/16	135679	137679
50	.0700	1-11/16	11/16	135680	137680
51	.0670	1-11/16	11/16	135681	137681
52	.0635	1-11/16	11/16	135682	137682
53	.0595	1-5/8	5/8	135683	137683
54	.0550	1-5/8	5/8	135684	137684
55	.0520	1-5/8	5/8	135685	137685
56	.0465	1-3/8	1/2	135686	137686
57	.0430	1-3/8	1/2	135687	137687
58	.0420	1-3/8	1/2	135688	137688
59	.0410	1-3/8	1/2	135689	137689
60	.0400	1-3/8	1/2	135690	137690

Package Quantites: Nos. 1 to 60 = 12/pkg

**135° split point on sizes No. 52 and larger*

SCREW MACHINE LENGTH DRILLS

Cobalt Heavy Duty / Straight Shank / 135° Split Point
High Speed Steel

List No. C-920 Straw Finish

Fractional Sizes

- Cobalt provides longer tool life and more heat resistance than HSS
- Short length for rigid strong tools
- 135° split point is self centering reducing thrust for ease of penetration, minimizes work hardening & the preferred point for stainless steels

Drill Size	Decimal Equivalent	Overall Length	Flute Length	C920 EDP No.
1/16	.0625	1-5/8	5/8	**935001**
5/64	.0781	1-11/16	11/16	**935002**
3/32	.0938	1-3/4	3/4	**935003**
7/64	.1094	1-13/16	13/16	**935004**
1/8	.1250	1-7/8	7/8	**935005**
9/64	.1406	1-15/16	15/16	**935006**
5/32	.1562	2-1/16	1	**935007**
11/64	.1719	2-1/8	1-1/6	**935008**
3/16	.1875	2-3/16	1-1/8	**935009**
13/64	.2031	2-1/4	1-3/16	**935010**
7/32	.2188	2-3/8	1-1/4	**935011**
15/64	.2344	2-7/16	1-5/16	**935012**
1/4,E	.2500	2-1/2	1-3/8	**935013**
17/64	.2656	2-5/8	1-7/16	**935014**
9/32	.2812	2-11/16	1-1/2	**935015**
19/64	.2969	2-3/4	1-9/16	**935016**
5/16	.3125	2-13/16	1-5/8	**935017**
21/64	.3281	2-15/16	1-11/16	**935018**
11/32	.3438	3	1-11/16	**935019**
23/64	.3594	3-1/16	1-3/4	**935020**
3/8	.3750	3-1/8	1-13/16	**935021**
25/64	.3906	3-1/4	1-7/8	**935022**
13/32	.4062	3-5/16	1-15/16	**935023**
27/64	.4219	3-3/8	2	**935024**
7/16	.4375	3-7/16	2-1/16	**935025**
29/64	.4531	3-9/16	2-1/8	**935026**
15/32	.4688	3-5/8	2-1/8	**935027**
31/64	.4844	3-11/16	2-3/16	**935028**
1/2	.5000	3-3/4	2-1/4	**935029**

Package Quantities: 1/16" to 9/32" = 12/pkg; 19/64" to 1/2" = 6/pkg.

SCREW MACHINE LENGTH DRILLS

Cobalt Heavy Duty / Straight Shank / 135° Split Point
High Speed Steel

List No. C-940 Straw Finish

Letter Sizes

- ■Cobalt provides longer tool life and more heat resistance than HSS
- ■Short length for rigid strong tools
- ■135° split point is self centering reducing thrust for ease of penetration, minimizes work hardening & the preferred point for stainless steels

Drill Size	Decimal Equivalent	Overall Length	Flute Length	C940 EDP No.
A	.2340	2-7/16	1-5/16	**935100**
B	.2380	2-1/2	1-3/8	**935101**
C	.2420	2-1/2	1-3/8	**935102**
D	.2460	2-1/2	1-3/8	**935103**
F	.2570	2-5/8	1-7/16	**935105**
G	.2610	2-5/8	1-7/16	**935106**
H	.2660	2-11/16	1-1/2	**935107**
I	.2720	2-11/16	1-1/2	**935108**
J	.2770	2-11/16	1-1/2	**935109**
K	.2810	2-11/16	1-1/2	**935110**
L	.2900	2-3/4	1-9/16	**935111**
M	.2950	2-3/4	1-9/16	**935112**
N	.3020	2-13/16	1-5/8	**935113**
O	.3160	2-15/16	1-11/16	**935114**
P	.3230	2-15/16	1-11/16	**935115**
Q	.3320	3	1-11/16	**935116**
R	.3390	3	1-11/16	**935117**
S	.3480	3-1/16	1-3/4	**935118**
T	.3580	3-1/16	1-3/4	**935119**
U	.3680	3-1/8	1-13/16	**935120**
V	.3770	3-1/4	1-7/8	**935121**
W	.3860	3-1/4	1-7/8	**935122**
X	.3970	3-5/16	1-15/16	**935123**
Y	.4040	3-5/16	1-15/16	**935124**
Z	.4130	3-3/8	2	**935125**

Package Quantities: A to L = 12/pkg; M to Z = 6/pkg.

SCREW MACHINE LENGTH DRILLS

Cobalt Heavy Duty / Straight Shank / 135° Split Point*
High Speed Steel

List No. C-900 Straw Finish

Wire Sizes

- Cobalt provides longer tool life and more heat resistance than HSS
- Short length for rigid strong tools
- 135° split point is self centering reducing thrust for ease of penetration, minimizes work hardening & the preferred point for stainless steels

Drill Size	Decimal Equivalent	Overall Length	Flute Length	C900 EDP No.
1	.2280	2-7/16	1-5/16	935030
2	.2210	2-7/16	1-5/16	935031
3	.2130	2-3/8	1-1/4	935032
4	.2090	2-3/8	1-1/4	935033
5	.2055	2-3/8	1-1/4	935034
6	.2040	2-3/8	1-1/4	935035
7	.2010	2-1/4	1-3/16	935036
8	.1990	2-1/4	1-3/16	935037
9	.1960	2-1/4	1-3/16	935038
10	.1935	2-1/4	1-3/16	935039
11	.1910	2-1/4	1-3/16	935040
12	.1890	2-1/4	1-3/16	935041
13	.1850	2-3/16	1-1/8	935042
14	.1820	2-3/16	1-1/8	935043
15	.1800	2-3/16	1-1/8	935044
16	.1770	2-3/16	1-1/8	935045
17	.1730	2-3/16	1-1/8	935046
18	.1695	2-1/8	1-1/16	935047
19	.1660	2-1/8	1-1/16	935048
20	.1610	2-1/8	1-1/16	935049
21	.1590	2-1/8	1-1/16	935050
22	.1570	2-1/8	1-1/16	935051
23	.1540	2-1/16	1	935052
24	.1520	2-1/16	1	935053
25	.1495	2-1/16	1	935054
26	.1470	2-1/16	1	935055
27	.1440	2-1/16	1	935056
28	.1405	1-15/16	15/16	935057
29	.1360	1-15/16	15/16	935058
30	.1285	1-15/16	15/16	935059
31	.1200	1-7/8	7/8	935060
32	.1160	1-7/8	7/8	935061
33	.1130	1-7/8	7/8	935062
34	.1110	1-7/8	7/8	935063
35	.1100	1-7/8	7/8	935064
36	.1065	1-13/16	13/16	935065
37	.1040	1-13/16	13/16	935066
38	.1015	1-13/16	13/16	935067

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List No. C-900 Straw Finish . . . *continued*

Drill Size	Decimal Equivalent	Overall Length	Flute Length	C900 EDP No.
39	.0995	1-13/16	13/16	935068
40	.0980	1-13/16	13/16	935069
41	.0960	1-13/16	13/16	935070
42	.0935	1-3/4	3/4	935071
43	.0890	1-3/4	3/4	935072
44	.0860	1-3/4	3/4	935073
45	.0820	1-3/4	3/4	935074
46	.0810	1-3/4	3/4	935075
47	.0785	1-3/4	3/4	935076
48	.0760	1-11/16	11/16	935077
49	.0730	1-11/16	11/16	935078
50	.0700	1-11/16	11/16	935079
51	.0670	1-11/16	11/16	935080
52	.0635	1-11/16	11/16	935081
53	.0595	1-5/8	5/8	935082
54	.0550	1-5/8	5/8	935083
55	.0520	1-5/8	5/8	935084
56	.0465	1-3/8	1/2	935085
57	.0430	1-3/8	1/2	935086
58	.0420	1-3/8	1/2	935087
59	.0410	1-3/8	1/2	935088
60	.0400	1-3/8	1/2	935089

Package Quantities: Nos. 1 to 60 = 12/pkg.
** 135° split point on sizes No. 52 and larger*

EXTRA LENGTH DRILLS

Heavy Duty / Straight Shank / 118° Notched Point / High Speed Steel

List No. T820E Black Oxide Finish

Fractional Sizes

- 118° K notched point for self centering, reduced thrust for ease of penetration
- Heavy duty construction for extra tool strength
- Black oxide finish for improved lubricity, reducing chip welding & galling

Drill Size	Decimal Equivalent	OAL = 8" Flute = 5-1/2"	OAL = 10" Flute = 7-1/2"	OAL = 12" Flute = 9"
3/32	.0938	941001	—	—
7/64	.1094	941002	—	—
1/8	.1250	941003	941101	941201
9/64	.1406	941004	941102	941202
5/32	.1562	941005	941103	941203
11/64	.1719	941006	941104	941204
3/16	.1875	941007	941105	941205
13/64	.2031	941008	941106	941206
7/32	.2188	941009	941107	941207
15/64	.2344	941010	941108	941208

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List No. T820E Black Oxide Finish . . . *continued*

Drill Size	Decimal Equivalent	OAL = 8" Flute = 5-1/2"	OAL = 10" Flute = 7-1/2"	OAL = 12" Flute = 9"
1/4	.2500	941011	941109	941209
17/64	.2656	941012	941110	941210
9/32	.2812	941013	941111	941211
19/64	.2969	941014	941112	941212
5/16	.3125	941015	941113	941213
21/64	.3281	941016	941114	941214
11/32	.3438	941017	941115	941215
23/64	.3594	941018	941116	941216
3/8	.3750	941019	941117	941217
25/64	.3906	941020	941118	941218
13/32	.4062	941021	941119	941219
27/64	.4219	—	941120	941220
7/16	.4375	941023	941121	941221
29/64	.4531	—	941122	941222
15/32	.4688	941025	941123	941223
31/64	.4844	—	941124	941224
1/2	.5000	941027	941125	941225
33/64	.5156	—	941126	941226
17/32	.5312	—	941127	941227
35/64	.5469	—	—	941228
9/16	.5625	—	—	941229
37/64	.5781	—	—	941230
19/32	.5938	—	—	941231
39/64	.6094	—	—	941232
5/8	.6250	—	—	941233
41/64	.6406	—	—	941234
21/32	.6562	—	—	941235
43/64	.6719	—	—	941236
11/16	.6875	—	—	941237
45/64	.7031	—	—	941238
23/32	.7188	—	—	941239
47/64	.7344	—	—	941240
3/4	.7500	—	—	941241

Package Quantities: all sizes = 1/pkg.

AC EXTENSION DRILLS

Straight Shank / 135° Split Point / 6” Extension

List No. T806 Black Oxide Finish

Fractional Sizes

Drill Size	Dec. Equiv.	Flute Length	Overall Length	T806 EDP No.
3/64	.0469	3/4	6	160000
1/16	.0625	7/8	6	160001
5/64	.0781	1	6	160002
3/32	.0938	1-1/4	6	160003
7/64	.1094	1-1/2	6	160004
1/8	.1250	1-5/8	6	160005
9/64	.1406	1-3/4	6	160006
5/32	.1562	2	6	160007
11/64	.1719	2-1/8	6	160008
3/16	.1875	2-5/16	6	160009
13/64	.2031	2-7/16	6	160010
7/32	.2188	2-1/2	6	160011
15/64	.2344	2-5/8	6	160012
1/4,E	.2500	2-3/4	6	160013
17/64	.2656	2-5/8	6	160014
9/32	.2812	3-1/16	6	160016
19/64	.2969	3-1/16	6	160017
5/16	.3125	3-3/16	6	160018
21/64	.3281	3-7/16	6	160019
11/32	.3438	3-7/16	6	160020
23/64	.3594	3-1/2	6	160021
3/8	.3750	3-5/8	6	160022
25/64	.3906	3-3/4	6	160023
13/32	.4062	3-3/4	6	160024
27/64	.4219	3-15/16	6	160025
7/16	.4375	4-1/16	6	160026
29/64	.4531	4-3/16	6	160027
15/32	.4688	4-5/16	6	160028
31/64	.4844	4-3/8	6	160029
1/2	.5000	4-1/2	6	160030

Package Quantities: 3/64” to 9/32” = 12/pkg; 19/64” to 1/2” = 6/pkg; 33/64” and up = 1/pkg.

- Heavy duty flute construction for increased tool strength
- Black oxide finish for increased wear resistance & improved lubricity reducing chip welding & galling
- AIA-NAS 907 specifications approved for aircraft applications
- 135° split point for self centering, reducing thrust for ease of penetration & the preferred point for stainless steel

AC EXTENSION DRILLS

Straight Shank / 135° Split Point / 6” Extension

List No. T806 Black Oxide Finish

Wire Sizes

Drill Size	Dec. Equiv.	Flute Length	Overall Length	T806 EDP No.
1	.2280	2-5/8	6	160031
2	.2210	2-5/8	6	160032
3	.2130	2-1/2	6	160033
4	.2090	2-1/2	6	160034
5	.2055	2-1/2	6	160035
6	.2040	2-1/2	6	160036
7	.2010	2-7/16	6	160037
8	.1990	2-7/16	6	160038
9	.1960	2-7/16	6	160039
10	.1935	2-7/16	6	160040
11	.1910	2-5/16	6	160041
12	.1890	2-5/16	6	160042
13	.1850	2-5/16	6	160043
14	.1820	2-3/16	6	160044
15	.1800	2-3/16	6	160045
16	.1770	2-3/16	6	160046
17	.1730	2-3/16	6	160047
18	.1695	2-1/8	6	160048
19	.1660	2-1/8	6	160049
20	.1610	2-1/8	6	160050
21	.1590	2-1/8	6	160051
22	.1570	2	6	160052
23	.1540	2	6	160053
24	.1520	2	6	160054
25	.1495	1-7/8	6	160055
26	.1470	1-7/8	6	160056
27	.1440	1-7/8	6	160057
28	.1405	1-3/4	6	160058
29	.1360	1-3/4	6	160059
30	.1285	1-5/8	6	160060
31	.1200	1-5/8	6	160061
32	.1160	1-5/8	6	160062
33	.1130	1-1/2	6	160063
34	.1110	1-1/2	6	160064
35	.1100	1-1/2	6	160065
36	.1065	1-7/16	6	160066
37	.1040	1-7/16	6	160067
38	.1015	1-7/16	6	160068
39	.0995	1-3/8	6	160069
40	.0980	1-3/8	6	160070
41	.0960	1-3/8	6	160071

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- Heavy duty flute construction for increased tool strength
- Black oxide finish for increased wear resistance & improved lubricity reducing chip welding & galling
- AIA-NAS 907 specifications approved for aircraft applications
- 135° split point for self centering, reducing thrust for ease of penetration & the preferred point for stainless steel

List No. T806 Black Oxide Finish . . . *continued*

Drill Size	Dec. Equiv.	Flute Length	Overall Length	T806 EDP No.
42	.0935	1-1/4	6	160072
43	.0890	1-1/4	6	160073
44	.0860	1-1/4	6	160074
45	.0820	1-1/8	6	160075
46	.0810	1-1/8	6	160076
47	.0785	1-1/8	6	160077
48	.0760	1	6	160078
49	.0730	1	6	160079
50	.0700	1	6	160080
51	.0670	1	6	160081
52	.0635	7/8	6	160082
53	.0595	7/8	6	160083
54	.0550	7/8	6	160084
55	.0520	7/8	6	160085
56	.0465	3/4	6	160086
57	.0430	3/4	6	160087
58	.0420	11/16	6	160088
59	.0410	11/16	6	160089
60	.0400	11/16	6	160090

Package Quantities: Nos. 1 to 60 = 12/pkg.

AC EXTENSION DRILLS

Straight Shank / 135° Split Point / 6” Extension

List No. T806 Black Oxide Finish

Letter Sizes

Drill Size	Dec. Equiv.	Flute Length	Overall Length	T806 EDP No.
C	.2420	2-3/4	6	160333
D	.2460	2-3/4	6	160334
F	.2570	2-7/8	6	160335
H	.2660	2-5/8	6	160336
I	.2720	2-7/8	6	160337
L	.2900	2-15/16	6	160338
O	.3160	3-3/16	6	160339
Q	.3320	3-7/16	6	160340
U	.3680	3-5/8	6	160341
V	.3770	3-5/8	6	160342
Y	.4040	3-7/8	6	160343

Package Quantities: A to L = 12/pkg; M to Z = 6/pkg.

- Heavy duty flute construction for increased tool strength
- Black oxide finish for increased wear resistance & improved lubricity reducing chip welding & galling
- AIA-NAS 907 specifications approved for aircraft applications
- 135° split point for self centering, reducing thrust for ease of penetration & the preferred point for stainless steel

AC EXTENSION DRILLS

Straight Shank / 135° Split Point / 12” Extension

List No. T812 Black Oxide Finish

Fractional Sizes

Drill Size	Dec. Equiv.	Flute Length	Overall Length	T812 EDP No.
3/64	.0469	3/4	12	160195
1/16	.0625	7/8	12	160196
5/64	.0781	1	12	160197
3/32	.0938	1-1/4	12	160198
7/64	.1094	1-1/2	12	160199
1/8	.1250	1-5/8	12	160200
9/64	.1406	1-3/4	12	160201
5/32	.1562	2	12	160202
11/64	.1719	2-1/8	12	160203
3/16	.1875	2-5/16	12	160204
13/64	.2031	2-7/16	12	160205
7/32	.2188	2-1/2	12	160206
15/64	.2344	2-5/8	12	160207
1/4,E	.2500	2-3/4	12	160208
17/64	.2656	2-5/8	12	160209
9/32	.2812	3-1/16	12	160210
19/64	.2969	3-1/16	12	160211
5/16	.3125	3-3/16	12	160212
21/64	.3281	3-7/16	12	160213
11/32	.3438	3-7/16	12	160214
23/64	.3594	3-1/2	12	160215
3/8	.3750	3-5/8	12	160216
25/64	.3906	3-3/4	12	160217
13/32	.4062	3-3/4	12	160218
27/64	.4219	3-15/16	12	160219
7/16	.4375	4-1/16	12	160220
29/64	.4531	4-3/16	12	160221
15/32	.4688	4-5/16	12	160222
31/64	.4844	4-3/8	12	160223
1/2	.5000	4-1/2	12	160224

Package Quantities: 3/64” to 9/32” = 12/pkg; 19/64” to 1/2” = 6/pkg; 33/64” and up = 1/pkg.

- Heavy duty flute construction for increased tool strength
- Black oxide finish for increased wear resistance & improved lubricity reducing chip welding & galling
- AIA-NAS 907 specifications approved for aircraft applications
- 135° split point for self centering, reducing thrust for ease of penetration & the preferred point for stainless steel
- 12” OAL for extended reach

AC EXTENSION DRILLS

Straight Shank / 135° Split Point / 12” Extension

List No. T812 Black Oxide Finish

Wire Sizes

Drill Size	Dec. Equiv.	Flute Length	Overall Length	T812 EDP No.
1	.2280	2-5/8	12	160225
2	.2210	2-5/8	12	160226
3	.2130	2-1/2	12	160227
4	.2090	2-1/2	12	160228
5	.2055	2-1/2	12	160229
6	.2040	2-1/2	12	160230
7	.2010	2-7/16	12	160231
8	.1990	2-7/16	12	160232
9	.1960	2-7/16	12	160233
10	.1935	2-7/16	12	160234
11	.1910	2-5/16	12	160235
12	.1890	2-5/16	12	160236
13	.1850	2-5/16	12	160237
14	.1820	2-3/16	12	160238
15	.1800	2-3/16	12	160239
16	.1770	2-3/16	12	160240
17	.1730	2-3/16	12	160241
18	.1695	2-1/8	12	160242
19	.1660	2-1/8	12	160243
20	.1610	2-1/8	12	160244
21	.1590	2-1/8	12	160245
22	.1570	2	12	160246
23	.1540	2	12	160247
24	.1520	2	12	160248
25	.1495	1-7/8	12	160249
26	.1470	1-7/8	12	160250
27	.1440	1-7/8	12	160251
28	.1405	1-3/4	12	160252
29	.1360	1-3/4	12	160253
30	.1285	1-5/8	12	160254
31	.1200	1-5/8	12	160255
32	.1160	1-5/8	12	160256
33	.1130	1-1/2	12	160257
34	.1110	1-1/2	12	160258
35	.1100	1-1/2	12	160259
36	.1065	1-7/16	12	160260
37	.1040	1-7/16	12	160261
38	.1015	1-7/16	12	160262
39	.0995	1-3/8	12	160263
40	.0980	1-3/8	12	160264
41	.0960	1-3/8	12	160265

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- Heavy duty flute construction for increased tool strength
- Black oxide finish for increased wear resistance & improved lubricity reducing chip welding & galling
- AIA-NAS 907 specifications approved for aircraft applications
- 135° split point for self centering, reducing thrust for ease of penetration & the preferred point for stainless steel
- 12” OAL for extended reach

List No. T812 Black Oxide Finish . . . *continued*

Drill Size	Dec. Equiv.	Flute Length	Overall Length	T812 EDP No.
42	.0935	1-1/4	12	160266
43	.0890	1-1/4	12	160267
44	.0860	1-1/4	12	160268
45	.0820	1-1/8	12	160269
46	.0810	1-1/8	12	160270
47	.0785	1-1/8	12	160271
48	.0760	1	12	160272
49	.0730	1	12	160273
50	.0700	1	12	160274
51	.0670	1	12	160275
52	.0635	7/8	12	160276
53	.0595	7/8	12	160277
54	.0550	7/8	12	160278
55	.0520	7/8	12	160279
56	.0465	3/4	12	160280
57	.0430	3/4	12	160281
58	.0420	11/16	12	160282
59	.0410	11/16	12	160283
60	.0400	11/16	12	160284

Package Quantities: Nos. 1 to 60 = 12/pkg.

AC EXTENSION DRILLS

Straight Shank / 135° Split Point / 12” Extension

List No. T812 Black Oxide Finish

Letter Sizes

Drill Size	Dec. Equiv.	Flute Length	Overall Length	T812 EDP No.
C	.2420	2-3/4	12	160322
D	.2460	2-3/4	12	160323
F	.2570	2-7/8	12	160324
H	.2660	2-7/8	12	160325
I	.2720	2-7/8	12	160326
L	.2900	2-15/16	12	160327
O	.3160	3-3/16	12	160328
Q	.3320	3-7/16	12	160329
U	.3680	3-5/8	12	160330
V	.3770	3-5/8	12	160331
Y	.4040	3-7/8	12	160332

Package Quantities: A to L = 12/pkg; M to Z = 6/pkg.

- Heavy duty flute construction for increased tool strength
- Black oxide finish for increased wear resistance & improved lubricity reducing chip welding & galling
- AIA-NAS 907 specifications approved for aircraft applications
- 135° split point for self centering, reducing thrust for ease of penetration & the preferred point for stainless steel
- 12” OAL for extended reach

TAPER LENGTH DRILLS

General Purpose / Straight shank / 118° Point / High Speed Steel

List No. T820S Black Oxide Finish
List No. T820P Bright Finish
List No. T820TN VERTANIUM® Coated

Fractional Sizes

- General purpose flute construction for use in a wide variety of materials
- Taper length for extended reach
- Black oxide finish for increased wear resistance & improved lubricity, reducing chip welding & galling
- Bright is excellent for non-ferrous materials & low tensile steels
- TiN coating for higher feeds & speeds, reduced heat at the cutting edge, added lubricity & longer tool life

Drill Size	Decimal Equivalent	Overall Length	Flute Length	T820S EDP No.	T820P EDP No.	T820TN EDP No
1/16	.0625	3	1-3/4	146802	147801	
5/64	.0781	3-3/4	2	146803	147803	
3/32	.0938	4-1/4	2-1/4	146804	147805	
7/64	.1094	4-5/8	2-1/2	146805	147806	
1/8	.1250	5-1/8	2-3/4	146807	147804	147800
9/64	.1406	5-3/8	3	146815	147812	147818
5/32	.1562	5-3/8	3	146823	147820	147826
11/64	.1719	5-3/4	3-3/8	146831	147838	147834
3/16	.1875	5-3/4	3-3/8	146849	147846	147842
13/64	.2031	6	3-5/8	146856	147853	147859
7/32	.2188	6	3-5/8	146864	147861	147867
15/64	.2344	6-1/8	3-3/4	146872	147879	147875
1/4,E	.2500	6-1/8	3-3/4	146880	147887	147883
17/64	.2656	6-1/4	3-7/8	146898	147895	147891
9/32	.2812	6-1/4	3-7/8	146906	147903	147909
19/64	.2969	6-3/8	4	146914	147911	147917
5/16	.3125	6-3/8	4	146922	147929	147925
21/64	.3281	6-1/2	4-1/8	146930	147937	147933
11/32	.3438	6-1/2	4-1/8	146948	147945	147941
23/64	.3594	6-3/4	4-1/4	146955	147952	147958
3/8	.3750	6-3/4	4-1/4	146963	147960	147966
25/64	.3906	7	4-3/8	146971	147978	147974
13/32	.4062	7	4-3/8	146989	147986	147982
27/64	.4219	7-1/4	4-5/8	146997	147994	147990
7/16	.4375	7-1/4	4-5/8	147003	148000	148006
29/64	.4531	7-1/2	4-3/4	147011	148018	148014
15/32	.4688	7-1/2	4-3/4	147029	148026	148022
31/64	.4844	7-3/4	4-3/4	147037	148034	148030
1/2	.5000	7-3/4	4-3/4	147045	148042	148048
33/64	.5156	8	4-3/4	147052	148059	
17/32	.5312	8	4-3/4	147060	148067	
35/64	.5469	8-1/4	4-7/8	147078	148075	
9/16	.5625	8-1/4	4-7/8	147086	148083	
37/64	.5781	8-3/4	4-7/8	147094	148091	
19/32	.5938	8-3/4	4-7/8	147102	148109	

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List No. T820S Black Oxide Finish . . . *continued*
List No. T820P Bright Finish
List No. T820TN VERTANIUM® Coated

Drill Size	Decimal Equivalent	Overall Length	Flute Length	T820S EDP No.	T820P EDP No.	T820TN EDP No.
39/64	.6094	8-3/4	4-7/8	**147110**	**148117**	
5/8	.6250	8-3/4	4-7/8	**147128**	**148125**	
41/64	.6406	9	5-1/8	**147136**	**148133**	
21/32	.6562	9	5-1/8	**147144**	**148141**	
43/64	.6719	9-1/4	5-3/8	**147151**	**148158**	
11/16	.6875	9-1/4	5-3/8	**147169**	**148166**	
45/64	.7031	9-1/2	5-5/8	**147177**	**148174**	
23/32	.7188	9-1/2	5-5/8	**147185**	**148182**	
47/64	.7344	9-3/4	5-7/8	**147193**	**148190**	
3/4	.7500	9-3/4	5-7/8	**147201**	**148208**	
49/64	.7656	9-7/8	6	**147219**	**148216**	
25/32	.7812	9-7/8	6	**147227**	**148224**	
51/64	.7969	10	6-1/8	**147235**	**148232**	
13/16	.8125	10	6-1/8	**147243**	**148240**	
53/64	.8281	10	6-1/8	**147250**	**148257**	
27/32	.8438	10	6-1/8	**147268**	**148265**	
55/64	.8594	10	6-1/8	**147276**	**148273**	
7/8	.8750	10	6-1/8	**147284**	**148281**	
57/64	.8906	10	6-1/8	**147292**	**148299**	
29/32	.9062	10	6-1/8	**147300**	**148307**	
59/64	.9219	10-3/4	6-1/8	**147318**	**148315**	
15/16	.9375	10-3/4	6-1/8	**147326**	**148323**	
61/64	.9531	11	6-3/8	**147334**	**148331**	
31/32	.9688	11	6-3/8	**147342**	**148349**	
63/64	.9844	11	6-3/8	**147359**	**148356**	
1	1.0000	11	6-3/8	**147367**	**148364**	
1-1/32	1.0312	11-1/8	6-1/2	**147383**	**148380**	
1-1/16	1.0625	11-1/4	6-5/8	**147409**	**148406**	
1-3/32	1.0938	11-1/2	6-7/8	**147425**	**148422**	
1-1/8	1.1250	11-3/4	7-1/8	**147441**	**148448**	
1-5/32	1.1562	11-7/8	7-1/4	**147466**	**148463**	
1-3/16	1.1875	12	7-3/8	**147482**	**148489**	
1-7/32	1.2188	12-1/8	7-1/2	**147508**	**148505**	
1-1/4	1.2500	12-1/2	7-7/8	**147524**	**148521**	
1-9/32	1.2812	14-1/8	8-1/2	**147532**	**148539**	
1-5/16	1.3125	14-1/4	8-5/8	**147540**	**148547**	
1-11/32	1.3438	14-3/8	8-3/4	**147557**	**148554**	
1-3/8	1.3750	14-1/2	8-7/8	**147565**	**148562**	
1-13/32	1.4062	14-5/8	9	**147573**	**148570**	
1-7/16	1.4375	14-3/4	9-1/8	**147581**	**148588**	
1-15/32	1.4688	14-7/8	9-1/4	**147599**	**148596**	
1-1/2	1.5000	15	9-3/8	**147607**	**148604**	
1-9/16	1.5625	15-1/4	9-5/8	**147615**	**148612**	
1-5/8	1.6250	15-5/8	9-7/8	**147623**	**148620**	
1-3/4	1.7500	16-1/4	10-1/2	**147649**	**148646**	

Package Quantities: 1/16” to 9/32” = 12/pkg; 19/64” to 3/8” = 6/pkg; 25/64” and up = 1/pkg.

TAPER LENGTH DRILLS

General Purpose / Straight Shank / 118° Point / High Speed Steel

List No. T840S Black Oxide Finish

Letter Sizes

Drill Size	Decimal Equivalent	Overall Length	Flute Length	T840S EDP No.
A	.2340	6-1/8	3-3/4	**146005**
B	.2380	6-1/8	3-3/4	**146013**
C	.2420	6-1/8	3-3/4	**146021**
D	.2460	6-1/8	3-3/4	**146039**
F	.2570	6-1/4	3-7/8	**146054**
G	.2610	6-1/4	3-7/8	**146062**
H	.2660	6-1/4	3-7/8	**146070**
I	.2720	6-1/4	3-7/8	**146088**
J	.2770	6-1/4	3-7/8	**146096**
K	.2810	6-1/4	3-7/8	**146104**
L	.2900	6-3/8	4	**146112**
M	.2950	6-3/8	4	**146120**
N	.3020	6-3/8	4	**146138**
O	.3160	6-1/2	4-1/8	**146146**
P	.3230	6-1/2	4-1/8	**146153**
Q	.3320	6-1/2	4-1/8	**146161**
R	.3390	6-1/2	4-1/8	**146179**
S	.3480	6-3/4	4-1/4	**146187**
T	.3580	6-3/4	4-1/4	**146195**
U	.3680	6-3/4	4-1/4	**146203**
V	.3770	7	4-3/8	**146211**
W	.3860	7	4-3/8	**146229**
X	.3970	7	4-3/8	**146237**
Y	.4040	7	4-3/8	**146245**
Z	.4130	7-1/4	4-5/8	**146252**

Package Quantities: A to L = 12/pkg; M to Z = 6/pkg.

- General purpose flute construction for use in a wide variety of materials
- Taper length for extended reach
- Black oxide finish for increased wear resistance & improved lubricity, reducing chip welding & galling

TAPER LENGTH DRILLS

General Purpose / Straight Shank / 118° Point / High Speed Steel

List No. T800S Black Oxide Finish

Wire Sizes

- General purpose flute construction for use in a wide variety of materials
- Taper length for extended reach
- Black oxide finish for increased wear resistance & improved lubricity, reducing chip welding & galling

Drill Size	Decimal Equivalent	Overall Length	Flute Length	T800S EDP No.
1	.2280	6-1/8	3-3/4	144596
2	.2210	6-1/8	3-3/4	144588
3	.2130	6	3-5/8	144570
4	.2090	6	3-5/8	144562
5	.2055	6	3-5/8	144554
6	.2040	6	3-5/8	144547
7	.2010	6	3-5/8	144539
8	.1990	6	3-5/8	144521
9	.1960	6	3-5/8	144513
10	.1935	6	3-5/8	144505
11	.1910	6	3-5/8	144497
12	.1890	6	3-5/8	144489
13	.1850	5-3/4	3-3/8	144471
14	.1820	5-3/4	3-3/8	144463
15	.1800	5-3/4	3-3/8	144455
16	.1770	5-3/4	3-3/8	144448
17	.1730	5-3/4	3-3/8	144430
18	.1695	5-3/4	3-3/8	144422
19	.1660	5-3/4	3-3/8	144414
20	.1610	5-3/4	3-3/8	144406
21	.1590	5-3/4	3-3/8	144398
22	.1570	5-3/4	3-3/8	144380
23	.1540	5-3/8	3	144372
24	.1520	5-3/8	3	144364
25	.1495	5-3/8	3	144356
26	.1470	5-3/8	3	144349
27	.1440	5-3/8	3	144331
28	.1405	5-3/8	3	144323
29	.1360	5-3/8	3	144315
30	.1285	5-3/8	3	144307
31	.1200	5-1/8	2-3/4	144299
32	.1160	5-1/8	2-3/4	144281
33	.1130	5-1/8	2-3/4	144273
34	.1110	5-1/8	2-3/4	144265
35	.1100	5-1/8	2-3/4	144257
36	.1065	4-5/8	2-1/2	144240
37	.1040	4-5/8	2-1/2	144232
38	.1015	4-5/8	2-1/2	144224
39	.0995	4-5/8	2-1/2	144216
40	.0980	4-5/8	2-1/2	144208

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List No. T800S Black Oxide Finish . . . *continued*

Drill Size	Decimal Equivalent	Overall Length	Flute Length	T800S EDP No.
41	.0960	4-5/8	2-1/2	**144190**
42	.0935	4-1/4	2-1/4	**144182**
43	.0890	4-1/4	2-1/4	**144174**
44	.0860	4-1/4	2-1/4	**144166**
45	.0820	4-1/4	2-1/4	**144158**
46	.0810	4-1/4	2-1/4	**144141**
47	.0785	4-1/4	2-1/4	**144133**
48	.0760	3-3/4	2	**144125**
49	.0730	3-3/4	2	**144117**
50	.0700	3-3/4	2	**144109**
51	.0670	3-3/4	2	**144091**
52	.0635	3-3/4	2	**144083**
53	.0595	3	1-3/4	**144075**
54	.0550	3	1-3/4	**144067**
55	.0520	3	1-3/4	**144059**
56	.0465	2-1/4	1-1/8	**144042**
57	.0430	2-1/4	1-1/8	**144034**
58	.0420	2-1/4	1-1/8	**144026**
59	.0410	2-1/4	1-1/8	**144018**
60	.0400	2-1/4	1-1/8	**144002**

Package Quantities: Nos. 1 to 60 = 12/pkg.

TAPER LENGTH DRILLS

Heavy Duty / Tanged Straight Shank / 118° Notched Point
High Speed Steel

List No. T820H Black Oxide Finish

Fractional Sizes

- ■Heavy duty construction to increase tool strength
- ■20% longer flute length than regular taper length for increased regrinds & reach
- ■Tanged shank that can be used with an ASA drill driver

Drill Size	Decimal Equivalent	Shank Dia.	Overall Length	Flute Length	Sleeve Size	T820H EDP No.
1/8	.1250	1/8	5-1/8	3-3/8	1	**152409**
9/64	.1406	9/64	5-3/8	3-5/8	1	**152417**
5/32	.1562	5/32	5-3/8	3-3/4	1	**152425**
11/64	.1719	11/64	5-3/4	4-1/8	1	**152433**
3/16	.1875	3/16	5-3/4	4-1/8	1	**152441**
13/64	.2031	13/64	6	4-3/8	1	**152458**
7/32	.2188	7/32	6	4-3/8	1	**152466**
15/64	.2344	15/64	6-1/8	4-13/16	1	**152474**
1/4	.2500	1/4	6-1/8	4-13/16	1	**152482**
17/64	.2656	17/64	6-1/4	5	1	**152490**
9/32	.2812	9/32	6-1/4	5	1	**152508**
19/64	.2969	19/64	6-3/8	5-1/8	1	**152516**
5/16	.3125	5/16	6-3/8	5-1/8	1	**152524**
21/64	.3281	21/64	6-1/2	5-1/4	2	**152532**
11/32	.3438	11/32	6-1/2	5-1/4	2	**152540**
23/64	.3594	23/64	6-3/4	5-3/8	2	**152557**

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List No. T820H Black Oxide Finish . . . *continued*

Drill Size	Decimal Equivalent	Shank Dia.	Overall Length	Flute Length	Sleeve Size	T820H EDP No.
3/8	.3750	3/8	6-3/4	5-3/8	2	**152565**
25/64	.3906	25/64	7	5-5/8	2	**152573**
13/32	.4062	13/32	7	5-5/8	2	**152581**
27/64	.4219	27/64	7-1/4	5-11/16	2	**152599**
7/16	.4375	7/16	7-1/4	5-11/16	2	**152607**
29/64	.4531	29/64	7-1/2	4-3/4	2	**152615**
15/32	.4688	15/32	7-1/2	4-3/4	2	**152623**
31/64	.4844	31/64	7-3/4	4-3/4	2	**152631**
1/2	.5000	1/2	7-3/4	4-3/4	2	**152649**
33/64	.5156	1/2	8	6	2	**152656**
17/32	.5312	1/2	8	6	2	**152664**
35/64	.5469	1/2	8-1/4	6-1/4	2	**152672**
9/16	.5625	1/2	8-1/4	6-1/4	2	**152680**
37/64	.5781	1/2	8-3/4	6-1/2	2	**152698**
19/32	.5938	1/2	8-3/4	6-1/2	2	**152706**
39/64	.6094	1/2	8-3/4	6-1/2	2	**152714**
5/8	.6250	1/2	8-3/4	6-1/2	2	**152722**
41/64	.6406	5/8	9	6-3/4	3	**152730**
21/32	.6562	5/8	9	6-3/4	3	**152748**
11/16	.6875	5/8	9-1/4	6-7/8	3	**152755**
23/32	.7188	5/8	9-1/2	7-1/8	3	**152763**
3/4	.7500	3/4	9-3/4	7-3/8	3	**152771**

Package Quantities: 3/32" to 9/32" = 12/pkg; 19/64" to 3/8" = 6/pkg; 25/64" to 3/4" = 1/pkg.

TAPER LENGTH DRILLS

Cobalt Heavy Duty / 135° Split Point / Straight Shank

List No. T820C Straw Finish

Fractional Sizes

- Cobalt provides heavy duty construction to increase tool strength
- 20% longer flute length than regular for increased regrinds & the ability to drill deeper holes
- Split Point for centering

Drill Size	Decimal Equivalent	Overall Length	Flute Length	T820C EDP No.
3/32	.0938	4-1/4	2-11/16	**936501**
1/8	.1250	5-1/8	3-3/8	**936502**
9/64	.1406	5-3/8	3-5/8	**936503**
5/32	.1562	5-3/8	3-3/4	**936504**
11/64	.1719	5-3/4	4-1/8	**936505**
3/16	.1875	5-3/4	4-1/8	**936506**
13/64	.2031	6	4-3/8	**936507**
7/32	.2188	6	4-3/8	**936508**
15/64	.2344	6-1/8	4-13/16	**936509**
1/4	.2500	6-1/8	4-13/16	**936510**
17/64	.2656	6-1/4	5	**936511**
9/32	.2812	6-1/4	5	**936512**
19/64	.2969	6-3/8	5-1/8	**936513**
5/16	.3125	6-3/8	5-1/8	**936514**
21/64	.3281	6-1/2	5-1/4	**936515**
11/32	.3438	6-1/2	5-1/4	**936516**

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List No. T820C Straw Finish . . . *continued*

Drill Size	Decimal Equivalent	Overall Length	Flute Length	T820C EDP No.
23/64	.3594	6-3/4	5-3/8	**936517**
3/8	.3750	6-3/4	5-3/8	**936518**
25/64	.3906	7	5-5/8	**936519**
13/32	.4062	7	5-5/8	**936520**
27/64	.4219	7-1/4	5-11/16	**936521**
7/16	.4375	7-1/4	5-11/16	**936522**
29/64	.4531	7-1/2	5-3/4	**936523**
15/32	.4688	7-1/2	5-3/4	**936524**
31/64	.4844	7-3/4	5-3/4	**936525**
1/2	.5000	7-3/4	5-3/4	**936526**

Package Quantities: 3/32" to 9/32" = 12/pkg; 19/64" to 3/8" = 6/pkg; 25/64" and up = 1/pkg

TAPER LENGTH DRILLS

Automotive / Tanged Straight Shank / 118° Point / High Speed Steel

List No. T820A Black Oxide Finish

Fractional Sizes

- Tanged shank can be used with ASA drill driver-see tech page 175 for dimensions
- Heavy duty construction for extra tool strength
- Taper length for extended reach
- Black oxide finish for increased wear resistance and improved lubricity reducing chip welding & galling

Drill Size	Decimal Equivalent	Overall Length	Flute Length	T820A EDP No.
1/8	.1250	5-1/8	2-3/4	**140008**
9/64	.1406	5-3/8	3	**140016**
5/32	.1562	5-3/8	3	**140024**
11/64	.1719	5-3/4	3-3/8	**140032**
3/16	.1875	5-3/4	3-3/8	**140040**
13/64	.2031	6	3-5/8	**140057**
7/32	.2188	6	3-5/8	**140065**
15/64	.2344	6-1/8	3-3/4	**140073**
1/4	.2500	6-1/8	3-3/4	**140081**
17/64	.2656	6-1/4	3-7/8	**140099**
9/32	.2812	6-1/4	3-7/8	**140107**
19/64	.2969	6-3/8	4	**140115**
5/16	.3125	6-3/8	4	**140123**
21/64	.3281	6-1/2	4-1/8	**140131**
11/32	.3438	6-1/2	4-1/8	**140149**
23/64	.3594	6-3/4	4-1/4	**140156**
3/8	.3750	6-3/4	4-1/4	**140164**
25/64	.3906	7	4-3/8	**140172**
13/32	.4062	7	4-3/8	**140180**
27/64	.4219	7-1/4	4-5/8	**140198**
7/16	.4375	7-1/4	4-5/8	**140206**
29/64	.4531	7-1/2	4-3/4	**140214**
15/32	.4688	7-1/2	4-3/4	**140222**
31/64	.4844	7-3/4	4-3/4	**140230**
1/2	.5000	7-3/4	4-3/4	**140248**
33/64	.5156	8	4-3/4	**140255**

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List No. T820A Black Oxide Finish . . . *continued*

Drill Size	Decimal Equivalent	Overall Length	Flute Length	T820A EDP No.
17/32	.5312	8	4-3/4	140263
35/64	.5469	8-1/4	4-7/8	140271
9/16	.5625	8-1/4	4-7/8	140289
37/64	.5781	8-3/4	4-7/8	140297
19/32	.5938	8-3/4	4-7/8	140305
41/64	.6406	9	5-1/8	140339
21/32	.6562	9	5-1/8	140347
43/64	.6719	9-1/4	5-3/8	140354
11/16	.6875	9-1/4	5-3/8	140362

Package Quantities: 3/32" to 9/32" = 12/pkg; 19/64" to 3/8" = 6/pkg; 25/64" and up =1/pkg.

TAPER LENGTH DRILLS

Parabolic / Tanged Straight Shank / 135° Split Point
High Speed Steel

List No. T872 Bright Finish
List No. T872TN VERTANIUM® Coated

Fractional Sizes

- High spiral parabolic flute design for superior chip ejection in deep hole drilling
- Design allows drilling to 10x diameter or more without pecking (sufficient coolant required)
- Bright is excellent for non-ferrous materials & low tensile steels
- TiN coating for higher feeds & speeds, reduced heat at the cutting edge, added lubricity & longer tool life
- Tanged shank that can be used with an ASA drill driver

Drill Size	Decimal Equivalent	Overall Length	Flute Length	T872 EDP No.	T872TN EDP No.
1/8	.1250	5-1/8	3-3/8	245005	245001
9/64	.1406	5-3/8	3-5/8	245013	245019
5/32	.1562	5-3/8	3-3/4	245021	245027
11/64	.1719	5-3/4	4-1/8	245039	245035
3/16	.1875	5-3/4	4-1/8	245047	245043
13/64	.2031	6	4-3/8	245054	245050
7/32	.2188	6	4-3/8	245062	245068
15/64	.2344	6-1/8	4-13/16	245070	245076
1/4	.2500	6-1/8	4-13/16	245088	245084
17/64	.2656	6-1/4	5	245096	245092
9/32	.2812	6-1/4	5	245104	
19/64	.2969	6-3/8	5-1/8	245112	245118
5/16	.3125	6-3/8	5-1/8	245120	245127
21/64	.3281	6-1/2	5-1/4	245138	245134
11/32	.3438	6-1/2	5-1/4	245146	245142
23/64	.3594	6-3/4	5-3/8	245153	245159

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List No. T872 Bright Finish . . . *continued*
List No. T872TN Vertanium® Coated

Drill Size	Decimal Equivalent	Overall Length	Flute Length	T872 EDP No.	T872TN EDP No.
3/8	.3750	6-3/4	5-3/8	**245161**	**245167**
25/64	.3906	7	5-5/8	**245179**	**245175**
13/32	.4062	7	5-5/8	**245187**	**245183**
27/64	.4219	7-1/4	5-11/16	**245195**	**245191**
7/16	.4375	7-1/4	5-11/16	**245203**	**245209**
29/64	.4531	7-1/2	5-3/4	**245211**	**245217**
15/32	.4688	7-1/2	5-3/4	**245229**	**245225**
31/64	.4844	7-3/4	5-3/4	**245237**	**245233**
1/2	.5000	7-3/4	5-3/4	**245245**	**245241**
17/32	.5312	8	6	**245246**	**–**

Package Quantities: 1/8" to 9/32" = 12/pkg; 19/64" to 3/8" = 6/pkg; 25/64" and up = 1/pkg

TAPER LENGTH DRILLS

Coolant Hole / Regular Helix / 118° Notched Point / High Speed Steel

List No. T820O Black Oxide Finish

Fractional Sizes

- ■Heavy duty construction to increase tool strength
- ■Coolant feeding for deeper hole drilling & higher penetration rates. Keeps the cutting edge cooler for added tool life.

Drill Size	Decimal Equivalent	Overall Length	Flute Length	T820O EDP No.
3/8	.3750	6-3/4	4-1/4	**937201**
25/64	.3906	7	4-3/8	**937202**
13/32	.4062	7	4-3/8	**937203**
27/64	.4219	7-1/4	4-5/8	**937204**
7/16	.4375	7-1/4	4-5/8	**937205**
29/64	.4531	7-1/2	4-3/4	**937206**
15/32	.4688	7-1/2	4-3/4	**937207**
31/64	.4844	7-3/4	4-3/4	**937208**
1/2	.5000	7-3/4	5	**937209**
33/64	.5156	8	5-1/4	**937210**
17/32	.5312	8	5-1/4	**937211**
35/64	.5469	8-1/4	5-3/8	**937212**
9/16	.5625	8-1/4	5-3/8	**937213**
37/64	.5781	8-1/2	5-5/8	**937214**
19/32	.5938	8-1/2	5-5/8	**937215**
39/64	.6094	8-3/4	5-3/4	**937216**
5/8	.6250	8-3/4	5-3/4	**937217**
41/64	.6406	9	5-7/8	**937218**
21/32	.6562	9	5-7/8	**937219**
43/64	.6719	9-1/4	6	**937220**
11/16	.6875	9-1/4	6	**937221**

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List No. T820O Black Oxide Finish . . . *continued*

Drill Size	Decimal Equivalent	Overall Length	Flute Length	T820O EDP No.
45/64	.7031	9-1/2	6-3/16	**937222**
23/32	.7188	9-1/2	6-3/16	**937223**
47/64	.7344	9-3/4	6-3/8	**937224**
3/4	.7500	9-3/4	6-3/8	**937225**
49/64	.7656	9-7/8	6-1/2	**937226**
25/32	.7812	9-7/8	6-1/2	**937227**
51/64	.7969	10	6-5/8	**937228**
13/16	.8125	10	6-5/8	**937229**
53/64	.8281	10-1/4	6-3/4	**937230**
27/32	.8438	10-1/4	6-3/4	**937231**
55/64	.8594	10-1/2	7	**937232**
7/8	.8750	10-1/2	7	**937233**
57/64	.8906	10-5/8	7	**937234**
29/32	.9062	10-5/8	7	**937235**
59/64	.9219	10-3/4	7	**937236**
15/16	.9375	10-3/4	7	**937237**
61/64	.9531	10-7/8	7-1/8	**937238**
31/32	.9688	10-7/8	7-1/8	**937239**
63/64	.9844	11	7-3/16	**937240**
1	1.0000	11	7-3/16	**937241**
1-1/32	1.0312	11-1/8	7-5/16	**937242**
1-1/16	1.0625	11-1/4	7-3/8	**937243**
1-3/32	1.0938	11-1/2	7-5/8	**937244**
1-1/8	1.1250	11-3/4	7-7/8	**937245**
1-5/32	1.1562	11-7/8	8	**937246**
1-3/16	1.1875	12	8-1/8	**937247**
1-7/32	1.2188	12-1/8	8-1/8	**937248**
1-1/4	1.2500	12-1/2	8-1/2	**937249**

Package Quantities: 1/8" to 9/32" = 12/pkg; 19/64" to 3/8" = 6/pkg; 25/64" and up = 1/pkg

TAPER SHANK DRILLS

General Purpose / High Speed Steel / 118° Point

List No. T120S Black Oxide Finish
List No. T120TN VERTANIUM® Coated

Fractional Sizes

- Standard shank sizes
- General purpose flute construction for use in a wide variety of materials
- Black oxide finish for increased wear resistance & improved lubricity, reducing chip welding & galling
- TiN coating for higher feeds & speeds, reduced heat at the cutting edge, added lubricity & longer tool life

Drill Size	Decimal Equivalent	Overall Length	Flute Length	Shank Taper No.	T120S EDP No.	T120TN EDP No.
1/8	.1250	5-1/8	1-7/8	1	183008	
9/64	.1406	5-3/8	2-1/8	1	183016	
5/32	.1562	5-3/8	2-1/8	1	183024	
11/64	.1719	5-3/4	2-1/2	1	183032	
3/16	.1875	5-3/4	2-1/2	1	183040	
13/64	.2031	6	2-3/4	1	183057	
7/32	.2188	6	2-3/4	1	183065	
15/64	.2344	6-1/8	2-7/8	1	183073	
1/4	.2500	6-1/8	2-7/8	1	183081	
17/64	.2656	6-1/4	3	1	183099	
9/32	.2812	6-1/4	3	1	183107	
19/64	.2969	6-3/8	3-1/8	1	183115	
5/16	.3125	6-3/8	3-1/8	1	183123	
21/64	.3281	6-1/2	3-1/4	1	183131	
11/32	.3438	6-1/2	3-1/4	1	183149	185149
23/64	.3594	6-3/4	3-1/2	1	183156	
3/8	.3750	6-3/4	3-1/2	1	183164	185164
25/64	.3906	7	3-5/8	1	183172	
13/32	.4062	7	3-5/8	1	183180	185180
27/64	.4219	7-1/4	3-7/8	1	183198	
7/16	.4375	7-1/4	3-7/8	1	183206	185206
29/64	.4531	7-1/2	4-1/8	1	183214	
15/32	.4688	7-1/2	4-1/8	1	183222	185222
31/64	.4844	8-1/4	4-3/8	2	183230	
1/2	.5000	8-1/4	4-3/8	2	183248	185248
33/64	.5156	8-1/2	4-5/8	2	183255	
17/32	.5312	8-1/2	4-5/8	2	183263	185263
35/64	.5469	8-3/4	4-7/8	2	183271	
9/16	.5625	8-3/4	4-7/8	2	183289	185289
37/64	.5781	8-3/4	4-7/8	2	183297	
19/32	.5938	8-3/4	4-7/8	2	183305	185305
39/64	.6094	8-3/4	4-7/8	2	183313	
5/8	.6250	8-3/4	4-7/8	2	183321	185321
41/64	.6406	9	5-1/8	2	183339	
21/32	.6562	9	5-1/8	2	183347	185347
43/64	.6719	9-1/4	5-3/8	2	183354	
11/16	.6875	9-1/4	5-3/8	2	183362	185362
45/64	.7031	9-1/2	5-5/8	2	183370	
23/32	.7188	9-1/2	5-5/8	2	183388	185388

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List No. T120S Black Oxide Finish . . . *continued*

List No. T120TN VERTANIUM® Coated

Drill Size	Decimal Equivalent	Overall Length	Flute Length	Shank Taper No.	T120S EDP No.	T120TN EDP No.
47/64	.7344	9-3/4	5-7/8	2	**183396**	
3/4	.7500	9-3/4	5-7/8	2	**183404**	**185404**
49/64	.7656	9-7/8	6	2	**183412**	
25/32	.7812	9-7/8	6	2	**183420**	**185420**
51/64	.7969	10-3/4	6-1/8	3	**183438**	
13/16	.8125	10-3/4	6-1/8	3	**183446**	**185446**
53/64	.8281	10-3/4	6-1/8	3	**183453**	
27/32	.8438	10-3/4	6-1/8	3	**183461**	**185461**
55/64	.8594	10-3/4	6-1/8	3	**183479**	
7/8	.8750	10-3/4	6-1/8	3	**183487**	**185487**
57/64	.8906	10-3/4	6-1/8	3	**183495**	
29/32	.9062	10-3/4	6-1/8	3	**183503**	**185503**
59/64	.9219	10-3/4	6-1/8	3	**183511**	
15/16	.9375	10-3/4	6-1/8	3	**183529**	**185529**
61/64	.9531	11	6-3/8	3	**183537**	
31/32	.9688	11	6-3/8	3	**183545**	**185545**
63/64	.9844	11	6-3/8	3	**183552**	
1	1.0000	11	6-3/8	3	**183560**	**185560**
1-1/64	1.0156	11-1/8	6-1/2	3	**183578**	
1-1/32	1.0312	11-1/8	6-1/2	3	**183586**	**185586**
1-3/64	1.0469	11-1/4	6-5/8	3	**183594**	
1-1/16	1.0625	11-1/4	6-5/8	3	**183602**	**185602**
1-5/64	1.0781	12-1/2	6-7/8	4	**183610**	
1-3/32	1.0938	12-1/2	6-7/8	4	**183628**	
1-7/64	1.1094	12-3/4	7-1/8	4	**183636**	
1-1/8	1.1250	12-3/4	7-1/8	4	**183644**	
1-9/64	1.1406	12-7/8	7-1/4	4	**183651**	
1-5/32	1.1562	12-7/8	7-1/4	4	**183669**	
1-11/64	1.1719	13	7-3/8	4	**183677**	
1-3/16	1.1875	13	7-3/8	4	**183685**	
1-13/64	1.2031	13-1/8	7-1/2	4	**183693**	
1-7/32	1.2188	13-1/8	7-1/2	4	**183702**	
1-15/64	1.2344	13-1/2	7-7/8	4	**183719**	
1-1/4	1.2500	13-1/2	7-7/8	4	**183727**	
1-17/64	1.2656	14-1/8	8-1/2	4	**183735**	
1-9/32	1.2812	14-1/8	8-1/2	4	**183743**	
1-19/64	1.2969	14-1/4	8-5/8	4	**183750**	
1-5/16	1.3125	14-1/4	8-5/8	4	**183768**	
1-21/64	1.3281	14-3/8	8-3/4	4	**183776**	
1-11/32	1.3438	14-3/8	8-3/4	4	**183784**	
1-23/64	1.3594	14-1/2	8-7/8	4	**183792**	
1-3/8	1.3750	14-1/2	8-7/8	4	**183802**	
1-25/64	1.3906	14-5/8	9	4	**183818**	
1-13/32	1.4062	14-5/8	9	4	**183826**	
1-27/64	1.4219	14-3/4	9-1/8	4	**183834**	
1-7/16	1.4375	14-3/4	9-1/8	4	**183842**	
1-29/64	1.4531	14-7/8	9-1/4	4	**183859**	

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List No. T120S Black Oxide Finish . . . *continued*

List No. T120TN VERTANIUM® Coated

Drill Size	Decimal Equivalent	Overall Length	Flute Length	Shank Taper No.	T120S EDP No.	T120TN EDP No.
1-15/32	1.4688	14-7/8	9-1/4	4	**183867**	
1-31/64	1.4844	15	9-3/8	4	**183875**	
1-1/2	1.5000	15	9-3/8	4	**183883**	
1-17/32	1.5313	16-3/8	9-3/8	5	**183891**	
1-9/16	1.5625	16-5/8	9-5/8	5	**183909**	
1-19/32	1.5938	16-7/8	9-7/8	5	**183917**	
1-5/8	1.6250	17	10	5	**183925**	
1-21/32	1.6562	17-1/8	10-1/8	5	**183933**	
1-11/16	1.6875	17-1/8	10-1/8	5	**183941**	
1-23/32	1.7188	17-1/8	10-1/8	5	**183958**	
1-3/4	1.7500	17-1/8	10-1/8	5	**183966**	
1-25/32	1.7812	17-1/8	10-1/8	5	**184329**	
1-13/16	1.8125	17-1/8	10-1/8	5	**183974**	
1-27/32	1.8438	17-1/8	10-1/8	5	**183982**	
1-7/8	1.8750	17-3/8	10-1/8	5	**183990**	
1-29/32	1.9062	17-3/8	10-3/8	5	**184006**	
1-15/16	1.9375	17-3/8	10-3/8	5	**184014**	
1-31/32	1.9688	17-3/8	10-3/8	5	**184022**	
2	2.0000	17-3/8	10-3/8	5	**184030**	
2-1/32	2.0312	17-3/8	10-3/8	5	**918404**	
2-1/16	2.0625	17-3/8	10-1/4	5	**184055**	
2-3/32	2.0938	17-3/8	10-1/4	5	**918406**	
2-1/8	2.1250	17-3/8	10-1/4	5	**184071**	
2-5/32	2.1562	17-3/8	10-1/4	5	**918408**	
2-3/16	2.1875	17-3/8	10-1/4	5	**184097**	
2-7/32	2.2188	17-3/8	10-1/8	5	**918410**	
2-1/4	2.2500	17-3/8	10-1/8	5	**184113**	
2-5/16	2.3125	17-3/8	10-1/8	5	**184121**	
2-3/8	2.3750	17-3/8	10-1/8	5	**184139**	
2-7/16	2.4375	18-3/4	11-1/4	5	**184147**	
2-1/2	2.5000	18-3/4	11-1/4	5	**184154**	
2-9/16	2.5625	19-1/2	11-7/8	5	**184162**	
2-5/8	2.6250	20-3/8	11-7/8	5	**184170**	
2-11/16	2.6875	20-3/8	12-3/4	5	**184188**	
2-3/4	2.7500	20-3/8	12-3/4	5	**184196**	
2-13/16	2.8125	21-1/8	13-3/8	5	**184204**	
2-7/8	2.8750	21-1/8	13-3/8	5	**184212**	
2-15/16	2.9375	21-3/4	14	5	**184220**	
3	3.0000	21-3/4	14	5	**184238**	
3-1/16	3.0625	24-1/2	14-5/8	6	**184246**	
3-1/8	3.1250	24-1/2	14-5/8	6	**184253**	
3-3/16	3.1875	24-1/2	14-5/8	6	**184261**	
3-1/4	3.2500	25-1/2	15-1/2	6	**184279**	
3-5/16	3.3125	25-1/2	15-1/2	6	**184287**	
3-3/8	3.3750	25-1/2	15-1/2	6	**184295**	
3-7/16	3.4375	25-1/2	15-1/2	6	**184303**	
3-1/2	3.5000	26-1/2	16-3/8	6	**184311**	

Package Quantities: all sizes = 1/pkg.

TAPER SHANK DRILLS

General Purpose / High Speed Steel / 118° Point

List No. T122S Black Oxide Finish

Fractional Sizes

- Shank larger than standard
- General purpose flute construction for use in a wide variety of materials
- Black oxide finish for increased wear resistance & improved lubricity, reducing chip welding & galling

Drill Size	Decimal Equivalent	Overall Length	Flute Length	Shank Taper No.	T122S EDP No.
3/8	.3750	7-3/8	3-1/2	2	**187009**
25/64	.3906	7-1/2	3-5/8	2	**187017**
13/32	.4062	7-1/2	3-5/8	2	**187025**
27/64	.4219	7-3/4	3-7/8	2	**187033**
7/16	.4375	7-3/4	3-7/8	2	**187041**
29/64	.4531	8	4-1/8	2	**187058**
15/32	.4688	8	4-1/8	2	**187066**
41/64	.6406	9-3/4	5-1/8	3	**187074**
21/32	.6562	9-3/4	5-1/8	3	**187082**
43/64	.6719	10	5-3/8	3	**187090**
11/16	.6875	10	5-3/8	3	**187108**
45/64	.7031	10-1/4	5-5/8	3	**187116**
23/32	.7188	10-1/4	5-5/8	3	**187124**
47/64	.7344	10-1/2	5-7/8	3	**187132**
3/4	.7500	10-1/2	5-7/8	3	**187140**
49/64	.7656	10-5/8	6	3	**187157**
25/32	.7812	10-5/8	6	3	**187165**
1	1.0000	12	6-3/8	4	**187173**
1-1/32	1.0312	12-1/8	6-1/2	4	**187181**
1-1/16	1.0625	12-1/4	6-5/8	4	**187199**

Package Quantities: all sizes = 1/pkg.

TAPER SHANK DRILLS

General Purpose / High Speed Steel / 118° Point

List No. T124S Black Oxide Finish

Fractional Sizes

- Shank smaller than standard
- General purpose flute construction for use in a wide variety of materials
- Black oxide finish for increased wear resistance & improved lubricity, reducing chip welding & galling

Drill Size	Decimal Equivalent	Overall Length	Flute Length	Shank Taper No.	T124S EDP No.
31/64	.4844	7-3/4	4-3/8	1	**188007**
1/2	.5000	7-3/4	4-3/8	1	**188015**
17/32	.5312	8	4-5/8	1	**188031**
9/16	.5625	8-1/4	4-7/8	1	**188056**
51/64	.7969	10	6-1/8	2	**188064**
13/16	.8125	10	6-1/8	2	**188072**
53/64	.8281	10	6-1/8	2	**188080**
27/32	.8438	10	6-1/8	2	**188098**

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List No. T124S Black Oxide Finish . . . *continued*

Drill Size	Decimal Equivalent	Overall Length	Flute Length	Shank Taper No.	T124S EDP No.
55/64	.8594	10	6-1/8	2	**188106**
7/8	.8750	10	6-1/8	2	**188114**
57/64	.8906	10	6-1/8	2	**188122**
29/32	.9062	10	6-1/8	2	**188130**
1-5/64	1.0781	11-1/2	6-7/8	3	**188148**
1-3/32	1.0938	11-1/2	6-7/8	3	**188155**
1-7/64	1.1094	11-3/4	7-1/8	3	**188163**
1-1/8	1.1250	11-3/4	7-1/8	3	**188171**
1-9/64	1.1406	11-7/8	7-1/4	3	**188189**
1-5/32	1.1562	11-7/8	7-1/4	3	**188197**
1-11/64	1.1719	12	7-3/8	3	**188205**
1-3/16	1.1875	12	7-3/8	3	**188213**
1-13/64	1.2031	12-1/8	7-1/2	3	**188221**
1-7/32	1.2188	12-1/8	7-1/2	3	**188239**
1-15/64	1.2344	12-1/2	7-7/8	3	**188247**
1-1/4	1.2500	12-1/2	7-7/8	3	**188254**
1-33/64	1.5156	15	9-3/8	4	**188262**
1-17/32	1.5312	15	9-3/8	4	**188270**
1-35/64	1.5469	15-1/4	9-5/8	4	**188278**
1-9/16	1.5625	15-1/4	9-5/8	4	**188288**
1-37/64	1.5781	15-1/2	9-7/8	4	**188292**
1-19/32	1.5938	15-1/2	9-7/8	4	**188296**
1-39/64	1.6094	15-5/8	10	4	**188300**
1-5/8	1.6250	15-5/8	10	4	**188304**
1-41/64	1.6406	15-3/4	10-1/8	4	**188308**
1-21/32	1.6562	15-3/4	10-1/8	4	**188310**
1-43/64	1.6719	15-3/4	10-1/8	4	**188316**
1-11/16	1.6875	15-3/4	10-1/8	4	**188320**
1-45/64	1.7031	15-3/4	10-1/8	4	**188326**
1-23/32	1.7188	15-3/4	10-1/8	4	**188338**
1-47/64	1.7344	16-1/4	10-3/8	4	**188342**
1-3/4	1.7500	16-1/4	10-3/8	4	**188346**
1-13/16	1.8125	16-1/4	10-3/8	4	**188353**
1-27/32	1.8438	16-1/4	10-3/8	4	**188357**
1-7/8	1.8750	16-1/2	10-1/2	4	**188361**
1-29/32	1.9062	16-1/2	10-1/2	4	**188368**
1-15/16	1.9375	16-5/8	10-5/8	4	**188379**
1-31/32	1.9688	16-5/8	10-5/8	4	**188384**
2	2.0000	16-5/8	10-5/8	4	**188387**

Package Quantities: all sizes = 1/pkg.

TAPER SHANK DRILLS

Cobalt / 135° Point

List No. T120C Straw Finish

Fractional Sizes

- Cobalt provides heavy duty construction to increase tool strength
- Heavy duty construction for extra tool strength

Drill Size	Decimal Equivalent	Overall Length	Flute Length	Shank Taper No.	T120C EDP No
1/2	.5000	8-1/4	4-3/8	2	**915708**
17/32	.5312	8-1/2	4-5/8	2	**915709**
9/16	.5625	8-3/4	4-7/8	2	**915710**
19/32	.5938	8-3/4	4-7/8	2	**915711**
5/8	.6250	8-3/4	4-7/8	2	**915712**
21/32	.6562	9-3/4	5-1/8	3	**915713**
11/16	.6875	10	5-3/8	3	**915714**
23/32	.7188	10-1/4	5-5/8	3	**915715**
3/4	.7500	10-1/2	5-7/8	3	**915716**
25/32	.7812	10-5/8	6	3	**915717**
13/16	.8125	10-3/4	6-1/8	3	**915718**
7/8	.8750	10-3/4	6-1/8	3	**915719**
15/16	.9375	10-3/4	6-1/8	3	**915720**
1	1.0000	11	6-3/8	3	**915721**
1-1/16	1.0625	12-1/4	6-5/8	4	**915722**
1-1/8	1.1250	12-3/4	7-1/8	4	**915723**
1-3/16	1.1875	13	7-3/8	4	**915724**
1-1/4	1.2500	13-1/2	7-7/8	4	**915725**

Package Quantities: all sizes = 1/pkg.

TAPER SHANK DRILLS

Extra Length #2 Taper Shank / High Speed Steel
118° Notched Point

List No. T120E Black Oxide Finish

Fractional Sizes

- ■Higher helix angle of 34° for more efficient chip removal, particularly in deep hole applications
- ■Heavy duty construction for extra tool strength
- ■ Black oxide finish for increased wear resistance & improved lubricity, reducing chip welding & galling
- ■ 118° K notched for self centering, reducing thrust for ease of penetration

Drill Size	Decimal Equivalent	Shank Taper	OAL 12" Flute 8"	OAL 16" Flute 12"
7/16	.4375	2	942120	942220
15/32	.4688	2	942121	942221
31/64	.4844	2	942122	942222
1/2	.5000	2	942123	942223
17/32	.5312	2	942124	942224
35/64	.5469	2	942125	—
9/16	.5625	2	942126	942226
37/64	.5781	2	942127	942227
19/32	.5938	2	942128	942228
39/64	.6094	2	942129	942229
5/8	.6250	2	942130	942230
41/64	.6406	2	942131	942231
21/32	.6562	2	942132	942232
43/64	.6719	2	942133	942233
11/16	.6875	2	942134	942234
45/64	.7031	2	942135	942235
23/32	.7188	2	942136	942236
47/64	.7344	2	942137	942237
3/4	.7500	2	942138	942238
49/64	.7656	2	942139	942239
25/32	.7812	2	942140	942240

Package Quantities: all sizes = 1/pkg.

SILVER AND DEMING DRILLS

1/2" Shank / High Speed Steel / 118° Point

NEW SIZES

List No. SD320P
List No. SD320F - 3 Flats on Shank
List No. SD320PTN VERTANIUM® Coated

Fractional Sizes

Drill Size	Decimal Equivalent	Overall Length	Flute Length	SD320P EDP No.	SD320F EDP No.	SD320PTN EDP No.
1/2	.5000	6	3-1/8	164202	164532	
33/64	.5156	6	3-1/8	164206	164533	
17/32	.5312	6	3-1/8	164074	164534	185605
35/64	.5469	6	3-1/8	164214	164535	
9/16	.5625	6	3-1/8	164075	164536	185603
37/64	.5781	6	3-1/8	164222	164537	
19/32	.5938	6	3-1/8	164076	164538	185606
39/64	.6094	6	3-1/8	164230	164539	
5/8	.6250	6	3-1/8	164077	164540	185604
41/64	.6406	6	3-1/8	164248	164541	
21/32	.6562	6	3-1/8	164078	164542	185607
43/64	.6719	6	3-1/8	164255	164543	
11/16	.6875	6	3-1/8	164079	164544	185611
45/64	.7031	6	3-1/8	164263	164545	
23/32	.7188	6	3-1/8	164082	164546	185608
47/64	.7344	6	3-1/8	164271	164547	
3/4	.7500	6	3-1/8	164073	164548	185615
49/64	.7656	6	3-1/8	164289	164549	
25/32	.7812	6	3-1/8	164081	164550	185609
51/64	.7969	6	3-1/8	164297	164551	
13/16	.8125	6	3-1/8	164099	164552	185619
53/64	.8281	6	3-1/8	164305	164553	
27/32	.8438	6	3-1/8	164107	164554	185610
55/64	.8594	6	3-1/8	164313	164555	
7/8	.8750	6	3-1/8	164115	164556	185623
57/64	.8906	6	3-1/8	164321	164557	
29/32	.9062	6	3-1/8	164123	164558	185612
59/64	.9219	6	3-1/8	164339	164559	
15/16	.9375	6	3-1/8	164131	164560	185627
61/64	.9531	6	3-1/8	164347	164561	
31/32	.9688	6	3-1/8	164149	164562	185613
63/64	.9844	6	3-1/8	164354	164563	
1	1.0000	6	3-1/8	164156	164564	185631
1-1/64	1.0156	6	3-1/8	164362	164565	
1-1/32	1.0312	6	3-1/8	164446	164566	
1-3/64	1.0469	6	3-1/8	164370	164567	
1-1/16	1.0625	6	3-1/8	164164	164568	
1-5/64	1.0781	6	3-1/8	164388	164569	
1-3/32	1.0938	6	3-1/8	164453	164570	
1-7/64	1.1094	6	3-1/8	164396	164571	
1-1/8	1.1250	6	3-1/8	164172	164572	
1-9/64	1.1406	6	3-1/8	164404	164573	

- 1/2" reduced shank for use in drill presses and portable electric drills.
- 3 driving flats on shank for more rigid holding for positive drilling and for 3-jaw chucks
- General purpose flute construction for a wide variety of appplications & materials
- TiN coating for higher feeds & speeds, reduced heat at the cutting edge, added lubricity & longer tool life

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List No. SD320P . . . *continued*
List No. SD320F
List No. SD320PTN VERTANIUM® Coated

Drill Size	Decimal Equivalent	Overall Length	Flute Length	SD320P EDP No.	SD320F EDP No.	SD320PTN EDP No.
1-5/32	1.1562	6	3-1/8	164461	164574	
1-11/64	1.1719	6	3-1/8	164412	164575	
1-3/16	1.1875	6	3-1/8	164180	164576	
1-13/64	1.2031	6	3-1/8	164420	164577	
1-7/32	1.2188	6	3-1/8	164479	164578	
1-15/64	1.2344	6	3-1/8	164438	164579	
1-1/4	1.2500	6	3-1/8	164198	164580	
1-17/64	1.2656	6	3-1/8	164302	164581	
1-9/32	1.2812	6	3-1/8	164304	164582	
1-19/64	1.2969	6	3-1/8	164306	164583	
1-5/16	1.3125	6	3-1/8	164308	164584	
1-21/64	1.3281	6	3-1/8	164310	164585	
1-11/32	1.3438	6	3-1/8	164312	164586	
1-23/64	1.3594	6	3-1/8	164314	164587	
1-3/8	1.3750	6	3-1/8	164316	164588	
1-25/64	1.3906	6	3-1/8	164318	164589	
1-13/32	1.4062	6	3-1/8	164320	164590	
1-27/64	1.4219	6	3-1/8	164322	164591	
1-7/16	1.4375	6	3-1/8	164324	164592	
1-29/64	1.4531	6	3-1/8	164326	164593	
1-15/32	1.4688	6	3-1/8	164328	164594	
1-31/64	1.4844	6	3-1/8	164330	164595	
1-1/2	1.5000	6	3-1/8	164332	164596	

Package Quantities: all sizes = 1/pkg.

SILVER AND DEMING DRILLS

1/2” Shank / Cobalt / 118° Split Point

List No. SD420C Straw Finish

Fractional Sizes

NEW

Drill Size	Decimal Equivalent	Overall Length	Flute Length	SD420C EDP No.
1/2	.5000	6	3-1/8	164602
17/32	.5312	6	3-1/8	164603
9/16	.5625	6	3-1/8	164604
19/32	.5938	6	3-1/8	164605
5/8	.6250	6	3-1/8	164606
21/32	.6562	6	3-1/8	164607
11/16	.6875	6	3-1/8	164608
23/32	.7188	6	3-1/8	164609
3/4	.7500	6	3-1/8	164610
25/32	.7812	6	3-1/8	164611
13/16	.8125	6	3-1/8	164612
27/32	.8438	6	3-1/8	164613
7/8	.8750	6	3-1/8	164614
29/32	.9062	6	3-1/8	164615
15/16	.9375	6	3-1/8	164616
31/32	.9688	6	3-1/8	164617
1	1.0000	6	3-1/8	164618

CORE DRILLS

Straight Shank / High Speed Steel / 118° Point

List No. T820-3 Three Flute
List No. T820-4 Four Flute

Fractional Sizes

- 3 flute for improved hole concentricity
- 4 flute for better hole finish & hole concentricity
- Extremely heavy web for a strong tool that will enlarge holes to approximately 60% of nominal diameter
- Black oxide finish for increased wear resistance & improved lubricity, reducing chip welding & galling
- Taper length for extended reach

Drill Size	Decimal Equivalent	Overall Length	Flute Length	T820-3 EDP No.	T820-4 EDP No.
1/4	.2500	6-1/8	3-3/4	**915810**	-
9/32	.2812	6-1/4	3-7/8	**915811**	-
5/16	.3125	6-3/8	4	**915812**	-
11/32	.3438	6-1/2	4-1/8	**915813**	-
3/8	.3750	6-3/4	4-1/4	**915814**	-
13/32	.4062	7	4-3/8	**915815**	-
7/16	.4375	7-1/4	4-5/8	**915816**	-
15/32	.4688	7-1/2	4-3/4	**915817**	-
1/2	.5000	7-3/4	4-3/4	**915818**	**915858**
17/32	.5312	8	4-3/4	**915819**	**915859**
9/16	.5625	8-1/4	4-7/8	**915820**	**915860**
19/32	.5938	8-3/4	4-7/8	**915821**	**915861**
5/8	.6250	8-3/4	4-7/8	**915822**	**915862**
21/32	.6562	9	5-1/8	**915823**	**915863**
11/16	.6875	9-1/4	5-3/8	**915824**	**915864**
23/32	.7812	9-7/8	6	-	**915865**
3/4	.7500	9-3/4	5-7/8	**915826**	**915866**
25/32	.7812	9-7/8	6	-	**915667**
13/16	.8125	10	6-1/8	-	**915868**
27/32	.8438	10	6-1/8	-	**915869**
7/8	.8750	10	6-1/8	-	**915870**
29/32	.9062	10	6-1/8	-	**915871**
15/16	.9375	10-3/4	6-1/8	-	**915872**
31/32	.9688	11	6-3/8	-	**915873**
1	1.0000	11	6-3/8	-	**915874**

Package Quantities: all sizes = 1/pkg.

CORE DRILLS

Taper Shank / High Speed Steel / 118° Point

List No. T120-4 Four Flute

Fractional Sizes

- 4 flute for better finish & greater accuracy
- Extremely heavy web for a strong tool that will enlarge holes to approximately 60% of nominal diameter
- Black oxide finish for increased wear resistance & improved lubricity, reducing chip welding & galling

Drill Size	Decimal Equivalent	Overall Length	Flute Length	Shank Taper No.	T120-4 EDP No.
1/2	.5000	8-1/4	4-3/8	2	**916008**
17/32	.5312	8-1/2	4-5/8	2	**916009**
9/16	.5625	8-3/4	4-7/8	2	**916010**
19/32	.5938	8-3/4	4-7/8	2	**916011**
5/8	.6250	8-3/4	4-7/8	2	**916012**
21/32	.6562	9	5-1/8	2	**916013**
11/16	.6875	9-1/4	5-3/8	2	**916014**
23/32	.7188	9-1/2	5-5/8	2	**916015**
3/4	.7500	9-3/4	5-7/8	2	**916016**
25/32	.7812	9-7/8	6	2	**916017**
13/16	.8125	10-3/4	6-1/8	3	**916018**
27/32	.8438	10-3/4	6-1/8	3	**916019**
7/8	.8750	10-3/4	6-1/8	3	**916020**
29/32	.9062	10-3/4	6-1/8	3	**916021**
15/16	.9375	10-3/4	6-1/8	3	**916022**
31/32	.9688	11	6-3/8	3	**916023**
1	1.0000	11	6-3/8	3	**916024**
1-1/32	1.0312	11-1/8	6-1/2	3	**916025**
1-1/16	1.0625	11-1/4	6-5/8	3	**916026**
1-3/32	1.0938	12-1/2	6-7/8	4	**916027**
1-1/8	1.1250	12-3/4	7-1/8	4	**916028**
1-5/32	1.1562	12-7/8	7-1/4	4	**916029**
1-3/16	1.1875	13	7-3/8	4	**916030**
1-7/32	1.2188	13-1/8	7-1/2	4	**916031**
1-1/4	1.2500	13-1/2	7-7/8	4	**916032**
1-9/32	1.2812	14-1/8	8-1/2	4	**916033**
1-5/16	1.3125	14-1/4	8-5/8	4	**916034**
1-11/32	1.3438	14-3/8	8-3/4	4	**916035**
1-3/8	1.3750	14-1/2	8-7/8	4	**916036**
1-13/32	1.4062	14-5/8	9	4	**916037**
1-7/16	1.4375	14-3/4	9-1/2	4	**916038**
1-15/32	1.4688	14-7/8	9-1/4	4	**916039**
1-1/2	1.5000	15	9-3/8	4	**916040**

Package Quantities: all sizes = 1/pkg.

MISCELLANEOUS DRILLS

Spotting Drills / Centering Drills / 118° Point / High Speed Steel

List No. D270P Bright Finish

Fractional Sizes

- 118° point for general purpose use
- Short flute and overall length is very rigid
- Designed for centering work, making a starting hole for larger drill, and chamfering
- No body clearance on 3/8" and larger gives tool the ability to be chucked close to the point for accurate starting or centering

Drill Size	Decimal Equivalent	Overall Length	Flute Length	D270P EDP No.
1/16	.0625	1-1/4	3/4	**165005**
3/32	.0938	1-1/4	3/4	**165021**
1/8	.1250	1-1/4	3/4	**165047**
5/32	.1562	1-1/2	1	**165062**
3/16	.1875	1-1/2	1	**165088**
7/32	.2188	1-1/2	1	**165104**
1/4	.2500	1-1/2	1	**165112**
9/32	.2812	1-1/2	1	**165120**
5/16	.3125	1-1/2	1	**165138**
3/8	.3750	2	1	**165500**
1/2	.5000	2	1	**165526**
5/8	.6250	2-1/4	1-1/8	**165534**
3/4	.7500	2-1/4	1-1/8	**165542**
1	1.0000	2-1/2	1-1/4	**165567**

Package Quantities: 1/16" - 9/32" = 12/pkg; 5/16" - 1/2" = 6/pkg; 5/8" - 1" = 1/pkg.

MISCELLANEOUS DRILLS

CNC Spotting Drills / 90° Point / High Speed Steel

List No. D270CNC-S Bright Finish

Fractional Sizes

- Used for locating regular point drills
- Excellent centering capability
- .0005 diameter tolerance for better accuracy
- .001 maximum lip height variation
- No body clearance

Drill Size	Overall Length	D270CNC-S EDP No.
1/4	**2-1/2**	**981101**
3/8	**3-1/8**	**981103**
1/2	**3-3/4**	**981105**
5/8	**4-1/4**	**981106**
3/4	**5**	**981107**
1	**6**	**981109**

Package Quantities: 1/4" - 1/2" = 6/pkg; 5/8" - 1" = 1/pkg

MISCELLANEOUS DRILLS

CNC Spotting Drills / 120° Point / High Speed Steel

List No. D270CNC-S Bright Finish

Fractional Sizes

- Used for locating regular point drills
- Excellent centering capability
- .0005 diameter tolerance for better accuracy
- .001 maximum lip height variation
- No body clearance

Drill Size	Overall Length	D270CNC-S EDP No.
1/4	**2-1/2**	**981080**
3/8	**3-1/8**	**981082**
1/2	**3-3/4**	**981084**
5/8	**4-1/4**	**981085**
3/4	**5**	**981086**
1	**6**	**981088**

Package Quantities: 1/4" - 1/2" = 6/pkg; 5/8" - 1" = 1/pkg

MISCELLANEOUS DRILLS

CNC Spotting Drills / 90° Point / Long Length / High Speed Steel

List No. D270CNC-L Bright Finish

Fractional Sizes

- Used for locating regular point drills
- Excellent centering capability
- .0005 diameter tolerance for better accuracy
- .001 maximum lip height variation
- No body clearance

Drill Size	Overall Length	D270CNC-L EDP No.
1/4	**4**	**981110**
3/8	**5**	**981112**
1/2	**6**	**981114**
5/8	**7-1/8**	**981115**
3/4	**8**	**981116**
1	**8**	**981118**

Package Quantities: 1/4" - 1/2" = 6/pkg; 5/8" - 1" = 1/pkg

MISCELLANEOUS DRILLS

CNC Spotting Drills / 120° Point / Long Length / High Speed Steel

List No. D270CNC-L Bright Finish

Fractional Sizes

- Used for locating regular point drills
- Excellent centering capability
- .0005 diameter tolerance for better accuracy
- .001 maximum lip height variation
- No body clearance

Drill Size	Overall Length	D270CNC-L EDP No
1/4	**4**	**981090**
3/8	**5**	**981092**
1/2	**6**	**981094**
5/8	**7-1/8**	**981095**
3/4	**8**	**981096**
1	**8**	**981098**

Package Quantities: 1/4" - 1/2" = 6/pkg; 5/8" - 1" = 1/pkg

MISCELLANEOUS DRILLS

Combined Drills and Countersinks / High Speed Steel / Plain Type

List No. 149PP Bright Finish

- Accurate centering operations
- Plain type have 60° included angle

Drill Size	Body Diameter	Drill Diameter	Overall Length	Drill Length	149PP EDP No.
00	1/8	0.025	1-1/4	0.025	166021
0	1/8	1/32	1-1/4	1/32	166011
1	1/8	3/64	1-1/4	3/64	166029
2	3/16	5/64	1-7/8	5/64	166037
3	1/4	7/64	2	7/64	166045
4	5/16	1/8	2-1/8	1/8	166052
5	7/16	3/16	2-3/4	3/16	166060
6	1/2	7/32	3	7/32	166078
7	5/8	1/4	3-1/4	1/4	166086
8	3/4	5/16	3-1/2	5/16	166094
Set	Sizes 1 through 5			5 pcs	167014

Package Quantities: all sizes = 12/pkg.

MISCELLANEOUS DRILLS

Combined Drills and Countersinks / High Speed Steel / Bell Type

List No. 150BP Bright Finish

- Accurate centering operations
- Bell type have included angles of 60° and 120°, used to form protected centers.

Drill Size	Body Diameter	Drill Diameter	Overall Length	Drill Length	150BP EDP No.
11	1/8	3/64	1-1/4	3/64	166508
12	3/16	1/16	1-7/8	1/16	166516
13	1/4	3/32	2	3/32	166524
14	5/16	7/64	2-1/8	7/64	166532
15	7/16	5/32	2-3/4	5/32	166540
16	1/2	3/16	3	3/16	166557
17	5/8	7/32	3-1/4	7/32	166565
18	3/4	1/4	3-1/2	1/4	166573

Package Quantities: 11 to 16 = 12/pkg; 17 to 18 = 1/pkg.

MISCELLANEOUS DRILLS

3/8" Reduced Shank / 118° Point / High Speed Steel

List No. RS375 Black Oxide

Drill Size	Flute Length	Overall Length	RS375 EDP No.
25/64	3-3/8	5-1/8	167300
13/32	3-7/8	5-1/4	167301
27/64	3-15/16	5-3/8	167302
7/16	4-1/16	5-1/2	167303
29/64	4-3/16	5-5/8	167304
15/32	4-5/16	5-3/4	167305
31/64	4-3/8	5-7/8	167306
1/2	4-1/2	6	167307
9/16	4-13/16	6-5/8	167311
5/8	5-3/16	7-1/8	167312

Package Quantities: all sizes = 1/pkg.

MASONRY BITS

NEW SIZES

Fast Spiral / Carbide Tipped

List No. M521P Bright Finish

Fractional Sizes

Drill Size	Decimal Equivalent	Overall Length	Shank Diameter	M521P EDP No.
1/8	.1250	3	1/8	167562
3/16	.1875	4	3/16	167563
1/4	.2500	4	1/4	167570
1/4	.2500	6	1/4	167571
1/4	.2500	13	1/4	167670
5/16	.3125	4	1/4	167588
5/16	.3125	6	1/4	167589
5/16	.3125	13	1/4	167688
3/8	.3750	4	1/4	167596
3/8	.3750	6	1/4	167597
3/8	.3750	13	1/4	167696
7/16	.4375	6	1/4	167605
1/2	.5000	4	1/4	167548
1/2	.5000	6	1/4	167613
1/2	.5000	6	3/8	167621
1/2	.5000	13	3/8	167704
9/16	.5625	6	3/8	167622
5/8	.6250	6	3/8	167639
5/8	.6250	6	1/2	167652
3/4	.7500	6	3/8	167647
3/4	.7500	6	1/2	167653
7/8	.8750	6	1/2	167654
1	1.0000	6	1/2	167662

Package Quantities: all sizes = 1/pkg.

MASONRY BITS

NEW

Regular Spiral / Carbide Tipped

List No. M522R

Fractional Sizes

Size	Decimal Equivalent	OA Length	Shank	M522R EDP
1/8	.1250	3	1/8	167800
3/16	.1875	4	3/16	167801
1/4	.2500	4	1/4	167802
5/16	.3125	4	1/4	167804
3/8	.3750	4	1/4	167806
1/4	.2500	6	1/4	167803
5/16	.3125	6	1/4	167805
3/8	.3750	6	1/4	167807
7/16	.4375	6	1/4	167809
1/2	.5000	6	3/8	167811
9/16	.5625	6	3/8	167812
5/8	.6250	6	1/2	167813
11/16	.6875	6	1/2	167814
3/4	.7500	6	1/2	167815
7/8	.8750	6	1/2	167816
1	1.0000	6	1/2	167817

Package Quantities: all sizes = 1/pkg.

MISCELLANEOUS DRILLS

Jobber Length / Carbide Tipped / High Speed Steel / 118° Point

List No. D320CT Bright Finish

Fractional Sizes

- Carbide-tipped for longer tool life & better abrasion resistance
- Bright finish, excellent for nonferrous applications & low tensile steels
- Heavy duty construction for increased tool strength
- Cam relieved 118° point-general purpose angle with radial relief for accurate holes

Drill Size	Decimal Equivalent	Overall Length	Flute Length	D320CT EDP No.
1/8	.1250	2-3/4	1-5/8	**192009**
9/64	.1406	2-7/8	1-3/4	**192017**
5/32	.1562	3-1/8	2	**192025**
11/64	.1719	3-1/4	2-1/8	**192033**
3/16	.1875	3-1/2	2-5/16	**192041**
13/64	.2031	3-5/8	2-7/16	**192058**
7/32	.2188	3-3/4	2-1/2	**192066**
15/64	.2344	3-7/8	2-5/8	**192074**
1/4	.2500	4	2-3/4	**192082**
17/64	.2656	4-1/8	2-7/8	**192090**
9/32	.2812	4-1/4	2-15/16	**192108**
19/64	.2969	4-3/8	3-1/16	**192116**
5/16	.3125	4-1/2	3-3/16	**192124**
21/64	.3281	4-5/8	3-5/16	**192132**
11/32	.3438	4-3/4	3-7/16	**192140**
23/64	.3594	4-7/8	3-1/2	**192157**
3/8	.3750	5	3-5/8	**192165**
25/64	.3906	5-1/8	3-3/4	**192173**
13/32	.4062	5-1/4	3-7/8	**192181**
27/64	.4219	5-3/8	3-15/16	**192199**
7/16	.4375	5-1/2	4-1/16	**192207**
29/64	.4531	5-5/8	4-3/16	**192215**
15/32	.4688	5-3/4	4-5/16	**192223**
31/64	.4844	5-7/8	4-3/8	**192231**
1/2	.5000	6	4-1/2	**192249**

Package Quantities: all sizes = 1/pkg.

MISCELLANEOUS DRILLS

Short Length / Carbide Tipped / High Speed Steel / 118° Point

List No. S920CT Bright Finish

Fractional Sizes

- Shorter length for CNC equipment

Drill Size	Decimal Equivalent	Overall Length	Flute Length	S920CT EDP No.
1/8	.1250	1-7/8	7/8	**190508**
9/64	.1406	1-15/16	15/16	**190516**
5/32	.1562	2-1/16	1	**190524**

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List No. S920CT Bright Finish . . . *continued*

Drill Size	Decimal Equivalent	Overall Length	Flute Length	S920CT EDP No.
11/64	.1719	2-1/8	1-1/16	**190532**
3/16	.1875	2-3/16	1-1/8	**190540**
13/64	.2031	2-1/4	1-3/16	**190557**
7/32	.2188	2-3/8	1-1/4	**190565**
15/64	.2344	2-7/16	1-5/16	**190573**
1/4	.2500	2-1/2	1-3/8	**190581**
17/64	.2656	2-5/8	1-7/16	**190599**
9/32	.2812	2-11/16	1-1/2	**190607**
19/64	.2969	2-3/4	1-9/16	**190615**
5/16	.3125	2-13/16	1-5/8	**190623**
21/64	.3281	2-15/16	1-11/16	**190631**
11/32	.3438	3	1-11/16	**190649**
23/64	.3594	3-1/16	1-3/4	**190656**
3/8	.3750	3-1/8	1-13/16	**190664**
25/64	.3906	3-1/4	1-7/8	**190672**
13/32	.4062	3-5/16	1-15/16	**190680**
7/16	.4375	3-7/16	2-1/16	**190706**
15/32	.4688	3-5/8	2-1/8	**190722**
1/2	.5000	3-3/4	2-1/4	**190748**

Package Quantities: all sizes = 1/pkg.

MISCELLANEOUS DRILLS

Taper Length with Tang / Carbide Tipped / High Speed Steel
118° Point

List No. T820CT Bright Finish

Fractional Sizes

- ■118° point for general purpose use
- ■Heavy duty construction for extra tool strength
- ■Taper length for extended reach
- ■Tanged shank for use with ASA drill drivers
- ■Carbide-tipped for longer tool life and abrasion resistance

Drill Size	Decimal Equivalent	Overall Length	Flute Length	T820CT EDP No.
1/8	.1250	5-1/8	2-3/4	**193007**
9/64	.1406	5-3/8	3	**193015**
5/32	.1562	5-3/8	3	**193023**
11/64	.1719	5-3/4	3-3/8	**193031**
3/16	.1875	5-3/4	3-3/8	**193049**
13/64	.2031	6	3-5/8	**193056**
7/32	.2188	6	3-5/8	**193064**
15/64	.2344	6-1/8	3-3/4	**193072**
1/4	.2500	6-12/8	3-3/4	**193080**
17/64	.2656	6-1/4	3-7/8	**193098**
9/32	.2812	6-1/4	3-7/8	**193106**
19/64	.2969	6-3/8	4	**193114**
5/16	.3125	6-3/8	4	**193122**
21/64	.3281	6-1/2	4-1/8	**193130**
11/32	.3438	6-1/2	4-1/8	**193148**
23/64	.3594	6-3/4	4-1/4	**193155**

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List No. T820CT Bright Finish . . . *continued*

Drill Size	Decimal Equivalent	Overall Length	Flute Length	T820CT EDP No.
3/8	.3750	6-3/4	4-1/4	**193163**
25/64	.3906	7	4-3/8	**193171**
13/32	.4062	7	4-3/8	**193189**
27/64	.4219	7-1/4	4-5/8	**193197**
7/16	.4375	7-1/4	4-5/8	**193205**
29/64	.4531	7-1/2	4-3/4	**193213**
15/32	.4688	7-1/2	4-3/4	**193221**
31/64	.4844	7-3/4	4-3/4	**193239**
1/2	.5000	7-3/4	4-3/4	**193247**
33/64	.5156	8	4-3/4	**193254**
17/32	.5312	8	4-3/4	**193262**
35/64	.5469	8-1/4	4-7/8	**193270**
9/16	.5625	8-1/4	4-7/8	**193288**
37/64	.5781	8-3/4	4-7/8	**193296**
19/32	.5938	8-3/4	4-7/8	**193304**
39/64	.6094	8-3/4	4-7/8	**193312**
5/8	.6250	8-3/4	4-7/8	**193320**

Package Quantities: all sizes = 1/pkg.

MISCELLANEOUS DRILLS

Carbide Tipped Die Drills / High Speed Steel / 118° Point

List No. 750CT Bright Finish

Fractional Sizes

- Carbide-tipped for longer tool life & better abrasion resistance
- Cam relieved point for shallow holes in hard materials from 45 Rc
- Straight flutes enhance hole concentricity

Drill Size	Decimal Equivalent	Overall Length	Flute Length	750CT EDP No.
3/16	.1875	3-1/2	1-1/2	**193502**
13/64	.2031	3-3/4	1-3/4	**193510**
7/32	.2188	3-3/4	1-3/4	**193528**
15/64	.2344	4	2	**193536**
1/4	.2500	4	2	**193544**
9/32	.2812	4-1/4	2-1/4	**193551**
5/16	.3125	4-1/2	2-1/2	**193569**
11/32	.3438	4-3/4	2-3/4	**193577**
3/8	.3750	5	3	**193585**
13/32	.4062	5-1/4	3	**193593**
7/16	.4375	5-1/2	3	**193601**
15/32	.4688	5-3/4	3-1/4	**193619**
1/2	.5000	6	3-1/2	**193627**
17/32	.5312	6	3-1/2	**193635**
9/16	.5625	6	3-1/2	**193643**
19/32	.5938	7	4	**193650**
5/8	.6250	7	4	**193668**
21/32	.6562	7-1/2	4-1/2	**193676**
11/16	.6875	7-1/2	4-1/2	**193684**
23/32	.7188	8	4-3/4	**193692**
3/4	.7500	8	4-3/4	**193700**

Package Quantities: 3/64" to 9/32" = 12/pkg; 19/64 to 1/2" = 6/pkg.

MISCELLANEOUS DRILLS

Screw Extractors

- Used in removing broken screws. You drill a hole in the broken screw, insert the proper size screw extractor and start a left-hand twist.

Extractor No.	Small End	Large End	OA Length	Thread Length	Size Drill to use	For screw & bolt sizes	EDP No
1	1/16	1/8	2	1/2	5/64	3/16 - 1/4	**421909**
2	3/32	13/64	2-3/8	7/8	7/64	1/4 - 5/16	**421917**
3	1/8	1/4	2-11/16	1	5/32	5/16 - 7/16	**421925**
4	3/16	11/32	3	1-1/4	1/4	7/16 - 9/16	**421933**
5	1/4	7/16	3-3/8	1-1/2	17/64	9/16 - 3/4	**421941**
6	3/8	19/32	3-3/4	1-3/4	13/32	3/4 - 1	**421958**
7	1/2	25/32	4-1/8	2-1/4	17/32	1 - 1-3/8	**421966**
8	3/4	1-1/32	4-3/8	2-1/4	13/16	1-3/8 - 1-3/4	**421974**
9	1	1-9/32	4-5/8	2-1/4	1-1/16	1-3/4 - '2-1/8	**421982**
10	1-1/4	1-9/16	5	2-1/2	1-5/16	2-1/8 - 2-1/2	**421990**

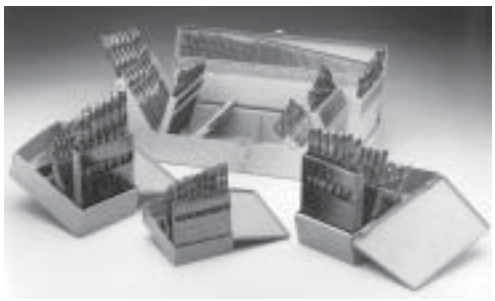
JOBBER LENGTH DRILL SETS

High Speed Steel (HS) / Cobalt (CS, HDC)

NEW SETS

Jobber Drill Sets in Indexed Cases

VERTANIUM™ Drill Sets in Indexed Cases



Set Number	Size Range	No. of Pieces	EDP No.	Set Number	VERTANIUM® EDP No.
HS300P	Nos. 1 - 60 Bright	60 pcs.	**174722**		
HS-315P	1/16 - 3/8 by 64ths w/case	21 pcs	**174744**		
HS-315	1/16 - 3/8 by 64ths w/case	21 pcs	**174745**		
HS-320	1/16 to 1/2 by 64ths	29 pcs	**174700**	**HS-320-TN**	**174705**
HS320P	1/16 to1/2 by 64ths Bright	29 pcs.	**174702**		
HS-321	1/16 to 1/2 by 32nds	15 pcs	**174718**	**HS-321-TN**	**174713**
HS-321P	1/16 to1/2 by 32nds Bright	15 pcs.	**174712**		
HS-300	Nos. 1 to 60	60 pcs	**174726**	**HS-300-TN**	**174721**
HS-301	Nos. 61-80	20 pcs	**174759**	**HS-301-TN**	**174967**
HS-340	A to Z	26 pcs	**174734**	**HS-340-TN**	**174739**
HS-340P	A-Z bright	26 pcs	**174746**		
3HS-1000	1/16 to 1/2 x 64, 1 to 60, A to Z	115 pcs	**174742**	**3HS-1000-TN**	**174747**
3HS-1000P	1/16-1/2 x 64, 1-60, A-Z	115 pcs.	**174743**		
HDC-420	1/16 - 1/2 by 32nds w/case	15 pcs	**174306**		
CS-320	1/16 to1/2 by 64ths	29 pcs.	**174305**		
M-360	1mm to 13mm by .5mm	25 pcs	**174304**		

JOBBER LENGTH DRILL SETS

Heavy Duty

VERTANIUM® Jobber Drill Sets in Indexed Cases

Set Number	Range of Sizes	Number of Drills	VERTANIUM® EDP No.
HD-420-TN	1/16 to 1/2 by 64ths	29	**174960**
HD-425-TN	1/16 to 1/4 by 64ths	12	**174961**
HD-426-TN	1/16 to 3/8 by 64ths	19	**174962**
HD-421-TN	1/16 to 1/2 by 32nds	15	**174963**
HD-440-TN	A to Z	26	**174964**
HD-400-TN	Nos. 1 to 60	60	**174965**
HD-401-TN	Nos. 61 to 80	20	**174966**

JOBBER LENGTH DRILL SETS

High Speed Steel

Drill Sets in Indexed Cases

Set Number	Size Range	No. of Pieces	EDP No.
Z-320	1/16 to 1/2 by 64ths	29 pcs	**174908**
Z-321	1/16 to 1/2 by 32nds	15 pcs	**174916**
Z-300	Nos. 1 to 60	60 pcs	**174924**
Z-340	A to Z	26 pcs	**174932**

JOBBER LENGTH DRILL SETS

High Speed Steel

Drill Set In Plastic Pocket Case

Set Number	Size Range	No. of Pieces	EDP No.
PS-360	1/16 to 1/4 by 64ths	13 pcs	**174502**

TAPER LENGTH DRILL SETS

Bright / 118° Point / High Speed Steel

NEW

Drill Set In Plastic Pocket Case

Set Number	Size Range	No. of Pieces	EDP No.
HS-820TLP	1/16 to 1/2 by 64ths	29 pcs	**174307**

REDUCED SHANK DRILL SETS

3/8” Shank / 118° Point / High Speed Steel

List No. RS375 Sets

Set Number	Size Range	No. of Pieces	EDP No.
RS375	1/16"-1/2"X64	15PC SET	**167309**
RS375	1/16"-1/2X32	29PC SET	**167310**

MISCELLANEOUS SETS

High Speed Steel

Silver and Deming Drill Set

Set Number	No. of Pieces	Sizes	EDP No.	VERTANIUM® EDP No.
SS-10	8	9/16, 5/8, 11/16, 3/4, 13/16, 7/8, 15/16, 1	**174957**	**184859**

SD DRILL SETS

1/2” Shank / High Speed Steel / 118° Point / Black Oxide Finish / 3 Flats on Shank

List No. SS10F Sets

Set Number	No. of Pieces	Sizes	EDP No.
SS-10F	8	9/16, 5/8, 11/16, 3/4, 13/16, 7/8, 15/16, 1	**164859**

SD DRILL SETS

1/2” Shank / Cobalt / 118° SplitPoint / Straw Finish / 3 Flats on Shank

NEW

List No. SS20C Sets

Set Number	No. of Pieces	Sizes	EDP No.
SS-20C	8	9/16, 5/8, 11/16, 3/4, 13/16, 7/8, 15/16, 1	**164619**

MISCELLANEOUS SETS

High Speed Steel

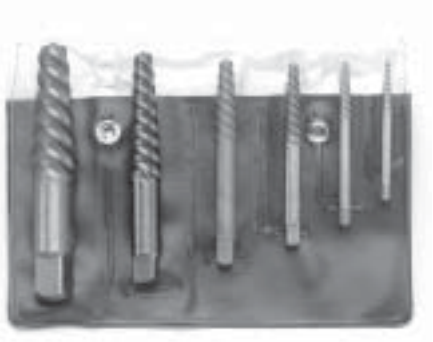
Combined Drill and Countersink Set

Set Number	Size Range	No. of Pieces	EDP No.
149-PP	Sizes 1 through 5	5 pcs	**167014**

MISCELLANEOUS SETS

High Speed Steel

Screw Extractor Sets



Set Number	No. of Pieces	Size Range	For screw & bolt sizes	EDP No.
15	5	Nos. 1-5	3/16 - 3/4	**422006**
16	6	Nos. 1-6	3/16 - 1	**422105**
16C	12	Nos. 1-6 w/ cobalt drill	3/16 - 1	**421500**

Package Quantities: 1 set/pkg.

CHUCKING REAMERS

■General Purpose
■Use thru hole applications

Straight Shank / Straight Flutes / 45° Chamfer / High Speed Steel

List No. R620

Fractional Sizes

Size	Decimal Equivalent	Shank Diameter	Flute Length	Overall Length	No. of Flutes	EDP Number
3/64	0.0469	0.0455	1/2	2-1/2	4	**960003**
1/16	0.0625	0.0585	1/2	2-1/2	4	**960004**
5/64	0.0781	0.0720	3/4	3	4	**960005**
3/32	0.0938	0.0880	3/4	3	4	**960006**
7/64	0.1094	0.1030	7/8	3-1/2	4	**960007**
1/8	0.1250	0.1190	7/8	3-1/2	6	**960008**
9/64	0.1406	0.1350	1	4	6	**960009**
5/32	0.1562	0.1510	1	4	6	**960010**
11/64	0.1719	0.1645	1-1/8	4-1/2	6	**960011**
3/16	0.1875	0.1805	1-1/8	4-1/2	6	**960012**
13/64	0.2031	0.1945	1-1/4	5	6	**960013**
7/32	0.2188	0.2075	1-1/4	5	6	**960014**
15/64	0.2344	0.2265	1-1/2	6	6	**960015**
1/4	0.2500	0.2405	1-1/2	6	6	**960016**
17/64	0.2656	0.2485	1-1/2	6	6	**960017**
9/32	0.2812	0.2485	1-1/2	6	6	**960018**
19/64	0.2969	0.2792	1-1/2	6	6	**960019**
5/16	0.3125	0.2792	1-1/2	6	6	**960020**
21/64	0.3281	0.2791	1-1/2	6	6	**960021**
11/32	0.3438	0.2792	1-1/2	6	6	**960022**
23/64	0.3594	0.3105	1-3/4	7	6	**960023**
3/8	0.3750	0.3105	1-3/4	7	6	**960024**
25/64	0.3906	0.3105	1-3/4	7	6	**960025**
13/32	0.4062	0.3105	1-3/4	7	6	**960026**
27/64	0.4219	0.3730	1-3/4	7	6	**960027**
7/16	0.4375	0.3730	1-3/4	7	6	**960028**
29/64	0.4530	0.3730	1-3/4	7	6	**960029**
15/32	0.4688	0.3730	1-3/4	7	6	**960030**
31/64	0.4844	0.4355	2	8	6	**960031**
1/2	0.5000	0.4355	2	8	6	**960032**
17/32	0.5312	0.4355	2	8	6	**960034**
9/16	0.5626	0.4355	2	8	6	**960036**
19/32	0.5938	0.5620	2	8	6	**960038**
5/8	0.6250	0.5620	2-1/4	9	6	**960040**
21/32	0.6562	0.5620	2-1/4	9	8	**960042**
11/16	0.6875	0.5620	2-1/4	9	8	**960044**
23/32	0.7188	0.6245	2-1/4	9	8	**960046**
3/4	0.7500	0.6245	2-1/2	9-1/2	8	**960048**
25/32	0.7812	0.6245	2-1/2	9-1/2	8	**960050**
13/16	0.8125	0.6245	2-1/2	9-1/2	8	**960052**
27/32	0.8438	0.6245	2-1/2	9-1/2	8	**960054**

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List No. R620 . . . *continued*

Size	Decimal Equivalent	Shank Diameter	Flute Length	Overall Length	No. of Flutes	EDP Number
7/8	0.8750	0.7495	2-5/8	10	8	**960056**
29/32	0.9062	0.7595	2-5/8	10	8	**960058**
15/16	0.9375	0.7495	2-5/8	10	8	**960060**
31/32	0.9688	0.7495	2-5/8	10	8	**960062**
1	1.0000	0.8745	2-3/4	10-1/2	8	**960064**

Package Quantities: all sizes = 1/pkg.

CHUCKING REAMERS

- General Purpose
- Use thru hole applications

Straight Shank / Straight Flutes / 45° Chamfer / High Speed Steel

List No. R610

Decimal Sizes

Size	Decimal Equivalent	Shank Diameter	Flute Length	Overall Length	No. of Flutes	EDP Number
.1240	0.1240	0.1190	7/8	3-1/2	6	**960140**
.1260	0.1260	0.1190	7/8	3-1/2	6	**960141**
.1865	0.1865	0.1805	1-1/8	4-1/2	6	**960142**
.1885	0.1885	0.1805	1-1/8	4-1/2	6	**960143**
.2490	0.2490	0.2405	1-1/2	6	6	**960144**
.2510	0.2510	0.2405	1-1/2	6	6	**960145**
.3115	0.3115	0.2792	1-1/2	6	6	**960146**
.3135	0.3135	0.2792	1-1/2	6	6	**960147**
.3740	0.3740	0.3105	1-3/4	7	6	**960148**
.3760	0.3760	0.3105	1-3/4	7	6	**960149**
.4365	0.4365	0.3730	1-3/4	7	6	**960150**
.4385	0.4385	0.3730	1-3/4	7	6	**960151**
.4990	0.4990	0.4355	2	8	6	**960152**
.5010	0.5010	0.4355	2	8	6	**960153**

Package Quantities: all sizes = 1/pkg.

CHUCKING REAMERS

■General Purpose
■Use thru hole applications

Straight Shank / Straight Flutes / 45° Chamfer / High Speed Steel

List No. R640

Letter Sizes

Size	Decimal Equivalent	Shank Diameter	Flute Length	Overall Length	No. of Flutes	EDP Number
A	0.2340	0.2265	1-1/2	6	6	960371
B	0.2380	0.2329	1-1/2	6	6	960372
C	0.2420	0.2329	1-1/2	6	6	960373
D	0.2460	0.2329	1-1/2	6	6	960374
F	0.2570	0.2405	1-1/2	6	6	960376
G	0.2610	0.2485	1-1/2	6	6	960377
H	0.2660	0.2485	1-1/2	6	6	960378
I	0.2720	0.2485	1-1/2	6	6	960379
J	0.2770	0.2485	1-1/2	6	6	960380
K	0.2810	0.2485	1-1/2	6	6	960381
L	0.2900	0.2792	1-1/2	6	6	960382
M	0.2950	0.2792	1-1/2	6	6	960383
N	0.3020	0.2792	1-1/2	6	6	960384
O	0.3160	0.2792	1-1/2	6	6	960385
P	0.3230	0.2792	1-1/2	6	6	960386
Q	0.3320	0.2792	1-1/2	6	6	960387
R	0.3390	0.2792	1-1/2	6	6	960388
S	0.3480	0.3105	1-3/4	7	6	960389
T	0.3580	0.3105	1-3/4	7	6	960390
U	0.3680	0.3105	1-3/4	7	6	960391
V	0.3770	0.3105	1-3/4	7	6	960392
W	0.3860	0.3105	1-3/4	7	6	960393
X	0.3970	0.3105	1-3/4	7	6	960394
Y	0.4040	0.3105	1-3/4	7	6	960395
Z	0.4130	0.3730	1-3/4	7	6	960396

Package Quantities: all sizes = 1/pkg.

CHUCKING REAMERS

■General Purpose
■Use thru hole applications

Straight Shank / Straight Flutes / 45° Chamfer / High Speed Steel

List No. R600

Wire Sizes

Size	Decimal Equivalent	Shank Diameter	Flute Length	Overall Length	No. of Flutes	EDP Number
1	0.2280	0.2173	1-1/2	6	6	960271
2	0.2211	0.2173	1-1/2	6	6	960272
3	0.2130	0.2075	1-1/4	5	6	960273
4	0.2090	0.2016	1-1/4	5	6	960274
5	0.2055	0.2016	1-1/4	5	6	960275

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List No. R600 . . . *continued*

Size	Decimal Equivalent	Shank Diameter	Flute Length	Overall Length	No. of Flutes	EDP Number
6	0.2040	0.1945	1-1/4	5	6	960276
7	0.2010	0.1945	1-1/4	5	6	960277
8	0.1990	0.1895	1-1/4	5	6	960278
9	0.1960	0.1895	1-1/4	5	6	960279
10	0.1935	0.1860	1-1/4	5	6	960280
11	0.1910	0.1860	1-1/4	5	6	960281
12	0.1890	0.1805	1-1/8	4-1/2	6	960282
13	0.1850	0.1805	1-1/8	4-1/2	6	960283
14	0.1820	0.1755	1-1/8	4-1/2	6	960284
15	0.1800	0.1755	1-1/8	4-1/2	6	960285
16	0.1770	0.1704	1-1/8	4-1/2	6	960286
17	0.1730	0.1645	1-1/8	4-1/2	6	960287
18	0.1695	0.1595	1-1/8	4-1/2	6	960288
19	0.1660	0.1595	1-1/8	4-1/2	6	960289
20	0.1610	0.1530	1-1/8	4-1/2	6	960290
21	0.1590	0.1530	1-1/8	4-1/2	6	960291
22	0.1570	0.1510	1	4	6	960292
23	0.1540	0.1460	1	4	6	960293
24	0.1520	0.1460	1	4	6	960294
25	0.1495	0.1430	1	4	6	960295
26	0.1470	0.1430	1	4	6	960296
27	0.1440	0.1350	1	4	6	960297
28	0.1405	0.1350	1	4	6	960298
29	0.1360	0.1275	1	4	6	960299
30	0.1285	0.1190	7/8	3-1/2	6	960300
31	0.1200	0.1120	7/8	3-1/2	6	960301
32	0.1160	0.1120	7/8	3-1/2	6	960302
33	0.1130	0.1055	7/8	3-1/2	4	960303
34	0.1110	0.1055	7/8	3-1/2	4	960304
35	0.1100	0.1030	7/8	3-1/2	4	960305
36	0.1065	0.1030	7/8	3-1/2	4	960306
37	0.1040	0.0950	7/8	3-1/2	4	960307
38	0.1015	0.0950	7/8	3-1/2	4	960308
39	0.0995	0.0928	7/8	3-1/2	4	960309
40	0.0980	0.0928	7/8	3-1/2	4	960310
41	0.0960	0.0928	7/8	3-1/2	4	960311
42	0.0935	0.0880	3/4	3	4	960312
43	0.0890	0.0810	3/4	3	4	960313
44	0.0860	0.0810	3/4	3	4	960314
45	0.0820	0.0771	3/4	3	4	960315
46	0.0810	0.0771	3/4	3	4	960316
47	0.0785	0.0720	3/4	3	4	960317
48	0.0760	0.0720	3/4	3	4	960318
49	0.0730	0.0660	3/4	3	4	960319
50	0.0700	0.0660	3/4	3	4	960320
51	0.0670	0.0660	3/4	3	4	960321
52	0.0635	0.0585	1/2	2-1/2	4	960322
53	0.0595	0.0585	1/2	2-1/2	4	960323

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List No. R600 . . . *continued*

Size	Decimal Equivalent	Shank Diameter	Flute Length	Overall Length	No. of Flutes	EDP Number
54	0.0550	0.0510	1/2	2-1/2	4	**960324**
55	0.0520	0.0510	1/2	2-1/2	4	**960325**
56	0.0465	0.0455	1/2	2-1/2	4	**960326**
57	0.0430	0.0390	1/2	2-1/2	4	**960327**
58	0.0420	0.0390	1/2	2-1/2	4	**960328**
59	0.0410	0.0390	1/2	2-1/2	4	**960329**
60	0.0400	0.0390	1/2	2-1/2	4	**960330**

Package Quantities: all sizes = 1/pkg.

CHUCKING REAMERS

Straight Shank / Helical Flutes / RHS/RHC / 45° Chamfer
High Speed Steel

List No. R620H

Fractional Sizes

■Right hand helix, right hand cut, chips flow up flutes for blind hole applications
■Smoother finish than straight flute

Size	Decimal Equivalent	Shank Diameter	Flute Length	Overall Length	No. of Flutes	EDP Number
1/16	0.0625	0.0585	1/2	2-1/2	4	**960404**
1/8	0.1250	0.1190	7/8	3-1/2	6	**960408**
3/16	0.1875	0.1805	1-1/8	4-1/2	6	**960412**
1/4	0.2500	0.2405	1-1/2	6	6	**960416**
5/16	0.3125	0.2792	1-1/2	6	6	**960420**
3/8	0.3750	0.3105	1-3/4	7	6	**960424**
7/16	0.4375	0.3730	1-3/4	7	6	**960428**
1/2	0.5000	0.4355	2	8	6	**960432**
5/8	0.6250	0.5620	2-1/4	9	6	**960440**
11/16	0.6875	0.5620	2-1/4	9	8	**960444**
3/4	0.7500	0.6245	2-1/2	9-1/2	8	**960448**
13/16	0.8125	0.6245	2-1/2	9-1/2	8	**960452**
7/8	0.8750	0.7495	2-5/8	10	8	**960456**
15/16	0.9375	0.7495	2-5/8	10	8	**960460**

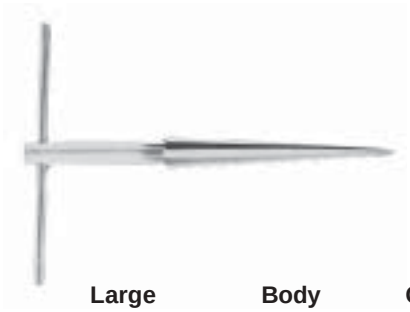
Package Quantities: all sizes = 1/pkg.

REPAIRMEN'S TAPER REAMERS

Carbon Steel / Straight Flutes

List No. 260

Reamer Number Sizes



- Used to enlarge holes in thin metals
- Ideal for use by automobile and bicycle repairmen, electricians, machinists, plumbers, and carpenters

Size	Small End	Decimal Equivalent	Large End	Body Length	Overall Length	EDP Number
5	1/8	0.1250	0.5000	3-5/8	5-1/2	**421404**
6	3/8	0.3750	1.0000	4-5/8	6-1/2	**421412**

Package Quantities: all sizes = 1/pkg.

TAPER PIPE REAMERS

Spiral Fluted / High Speed Steel

List No. 2249

- 3/4 taper per foot,, same as American National Standard pipe taps
- RH cut, LH spiral pushes chips forward, thru hole applications
- Square on end of shank for hand maintenance or production reaming

Nominal Pipe Size	Large End Diameter	Small End Diameter	Flute Length	No. of Flutes	Overall Length	Shank Diameter	EDP Number
1/8	0.3620	0.3160	3/4	6	2-1/8	.4375	**421008**
1/4	0.4720	0.4060	1-1/16	6	2-7/16	.5626	**421016**
3/8	0.6060	0.5400	1-1/16	6	2-9/16	.7000	**421024**
1/2	0.7510	0.6650	1-3/8	6	3-1/8	.6875	**421032**
3/4	0.9620	0.8760	1-3/8	8	3-1/4	.9063	**421040**
1	1.2120	1.1030	1-3/4	8	3-3/4	1.1250	**421057**
1-1/4	1.5530	1.4440	1-3/4	10	4	1.3125	**421065**
1-1/2	1.7930	1.6840	1-3/4	10	4-1/4	1.5000	**421073**
2	2.2680	2.1590	1-3/4	12	4-1/2	1.8750	**421081**

Package Quantities: all sizes = 1/pkg.

TAPER PIN REAMERS

Straight Fluted / High Sped Steel / Right Hand Cut
Straight Shank / Square Drive

List No. RTP

Reamer Number Sizes

- Thru hole applications for taper pin reaming
- Match taper pin specifications
- Square on shank for hand applications
- 1/4" taper per foot

Reamer Number	Shank Diameter	Large End Diameter	Small End Diameter	Flutel Length	Overall Length	EDP Number
0	11/64	0.1638	0.1287	1-11/16	2-15/16	963406
1	3/16	0.1798	0.1447	1-11/16	2-15/16	963407
2	13/64	0.2008	0.1605	1-15/16	3-3/16	963408
3	15/64	0.2294	0.1813	2-5/16	3-11/16	963409
4	17/64	0.2604	0.2071	2-9/16	4-1/16	963410
5	5/16	0.2994	0.2409	2-13/16	4-5/16	963411
6	23/64	0.3540	0.2773	3-11/16	5-7/16	963412
7	13/32	0.4220	0.3297	4-7/16	6-5/16	963413
8	7/16	0.5050	0.3971	5-3/16	7-3/16	963414
9	9/16	0.6066	0.4805	6-1/16	8-5/16	963415
10	5/8	0.7216	0.5799	6-13/16	9-5/16	963416

Package Quantities: all sizes = 1/pkg.

TAPER PIN REAMERS

Spiral Fluted / High Speed Steel / Left Hand Helix / Right Hand Cut
Straight Shank / Square Drive

List No. RTP-L

Reamer Number Sizes

- LH helix RH cut pushes chips forward in thru hole applications
- Smoother finish than straight flute reamers
- Matches taper pin specifications
- Square on shank for hand applications
- Hand maintenance or production reaming

Reamer Number	Shank Diameter	Large End Diameter	Small End Diameter	Flutel Length	Overall Length	EDP Number
0	11/64	0.1638	0.1287	1-11/16	2-15/16	963436
1	3/16	0.1798	0.1447	1-11/16	2-15/16	963437
2	13/64	0.2008	0.1605	1-15/16	3-3/16	963438
3	15/64	0.2294	0.1813	2-5/16	3-11/16	963439
4	17/64	0.2604	0.2071	2-9/16	4-1/16	963440
5	5/16	0.2994	0.2409	2-13/16	4-5/16	963441
6	23/64	0.3540	0.2773	3-11/16	5-7/16	963442
7	13/32	0.4220	0.3297	4-7/16	6-5/16	963443
8	7/16	0.5050	0.3971	5-3/16	7-3/16	963444
9	9/16	0.6066	0.4805	6-1/16	8-5/16	963445
10	5/8	0.7216	0.5799	6-13/16	9-5/16	963446

Package Quantities: all sizes = 1/pkg.

VTD Intermediate Diameter non-stock Reamers

Straight Shank Chucking Reamer / RH Helical Flute / RH Cut / Regular Length

NEW

List No. R620

(Note: Fast Reamer is 48 pieces or less)

Size Range	EDP No.	Size Range	EDP No.	Size Range	EDP No.	Size Range	EDP No.
.0400- .0430	963000	.1891- .2041	963012	.4063- .4385	963024	.8491- .9062	963036
.0431- .0500	963001	.2042- .2188	963013	.4386- .4688	963025	.9063- .9740	963037
.0501- .0635	963002	.2189- .2205	963014	.4689- .5010	963026	.9741-1.0000	963038
.0636- .0785	963003	.2206- .2335	963015	.5011- .5330	963027	1.0001-1.0625	963039
.0786- .0938	963004	.2336- .2375	963016	.5331- .5635	963028	1.0626-1.1250	963040
.0939- .1040	963005	.2376- .2475	963017	.5636- .6010	963029	1.1251-1.1875	963041
.1041- .1160	963006	.2476- .2530	963018	.6011- .6260	963030	1.1876-1.2500	963042
.1161- .1285	963007	.2531- .2840	963019	.6261- .6719	963031	1.2501-1.3125	963043
.1286- .1406	963008	.2841- .3135	963020	.6720- .7230	963032	1.3126-1.3750	963044
.1407- .1570	963009	.3136- .3438	963021	.7231- .7656	963033	1.3751-1.4375	963045
.1571- .1719	963010	.3439- .3770	963022	.7657- .8125	963034	1.4376-1.5000	963046
.1720- .1890	963011	.3771- .4062	963023	.8126- .8490	963035		

** Fast Reamer is on orders of 48 pieces or less with shipment in 24 hours.*

VTD Intermediate Diameter non-stock Reamers

Taper Shank Chucking Reamer / Straight Flute / RH Cut / Regular Length / HSS

NEW

List No. RTS690

(Note: Fast Reamer is 48 pieces or less)

Size Range	EDP No.	Size Range	EDP No.	Size Range	EDP No.	Size Range	EDP No.
.1750- .1890	963047	.3771- .4062	963055	.6261- .6719	963063	1.0001-1.0625	963071
.1891- .2041	963048	.4063- .4385	963056	.6720- .7230	963064	1.0626-1.1250	963072
.2042- .2188	963049	.4386- .4688	963057	.7231- .7656	963065	1.1251-1.1875	963073
.2189- .2530	963050	.4689- .5010	963058	.7657- .8125	963066	1.1876-1.2500	963074
.2531- .2840	963051	.5011- .5330	963059	.8126- .8490	963067	1.2501-1.3125	963075
.2841- .3135	963052	.5331- .5635	963060	.8491- .9062	963068	1.3126-1.3750	963076
.3136- .3438	963053	.5636- .5938	963061	.9063- .9740	963069	1.3751-1.4375	963077
.3439- .3770	963054	.5939- .6260	963062	.9741-1.0000	963070	1.4376-1.5000	963078

** Fast Reamer is on orders of 48 pieces or less with shipment in 24 hours.*

VTD Intermediate Diameter non-stock Reamers

Straight Shank Chucking Reamer / Straight Flute / RH Cut / Regular Length / HSS

NEW

List No. R620H

(Note: Fast Reamer is 48 pieces or less)

Size Range	EDP No.	Size Range	EDP No.	Size Range	EDP No.	Size Range	EDP No.
.0550- .0635	963079	.1891- .2041	963089	.4689- .5010	963099	.8491- .9062	963109
.0636- .0785	963080	.2042- .2188	963090	.5011- .5330	963100	.9063- .9740	963110
.0786- .0938	963081	.2189- .2530	963091	.5331- .5635	963101	.9741-1.0000	963111
.0939- .1040	963082	.2531- .2840	963092	.5636- .6010	963102	1.0001-1.0625	963112
.1041- .1160	963083	.2841- .3135	963093	.6011- .6260	963103	1.0626-1.1250	963113
.1161- .1285	963084	.3136- .3438	963094	.6261-.6719	963104	1.1251-1.1875	963114
.1286- .1406	963085	.3439- .3770	963095	.6720- .7230	963105	1.1876-1.2500	963115
.1407- .1570	963086	.3771- .4062	963096	.7231- .7656	963106	1.2501-1.3125	963116
.1571- .1719	963087	.4063- .4385	963097	.7657- .8125	963107	1.3126-1.3750	963117
.1720- .1890	963088	.4386- .4688	963098	.8126- .8490	963108	1.3751-1.4375	963118
						1.4376-1.5000	963119

** Fast Reamer is on orders of 48 pieces or less with shipment in 24 hours.*

Taps and Dies

CNC Forming Taps

ISO Metric Threads

Pipe Taps

Special Purpose Taps

General Tap Information

Threading Dies

Drills

VERMONT TAP FACTS: TYPES OF TAPS

Straight Fluted Hand Taps

These are general purpose taps used for a wide variety of hand and machine tapping applications. They are available, in most cases, in taper, plug, semi-bottoming, and bottoming chamfers and in various numbers of flutes.

Spiral Pointed Taps

These taps have a special angular grind at the point which shears chips and drives them ahead of the tap. Advantages are reduced tapping torque and increased speed in through hole tapping.

Spiral Fluted Taps

These taps are manufactured with spiral flutes for increased chip clearing efficiency in soft materials in which stringy chips are generated. Especially useful in tapping deep or blind holes, and in bridging keyways, these taps are available with regular or high helix flutes.

Fluteless or Forming Taps

Forming taps generate threads by displacing rather than cutting metal, thereby eliminating or greatly reducing chips. They are especially useful for applications in which chips cannot be tolerated. CNC Forming taps are designed to allow tapping harder and tougher materials than have been successfully tapped with other forming taps.

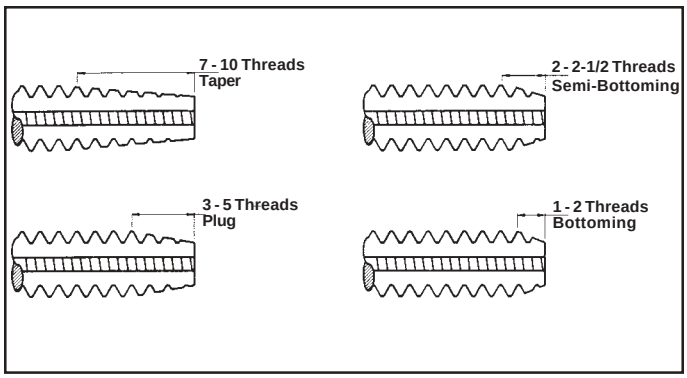
Extra Length Taps

Vermont Tap and Die produces, as standard and special, five different types of taps with extra long shanks that permit tapping in deep or obstructed areas. They are extension taps, pulley taps, nut taps, tapper taps and taper pipe taps (extra length). Of these, nut taps, tapper taps, and extension taps 7/16” and larger have shank diameters smaller than the minor diameter of the nut being tapped.

Pipe Taps

Taps for internal threading of pipe, pipe fittings, or holes in which threaded pipe is to be assembled are pipe taps. The types of pipe taps manufactured by Vermont Tap and Die as standard include: Taper Pipe Taps in regular or interrupted thread; Extra Length Taper Pipe Taps in regular or interrupted thread; and Straight Pipe Taps. Interrupted thread pipe taps are manufactured with alternate teeth removed on adjacent lands (with the exception of the first few threads at the point). Designed for tapping certain tough metals or those which tend to tear or load the cutting teeth, these taps are to be used only when regular full thread taps fail.

VERMONT TAP FACTS: CHAMFER STYLES



All taps have a certain number of threads at the starting end chamfer ground and relieved. This chamfer helps to guide the tap into the hole and also serves to distribute the cutting action over as many threads as possible. There are four standard styles of tap chamfer —taper, plug, semi-bottoming, and bottoming — with a different number of threads chamfered in each case. Each is designed for a different type of hole situation.

Taper taps have 7 to 10 threads chamfered and are designed for threading through holes.

Plug taps have 3 to 5 threads chamfered and are most widely used in through holes and in blind holes that do not have to be threaded all the way to the bottom. Although most hand taps are available in taper, plug, and bottoming styles, some taps, such as pipe taps, are available only in the plug chamfer.

Semi-bottoming taps have 2 to 2-1/2 threads chamfered and are designed for both through and blind hole tapping.

Bottoming taps have 1 to 2 threads chamfered, and are designed to thread blind holes close to the bottom.

NUMBER OF FLUTES

Cutting taps (as opposed to forming taps which do not cut metal or produce chips) are manufactured with a number of flutes running the length of their thread sections. These flutes have two functions: ground perpendicular to the tap threads as they are, they provide the teeth which cut into the object being threaded; and they provide channels along which the metal chips produced in thread cutting can escape from the workpiece. Generally speaking, increasing the number of flutes increases the number of cutting faces presented to the work piece, thereby distributing the cutting action over a greater number of teeth and reducing the wear on each tooth.

The basic number of flutes for most standard hand tap sizes from No. 8 through 1" is four, but for applications in which greater land strength or greater chip clearing ability is required (as in the case of tough, stringy metals), two and three fluted taps are available as optional standards. Two and three fluted taps are provided as standard in the spiral pointed and spiral fluted tap lines while standard pipe taps, in the larger sizes, are manufactured with as many as eight flutes.

THREAD PITCH DIAMETER LIMITS

The basic pitch diameter of any given thread size is equivalent to both the maximum pitch diameter of all screws manufactured to that size and to the minimum pitch diameter of any nut of that size. However, since basic pitch diameter is a theoretical figure which cannot be attained under production conditions, it is primarily a control point from which standardized deviations or tolerances are established.

Accordingly, since basic pitch diameter is the same as minimum pitch diameter of internally threaded objects such as nuts, standard taps in a given size are manufactured to various different tolerance levels that produce dimensions greater than that of basic pitch diameter. For instance, the basic pitch diameter of a 1/4-20 screw thread is .2175, but a 1/4-20 tap produced to the tolerances of G H3 limits has a pitch diameter tolerance range of .2185 to .2190. Pitch diameter limits for taps through 1" in diameter follow.

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"

TECHNICAL DATA

Of most importance to successful hole tapping is the information for determining the correct tap/drill sizes given for thread cutting taps on page 165. The same information for forming taps can be found on page 152. In addition, specific recommendations regarding tapping in different types of material can be found on page 162.

SCREW THREAD CLASSES OF FIT

Three classes of fit have been established for screw threads in the unified system which permit the making of standard recommendations that relate screw thread class of fit to specific tap tolerance limits.

The class of fit of two threaded members such as a nut and a bolt is expressed by a symbol containing a number and a letter as part of the thread designation. The number, 1 through 3, expresses the class of fit while the letter "A" or "B" respectively expresses whether external or internal threads are involved. In the example "1/2-13 UNC-2B", 2B expresses the class of fit for an internal thread.

Class 1A External and Class 1B Internal Threads

This class of fit is intended to apply to the manufacture of threaded parts where frequent quick assembly is necessary or desired. A wide allowance, or difference, between basic pitch diameter and maximum pitch diameter, is provided to permit the loose assembly.

Class 2A External and Class 2B Internal Threads

This class of fit is medium loose and is intended to apply to screws, bolts, and nuts for general fastener use. This allowance will permit freedom of fit to prevent seizure in assembly and will allow limited plating and coating.

Class 3A External and Class 3B Internal Threads

This class of fit is intended for thread assembly where closeness of fit and accuracy of thread angle and lead are required. This close fit can be obtained consistently only by use of high quality tooling and equipment and a highly efficient system of gaging and inspection.

Where the letter "U", "A", or "B" do not appear in thread designation (for example, 1/2-13NC-2), gaging and tap pitch diameter would conform to earlier American Standard threads, which include Class 2 and Class 3 only.

Unified threads, American threads, and UNJ threads have the same tap thread form so that Unified and American threaded parts are mechanically interchangeable.

UNJ internal threads are produced with taps with standard thread form. Radius root applies only to the externally threaded member. Special oversize minor diameter (drilled hole) is required in UNJ threads. Refer to MIL-S-8879A which is the industry standard for the UNJ thread.

PITCH DIAMETER LIMIT RECOMMENDATIONS

The chart on the next page lists recommendations of specific taps by pitch diameter limit in each thread size for each class of fit. The recommended tap in each case should provide the required class of fit under good tapping conditions. There are some conditions, however, such as a tendency to oversize tapping, that may necessitate the selection of an alternate pitch diameter limit. Generally, if only the first few holes gage loose and can be tolerated, it is best to use the recommended pitch diameter limit in order to secure maximum tap life.

Pitch diameters shown under "Min/All Classes (Basic)" are those for the thread gage GO member. Pitch diameters shown under the four "Max" classes are those for the HI or NO GO member. If only the class of fit is shown on orders, taps with corresponding limits as shown on this chart will be furnished. If only ground thread is specified, taps with the limit for Class 2B or 3B fit will be furnished.

In very abrasive material, improved tap life can be realized by using taps with one pitch diameter limit higher than recommended in the chart. The first few holes tapped may gage a little loose, but

PITCH DIAMETER LIMIT RECOMMENDATIONS (continued)

after wear land has developed, good gaging will usually follow.

There are several factors other than the pitch diameter limit in maintaining good gaging. High flute hook, high chamfer relief, and high thread relief as well as spindle run-out, misalignment, overfeeding, in or out, and incorrect tapping speeds can all cause oversize gaging. On the other hand, some materials tend to expand under comparatively low heat conditions and to close up the tapped hole, which will result in tight gaging.

Some high production tapping machines cause the tap to stop on reversing about one thread from the top of the hole and pull out without turning. This causes distortion of the top thread that may restrict the GO gage. If gaging problems persist, call your Vermont representative or the Technical Service Department at Vermont Tap & Die.

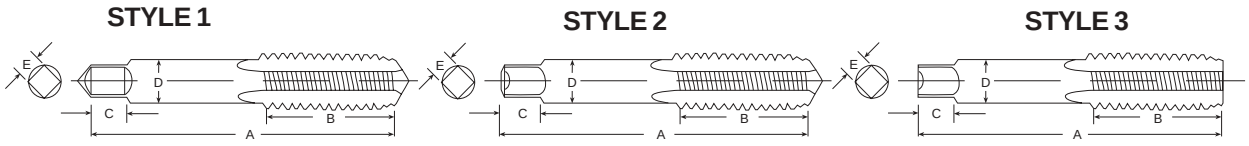
TECHNICAL TABLES

TABLE #1 TAP RECOMMENDATIONS FOR CLASSES 2, 3, 1B, 2B & 3B
UNIFIED AND AMERICAN NATIONAL SCREW THREADS

	THREADS PER INCH		RECOMMENDED TAP LIMITS				INTERNAL THREAD PITCH DIAMETER LIMITS				
SIZE	NC UNC	NF UNF	CLASS 2	CLASS 3	CLASS 2B	CLASS 3B	MIN/ALL CLASSES (BASIC)	MAX CLASS 2	MAX CLASS 3	MAX CLASS 2B	MAX CLASS 3B
0		80	G H1	G H1	G H2	G H1	.0519	.0536	.0532	.0542	.0536
1	64		G H1	G H1	G H2	G H1	.0629	.0648	.0643	.0655	.0648
1		72	G H1	G H1	G H2	G H1	.0640	.0658	.0653	.0665	.0659
2	56		G H1	G H1	G H2	G H1	.0744	.0764	.0759	.0772	.0765
2		64	G H1	G H1	G H2	G H1	.0759	.0778	.0773	.0786	.0779
3	48		G H1	G H1	G H2	G H1	.0855	.0877	.0871	.0885	.0877
3		56	G H1	G H1	G H2	G H1	.0874	.0894	.0889	.0902	.0895
4	40		G H2	G H1	G H2	G H2	.0958	.0982	.0975	.0991	.0982
4		48	G H1	G H1	G H2	G H1	.0985	.1007	.1001	.1016	.1008
5	40		G H2	G H1	G H2	G H2	.1088	.1112	.1105	.1121	.1113
5		44	G H1	G H1	G H2	G H1	.1102	.1125	.1118	.1134	.1126
6	32		G H2	G H1	G H3	G H2	.1177	.1204	.1196	.1214	.1204
6		40	G H2	G H1	G H2	G H2	.1218	.1242	.1235	.1252	.1243
8	32		G H2	G H1	G H3	G H2	.1437	.1464	.1456	.1475	.1465
8		36	G H2	G H1	G H2	G H2	.1460	.1485	.1478	.1496	.1487
10	24		G H3	G H1	G H3	G H3	.1629	.1662	.1653	.1672	.1661
10		32	G H2	G H1	G H3	G H2	.1697	.1724	.1716	.1736	.1726
12	24		G H3	G H1	G H3	G H3	.1889	.1922	.1913	.1933	.1922
12		28	G H3	G H1	G H3	G H3	.1928	.1959	.1950	.1970	.1959
1/4	20		G H3	G H2	G H5	G H3	.2175	.2211	.2201	.2223	.2211
1/4		28	G H3	G H1	G H4	G H3	.2268	.2299	.2290	.2311	.2300
5/16	18		G H3	G H2	G H5	G H3	.2764	.2805	.2794	.2817	.2803
5/16		24	G H3	G H1	G H4	G H3	.2854	.2887	.2878	.2902	.2890
3/8	16		G H3	G H2	G H5	G H3	.3344	.3389	.3376	.3401	.3387
3/8		24	G H3	G H1	G H4	G H3	.3479	.3512	.3503	.3528	.3516
7/16	14		G H5	G H3	G H5	G H3	.3911	.3960	.3947	.3972	.3957
7/16		20	G H3	G H1	G H5	G H3	.4050	.4086	.4076	.4104	.4091
1/2	13		G H5	G H3	G H5	G H3	.4500	.4552	.4537	.4565	.4548
1/2		20	G H3	G H1	G H5	G H3	.4675	.4711	.4701	.4731	.4717
9/16	12		G H5	G H3	G H5	G H3	.5084	.5140	.5124	.5152	.5135
9/16		18	G H3	G H2	G H5	G H3	.5264	.5305	.5294	.5323	.5308
5/8	11		G H5	G H3	G H5	G H3	.5660	.5719	.5702	.5732	.5714
5/8		18	G H3	G H2	G H5	G H3	.5889	.5930	.5919	.5949	.5934
3/4	10		G H5	G H3	G H5	G H5	.6850	.6914	.6895	.6927	.6907
3/4		16	G H3	G H2	G H5	G H3	.7094	.7139	.7126	.7159	.7143
7/8	9		G H6	G H4	G H6	G H4	.8028	.8098	.8077	.8110	.8089
7/8		14	G H4	G H2	G H6	G H4	.8286	.8335	.8322	.8356	.8339
1	8		G H6	G H4	G H6	G H4	.9188	.9264	.9242	.9276	.9254
1		12	G H4	G H2	G H6	G H4	.9459	.9515	.9499	.9535	.9516
1		14 NS	G H4	G H2	G H6	G H4	.9536	.9585	.9572	.9609	.9590
1-1/8	7		G H8	G H4	G H8	G H4	1.0322	1.0407	1.0381	1.0416	1.0393
1-1/8		12	G H4	G H4	G H6	G H4	1.0709	1.0765	1.0749	1.0787	1.0768
1-1/4	7		G H8	G H4	G H8	G H4	1.1572	1.1657	1.1631	1.1668	1.1644
1-1/4		12	G H4	G H4	G H6	G H4	1.1959	1.2015	1.1999	1.2039	1.2019
1-3/8	6		G H8	G H4	G H8	G H4	1.2667	1.2768	1.2738	1.2771	1.2745
1-3/8		12	G H4	G H4	G H6	G H4	1.3209	1.3265	1.3249	1.3291	1.3270
1-1/2	6		G H8	G H4	G H8	G H4	1.3917	1.4018	1.3988	1.4022	1.3996
1-1/2		12	G H4	G H4	G H6	G H4	1.4459	1.4515	1.4499	1.4542	1.4522

NOTES: ***Class 1B:*** *tapped holes can be produced with cut thread taps.* ***Class 2B:*** *cut thread taps may be used under normal conditions and in average materials for producing tapped holes to this classification. The above recommended taps normally produce the class of thread indicated in 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.*

ILLUSTRATION #1 GENERAL TAP DIMENSIONS



A = Overall Length B = Thread Length including chamfer C = Square Length D = Shank Diameter E = Size of Square

TABLE #2 USCTI TABLE 302 STANDARD TAP DIMENSIONS, GROUND THREAD

NOMINAL DIAMETER RANGE (INCHES)		TAP SIZE				TAP DIMENSIONS (INCHES)				
OVER	TO (INCL)	MACHINE SCREW NO.	FRACTIONAL INCHES	METRIC MILLIMETERS	STYLE	OVERALL LENGTH A	THREAD LENGTH B	SQUARE LENGTH C	SHANK DIAMETER D	SIZE OF SQUARE E
.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	.395		3/8	M10	2	2-15/16	1-1/4	7/16	.381	.286
.395	.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

TABLE #3 USCTI TABLE 303 SPECIAL FINE PITCH TAPS – SHORT SERIES

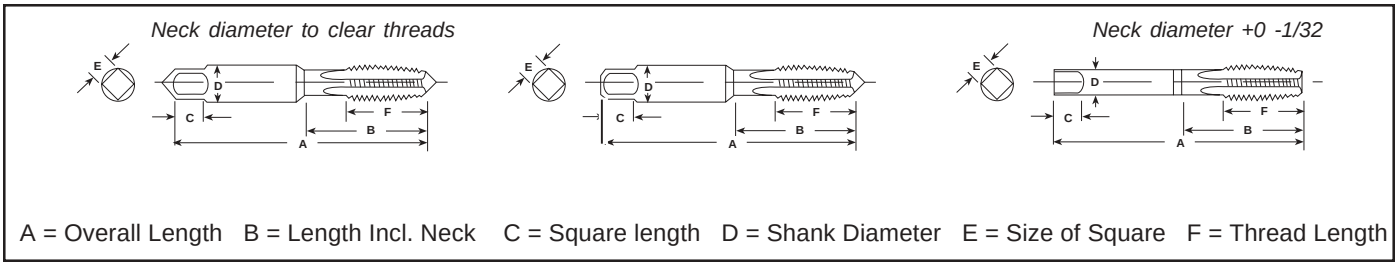
Unless otherwise specified, special taps 1.010" to 1.510" diameter inclusive, have 14 or more threads per inch or 1.75 millimeter pitch and finer. Sizes over 1.510" diameter with 10 or more threads per inch or 2.5 millimeter pitch and finer will be made to the general dimensions shown below. Standard tap dimensions are illustrated on the previous page.

NOMINAL DIAMETER RANGE (INCHES)		TAP SIZE		TAP DIMENSIONS (INCHES)				
OVER	TO (INCL)	FRACTIONAL INCHES	METRIC MILLIMETERS	OVERALL LENGTH A	THREAD LENGTH B	SQUARE LENGTH C	SHANK DIAMETER D	SIZE OF SQUARE E
1.010	1.073	1-1/16	M27	4	1-1/2	7/8	.896	.672
1.073	1.135	1-1/8		4	1-1/2	7/8	.896	.672
1.135	1.198	1-3/16	M30	4	1-1/2	1	1.021	.766
1.198	1.260	1-1/4		4	1-1/2	1	1.021	.766
1.260	1.323	1-5/16	M33	4	1-1/2	1	1.108	.831
1.323	1.385	1-3/8		4	1-1/2	1	1.108	.831
1.385	1.448	1-7/16	M36	4	1-1/2	1	1.233	.925
1.448	1.510	1-1/2		4	1-1/2	1	1.233	.925
1.510	1.635	1-5/8	M39	5	2	1-1/8	1.305	.979
1.635	1.760	1-3/4	M42	5	2	1-1/4	1.430	1.072
1.760	1.885	1-7/8		5	2	1-1/4	1.519	1.139
1.885	2.010	2	M48	5	2	1-3/8	1.644	1.233
2.010	2.135	2-1/8		5-1/4	2	1-3/8	1.769	1.327
2.135	2.260	2-1/4	M56	5-1/4	2	1-7/16	1.894	1.420
2.260	2.385	2-3/8		5-1/4	2	1-7/16	2.019	1.514
2.385	2.510	2-1/2		5-1/4	2	1-1/2	2.100	1.575
2.510	2.635	2-5/8	M64	5-1/2	2	1-1/2	2.100	1.575
2.635	2.760	2-3/4		5-1/2	2	1-1/2	2.100	1.575
2.760	2.885	2-7/8	M72	5-1/2	2	1-1/2	2.100	1.575
2.885	3.010	3		5-1/2	2	1-1/2	2.100	1.575
3.010	3.135	3-1/8		5-3/4	2	1-1/2	2.100	1.575
3.135	3.260	3-1/4	M80	5-3/4	2	1-1/2	2.100	1.575
3.260	3.385	3-3/8		5-3/4	2	1-1/2	2.100	1.575
3.385	3.510	3-1/2		5-3/4	2	1-1/2	2.100	1.575
3.510	3.635	3-5/8	M90	6	2	1-3/4	2.100	1.575
3.635	3.760	3-3/4		6	2	1-3/4	2.100	1.575
3.760	3.885	3-7/8		6	2	1-3/4	2.100	1.575
3.885	4.010	4	M100	6	2	1-3/4	2.100	1.575

TABLE #4 GENERAL TAP DIMENSION TOLERANCES

ELEMENT	NOMINAL DIAMETER RANGE (INCHES) OVER	TO (INCL.)	DIRECTION	TOLERANCE (INCHES) CUT THREAD	GROUND THREAD
Length Overall - A	.052	1.010	Plus or Minus	1/32	1/32
	1.010	4.010	Plus or Minus	1/16	1/16
Length of Thread - B	.052	.223	Plus or Minus	3/64	3/64
	.223	.510	Plus or Minus	1/16	1/16
	.510	1.510	Plus or Minus	3/32	3/32
	1.510	4.010	Plus or Minus	1/8	1/8
Length of Square - C	.052	1.010	Plus or Minus	1/32	1/32
	1.010	4.010	Plus or Minus	1/16	1/16
Diameter of Shank - D	.052	.223	Minus	.004	.0015
	.223	.635	Minus	.005	.0015
	.635	1.010	Minus	.005	.002
	1.010	1.510	Minus	.007	.002
	1.510	2.010	Minus	.007	.003
	2.010	4.010	Minus	.009	.003
Size of Square - E	.052	.510	Minus	.004	.004
	.510	1.010	Minus	.006	.006
	1.010	2.010	Minus	.008	.008
	2.010	4.010	Minus	.010	.010

ILLUSTRATION #2 NECKED TAPS



A = Overall Length B = Length Incl. Neck C = Square length D = Shank Diameter E = Size of Square F = Thread Length

TABLE #5 USCTI TABLE 302A GENERAL TAP DIMENSIONS AND TOLERANCES Optional Necks and Optional Shortened Thread Length

NOMINAL DIAMETER RANGE (INCHES)		TAP SIZE				TAP DIMENSIONS (INCHES)					
OVER	TO (INCL)	MACHINE SCREW NO.	FRACTIONAL INCHES	METRIC MILLIMETERS	STYLE	OVERALL LENGTH A	LENGTH *B	SQUARE LENGTH C	SHANK DIAMETER D	SIZE OF SQUARE E	THREAD LENGTH **F
.104	.117	4			1	1-7/8	9/16	3/16	.141	.110	5/16
.117	.130	5	1/8	M3, M3.15	1	1-15/16	5/8	3/16	.141	.110	5/16
.130	.145	6		M3.5	1	2	11/16	3/16	.141	.110	3/8
.145	.171	8	5/32	M4	1	2-1/8	3/4	1/4	.168	.131	3/8
.171	.197	10	3/16	M4.5, M5	1	2-3/8	7/8	1/4	.194	.152	1/2
.197	.223	12	7/32		1	2-3/8	15/16	9/32	.220	.165	1/2
.223	.260	14	1/4	M6, M6.3	2	2-1/2	1	5/16	.255	.191	5/8
.260	.323		5/16	M7, M8	2	2-23/32	1-1/8	3/8	.318	.238	11/16
.323	.395		3/8	M10	2	2-15/16	1-1/4	7/16	.381	.286	3/4
.395	.448		7/16		3	3-5/32	—	13/32	.323	.242	7/8
.448	.510		1/2	M12, M12.5	3	3-3/8	—	7/16	.367	.275	15/16
.510	.573		9/16	M14	3	3-19/32	—	1/2	.429	.322	1
.573	.635		5/8	M16	3	3-13/16	—	9/16	.480	.360	1-3/32
.635	.709		11/16	M18	3	4-1/32	—	5/8	.542	.406	1-3/32
.709	.760		3/4		3	4-1/4	—	11/16	.590	.442	1-7/32
.760	.823		13/16	M20	3	4-15/32	—	11/16	.652	.489	1-7/32
.823	.885		7/8	M22	3	4-11/16	—	3/4	.697	.523	1-11/32
.885	.948		15/16	M24	3	4-29/32	—	3/4	.760	.570	1-11/32
.948	1.010		1	M25	3	5-1/8	—	13/16	.800	.600	1-1/2

** "B" based on Table 302, column B and shall be no less than minimum USCTI Table 302 thread length.*
*** "F" based on the length of 12 pitches of the UNC series.*
Notes: 1) "F" is minimum value and has no tolerance. 2) Unless otherwise specified, all tolerances are in accordance with USCTI Table 302. 3) For eccentricity tolerances, see USCTI Table 317.

TABLE #6 USCTI TABLE 317 ECCENTRICITY TOLERANCES OF TAP ELEMENTS

	RANGE SIZES ARE INCLUSIVE			CUT THREAD		GROUND THREAD	
ELEMENT	INCH AND MACHINE SCREW	PIPE	METRIC	ECCENTRICITY	*T.I.V.	ECCENTRICITY	*T.I.V.
Square (at central point)	#0 to 1/2"	1/16" to 1/8"	M1.6 to M12	.0030	.0060	.0030	.0060
	Over 1/2" to 4"	1/4" to 4"	Over M12 to M100	.0040	.0080	.0040	.0080
Shank	#0 to 5/16"	1/16"	M1.6 to M8	.0030	.0060	.0050	.0010
	Over 5/16" to 4"	1/8" to 4"	Over M8 to M100	.0040	.0080	.0008	.0016
Major Diameter	#0 to 5/16"	1/16"	M1.6 to M8	.0025	.0050	.0005	.0010
	Over 5/16" to 4"	1/8" to 4"	Over M8 to M100	.0040	.0080	.0008	.0016
Pitch Diameter (at first full thread)	#0 to 1/2"	1/16"	M1.6 to M8	.0025	.0050	.0005	.0010
	Over 1/2" to 4"	1/8" to 4"	Over M8 to M100	.0040	.0080	.0008	.0016
**Chamfer	#0 to 1/2"	1/16" to 1/8"	M1.6 to M12	.0020	.0040	.0010	.0020
	Over 1/2" to 4"	1/4" to 4"	Over M12 to M100	.0030	.0060	.0015	.0030

** Total Indicator Variation. Figures are given for both eccentricity and total indicator variation to avoid misunderstanding.*
*** Chamfer should preferably be inspected by light projection to avoid errors due to indicator contact points dropping into the thread grooves. United States Cutting Tool Institute (USCTI) governs tap dimensions for the United States.*

TABLE #7 SURFACE TREATMENTS AND COATINGS FOR HIGH SPEED STEEL GROUND THREAD TAPS

Coating	Properties and Application	Precautions
VERTANIUM® Titanium Nitride (TiN)	Proprietary TiN coating (hardness 2300 Vickers) offers significantly improved wear life and thread finish, often at higher tapping speeds in a broad range of materials, especially ferrous steels. Golden color.	Use with caution in nonferrous materials because of tendency to gall.
VERTANIUM ULTRA® Titanium Carbonitride (TiCN)	Proprietary TiCN coating (hardness 3000 Vickers) is harder, tougher and more wear resistant than TiN under conditions of moderate cutting temperatures. Like TiN, TiCN may be used at higher cutting speeds in a broad range of materials, especially ferrous steels. Blue-gray color.	Use with caution in nonferrous materials because of tendency to gall. TiAlN is a better choice when used at extreme temperatures.
Titanium Aluminum Nitride (TiAlN)	TiAlN coating (2600 Vickers) offers improved wear life and thread finish, especially in conditions where high temperatures can be generated. Violet-gray color.	Use with caution in nonferrous materials because of tendency to gall.
Chromium Nitride (CrN)	CrN is medium hard (1800 Vickers) has lower wear resistance than TiN, TiCN and TiAlN. However unlike thesecoatings, CrN does not gall when used in some nonferrous work materials. Silver color.	Ineffective in ferrous materials.
Nitride A-10	Hardened case extends wear life in abrasive materials.	Avoid on taper pipe, fast spiral and small diameter (<#6) or fine pitch taps due to tendency for thread chipping.
Oxide X-10	Helps prevent galling in ferrous (iron based) materials. For free machining steel.	Has a tendency to cause galling in nonferrous materials such as aluminum.
Nitride and Oxide X-20	Combines the benefits of nitride and oxide surface treatments.	See precautions for nitride and oxide surface treatments.

TABLE #8 SURFACE TREATMENT APPLICATION GUIDE

MATERIAL GROUP		TiN VERTANIUM®	TiCN VERTANIUM ULTRA®	TiAlN	CrN	Nitride A-10	Oxide X-10	Nitride/ Oxide X-20
Speed compared to uncoated tap ▶		+50% speed	+50% speed	+100% speed	same			
Carbon steels	1010, 1045	ALT	FIRST	NR	NR	NR	POS	POS
Alloy steels	4140, 8620	ALT	FIRST	NR	NR	NR	POS	POS
Tool steels	A2, D2, H13	ALT	FIRST	POS	NR	NR	POS	POS
Stainless, 300 series	304, 316	ALT	FIRST	POS	NR	NR	POS	POS
Stainless, 400 series	414, 440	ALT	FIRST	POS	NR	NR	POS	POS
Stainelss, PH	15-5PH, 17-4PH	ALT	FIRST	ALT	NR	NR	POS	POS
Cast irons, ductile		ALT	FIRST	NR	NR	POS	POS	POS
Cast irons, gray	Class 20 -50	ALT	FIRST	NR	NR	POS	POS	POS
Aluminum, wrought	1100, 2024	NR	NR	NR	FIRST	ALT	NR	NR
Aluminum, silicon, cast	319, 360, 380	ALT	FIRST	NR	POS	POS	NR	NR
Copper and alloys		NR	NR	NR	FIRST	ALT	NR	NR
Brass		NR	NR	NR	FIRST	ALT	NR	NR
Bronze		NR	NR	NR	FIRST	ALT	NR	NR
Zinc		NR	NR	NR	FIRST	ALT	NR	NR
Magnesium and alloys		NR	NR	NR	FIRST	ALT	NR	NR
Titaniums, pure	CP Ti	NR	NR	NR	POS	FIRST	NR	NR
Titanium, alloys	Ti-6Al-4V	POS	POS	POS	POS	POS	NR	NR
Nickel based alloys	Monel, Inconel	ALT	FIRST	ALT	ALT	POS	POS	POS
Iron based alloys	A-286, Incoloy	ALT	FIRST	ALT	NR	POS	POS	POS
Cobalt based alloys	Haynes	ALT	FIRST	ALT	NR	POS	POS	POS
Plastics, soft		FIRST	ALT	NR	POS	ALT	NR	NR
Platics, abrasive		ALT	FIRST	NR	POS	ALT	NR	NR
Graphite		ALT	FIRST	NR	POS	ALT	NR	NR

FIRST = First Choice: Best choice among all commercially available coatings. Should provide superior results in the proper application.

ALT = Alternate: Provides a significant performance benefit over uncoated tool. This may include improved life, productivity, size, finish, etc., or any combination.

POS = Possible: Performance often application dependent. Results are difficult to predict and may be variable.

NR = Not Recommended: Not compatible with the selected material. Likely to perform worse than an uncoated tool or benefit may not be cost justifiable.

For hardness levels less than 275BHN or 28 HRC.

CNC FORMING TAPS

Ground Thread / High Speed Steel

Vermont CNC Forming Taps are designed to produce internal threads by displacing the material instead of removing material. There is no metal removal, so there are no chips. The starting end of these taps is tapered as part of the thread grinding operation instead of chamfered. As the forming tap starts its rotation into the hole, material is gradually displaced throughout the starting taper until a fully formed thread is produced in the workpiece. The thread section in back of the starting taper sizes and burnishes the thread in the part.

Advantages in the use of CNC Forming Taps

- Greater tap strength, especially in smaller sizes
- Greater fastener strength in the product thread is often realized
- Spindle speed may be increased 50% or more; in fact, it is usually necessary to increase spindle speed for consistent gaging and best thread finish
- Better tap life in abrasive materials; no cutting edges to get dull
- Thread size (gaging) is less likely to be affected by spindle flotation or "runout"
- No chips to be removed from the workpiece location or to be cleaned up and handled

Vermont CNC Forming Taps are made to precise specifications and closely held tolerances to produce high quality threads at low cost.

For best results in using forming taps, special attention must be given to hole preparation and to the tapping operation.

Hole size is extremely critical. The thread will "form up" according to the amount of material available to the tap. The tap drill chart (Table #10) on page 152 shows the correct hole size and closest standard drill sizes. Cored holes and punched holes that are tapered should have as little taper as possible. The theoretical hole size should be at a point halfway into the hole.

Good lubrication is necessary because of the conditions of high friction. The coolant should contain an oil base, or a good lubricant additive. We suggest consulting with a coolant expert. The right kind of lubrication, properly applied, will have considerable effect on tap life and tapped thread quality.

Forming taps have been used in soft materials for several years, but with limited success in harder materials. The design of the CNC Forming tap makes it possible to form tap some free machining grades of stainless steel, steel stampings and fasteners with hardness no higher than about 25 Rc.

When tapping blind holes, tap life and thread quality will improve if the holes are drilled deep enough for some extra bottom clearance so a plug tap can be used instead of a bottoming tap. External centers at the thread end can be ground off if necessary. There is considerable difference in tapping torque (effort) between plug and bottoming forming taps. CNC forming bottoming taps have about 2 threads tapered for starting, and plug taps have 3 to 5 threads tapered.

The CNC Forming Tap design provides some opening for coolant and to prevent hydraulic pressure in blind hole tapping in normal hole depths. Oil grooves are supplied in CNC Forming taps #5 (M3) and larger to provide additional coolant opening for deep hole tapping.

Limitations in form tapping that must be considered

There is usually a rough appearance at the crest of the thread in the workpiece which causes some concern in quality control, but has no effect on the quality of the thread assembly – no contact is made with the mating part except at the thread flanks. A close examination will show that formed threads generally have better flank finish than threads produced by cutting.

If the rough crests in the product threads cannot be accepted, a controlled root forming tap can be made as a special. The controlled root, being the same diameter as the rough crest, will burnish it off smooth. There would be some loss of tap life.

Large diameter coarse thread forming taps require considerably more power to drive. Thread pitches coarser than 12 threads per inch get more difficult. Thread pitch (coarseness) has greater effect on tapping torque than the diameter. A 1"-20 will run about as well as 1/2-20. There are no size limitations in form tapping, but threads coarser than 12 may make it impossible.

Form taps cannot be successfully reconditioned, so careful evaluation as to cost effectiveness must be made if a resharpening program is an important part of cutting tap economy.

Pipe threads cannot be satisfactorily tapped with forming taps except those straight pipe threads for fastening rather than for sealing purposes. It is practically impossible to form tap a fully profiled pipe thread that must function as a sealing connection.

Special size and thread pitch and left hand CNC Forming taps are available as special.

Your Vermont representative is available to work with you to determine feasibility of form tapping.

CNC Forming Tap Hole Drilling Information

The thread percentages shown in Table #10 are theoretical and accordingly, all tap drills recommended are specified only to the nearest standard drill size.

Large diameter holes (1/2" and larger) with very fine thread (NEF and finer) should be reamed to size in order to produce theoretical 75% thread.

Holes to be drilled and tapped for National Coarse threads should be adjusted to provide for 60% or 65% thread rather than 75%. The lesser percent threads will furnish fully adequate thread strength (due to the extra strength imparted to them by the cold-forming action of these taps), but will require significantly less tapping effort than would be needed in producing 75% thread.

For cored holes, the core pin size must be adjusted to the appropriate drill size recommended in Table #10. Because of the taper in the core pin (which should be held to a minimum consistent with good withdrawal), the point of measurement of the pin diameter should be at half the hole depth. This will make the hole large at the entrance and small at the exit, but overall thread contact will provide good fastener strength.

Since cold-forming taps displace metal rather than remove it, there will be a certain amount of deformation (burr) at the entrance of the tapped hole. The CNC Forming Tap tends to minimize this condition, but it is impossible to eliminate it completely. If this raised condition is not acceptable, countersinking will be necessary.

CNC FORMING TAPS

Ground Thread / High Speed Steel

When engineering a new job with the Forming Tap, it is recommended that the drill size for 65% of thread be used as shown on Table #10 and #11. In most cases, the tap limit shown on Table #9 will produce the class of fit indicated. If it does not, use a lower or higher H number than indicated or contact the factory.

The formula on which Table #10 and #11 is based, is derived form extensive statistical data and laboratory testing on a wide variety of ductile metals, and can be expressed as follows:

Hole Size =

Basic tap major diameter - $\frac{.0068 \times \text{amount of \% of thread}}{\text{threads per inch.}}$

Example: Correct hole size for 65% of thread with a 1/4-20 CNC Forming Tap

Basic tap O.D. = .2500

Hole Size = $.2500 - \frac{.0068 \times 65}{20} = \frac{.442}{20}$

$= .2500 - \frac{.442}{20}$

$= .2500 - .0220$

$= .2280$ or #1 drill

If results are not satisfactory or if assistance is needed in determining correct hole sizes, contact your area Vermont sales representative or the Technical Services Department at Vermont Tap and Die.

TABLE #9
CNC FORMING TAP RECOMMENDATIONS FOR NOMINAL CLASS OF FIT

TAP SIZE	PITCH	BASIC PITCH DIA.	H LIMIT / RECOMMENDED TAP TOLERANCE FOR CLASS 2 FIT	CLASS 2B FIT	CLASS 3B FIT
2	56	.0744	-	-	-
2	64	.0759	-	-	-
3	48	.0855	-	-	-
3	56	.0874	-	-	-
4	40	.0958	H3	H5	H3
4	48	.0985	H3	H5	H3
5	40	.1088	H3	H5	H3
5	44	.1102	H3	H5	H3
6	32	.1117	H3	H5	H3
6	40	.1218	H3	H5	H3
8	32	.1437	H3	H5	H3
8	36	.1460	H3	H5	H3
10	24	.1629	H4	H6	H4
10	32	.1697	H4	H6	H4
12	24	.1889	H4	H6	H4
12	28	.1928	H4	H6	H4
1/4	20	.2175	H4	H6	H4
1/4	28	.2268	H4	H6	H4
5/16	18	.2764	H5	H7	H5
5/16	24	.2854	H5	H7	H5
3/8	16	.3344	H5	H7	H5
3/8	24	.3479	H5	H7	H5
7/16	14	.3911	H5	H8	H5
7/16	20	.4050	H5	H8	H5
1/2	13	.4500	H5	H8	H5
1/2	20	.4675	H5	H8	H5
9/16	12	.5084	H7	H10	H7
9/16	18	.5264	H7	H10	H7

TABLE #10
TAP DRILL SIZES FOR FORMING TAPS

$\text{THEORETICAL HOLE SIZE} = (\text{BASIC TAP O.D.}) - \frac{.0068 \times \%\ \text{OF THREAD}}{\text{THREADS PER INCH}}$ (core, punch, or dirll size)

		75% THREAD		70% THREAD		65% THREAD		60%THREAD	
TAP SIZE	PITCH	THEORETICAL HOLE SIZE	NEAREST DRILL SIZE	THEORETICAL HOLE SIZE	NEAREST DRILL SIZE	THEORETICAL HOLE SIZE	NEAREST DRILL SIZE	THEORETICAL HOLE SIZE	NEAREST DRILL SIZE
2	56	.0769	1.95 mm	.0774	1.95 mm	.0781	5/64	.0787	#47
2	64	.0780	5/64	.0785	#47	.0791	2.0 mm	.0796	2.0 mm
3	48	.0884	2.25 mm	.0890	#43	.0898	#43	.0905	2.3 mm
3	56	.0899	#43	.0904		.0911	2.3 mm	.0917	2.3 mm
4	40	.0993	2.5 mm	.1000	#39	.1010	#39	.1018	#38
4	48	.1014	#38	.1020	#38	.1028	2.6 mm	.1035	2.6 mm
5	40	.1123	#34	.1130	#33	.1140	#33	.1148	2.9 mm
5	44	.1134	#33	.1141	2.9 mm	.1150	2.9 mm	.1157	
6	32	.1221	3.1 mm	.1230	3.1 mm	.1242		.1252	1/8
6	40	.1253	1/8	.1260	3.2 mm	.1270	3.2 mm	.1278	3.25 mm
8	32	.1481	3.75 mm	.1490		.1502	#25	.1512	3.8 mm
8	36	.1498	#25	.1507	3.8 mm	.1517	#24	.1526	#24
10	24	.1688		.1700	#18	.1716	11/64	.1729	11/64
10	32	.1741	#17	.1750	=	.1762		.1772	#16
12	24	.1948	#10	.1960	#9	.1976	5.0 mm	.1989	#8
12	28	.1978	5.0 mm	.1989	#8	.2002	#8	.2014	#7
1/4	20	.2245	5.7 mm	.2260		.2279	#1	.2295	#1
1/4	28	.2318		.2329	5.9 mm	.2342	A	.2354	15/64
5/16	18	.2842	7.2 mm	.2861	7.25 mm	.2879	7.3 mm	.2898	L
5/16	24	.2912	7.4 mm	.2927		.2941	M	.2955	7.5 mm
3/8	16	.3431	11/32	.3452	8.75 mm	.3474	S	.3495	8.9 mm
3/8	24	.3537	9.0 mm	.3552	9.0 mm	.3566		.3580	T
7/16	14	.4011		.4035	Y	.4059	13/32	.4084	
7/16	20	.4120	Z	.4137	10.5 mm	.4154		.4171	
1/2	13	.4608		.4634		.4660		.4686	15/32
1/2	20	.4745	12.0 mm	.4762		.4779		.4796	
9/16	12	.5200		.5229		.5257		.5285	17/32
9/16	18	.5342	13.5 mm	.5361		.5380		.5398	

CNC FORMING TAPS

Ground Thread / High Speed Steel

The Vermont CNC Forming Tap is a new design expanding the use of forming taps further into harder and less ductile materials which up to now have not been successfully tapped with other existing types of forming taps.

The design of the CNC Forming Tap makes it less sensitive to undesirable hole conditions such as size variation, out-of-roundness, and excessive taper that often cause other forming taps to fail or break. However, in the case of holes that are small, or excessively tapered, the CNC Forming Tap may generate some fine chips.

The same recommendations, such as hole size, coolant, and spindle speed, that are made for other forming taps also apply to corresponding CNC Forming Taps.

CNC Forming Taps are available, as standard, in sizes, thread pitches, and pitch diameter limits shown on pages 38 and 39.

Bottom style CNC Forming Taps have approximately 2 threads tapered. Plug style CNC Forming Taps have approximately 4 threads tapered.

Other diameter, thread pitches, and left hand threads, may be available as special.

If further assistance is needed when engineering a new job with the CNC Forming Tap, contact your area Vermont sales representative, or the Technical Services Department at Vermont Tap and Die.

TABLE #11
METRIC TAP / DRILL SIZES FOR FORMING TAPS

THEORETICAL HOLE SIZE = (BASIC TAP O.D.) - .0068 X % OF THREAD / THREADS PER INCH
(core, punch, or drill size)

		75% THREAD		70% THREAD		65% THREAD		60 %THREAD	
TAP SIZE	PITCH	THEORETICAL HOLE SIZE	NEAREST DRILL SIZE	THEORETICAL HOLE SIZE	NEAREST DRILL SIZE	THEORETICAL HOLE SIZE	NEAREST DRILL SIZE	THEORETICAL HOLE SIZE	NEAREST DRILL SIZE
M3	0.5	.1081	2.75 mm	.1087	2.75 mm	.1094	7/64	.1101	2.8 mm
M3	0.6	.1061	2.7 mm	.1069	2.7 mm	.1077	2.75 mm	.1085	2.75 mm
M3.5	0.6	.1258	3.2 mm	.1265	3.2 mm	.1274	3.2 mm	.1281	#30
M4	0.7	.1434	#27	.1444	#27	.1453	3.7 mm	.1462	3.7 mm
M4	0.8	.1414	3.6 mm	.1425	3.6 mm	.1435	#27	.1447	#27
M4.5	0.75	.1621	4.1 mm	.1631	4.1 mm	.1661	#19	.1651	4.2 mm
M5	0.8	.1808	4.6 mm	.1819	4.6 mm	.1829	#14	.1840	4.7 mm
M5	0.9	.1788	#15	.1800	#15	.1812	4.6 mm	.1824	#14
M6	1	.2161	5.5 mm	.2175	5.5 mm	.2188	7/32	.2202	5.6 mm
M6.3	1	.2280	5.8 mm	.2293	5.8 mm	.2306	5.8 mm	.2320	5.9 mm
M7	1	.2555	6.5 mm	.2569	6.5 mm	.2582	F	.2595	6.6 mm
M8	1	.2949	7.5 mm	.2962	7.5 mm	.2976	19/64	.2989	7.6 mm
M8	1.25	.2899	7.4 mm	.2915	7.4 mm	.2932	7.4 mm	.2949	7.5 mm
M10	1.25	.3686	9.4 mm	.3702	9.4 mm	.3720	9.4 mm	.3726	9.5 mm
M10	1.5	.3636	9.2 mm	.3656	9.3 mm	.3676	9.3 mm	.3696	9.4 mm
M12	1.25	.4474	11.4 mm	.4490	11.4 mm	.4507	11.4 mm	.4524	11.5 mm
M12	1.75	.4373	11.1 mm	.4397	7/16	.4420	11.2 mm	.4443	11.3 mm
M14	1.25	.5261	13.4 mm	.5278	13.4 mm	.5295	13.4 mm	.5311	11.5 mm
M14	1.5	.5211	13.2 mm	.5231	13.3 mm	.5251	13.3 mm	.5271	13.4 mm
M14	2	.5110	13.0 mm	.5137	13.0 mm	.5164	13.1 mm	.5191	13.2 mm

ISO METRIC THREADS

The ISO (International Standards Organization) metric screw thread system is the international standard.

Standards for taps and dies for ISO metric threads have been established by the United States Cutting Tool Institute. Those standards cover general dimensions of tap overall length, thread length, shank diameter, square size, and the thread major diameter and pitch diameter needed to produce the required thread assembly fit.

All standards established by USCTI are to best suit tapping operations in the U.S. The shank and square dimensions of the closest American Standard tap are used so that existing tapping equipment can be used. For example, M8 x 1.25 tap with basic major diameter of .3150 would be made to 5/16 tap general dimensions. Those taps would be used essentially the same as 5/16 taps, with the only difference being in the thread lead.

If a lead screw or other lead mechanism must be used, it must be changed to the metric thread pitch.

There are three classes of fit in the ISO system for internal threads or nuts: close fit - Class 5H; medium fit - Class 6H; and free fit - Class 7H.

The most commonly used and generally recommended class of fit is 6H which is closely equivalent to the Unified System class 2-B fit.

Metric tap pitch diameter, for U.S. operation, is indicated in 'D' limit which is essentially the same as the 'H' limit in American Standard taps.

Conversion to the metric thread system is not complicated. However, when in doubt about class of fit or tap pitch diameter requirements, indicate the pitch diameter shown on the thread gage or on the work piece point when ordering taps, or contact Vermont Tap & Die Technical Services Department.

TABLE #12 METRIC SCREW THREADS

	INTERNAL THREAD – CLASS 6H (Nut or Workpiece)							TAP THREAD DIMENSIONS			
	MILLIMETERS			INCHES				MILLIMETERS		INCHES	
NOMINAL SIZE AND PITCH	PITCH DIAMETER MIN	PITCH DIAMETER MAX	MIN. MAJOR DIA.	PITCH DIAMETER MIN	PITCH DIAMETER MAX	MIN. MAJOR DIA.	D LIMIT	PITCH DIAMETER MIN	PITCH DIAMETER MAX	PITCH DIAMETER MIN	PITCH DIAMETER MAX
M1.6 x 0.35	1.373	1.458	1.600	.0541	.0574	.0630	D3	1.397	1.412	.0550	.0556
M1.8 x 0.35	1.573	1.658	1.800	.0620	.0653	.0709	D3	1.598	1.613	.0629	.0635
M2 x 0.4	1.740	1.830	2.000	.0685	.0720	.0787	D3	1.763	1.778	.0694	.0700
M2 x 0.45	1.707	1.802	2.000	.0672	.0709	.0787	D3	1.730	1.745	.0681	.0687
M2.2 x 0.45	1.908	2.003	2.200	.0751	.0789	.0866	D3	1.930	1.945	.0760	.0766
M2.5 x 0.45	2.208	2.303	2.500	.0869	.0907	.0984	D3	2.230	2.245	.0878	.0884
M3 x 0.6	2.610	2.722	3.000	.1028	.1072	.1181	D4	2.642	2.662	.1040	.1048
M3 x 0.5	2.675	2.775	3.000	.1053	.1093	.1181	D3	2.697	2.712	.1062	.1068
M3.5 x 0.6	3.110	3.222	3.500	.1225	.1268	.1378	D4	3.142	3.162	.1237	.1245
M4 x 0.8	3.481	3.606	4.000	.1370	.1420	.1575	D4	3.510	3.530	.1382	.1390
M4 x 0.7	3.545	3.663	4.000	.1396	.1442	.1575	D4	3.576	3.596	.1408	.1416
M4.5 x 0.75	4.013	4.131	4.500	.1580	.1626	.1772	D4	4.044	4.064	.1592	.1600
M5 x 0.9	4.417	4.551	5.000	.1739	.1792	.1969	D4	4.448	4.468	.1751	.1759
M5 x 0.8	4.480	4.605	5.000	.1764	.1813	.1969	D4	4.511	4.531	.1776	.1784
M6 x 1	5.350	5.500	6.000	.2106	.2165	.2362	D5	5.387	5.412	.2121	.2131
M6.3 x 1	5.650	5.800	6.300	.2224	.2283	.2480	D5	5.687	5.712	.2239	.2249
M7 x 1	6.350	6.500	7.000	.2500	.2559	.2756	D5	6.388	6.413	.2515	.2525
M8 x 1.25	7.188	7.348	8.000	.2830	.2893	.3150	D5	7.221	7.251	.2843	.2855
M8 x 1	7.350	7.500	8.000	.2894	.2953	.3150	D5	7.389	7.414	.2909	.2919
M10 x 1.5	9.026	9.206	10.000	.3553	.3624	.3937	D6	9.070	9.100	.3571	.3583
M10 x 1.25	9.188	9.348	10.000	.3617	.3680	.3937	D5	9.220	9.250	.3630	.3642
M12 x 1.75	10.863	11.063	12.000	.4277	.4356	.4724	D6	10.909	10.939	.4295	.4307
M12 x 1.25	11.188	11.368	12.000	.4405	.4476	.4724	D5	11.222	11.252	.4418	.4430
M14 x 2	12.701	12.913	14.000	.5000	.5084	.5512	D7	12.748	12.789	.5019	.5035
M14 x 1.5	13.026	13.216	14.000	.5128	.5203	.5512	D6	13.071	13.101	.5146	.5158
M14 x 1.25	13.188	13.368	14.000	.5192	.5263	.5512	D5	13.221	13.251	.5205	.5217
M16 x 2	14.701	14.913	16.000	.5788	.5871	.6299	D7	14.750	14.790	.5807	.5823
M16 x 1.5	15.026	15.216	16.000	.5916	.5990	.6299	D6	15.072	15.102	.5934	.5946
M18 x 2.5	16.376	16.600	18.000	.6447	.6535	.7087	D7	16.424	16.464	.6466	.6482
M18 x 1.5	17.026	17.216	18.000	.6703	.6778	.7087	D6	17.071	17.101	.6721	.6733
M20 x 2.5	18.376	18.600	20.000	.7235	.7323	.7874	D7	18.425	18.466	.7254	.7270
M20 x 1.5	19.026	19.216	20.000	.7490	.7565	.7874	D6	19.070	19.100	.7508	.7520
M22 x 2.5	20.376	20.600	22.000	.8022	.8110	.8661	D7	20.424	20.465	.8041	.8057
M22 x 1.5	21.026	21.216	22.000	.8278	.8353	.8661	D6	21.072	21.102	.8296	.8308
M24 x 3	22.051	22.316	24.000	.8682	.8786	.9449	D8	22.113	22.154	.8706	.8722
M24 x 2	22.701	22.925	24.000	.8937	.9026	.9449	D7	22.748	22.789	.8956	.8972
M27 x 3	25.051	25.316	27.000	.9863	.9967	1.0630	D8	25.103	25.154	.9883	.9903
M27 x 2	25.701	25.925	27.000	1.0118	1.0207	1.0630	D7	25.748	25.789	1.0137	1.0153
M30 x 3.5	27.727	28.007	30.000	1.0916	1.1026	1.1811	D9	27.790	27.841	1.0941	1.0961
M30 x 2	28.701	28.925	30.000	1.1300	1.1388	1.1811	D7	28.750	28.791	1.1319	1.1335
M33 x 3.5	30.727	31.007	33.000	1.2097	1.2207	1.2992	D9	30.790	30.841	1.2122	1.2142
M33 x 2	31.701	31.925	33.000	1.2481	1.2569	1.2992	D7	31.750	31.791	1.2500	1.2516
M36 x 4	33.402	33.702	36.000	1.3150	1.3268	1.4173	D9	33.464	33.515	1.3175	1.3195
M36 x 3	34.051	34.316	36.000	1.3406	1.3510	1.4173	D8	34.102	34.153	1.3426	1.3446

PIPE TAPS

Pipe thread tapping is more difficult than machine thread tapping. The demands for accuracy of the product thread are greater because a pipe thread is not a fastening thread, but a sealing assembly.

Pipe taps and other threading tools must cut 100% of the thread height to maintain the standard thread profile. Pipe thread engagement generally requires total thread contact of the two parts. Both thread flanks and the crest and root of the thread.

Because of the very heavy chip load on a pipe tap, the design and use of these taps must be given special consideration.

- Tap design must provide relief features and flute form to hold tapping effort to a minimum.
- Sharpness must be retained to minimize stop line ridges in the product thread.
- Lead screw control is best in pipe tapping.
- The tap and the workpiece must be held rigid.
- A good cutting oil should be used.
- A flow of coolant should be used whenever possible. If a coolant flow is not possible, oil should be brushed on the tap and in the hole. The use of a squirt can is not as efficient as brushing on.
- Tapping depth must be controlled to prevent driving the taper pipe tap beyond the gage line. This should be controlled by a stop on the tapper.
- The practice of twisting a wire around the tap thread to serve as a stop gage is highly detrimental to tap performance. It blocks coolant and interferes with chip motion in the flutes.
- There must be ample power to drive the tap, without stopping or hesitation, to the required depth.

Call your Vermont Tap & Die distributor or representative for assistance with pipe threading problems.

Technical Information

All 1/8" pipe taps are available with either the small (.3125 diameter) shank or with the standard large (.4375 diameter) shank. If not specified, the large shank will be furnished.

Special projection taps (short or long) are available.

Pottstown type and other special shank taps are available as special.

British pipe taps BSPT (Rc) and BSPP (Rp) and BSPF (G) are available as special. These taps are made to American standard pipe tap general dimensions (standard blank) with British Standard Pipe thread — Whitworth form.

When tapping pipe threads, the hole size should be adjusted so that the tap will develop the full thread profile in the workpiece. Generally, the drill selected is the nearest standard drill size less than the tap minor diameter. (See Table 18)

The Use of Taper Pipe Reamers

Most taper pipe thread tapping can be done in a straight drilled hole - not taper reamed.

There are some pipe thread assembly conditions that require reaming to have a greater number of fully profiled or "perfect" threads in the hole, such as the ANPT and some gas coupling threads.

Taper reaming should be avoided whenever possible. It imposes an unnaturally high strain on the tap threads because the tap has to start its cut at the crests of the full threads, with the cutting forces in the direction of the tap cross section, instead of progressing along the chamfered thread and in a lengthwise direction. The tap chamfer is really ineffective.

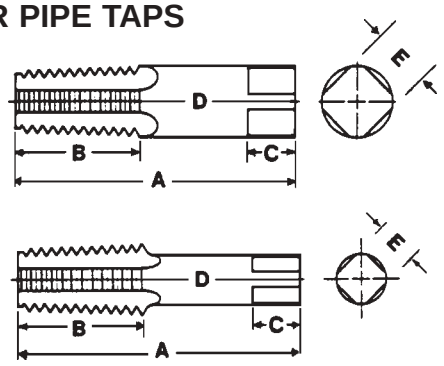
Taper reaming depth must be carefully controlled. If it is too deep, the tap will not produce a full height pipe thread when stopped at the required gaging position. If it is not reamed deeply enough, an even greater load is imposed on the tap, resulting in reduced tap life.

Taper pipe reaming has been found to be an unnecessary operation and the cause of what was believed to be "tapping problems."

TABLE #13 USCTI TABLE 310
PIPE TAP THREAD DESIGNATION SYMBOLS

DESIGNATION	THREAD SERIES DESCRIPTION	AMERICAN NATIONAL STANDARD REFERENCE NO.
NH	American Standard hose coupling threads of full form	B2.4 (B1.20.7)
NPS	American Standard straight pipe threads	–
NPSC	American Standard straight pipe threads in pipe couplings	B1.20.1
NPSF	Dryseal American Standard fuel internal straight pipe threads	B1.20.3
NPSH	American Standard straight hose coupling threads for joining to American Std taper pipe threads	B24
NPSI	Dryseal American Std intermediate internal straight pipe threads	B1.20.3
NPSL	American Standard straight pipe threads for loose fitting mechanical joints with locknuts	B1.20.1
NPSM	American Standard straight pipe threads for free-fitting mechanical joints for fixtures	B1.20.1
ANPT	Aeronautical National Form taper pipe threads	As published in MIL-P-7105
NPT	American Standard taper pipe threads for general use	B1.20.1
NPTF	Dryseal American Standard taper pipe threads	B1.20.3
NPTR	American Standard taper pipe threads for railing joints	B1.20.1
NGO	National gas outlet threads	ANSI/CGA V-1 (B57.1)
NGS	National gas straight threads	ANSI/CGA V-1 (B57.1)
NGT	National gas taper threads (see also SGT)	ANSI/CGA V-1 (B57.1)

TABLE #14 USCTI TABLE 311
GENERAL DIMENSIONS AND TOLERANCES FOR STRAIGHT AND TAPER PIPE TAPS



Nominal Size (Inches)	Dimensions - Inches				
	Length Overall A	Length of Thread B	Length of Square C	Diameter of Shank D	Size of Square E
1/16	2-1/8	11/16	3/8	.3125	.234
1/8	2-1/8	3/4	3/8	.3125	.234
1/8	2-1/8	3/4	3/8	.4375	.328
1/4	2-7/16	1-1/16	7/16	.5625	.421
3/8	2-9/16	1-1/16	1/2	.7000	.531
1/2	3-1/8	1-3/8	5/8	.6875	.515
3/4	3-1/4	1-3/8	11/16	.9063	.679
1	3-3/4	1-3/4	13/16	1.1250	.843
1-1/4	4	1-3/4	15/16	1.3125	.984
1-1/2	4-1/4	1-3/4	1	1.5000	1.125
2	4-1/2	1-3/4	1-1/8	1.8750	1.406
2-1/2	5-1/2	2-9/16	1-1/4	2.2500	1.687
3	6	2-5/8	1-3/8	2.6250	1.968
3-1/2	6-1/2	2-11/16	1-1/2	2.8125	2.108
4	6-3/4	2-3/4	1-5/8	3.0000	2.250

Element	Range	Direction	Tolerance
Length Overall A	1/16" to 3/4" incl. 1" to 4" incl.	Plus or Minus Plus or Minus	1/32" 1/16"
Length of Thread B	1/16" to 3/4" incl. 1" to 1-1/4" incl. 1-1/2" to 4" incl.	Plus or Minus Plus or Minus Plus or Minus	1/16" 3/32" 1/8"
Length of Square C	1/16" to 3/4" incl. 1" to 4" incl.	Plus or Minus Plus or Minus	1/32" 1/16"
Diameter of Shank D	1/16" to 1/8" incl. 1/4" to 1/2" incl. 3/4" to 1" incl. 1-1/4" to 4" incl.	Minus Minus Minus Minus	.0015" .0020" .0020" .0030
Size of Square E	1/16" to 1/8" incl. 1/8" to 3/4" incl. 1" to 4" incl.	Minus Minus Minus	.0040" .0060" .0080"

TABLE #15 USCTI TABLE 334
THREAD LIMITS FOR STRAIGHT PIPE TAPS - CUT THREAD
American Standard Pipe Form (NPS) (NPSC)

NOMINAL SIZE (in.)	THREADS PER INCH NPS	SIZE AT GAGING NOTCH	PITCH DIAMETER	
			MIN.	MAX.
1/8	27	0.3736	0.3721	0.3751
1/4	18	0.4916	0.4908	0.4938
3/8	18	0.6270	0.6257	0.6292
1/2	14	0.7784	0.7776	0.7811
3/4	14	0.9889	0.9876	0.9916
1	11-1/2	1.2386	1.2372	1.2412
1-1/4	11-1/2	1.5834	1.5817	1.5862
1-1/2	11-1/2	1.8223	1.8207	1.8252
2	11-1/2	2.2963	2.2944	2.2994
2-1/2	8	2.7622	2.7605	2.7660
3	8	3.3885	3.3869	3.3924
3-1/2	8	3.8888	3.8873	3.8928
4	8	4.3871	4.3856	4.3911

TABLE #16 USCTI TABLE 335
THREAD LIMITS FOR STRAIGHT PIPE TAPS - GROUND THREAD
American Standard Pipe Form (NPS) (NPSC) (NPSM)

NOM. SIZE (in.)	THREADS PER INCH NPS	MAJOR DIAMETER			PITCH DIAMETER		
		PLUG AT GAGING NOTCH	MIN. G	MAX. H	PLUG AT GAGING NOTCH E	MIN. K	MAX. L
1/8	27	0.3983	0.4022	0.4032	0.3736	0.3746	0.3751
1/4	18	0.5286	0.5347	0.5357	0.4916	0.4933	0.4938
3/8	18	0.6640	0.6701	0.6711	0.6270	0.6287	0.6292
1/2	14	0.8260	0.8347	0.8357	0.7784	0.7806	0.7811
3/4	14	1.0364	1.0447	1.0457	0.9889	0.9906	0.9916
1	11-1/2	1.2966	1.3062	1.3077	1.2386	1.2402	1.2412
1-1/4	11-1/2	1.6413	1.6507	1.6522	1.5834	1.5847	1.5862
1-1/2	11-1/2	1.8803	1.8897	1.8912	1.8223	1.8237	1.8252
2	11-1/2	2.3542	2.3639	2.3654	2.2963	2.2979	2.2994
2-1/2	8	2.8454	2.8604	2.8619	2.7622	2.7640	2.7660
3	8	3.4718	3.4868	3.4883	3.3885	3.3904	3.3924
3-1/2	8	3.9721	3.9872	3.9887	3.8888	3.8908	3.8928
4	8	4.4704	4.4855	4.4870	4.3871	4.3891	4.3911

TABLE #17 USCTI TABLE 335A
THREAD LIMITS FOR STRAIGHT PIPE TAPS - GROUND THREAD
American Dryseal Pipe Form (NPSF)

		MAJOR DIAMETER		PITCH DIAMETER			
NOM. SIZE (in.)	THDS PER INCH NPSF	MIN. G	MAX. H	PLUG AT GAGING NOTCH E	MIN. K	MAX. L	MINOR DIA. FLAT MAX.
1/16	27	0.3008	0.3018	0.2812	0.2772	0.2777	0.004
1/8	27	0.3932	0.3942	0.3736	0.3696	0.3701	0.004
1/4	18	0.5239	0.5249	0.4916	0.4859	0.4864	0.005
3/8	18	0.6593	0.6603	0.6270	0.6213	0.6218	0.005
1/2	14	0.8230	0.8240	0.7784	0.7712	0.7717	0.005
3/4	14	1.0335	1.0345	0.9889	0.9817	0.9822	0.005
1	11-1/2	1.2933	1.2943	1.2386	1.2295	1.2305	0.006

TABLE #18 TAP DRILL SIZES FOR TAPER AND STRAIGHT PIPE TAPS

		TAPER PIPE THREADS		
SIZE OF TAP	THREADS PER INCH	WITH TAPER PIPE REAMER	WITHOUT TAPER PIPE REAMER	STRAIGHT* PIPE THREADS
1/16	27	A	C	—
1/8	27	21/64	Q	T
1/4	18	27/64	7/16	15/32
3/8	18	9/16	9/16	.603†
1/2	14	11/16	45/64	19mm
3/4	14	57/64	29/32	61/64
1	11-1/2	1-1/8	1-9/64	1-13/64
1-1/4	11-1/2	1-15/32	1-31/64	1-35/64
1-1/2	11-1/2	1-45/64	1-23/32	1-25/32
2	11-1/2	2-11/64	2-3/16	2-1/4

** NPS only*
† Special diameter required, no commercial drill available

TABLE #19 USCTI TABLE 338
THREAD LIMITS FOR CUT AND GROUND THREAD TAPER PIPE TAPS
American Standard Pipe Form (NPT) and American Standard Dryseal Pipe Form (NPTF)

NOMINAL SIZE (inches)	THREADS PER INCH NPT	GAGE MEASUREMENT - INCHES		TAPER PER FOOT - INCHES			
				CUT THREAD		GROUND THREAD	
		PROJECTION	TOLERANCE + or -	MIN.	MAX.	MIN.	MAX.
1/16	27	0.312	1/16	23/32	27/32	23/32	25/32
1/8	27	0.312	1/16	23/32	27/32	23/32	25/32
1/4	18	0.459	1/16	23/32	27/32	23/32	25/32
3/8	18	0.454	1/16	23/32	27/32	23/32	25/32
1/2	14	0.579	1/16	23/32	13/16	23/32	25/32
3/4	14	0.565	1/16	23/32	13/16	23/32	25/32
1	11-1/2	0.678	3/32	23/32	13/16	23/32	25/32
1-1/4	11-1/2	0.686	3/32	23/32	13/16	23/32	25/32
1-1/2	11-1/2	0.699	3/32	23/32	13/16	23/32	25/32
2	11-1/2	0.667	3/32	23/32	13/16	23/32	25/32
2-1/2	8	0.925	3/32	47/64	51/64	47/64	25/32
3	8	0.925	3/32	47/64	51/64	47/64	25/32
3-1/2	8	0.938	1/8	47/64	51/64	47/64	25/32
4	8	0.950	1/8	47/64	51/64	47/64	25/32

TABLE #20 USCTI TABLE 338
FORMULAE VALUES

THREADS PER INCH	A	B	C	D	E
27	0.0267	0.0296	0.0257	0.0234	0.0251
18	0.0408	0.0444	0.0401	0.0377	0.0395
14	0.0535	0.0571	0.0525	0.0515	0.0533
11-1/2	0.0658	0.0696	0.0647	0.0614	0.0649
8	0.0966	0.1000	0.0946	–	–

FORMULAE

Cut and Ground Thread - American Standard Pipe Form
Minimum major diameter = measured pitch diameter plug A
Maximum major diameter = measured pitch diameter plus B
Minimum minor diameter = measured pitch diameter minus B
Maximum minor diameter = measured pitch diameter minus C

Ground Thread - American Standard Dryseal Pipe Form
Minimum major diameter = measured pitch diameter plus D
Maximum major diameter = measured pitch diameter plus E
Minimum minor diameter = maximum or smaller
Maximum minor diameter = measured pitch diameter minus E

SPECIAL PURPOSE TAPS

Tapping and threading are among the more difficult areas of metal cutting production due to the high degree of accuracy required by thread fit and to differences in the wide variety of materials being threaded. The ratio of chip load to strength is already built into the tap and cannot be altered in use. The only effective means of making adjustment to provide improved tool life and required quality of the threaded part is by alteration of tap design. Often only a few minor changes in tap design will increase tap life many times over, as well as insuring consistent “fit” and thread quality.

Although the Vermont Tap and Die standard line of taps produces satisfactory results in most tapping applications, there are a growing number of highly specialized operations that must have special purpose tooling in order to be completely successful. This section of the catalog contains some of the specialty taps Vermont has designed for special or unusually severe applications.

Special purpose taps are generally made to standard dimensions, with departure from standards only to change specific elements, making only those design changes that are absolutely necessary in order to keep the cost of special purpose taps as close as possible to that of standard taps.

One of the several items of information needed in designing taps for special applications is the type of tapping equipment being used. If the type and make of the machine and tapping attachments is provided, along with other information such as the type of material involved, the best tap for the job is more quickly designed.

Nut Tapping

Vermont Tap & Die has for several years worked very closely with manufacturers of high production nut tapping equipment which has provided the opportunity to redesign taps to match machine changes and unusual applications.

All this makes it possible for Vermont to offer a specialty line of Spiral Point taps manufactured to most effectively withstand the conditions of automated, high production nut tapping. These taps are available in a full range of machine screw, fractional, and metric sizes, made to standard Spiral Point tap dimensions. They are also available in special lengths and special oversizes.

Vermont can furnish a full range of Tapper Tap Nibs for all styles of bent shank and hook shank assembly in solder type, sectional, and screw type, sectional. All Vermont Tapper Tap Nibs are especially designed to perform under the conditions of extremely high production that are associated with this method of tapping.

Short Projection Pipe Taps

Short projection taper pipe taps are used where a restriction at the bottom of the hole prevents standard projection taps from tapping deep enough to achieve correct gaging.

Vermont offers a wide variety of short projection taper pipe taps through Fast Tap Service, all with straight flutes, in various combinations of full and interrupted thread, and NPT (interchangeable with ANPT) and NPTF thread forms. Refer to the Fast Tap Catalog for the minimum projection that can be supplied on standard blanks.

Coolant Fed (Oil Hole) Taps

Vermont Tap & Die has recognized the increased availability of machines with through-the-spindle coolant capability and has developed several coolant-fed (oil-hole) tap designs to take advantage of this improving technology.

Some of the most difficult tapping applications can be made routine by forcing fluid through the tap at high pressure. This action ensures adequate cooling and lubrication at the cutting edge, even in very deep holes. In closed or blind hole tapping the fluid stream helps push chips up out of the hole, preventing dangerous chip packing. When it is necessary to tap close to the bottom of blind holes, coolant-fed taps prevent accumulation of chips at the bottom which can lead to tap breakage.

Many difficult through-hole tapping applications can be improved by the use of coolant-fed taps with holes exiting in the flutes, which direct fluid at the point of cut.

Vermont offers a range of straight-fluted CNC-style coolant-fed taps with through holes as standard and through Fast Tap Service for quick delivery. In addition, Vermont will design special coolant-fed taps for virtually any application, starting at 1/4” (6 mm) diameter tap size.

Taps for Non-metallics

Most hard varieties of non-metallics, such as Bakelite, require special attention to tap design and hardness in order for the tap to withstand the highly abrasive material conditions involved and to produce a good quality thread in long runs. Vermont Tap & Die has developed a highly successful tap line for such applications. This is a non-stocking item, made to best suit the specific application in standard general dimensions. There is also a special design for the softer grades of non-metallics that produce long stringy chips in tapping.

In addition, tapping plastic pipe fittings can be a very real problem due to the tough chips that will not break off at the bottom of the hole as the tap is withdrawn. Vermont has an especially designed Taper Pipe tap that will cut off those chips as the tap starts to reverse.

Your local Vermont distributor or representative can secure more information on any of these special purpose taps for your particular application.

Combination Tap and Drill

Vermont Tap & Die offers as special a line of Drill and Tap Combinations. A full range of tap size and thread pitch combinations are available in machine screw, hand tap and pipe tap in these combination tools.

SPECIAL PURPOSE TAPS

These tools can be made up as combination tap and drill, combination tap and core drills, or combination tap and reamer. In all cases, the various length elements are determined to best suit the thickness of the part. In the case of a combination tap and standard drill, the drill length should be sufficient to permit it to break through before the tap starts to cut, especially in the case of taps with coarse threads.

The tap thread length should be adjusted to provide only the required thread depth. The tap shank diameter and length and square size should be to the standards of that tap size, unless otherwise specified.

Regular combination taps and drills in sizes No. 3 through 3/8" are made with two spiral flutes that extend throughout the drill and tap section. Sizes larger than 3/8" are made with standard numbers of flutes for Straight Fluted taps in the tap section, and with two spiral flutes in the drill section.

Taper pipe and drill combinations should have an even number of flutes in the tap section to prevent one land from blocking chips in one of the drill flutes. Tap and drill flutes may be spiral, straight, or any combination of both.

Combination tap and reamers, or tap and core drills have the same number of straight flutes as the tap standard. These tools can be made with right hand or left hand cut, and right hand or left hand spiral flutes.

This is highly specialized tooling. For best results at lowest possible cost, your Vermont distributor or representative should be consulted.

Piloted Taps

There are many troublesome situations where holding size is a major problem. Such trouble may be due to a horizontal tapping set-up with tap holder flotation, or to very fine thread pitch relative to a large tap size, or to unusually close gaging conditions – or to any one of many other unusual situations.

One of the easiest and most efficient means of overcoming this problem is to use a tap with a pilot at the thread end. The pilot diameter must be adjusted to just fit in the hole being tapped. This pilot diameter is usually held to very close tolerances. Of course, it is also necessary to hold the hole size to a close tolerance.

In many cases, a standard tap can be reworked by grinding a pilot at the thread end and grinding in a new chamfer just back of the pilot. This style of piloted tap cannot be used in close bottom blind hole tapping. In such an application a pilot must be on the shank directly in back of the thread section and be used with a support bushing similar to a drill bushing.

If lead screw control is required where there is no lead screw built into the tapping equipment, the pilot in back of the thread section can be threaded and run in a threaded bushing to achieve lead screw control.

It has been stated that all Acme taps should have pilots, with a plain cylindrical pilot on the first (roughing) tap and a threaded pilot on the other taps in the set. Field tests have shown that there is usually no need for pilots on an Acme tap to produce a general purpose (2G) fit. When it is not necessary to have pilots, the cost of taps can be substantially reduced.

Acme taps required to produce a close general purpose fit (4G) and all classes of centralizing fit (2C, 3C, 4C, 5C, and 6C) should be piloted with a plain pilot on the first roughing tap and threaded pilots on all others in the set.

Your Vermont representative can assist you in determining the best piloting arrangement for your specific need.

Shell Taps

When using very large taps in sustained production the possibility of using Shell Taps should be considered. Vermont Tap & Die will design and manufacture Shell Taps in a wide range of lengths, methods of drive, and designs to best suit specific applications.

One of the advantages of a Shell Tap is that its shank, or arbor, will last indefinitely, so that when replacement is required, only the threaded section, or shell, need be purchased. Tap resharpening can be accomplished in the same manner as with conventional taps with the shell tap mounted on the arbor.

Shell Taps are available from Vermont Tap & Die in sizes up to 8" diameter and with any thread pitch, right or left hand thread.

In order to furnish the best tap at the lowest possible cost, it is necessary to know the depth of the hole, whether through or blind, type of material and type of machine. Determination of the shell tap length (thread length) is based on tapping depth and provision for resharpening.

There are two methods of locking the shell tap to the arbor: 1) Drive lugs built into the arbor that engage in drive slots in the back face of the shell tap; 2) Keyways in the arbor hole of the shell tap and arbor to lock with straight keys, or Woodruff keys. For greatest tap strength, ease of changing, and best arbor life, the first method is best.

Acme Taps (and other translating thread taps)

Vermont Tap & Die has the manufacturing and design engineering capabilities to furnish a wide range of the following full special translating thread taps: Acme, Stub Acme and Modified Square Thread (no less than 10 degrees included flank angle); in standard thread forms and in many modified thread forms; in right hand or left hand thread; and in multiple thread lead with thread helix angles up to 20 degrees helix. The latter would include multiple leads of up to four (quadruple lead) in all sizes and thread pitch combinations and up to a multiple lead of six in some size and pitch combinations.

In an Acme thread assembly with fast translating movement, involving a relatively small diameter, it is always best to design for a finer pitch multiple lead. For example, if a 1.000" diameter screw must move something 1/2 inch per revolution, it would require 2 threads per inch with single lead. A 1"-2 Acme thread would be extremely difficult to produce —both externally and internally—and would be just about impossible to tap. However, four threads per inch, double lead, would provide the same rate of movement in a single screw rotation and would permit much easier threading of both members, especially in tapping.

SPECIAL PURPOSE TAPS

To be certain of furnishing the best possible tap or taps for a particular application, Vermont should be furnished with a drawing of the part to be tapped that would show all thread specifications. If a drawing is not available, the following information is necessary.

A. Type of material to be tapped
B. Depth of hole to be tapped
C. Whether the tap will pass through the part without reversing
D. On what sort of equipment is the thread to be used—lathe, radial drill, etc.
E. Required class of fit
F. Right or left hand thread
G. Multiple of lead—single, double, etc.

Other translating thread taps such as 60° stub thread and buttress thread are available as special.

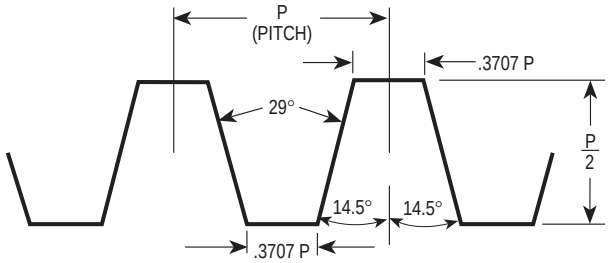
It is generally best to use translating thread taps in sets of two or more, but in a situation of comparatively fine thread pitch, relative to tap size, or in very soft material, the use of a single tap to produce the full thread will work. All inquiries and orders involving translating thread taps are given personal individual attention by the Vermont Tap & Die product design and engineering staff in order to determine which combinations of sets and tap dimensions will produce the best thread at the lowest possible cost.

ILLUSTRATION #3 AMERICAN STANDARD ACME THREADS

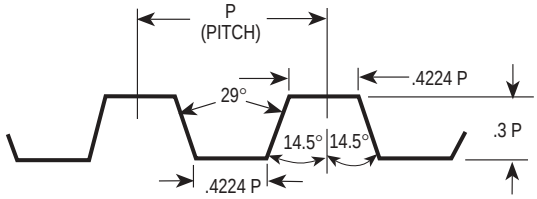
American Standard Acme Threads are used to produce traversing motion in valves and other mechanisms requiring frequent use with alignment and free movement over long periods of operation.

American Standard General Purpose Threads provide clearance of all points of contact for free movement of internal and external threaded mated parts, and are applicable with axial support of both threaded parts.

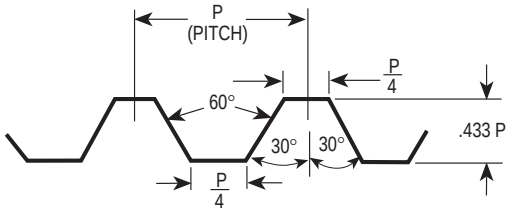
American Standard Acme Centralizing Threads have clearance at pitch and minor diameters, limited clearance at major diameters so that alignment of screw and nut is controlled.



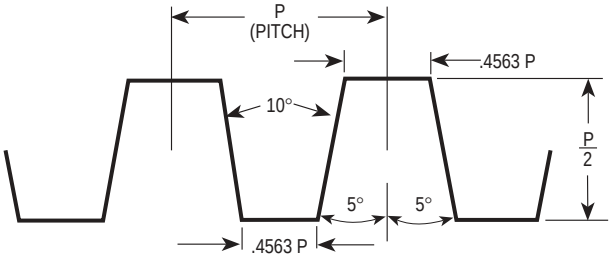
Standard Stub Acme Threads are for purposes similar to Acme General Purpose, where coarse-pitch thread of shallow height is required. Clearance and allowance are similar to Acme General Purpose Thread.



Standard 60° Stub Threads may be substituted for Acme Threads where axial leads do not require smaller flank angle. They are also for applications where shallow thread height is required, as on fitting-up bolts and nuts.



Standard Modified Square Threads are used as equivalent to Square Threads for all practical considerations. However, they should not be used where Acme Threads can serve the same purpose.



TECHNICAL INFORMATION

Tap Design and Operation Recommendations

All Standard Industrial taps are manufactured to perform satisfactorily in most materials that are likely to be tapped. There are some materials that require different tap design in which surface treatment is of definite value, such as cast iron and aluminum. The most significant tap design change is flute hook, or rake. Chamfer relief change (increase) is helpful in some applications.

There are three hook angles that cover about 90% of all materials. They are described below.

1. Standard hook of 6° to 10° is the specification for all standard stock taps and is best for most steel, malleable iron and soft plastic materials.
2. Low hook (or rake) for highly abrasive materials such as cast iron, cast brass, cast bronze and had plastic – any material in which small (powder) chips appear, is abrasive, and requires low hook for wear resistance.
3. High hook for soft materials in which thread tearing and otherwise rough thread conditions are a common problem. High hook reduces tapping torque and has the effect of sharpness after actually becoming dull at the cutting edges. It also improves the chip pattern for better chip flow in some tough materials.

Chamfer relief is one of the most critical elements in tap design because the material removal occurs within the chamfered threads and the first full thread. There are restrictions as to the amount of relief in land spacing, but there must be chamfer relief (or back-off) beginning right at the cutting edge at the rate of .002 to .004 drop per 1/32", as measured with a dial indicator.

There are two major reasons to surface treat or coat taps. One is to provide a higher surface hardness to resist wear in abrasive material and the other is to resist galling or loading the tap.

VERTANIUM® (Titanium Nitride) is the most significant advancement in surface coatings for cutting tools in recent years. It combines extreme surface hardness with a greatly reduced coefficient of friction to greatly improve tool life, thread finish and gaging in a wide variety of applications.

Nitriding is the most effective surface hardening treatment on taps, but it must be selected for material in which tapping torque is relatively low, as is most highly abrasive material. Nitride is not recommended in small size taps—smaller that #6 or in large size coarse thread taps.

Steam oxide is the most effective means of reducing galling. It is not recommended for materials with high copper or aluminum content.

The combination of nitride and steam oxide provides wear resistance and anti-galling values that improve tap life and thread quality in some hard steels and stainless steels.

Chromium nitride and chromium carbide coatings provide surface hardness and anti-galling in materials with high copper or nickel content.

Both surface treatment and tap design can be worked out to cover a variety of materials with the same tap. It is not suggested that a user orders and stocks taps for each kind of material being tapped. The use of standard stock taps is recommended wherever they will work. Special design and treatment should be used to cover unusually severe conditions in difficult materials or in a tapping operation that may be causing tapping problems.

Horizontal Tapping

Among the most difficult and troublesome tapping operations is blind hole tapping in a horizontal position, i.e., on automatic screw machines, horizontal mills and lathes.

The reason for the difficulty is that the cutting oil or coolant will not stay in the hole. Regardless of the quantity of coolant being applied, most of the coolant never gets to the point of cut in the hole.

If the threaded holes are not too deep, or more than three diameters, it is fairly workable by using a heavy grade of cutting oil. If it is a deep or recessed hole, the tap is sure to run dry in the last few revolutions, and that is what causes the trouble.

In tap sizes 1/2” and larger, the oil hole tap can be a real workable solution to a very tough problem, but it must be designed for the job.

If the holes to be tapped are drilled through and the tapping is done on something like a horizontal mill so there is access to the back side of the workpiece, an extra coolant nozzle might be used to run the coolant into the hole at the exit side or back side. A portable pump may be used for this purpose.

If small parts are being tapped on something like an automatic screw machine or a lathe and a great deal of difficulty is encountered in tapping, it may be best to change over to tapping on a drill press.

A great number of what had been very difficult tapping jobs have been substantially improved simply by changing from horizontal to vertical tapping, nothing more.

The blind hole will fill up with coolant, and as the tap goes in, it will force that coolant back out the tap flutes insuring against running dry and will wash a lot of the chips out.

In any discussion with a customer who is planning a new job that includes tapping horizontally, these potential problems and solutions should be brought out.

TECHNICAL INFORMATION

TABLE #21 SUGGESTED SPEEDS FOR HIGH SPEED STEEL AND VERTANIUM TAPS

WORK MATERIAL		SPEED-FEET-PER-MINUTE UNCOATED	VERTANIUM
Alloy Steels	125-225 BHN	30-60	60-120
	225-325 Bhn	20-45	40-90
	325-425 Bhn	10-35	20-70
Aluminum Alloys		75-150	*150-300
Carbon Steels	Low Carbon (.10-.25C)	50-75	100-150
225 Bhn or less	Med Carbon (.30-.55C)	40-65	80-130
	High Carbon (.60-.95C)	30-55	60-110
Cast Iron	Ductile, Annealed	40-60	80-120
	Ductile, As Cast	20-45	40-90
	Gray (Class 20, 25)	40-80	80-160
	Gray (Class 30-50)	25-50	50-100
	Malleable 200 Bhn or less	30-60	60-120
Copper Alloys		40-100	*80-200
Graphites & Carbons		5-10	10-20

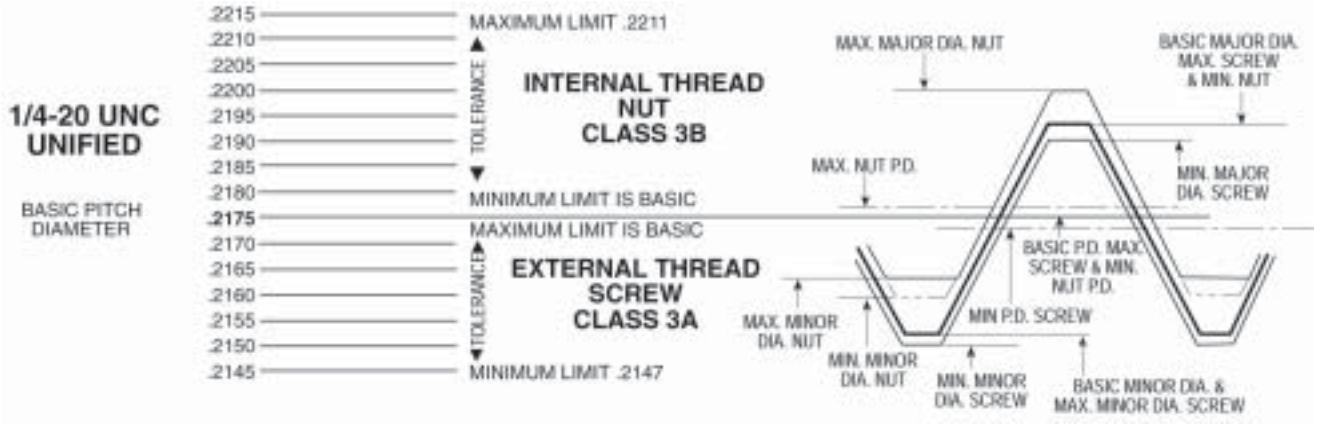
WORK MATERIAL		SPEED-FEET-PER-MINUTE UNCOATED	VERTANIUM
High Temperature	Cobalt Base (Haynes Alloys)	3-8	5-16
Alloys	Iron Base (Incoloy, A-286)	7-15	15-30
	Nickel Base (Hastelloy, Inconel)	4-10	8-20
Magnesium		100-150	*150-200
Plastics		25-50	50-100
Stainless Steels		15-35	30-70
Titanium	Pure	25-55	*50-110
	Alloys (Ti-6A1-4V)	10-25	*20-50
Tool Steels	200-275 Bhn	15-30	30-60
	300-350 Bhn	10-25	20-50
	40-50 Rc	5-15	10-30
Zinc Alloys		100-150	*150-250

** Success of VERTANIUM® taps in nonferrous materials depends on the machining conditions used.*

TABLE #22 SPEEDS FOR TAPS CONVERSION CHART - fpm to rpm

Tap Sizes	Taper Pipe Taps	Surface Feet per Minute																	
		5'	10'	15'	20'	25'	30'	40'	50'	60'	70'	80'	90'	100'	110'	120'	130'	140'	150'
		Revolutions per Minute																	
0		318	637	955	1273	1592	1910	2546	3183	3820	4456	5093	5729	6366	7003	7639	8276	8913	9549
1		273	546	819	1046	1308	1570	2093	2617	3140	3663	4186	4710	5233	5756	6279	6805	7326	7849
2		212	424	637	888	1110	1333	1777	2221	2665	3109	3554	3999	4442	4886	5330	5774	6218	6662
3		191	382	573	772	964	1157	1543	1929	2315	2701	3086	3472	3858	4244	4629	5015	5401	5787
4		174	347	521	682	853	1023	1364	1705	2046	2387	2728	3069	3411	3751	4092	4434	4775	5116
5		147	294	441	611	764	917	1222	1528	1833	2139	2445	2750	3056	3361	3667	3973	4278	4584
6		136	273	409	553	691	829	1106	1382	1659	1935	2212	2488	2766	3042	3318	3595	3871	4148
8		119	239	358	466	583	699	932	1165	1398	1631	1864	2097	2330	2563	2796	3029	3262	3495
10		101	201	302	402	502	603	804	1005	1205	1406	1607	1808	2009	2210	2411	2612	2813	3014
12		87	174	260	354	442	531	707	884	1061	1238	1415	1592	1769	1945	2122	2300	2476	2653
1/4		76	153	229	306	382	458	611	764	917	1070	1222	1375	1528	1681	1833	1986	2139	2292
5/16		62	123	185	245	306	367	489	611	733	856	978	1100	1222	1345	1467	1589	1711	1833
3/8		50	101	151	204	255	305	407	509	611	713	815	917	1019	1120	1222	1324	1426	1528
7/16	1/8	43	87	130	175	219	262	349	437	524	611	698	786	873	960	1048	1135	1222	1310
1/2	–	38	76	115	153	191	229	305	382	458	535	611	688	764	840	917	993	1070	1146
9/16	1/4	34	68	102	137	172	206	274	342	410	478	547	616	683	752	820	888	952	1020
5/8	–	32	64	96	122	153	183	244	306	367	728	489	550	611	672	733	794	856	917
11/16	3/8	28	55	83	111	138	167	222	278	333	389	444	500	556	611	667	722	778	833
3/4	–	25	51	76	102	128	153	203	255	305	357	407	458	509	560	611	662	713	764
7/8	1/2	22	43	65	87	109	131	175	218	262	306	350	392	437	480	524	568	611	655
1	–	19	38	57	76	96	115	153	191	230	268	305	344	382	420	458	497	535	573
1-1/8	3/4	17	34	51	68	84	102	136	170	204	238	272	306	340	373	407	441	475	509
1-1/4	–	15	31	46	61	76	92	122	153	183	214	244	275	305	336	367	397	428	458
1-3/8	1	14	28	42	56	69	83	111	139	167	194	222	250	278	306	333	361	389	417
1-1/2	–	13	25	38	51	63	76	102	127	153	178	204	229	255	280	305	331	356	382
1-5/8		12	23	35	47	59	71	94	118	141	165	188	212	235	259	282	306	329	353
1-3/4		11	22	33	44	55	65	87	109	131	153	175	196	218	240	262	284	306	327
1-7/8		10	20	30	41	51	61	81	102	122	143	163	183	204	224	244	265	285	306
2		9	19	29	38	48	57	76	96	115	134	153	172	191	210	229	248	267	287
M1		490	979	1469	1959	2449	2938	3918	4897	5877	6856	7836	8815	9795	10774	11754	12733	13713	14692
M2		242	484	725	967	1209	1451	1934	2418	2901	3385	3868	4352	4835	5319	5803	6286	6770	7253
M3		162	324	486	647	829	971	1295	1619	1942	2266	2590	2914	3237	3561	3885	4208	4532	4856
M3.5		138	277	415	557	692	830	1107	1384	1661	1938	2214	2491	2768	3045	3322	3599	3875	4152
M4		122	243	365	487	608	730	973	1217	1460	1698	1946	2190	2433	2676	2920	3163	3406	3650
M5		97	194	291	388	785	582	776	970	1163	1357	1551	1745	1939	2133	2327	2521	2715	2909
M6		81	162	243	324	405	486	647	809	971	1133	1295	1457	1619	1781	1942	2104	2266	2428
M7		69	138	208	277	346	415	554	692	830	969	1107	1246	1384	1522	1661	1799	1938	2076
M8		61	121	182	243	303	364	485	606	728	849	970	1091	1213	1334	1455	1577	1698	1819
M10		48	97	145	194	242	291	388	485	582	679	776	873	970	1067	1163	1260	1357	1454
M12		40	81	121	162	202	243	324	405	486	567	647	728	809	890	971	1052	1133	1214
M14		35	69	104	139	173	208	277	347	416	485	555	624	693	763	832	901	971	1040
M16		30	61	91	121	152	182	243	303	364	424	485	546	606	667	728	788	849	910
M18		27	54	81	108	135	162	216	269	323	377	431	485	539	593	647	700	754	808
M20		24	49	73	97	121	146	194	243	291	340	388	437	485	534	582	631	680	728
M22		22	44	66	88	110	132	176	221	265	309	353	397	441	485	529	573	618	662
M24		20	40	61	81	101	121	162	202	243	283	323	364	404	445	485	526	566	606
M27		18	36	54	72	90	108	144	180	216	252	287	323	359	395	431	467	503	539
M30		16	32	49	65	81	97	129	162	194	226	259	291	323	356	388	420	453	485

ILLUSTRATION #4 THE "BASIC" POINT IN THREAD MEASUREMENT



All measurements must have a reference point or base from which to proceed. In the case of screw threads this control point is called the BASIC, or theoretically correct size, which is calculated on the basis of a full form thread. On any given screw thread, there is Basic Major Diameter, Basic Pitch Diameter, and Basic Minor Diameter.

Although it is impossible in practice to precisely form screw threads to their theoretical or BASIC sizes, it is possible to establish limits which deviations must not exceed. These are called the "Maximum" and "Minimum" Limits. If the product is no smaller than the Minimum Limit and no larger than the Maximum Limit, then it is within the size limits required. The difference between the Maximum and Minimum Limits is the TOLERANCE.

For practical purposes, the Basic size is not necessarily between the Maximum and Minimum Limits. Instead, in most instances, the Basic Size is one of the Limits. In general, tolerances for internal threads will be above Basic and for external threads below Basic. See the example above.

For purposes of graphic representation, the Basic Pitch Diameter is commonly designated by a line with variations from it indicated by shorter lines spaced to represent a numerical scale, as shown on the left half of the sketch.

On an actual screw thread, the Basic Dimensions would follow the contour of the theoretically perfect thread, as shown on the right half of the sketch.

TABLE #23 CONSTANTS FOR FINDING SCREW THREAD ELEMENTS

Subtract constant for the number of threads per inch from Major Diameter to find value of thread elements.
Single Height: Subtract from Major Diameter to give Pitch Diameter
Double Height: Subtract from Major Diameter to give Minor Diameter
83-1/3% Double Height: Subtract from Major Diameter to give Minor Diameter of Ring Gage

Unified and National Form for thread

THREADS PER INCH	PITCH IN INCHES	SINGLE HEIGHT	DOUBLE HEIGHT	83-1/3% DOUBLE HEIGHT
2	.500000	.324759	.649519	.541265
2-1/4	.444444	.288675	.577350	.481125
2-3/8	.421052	.273481	.546962	.455801
2-1/2	.400000	.259807	.519614	.433012
2-5/8	.380952	.247435	.494870	.412392
2-3/4	.363636	.236188	.472376	.393647
2-7/8	.347826	.225920	.451480	.376533
3	.333333	.216506	.433012	.360843
3-1/4	.307692	.199852	.399704	.333086
3-1/2	.285711	.185577	.371154	.309294
4	.250000	.162379	.324758	.270631
4-1/2	.222222	.144337	.288674	.240561
5	.200000	.129903	.259806	.216504
5-1/2	.181818	.118093	.236186	.196821
6	.166666	.108253	.216506	.180421
7	.142857	.092788	.185576	.154646
8	.125000	.081189	.162378	.135314
9	.111111	.072168	.144336	.120279
10	.100000	.064952	.129904	.108253
11	.090909	.059046	.118092	.098409
11-1/2	.086956	.056480	.112960	.094133
12	.083333	.054127	.108255	.090212
13	.076923	.049963	.099926	.083271
14	.071428	.046394	.092788	.077323
16	.062500	.040595	.081190	.067658
18	.055555	.036086	.072172	.060143
19	.052631	.034185	.068370	.056974
20	.050000	.032475	.064950	.054124
22	.045454	.029523	.059046	.049204
24	.041666	.027063	.054126	.045104
27	.037037	.024056	.048112	.040093
28	.035714	.023197	.046394	.038661
30	.033333	.021651	.043302	.036084
32	.031250	.020297	.040594	.033828
34	.029411	.019103	.038206	.031838
36	.027777	.018042	.036084	.030069
40	.025000	.016237	.032474	.027061
44	.022727	.014761	.029522	.024603
48	.020833	.043531	.027062	.022551
50	.020000	.012990	.025980	.021649
56	.017857	.011598	.023196	.019329
60	.016666	.010825	.021650	.018042
64	.015625	.010148	.020296	.016913
72	.013888	.009021	.018042	.015034
80	.012500	.008118	.016236	.013529

MINOR DIAMETER OF TAPPED HOLES

Taps are different from other cutting tools as few operating variables are possible. The feed per revolution is fixed by the lead or pitch of the tap. The rate of metal removed per tooth is thus governed by effective chamfer length, number of flutes, revolutions per minute, and minor diameter of the product. In addition, application of cutting fluid is difficult as chips cannot always be removed from the cutting zone and the cross-sectional area of the tap is often small compared to the load imposed. Since freedom of choice as to relief, rake, and shear angles is frequently limited, and the tap must usually stop and reverse in the cut, it should be realized that every reasonable precaution should be taken to favor the tap.

There are four general groups of tapped holes.

The first and largest group includes holes into which a threaded part is inserted for fastening purposes only and left either for the life of the part or until repairs are needed. The second group includes holes which are used to adjust parts of a machine where the screw or bolt may be tightened or loosened many times. In the third group are holes in which a crew is used to move a slide or nut and hold it at a desired location. The fourth group consists of holes for studs.

The first group includes the greater percentage of holes with Unified Form of Thread. It is the group for which reasonable recommendations on minor diameter can be made. Some holes in the second group can be included but other applications may require individual attention.

In Unified Inch Screw Threads ANSI B1.1, Metric Screw Threads ANSI B1.13M, and Screw Threads for Federal Services, Handbook H-28, the maximum minor diameter runs from about 53% engagement with a basic thread plug on a No. 0-80, 61% engagement on an M1.6 x 0.35 to about 66% engagement on 1/2", (M12) diameter and larger.

Tests have shown that tapping torque increases when the minor diameter decreases. Two principal reasons for this should be emphasized.

First, the increase in material removed is shown by sketch-where a 10-24 basic screw thread is shown by the heavy outline and the Class 2B maximum tapped hole size is shown by the dot and dash lines.

As the thread height increases, the width of chip and amount of material removed increases rapidly. The sketch shows that on a basic thread form, a 50% thread height represents the removal of only 31.3% of the basic area, while an increase to 75% thread height increases the area to be removed to 60.9%, or practically double the first amount. With a tapped hole increased to the maximum pitch diameter, the figures increase to approximately 40% and 72% of the area.

The second cause of increase in torque is, except in the case of spiral point or spiral flute taps, when a tap enters a drilled hole it starts cutting chips which will usually remain in the flutes as the tap advances. If stringy chips result, they roll over and over between the minor diameter of the hole and the bottom of the flutes, causing considerable friction. As the drilled hole becomes smaller, the amount of chips to be removed becomes so great that the friction generated may require as much power as does actual cutting.

This friction increase is apparent where the power used in cutting cast iron with its fine crumbling chips, increases in proportion to the metal removed, but the curling chips from No. 1020 A.I.S.I. steel clog the flutes of the tap, resulting in an increase in torque out of proportion to the metal removed and detrimental to the tap.

In addition to causing friction, these curling chips score and tear the thread resulting in rough and oversize holes, and leads to work rejection. This is especially true of the Unified Coarse Thread series in sizes 1/2" , and the Metric Thread Sizes M12 and smaller.

While minor diameter limits shown in B1.1, B1.13M and H-28 result in a satisfactory threaded hole, there are cases where a larger hole will save time and tool cost. Tests show that in general the bolt, or external thread, breaks at about 55% thread engagement, and there is very little increase in the strength of the nut when the thread height is increased.

It is, therefore, an advantage to tap users to keep the minor diameter as large as possible. If tapping difficulties continue, the Fine Thread Series should be considered, as the volume of chips is much smaller and the strength of the internal thread is practically the same.

It must be remembered that the part to be tapped is usually the more valuable and that the balance of strength should be in the tapped hole.

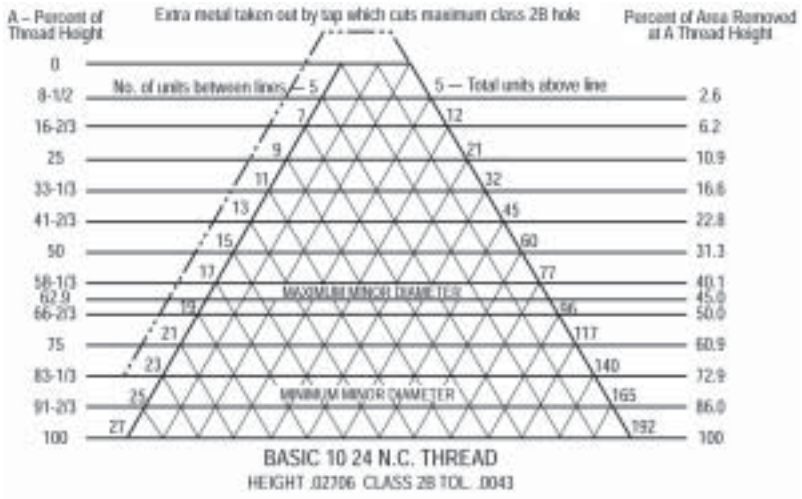


TABLE #24 TAP DRILL SIZES

Probable Percentage of Full Thread Produced In Tapped Hole Using Stock Sizes of Drill

TAP	TAP DRILL	DEC. EQUIV.	THEOR. % OF THREAD	PROB. OVERSIZE (MEAN)	HOLE SIZE	% OF THREAD
0-80	56	.0465	83	.0015	.0480	74
	3/64	.0469	81	.0015	.0484	71
1-64	54	.0550	89	.0015	.0565	81
	53	.0595	67	.0015	.0610	59
1-72	53	.0595	75	.0015	.0610	67
	1/16	.0625	58	.0015	.0640	50
2-56	51	.0670	82	.0017	.0687	74
	50	.0700	69	.0017	.0717	62
	49	.0730	56	.0017	.0747	49
	50	.0700	79	.0017	.0717	70
2-64	49	.0730	64	.0017	.0747	56
	48	.0760	85	.0017	.0779	78
3-48	5/64	.0781	77	.0019	.0800	70
	47	.0785	76	.0019	.0804	69
	46	.0810	67	.0019	.0829	60
	45	.0820	63	.0019	.0839	56
3-56	46	.0810	78	.0019	.0829	69
	45	.0820	73	.0019	.0839	65
	44	.0860	56	.0019	.0879	48
4-40	44	.0860	80	.0020	.0880	74
	43	.0890	71	.0020	.0910	65
	42	.0935	57	.0020	.0955	51
	3/32	.0938	56	.0020	.0958	50
4-48	42	.0935	68	.0020	.0955	61
	3/32	.0938	68	.0020	.0958	60
	41	.0960	59	.0020	.0980	52
5-40	40	.0980	83	.0023	.1003	76
	39	.0995	79	.0023	.1018	71
	38	.1015	72	.0023	.1038	65
	37	.1040	65	.0023	.1063	58
5-44	38	.1015	79	.0023	.1038	72
	37	.1040	71	.0023	.1063	63
	36	.1065	63	.0023	.1088	55
6-32	37	.1040	84	.0023	.1063	78
	36	.1065	78	.0026	.1091	71
	7/64	.1094	70	.0026	.1120	64
	35	.1100	69	.0026	.1126	63
	34	.1110	67	.0026	.1136	60
	33	.1130	62	.0026	.1156	55
6-40	34	.1110	83	.0026	.1136	75
	33	.1130	77	.0026	.1156	69
	32	.1160	68	.0026	.1186	60
8-32	29	.1360	69	.0029	.1389	62
	28	.1405	58	.0029	.1434	51
8-36	29	.1360	78	.0029	.1389	70
	28	.1405	68	.0029	.1434	57
	9/64	.1406	68	.0029	.1435	57
10-24	27	.1440	85	.0032	.1472	79
	26	.1170	79	.0032	.1502	74
	25	.1495	75	.0032	.1527	69
	24	.1520	70	.0032	.1552	64
	23	.1540	67	.0032	.1572	61
	5/32	.1563	62	.0032	.1595	56
	22	.1570	61	.0032	.1602	55
10-32	5/32	.1563	83	.0032	.1595	75
	22	.1570	81	.0032	.1602	73
	21	.1590	76	.0032	.1622	68
	20	.1610	71	.0032	.1642	64
	19	.1660	59	.0032	.1692	51
12-24	11/64	.1719	82	.0035	.1754	75
	17	.1730	79	.0035	.1765	73
	16	.1770	72	.0035	.1805	66
	15	.1800	67	.0035	.1835	60
	14	.1820	63	.0035	.1855	56
12-28	16	.1770	84	.0035	.1805	77
	15	.1800	78	.0035	.1835	70
	14	.1820	73	.0035	.1855	66
	13	.1850	67	.0035	.1885	59
	3/16	.1875	61	.0035	.1910	54
1/4-20	9	.1960	83	.0038	.1998	77
	8	.1990	79	.0038	.2028	73
	7	.2010	75	.0038	.2048	70
	13/64	.2031	72	.0038	.2069	66
	6	.2040	71	.0038	.2078	65
	5	.2055	69	.0038	.2093	63
	4	.2090	63	.0038	.2128	57
1/4-28	3	.2130	80	.0038	.2168	72
	7/32	.2188	67	.0038	.2226	59
	2	.2210	63	.0038	.2248	55
5/16-18	F	.2570	77	.0038	.2608	72
	G	.2610	71	.0041	.2651	66
	17/64	.2656	65	.0041	.2697	59
	H	.2660	64	.0041	.2701	59
5/16-24	H	.2660	86	.0041	.2701	78
	I	.2720	75	.0041	.2761	67
	J	.2770	66	.0041	.2811	58
3/8-16	5/16	.3125	77	.0044	.3169	72
	O	.3160	73	.0044	.3204	68
	P	.3230	64	.0044	.3274	59
3/8-24	21/64	.3281	87	.0044	.3325	79
	Q	.3320	79	.0044	.3364	71
	R	.3390	67	.0044	.3434	58
7/16-14	T	.3580	86	.0046	.3626	81
	23/64	.3594	84	.0046	.3640	79
	U	.3680	75	.0046	.3726	70
	3/8	.3750	67	.0046	.3796	62
	V	.3770	65	.0046	.3816	60
7/16-20	W	.3860	79	.0046	.3906	72
	25/64	.3906	72	.0046	.3952	65
	X	.3970	62	.0046	.4016	55
1/2-13	27/64	.4219	78	.0047	.4266	73
	7/16	.4375	63	.0047	.4422	58
1/2-20	29/64	.4531	72	.0047	.4578	65
9/16-12	15/32	.4688	87	.0048	.4736	82
	31/64	.4844	72	.0048	.4892	68
9/16-18	1/2	.5000	87	.0048	.5048	80
	33/64	.5156	65	.0048	.5204	58
5/8-11	17/32	.5313	79	.0049	.5362	75
	35/64	.5469	66	.0049	.5518	62
5/8-18	9/16	.5625	87	.0049	.5674	80
	37/64	.5781	65	.0049	.5831	58
3/4-10	41/64	.6406	84	.0050	.6456	80
	21/32	.6563	72	.0050	.6613	68
3/4-16	11/16	.6875	77	.0050	.6925	71
7/8-9	49/64	.7656	76	.0052	.7708	72
	25/32	.7812	65	.0052	.7864	61
7/8-14	51/64	.7969	84	.0052	.8021	79
	13/16	.8125	67	.0052	.8177	62
1”-8	55/64	.8594	87	.0059	.8653	83
	7/8	.8750	77	.0059	.8809	73
	57/64	.8906	67	.0059	.8965	64
	29/32	.9063	58	.0059	.9122	54
1”-12	29/32	.9063	87	.0060	.9123	81
	59/64	.9219	72	.0060	.9279	67
	15/16	.9375	58	.0060	.9435	52
1”-14	59/64	.9219	84	.0060	.9279	78
	15/16	.9375	67	.0060	.9435	61
1-1/8—7	31/32	.9688	84	.0062	.9750	81
	63/64	.9844	76	.0067	.9911	72
	1	1.0000	67	.0070	1.0070	64
	1-1/64	1.0156	59	.0070	1.0226	55
1-1/8—12	1-1/32	1.0313	87	.0071	1.0384	80
	1-3/64	1.0469	72	.0072	1.0541	66
1-1/4—7	1-3/32	1.0938	84			
	1-7/64	1.1094	76			
	1-1/8	1.1250	67			
1-1/4—12	1-5/32	1.1563	87			
	1-11/64	1.1719	72			
1-3/8—6	1-3/16	1.1875	87			
	1-13/64	1.2031	79			
	1-7/32	1.2188	72			
	1-15/64	1.2344	65			
1-3/8—12	1-9/32	1.2813	87			
	1-19/64	1.2969	72			
1-1/2—6	1-5/16	1.3125	87			
	1-21/64	1.3281	79			
	1-11/32	1.3438	72			
	1-23/64	1.3594	65			
1-1/2—12	1-13/32	1.4063	87			
	1-27/64	1.4219	72			

REAMING RECOMMENDED

TABLE #24 METRIC TAP DRILL SIZES
Probable Percentage of Full Thread Produced In Tapped Hole Using Stock Sizes of Drill

Metric Tap Size (mm)	Tap Drill Drill (mm or in.)	Decimal Equiv. Tap Drill (in.)	Thoretical % of Thread	Probable Mean Oversize (in.)	Probable Hole Size (in.)	Probable % of Thread
M1.6 x 0.35	1.20mm	.0472	88	.0014	.0486	80
	1.25mm	.0492	77	.0014	.0506	69
M2 x 0.4	1/16	.0625	79	.0015	.0640	72
	1.60mm	.0630	77	.0017	.0647	69
	52	.0635	74	.0017	.0652	66
M2.5 x 0.45	2.05mm	.0807	77	.0019	.0826	69
	46	.0810	76	.0019	.0829	67
	45	.0820	71	.0019	.0839	63
M3 x 0.5	40	.0980	79	.0023	.1003	70
	2.5mm	.0984	77	.0023	.1007	68
	39	.0995	73	.0023	.1018	64
M3.5 x 0.6	33	.1130	81	.0026	.1156	72
	2.9mm	.1142	77	.0026	.1168	68
	32	.1160	71	.0026	.1186	63
M4 x 0.7	3.2mm	.1260	88	.0029	.1289	80
	30	.1285	81	.0029	.1314	73
	3.3mm	.1299	77	.0029	.1328	69
M4.5 x 0.75	3.7mm	.1457	82	.0032	.1489	74
	26	.1470	79	.0032	.1502	70
	25	.1495	72	.0032	.1527	64
M5 x 0.8	4.2mm	.1654	77	.0032	.1686	69
	19	.1660	75	.0032	.1692	68
M6 x 1	10	.1935	84	.0038	.1973	76
	9	.1960	79	.0038	.1998	71
	5.0mm	.1969	77	.0038	.2006	70
	8	.1990	73	.0038	.2028	65
M7 x 1	A	.2340	81	.0038	.2378	74
	6.0mm	.2362	77	.0038	.2400	70
	B	.2380	74	.0038	.2418	66
M8 x 1.25	6.7mm	.2638	80	.0041	.2679	74
	17/64	.2656	77	.0041	.2697	71
	H	.2660	77	.0041	.2701	70
	6.8mm	.2677	74	.0041	.2718	68
M10 x 1.5	8.4mm	.3307	82	.0044	.3351	76
	Q	.3320	80	.0044	.3364	75
	8.5mm	.3346	77	.0044	.3390	71
M12 x 1.75	10.2mm	.4016	79	.0047	.4063	75
	Y	.4040	76	.0047	.4087	71
	13/32	.4062	74	.0047	.4109	69
M14 x 2	15/32	.4688	81	.0048	.4736	76
	12mm	.4724	77	.0048	.4772	72
M16 x 2	35/64	.5469	81	.0049	.5518	76
	14mm	.5512	77	.0049	.5561	72
M20 x 2.5	11/16	.6875	78	.0050	.6925	74
	17.5mm	.6890	77	.0052	.6942	73
M24 x 3	13/16	.8125	86	.0052	.8177	82
	21mm	.8268	76	.0054	.8322	73
	53/64	.8281	76	.0054	.8335	73
M30 x 3.5	1-1/32	1.0312	83	.0071	1.0383	80
	25.5mm	1.0433	77	.0071	1.0504	73
	1-3/64	1.0469	75	.0072	1.0541	70
M36 x 4	1-17/64	1.2656	74	REAMING RECOMMENDED		

TABLE #25 TAP DRILL SIZE FORMULAE

$$\text{Major Diameter of Thread} - \frac{.01299 \times \text{Amt. of percentage of full thread}}{\text{Number of threads per inch}} = \text{Drilled Hole Size}$$

Note: Select nearest commercial stock drill.

Percentage of Full Thread for Other Drill Sizes

$$\text{No. of Threads per Inch} \times \left(\frac{\text{Major Diameter of Thread - Selected Drill Diameter}}{.01299} \right) = \text{Percentage of Full Thread}$$

TABLE #26 Standard System of Marking (Ref. U.S.C.T.I. Table 301B)

Standard Tap Marking	Product Thread Designation	Thread Series	Governing Standards
STI	STI	Helical Coil wire screw thead insert	ASME B18.29.1
ACME-C	ACME-C	Acme thread—centralizing	ASME B1.5
ACME-G	ACME-G	Acme thread—general purpose	ASME B1.5
STUB ACME	STUB ACME	Stub Acme Thread	ASME B1.8
NH	NH	American National Hose	ASME B1.20.7
ANPT	ANPT	Aeronautical National form taper pipe	MIL-P-7105
NGO	NGO	National Gas outlet thread	ANSI/CSA/CGA STD V-1
NGS	NGS	National Gas straight thread	ANSI/CSA/CGA STD V-1
NGT	NGT	National Gas taper thread	ANSI/CSA/CGA STD V-1
PTF-SAE	PTF-SAE-SHORT	Dryseal SAE short taper pipe thread	ASME B1.20.3
AMO	AMO	American National Standard Microscope Objective Thread	ASME B1.11
UNM	UNM	Unified Miniature thread series	ASME B1.10

TABLE #26 Standard System of Marking (Ref. U.S.C.T.I. Table 301B) continued

Standard Tap Marking	Product Thread Designation	Thread Series	Governing Standards
BUTT	BUTT	American Buttress thread	ASME B1.9
SGT	SGT	Special Gas taper thread	ANSI/CSA/CGA STD V-1
SPL-PTF	PTF	Special Dryseal taper pipe thread	ASME B1.20.3
BSW	BSW	British Standard Whitworth coarse thread	BSI BS84
BSF	BSF	British Standard Whitworth fine thread	BSI BS84
Rc	Rc	British Standard Taper Pipe for pressure tight joints	BSI BS21
Rp	Rp	British Standard Straight Pipe for pressure tight joints	BSI BS21
G	G	Brittish Standard Straight Pipe for non-pressure tight joints such as mechanical assemblies	BSI BS2779
G-trunc	G-trunc	British Standard Straight Pipe for non-pressure tight joints such as mechanical assemblies with truncated crests	BSI BS2779
M	M	Metric Screw Threads - M profile with basic ISO 68 profile	ASME B1.13M, B1.18M
M	MJ	Metric Screw Threads - MJ profile with a rounded root radius equal to 0.15011P to 0.18042P (ext. thd. only)	ASME B1.21M
NC	NC5IF	Class 5 interference fit internal thread Entire ferrous material range	ASME B1.12
NC	NC5INF	Class 5 interference fit internal thread Entire nonferrous material range	ASME B1.12
NPS	NPSC	American Standard Straight Pipe threads in pipe couplings	ASME B1.20.1
NPSF	NPSF	Dryseal American Standard fuel internal straight pipe threads	ASME B1.20.3
NPSH	NPSH	American Standard Straight Hose coupling threads for joining to American Standard taper pipe threads	ASME B1.20.7
NPSI	NPSI	Dryseal American Standard Intermediate internal straight pipe threads	ASME B1.20.3
NPSL	NPSL	American Standard Straight Pipe threads for loose fitting mechanical joints with locknuts	ASME B1.20.1
NPS	NPSM	American Standard Straight Pipe threads for free fitting mechanical joints for fixtures	ASME B1.20.1
NPT	NPT	American Standard Taper Pipe threads for general use.	ASME B1.20.1
NPTF	NPTF	Dryseal American Standard Taper Pipe threads	ASME B1.20.3
NPTR	NPTR	American Stanard Taper Pipe threads for railing joints	ASME B1.20.1
N	UN	Unified Inch Screw Thread, constant pitch series	ASME B1.1
NC	UNC	Unified Inch Screw Thread, coarse pitch series	ASME B1.1
NF	UNF	Unified Inch Screw Thread, fine pitch series	ASME B1.1
NEF	UNEF	Unified Inch Screw Thread, extra fine pitch series	ASME B1.1
N	UNJ	Unified Inch Screw Thread, constant pitch series, with rounded root radius 0.15011P to 0.18042P (ext. thd. only)	ASME B1.15
NC	UNJC	Unified Inch Screw Thread, coarse pitch series, with rounded root radius 0.15011P to 0.18042P (ext. thd. only)	ASME B1.15
NF	UNJF	Unified Inch Screw Thread, fine pitch series, with rounded root radius 0.15011P to 0.18042P (ext. thd. only)	ASME B1.15
NEF	UNJEF	Unified Inch Screw Thread, extra fine pitch series, with rounded root radius 0.15011P to 0.18042P (ext. thd. only)	ASME B1.15
NS	UNJS	Unified Inch Screw Thread, special pitch series, with rounded root radius 0.15011P to 0.18042P (ext. thd. only)	ASME B1.15
N	UNR	Unified Inch Screw Thread, constant pitch series, with rounded root radius not less than 0.108P (ext. thd. only)	ASME B1.1
NC	UNRC	Unified Inch Screw Thread, coarse pitch series, with rounded root radius not less than 0.108P (ext. thd. only)	ASME B1.1
NF	UNRF	Unified Inch Screw Thread, fine pitch series, with rounded root radius not less than 0.108P (ext. thd. only)	ASME B1.1
NEF	UNREF	Unified Inch Screw Thread, extra fine pitch series, with rounded root radius not less than 0.108P (ext. thd. only)	ASME B1.1
NS	UNS	Unified Inch Screw Thread, special diameter, pitch, or length of engagement	ASME B1.1

** Taps are not marked with "U" but with the symbol for the corresponding American Standard thread form with which it is compatible.*
For pipe tap thread designation symbols, see page 155.

TABLE #27 WORD AND TERM DEFINITIONS APPLYING TO SCREW THREADS, TAPS AND DIES

ALLOWANCE. An allowance is an intentional difference in correlated dimensions of mating parts. It is the minimum clearance (positive allowance) or maximum interference (negative allowance) between such parts.

ANGLE OF THREAD. The angle included between the flanks of the thread, measured in an axial plane.

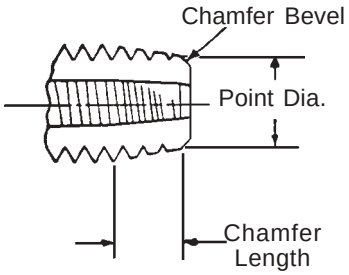
AXIS. The longitudinal central line through the screw or tap.

BACK TAPER. A slight axial relief on the thread of the tap which makes the pitch diameter of the thread near the shank somewhat smaller than that at the chamfered end. (See RELIEF)

BASIC. The theoretical or nominal standard size from which all variations are made. (See SIZE)

CHAMFER. The tapering of the end of the thread on a tap by cutting away and relieving the crest of the first few teeth to distribute the cutting action over several teeth. It also acts as a guide in starting the tap. When this tapering amounts to 8 to 10 threads, the tap is called a *taper* tap; when 3 to 5 threads, a *plug* tap; and with 1 to 2 threads chamfer, a *bottoming* tap.

Chamfer Dimensions



CORE DIAMETER. The diameter of an imaginary cylinder tangent to the deepest part of the flute.

CREST. The top surface joining the two flanks of a thread. The crest of an external thread is at its major diameter, while the crest of an internal thread is at its minor diameter.

CREST CLEARANCE. The space between the crest of a thread and the root of its component.

CUTTING EDGE. The leading side of the land in the direction of rotation for cutting and which does the actual cutting.

DEPTH OF THREAD. The distance between the crest and the base of the thread, measured normal to the axis.

DRYSEAL. A fuel connection for both external and internal application designed for use where the assembled product must withstand high fluid or gas pressures without the use of a sealing compound or where a sealer is functionally objectionable.

FLANK. The surface of the thread, sometimes referred to as side of thread, which connects the crest with the root.

FLUTES. The longitudinal channels formed in a tap to create cutting edges on the thread profile and to provide chip spaces and cutting-fluid passages.

FLUTE LEAD. The axial advance of a helical or spiral cutting edge in one turn around the tool axis.

HEEL. The face of the tap land trailing the cutting edge during forward rotation.

HEIGHT OF THREAD. The distance between the crest and the base of thread measured normal to the axis.

HELIX ANGLE—FLUTE. Flutes of taps are sometimes cut helically instead of straight. This helix angle is the angle made by the flute with the axis of the tap. (Helical flutes are sometimes called spiral flutes.)

HELIX ANGLE—THREAD. The angle made by the helix of a thread at the pitch diameter with a plane perpendicular to the axis.

HOOK. The concave cutting face of a tap land between the crest and the root of thread.

INTERRUPTED THREAD. A tap having an odd number of lands, with every other tooth along the thread helix removed.

Tap Terms

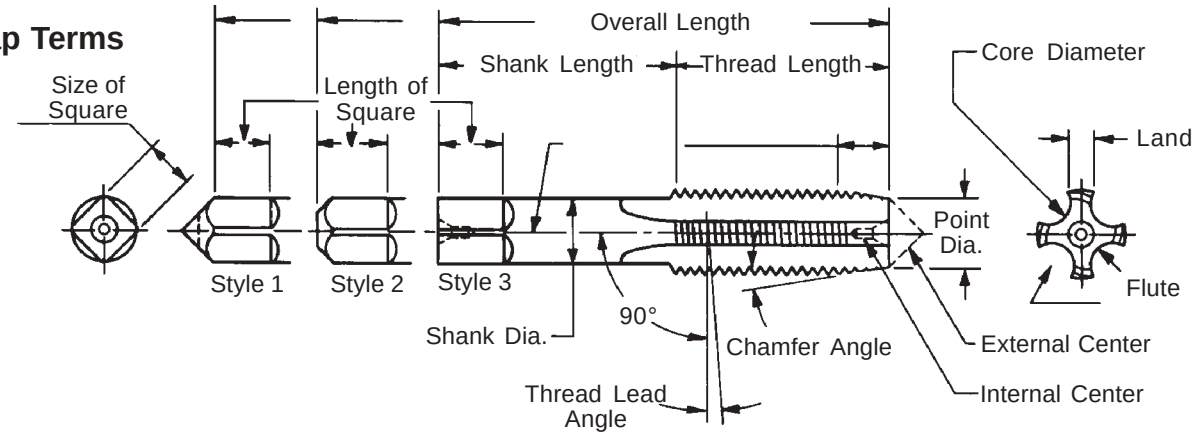


TABLE #27 WORD AND TERM DEFINITIONS APPLYING TO SCREW THREADS, TAPS AND DIES (continued)

LAND. One of the threaded sections between the flutes on a tap.

LEAD. The distance a screw thread advances axially in one complete turn. On a single-thread screw or tap, the lead and pitch are identical. On a double-thread, the lead is twice the pitch; on a triple-thread, the lead is three times the pitch, etc.

LEAD ERROR. The amount the actual lead of the screw thread differs from the specified lead.

LEAD—DRUNKEN. Irregular advance of the thread helix or lead. Usually called “drunken thread.”

LENGTH OF ENGAGEMENT. The length of contact between two mating threaded parts measured axially.

LIMITS. The maximum and minimum sizes permissible for a specific dimension. (See ALLOWANCE AND TOLERANCE)

MAJOR DIAMETER. The largest diameter of a straight thread. On a taper thread, the largest diameter at any given plane normal to the axis. The term “major diameter” replaces the term “outside diameter” as applied to the thread of a screw or tap and also the term “full diameter” as applied to the thread of a nut or die.

MINOR DIAMETER. The smallest diameter of a straight thread. On a taper thread, the smallest diameter at any given plane normal to the axis. The term “minor diameter” replaces the terms “root diameter” and “core diameter” as applied to the thread of a screw or tap and also the term “inside diameter” as applied to the thread of a nut or die.

PERCENT OF THREAD. One-half the difference between the basic major diameter and the actual minor diameter of an internal thread, divided by the basic thread height, expressed as percentage.

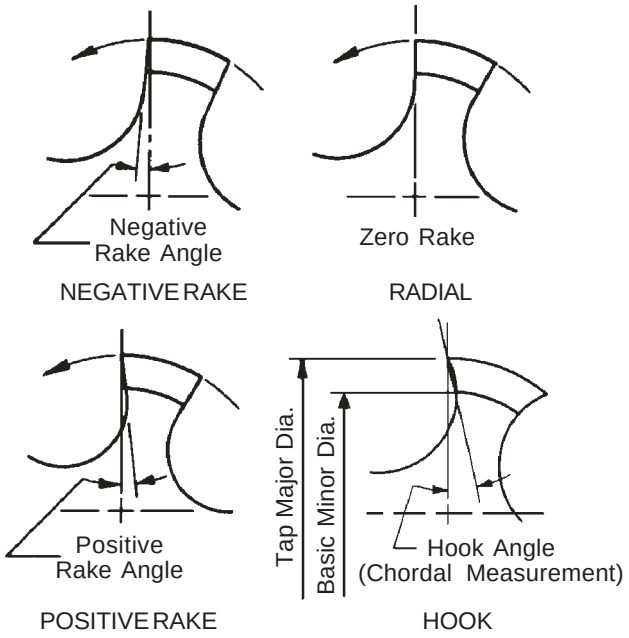
PITCH. The distance from a point on a screw thread to a corresponding point on the next thread, measured parallel to the axis and on the same side of the axis. The pitch equals one divided by the number of threads per inch.

PITCH DIAMETER. On a straight screw thread, the diameter of an imaginary cylinder, the surface of which would pass through the threads at such points as to make equal the width of the threads and the width of the spaces cut by the surface of the cylinder. On a taper screw thread, the diameter at a given distance from a reference plane perpendicular to the axis of an imaginary cone, the surface of which would pass through the threads at such points as to make equal the width of the threads and the width of the spaces cut by the surface of the cone.

PITCH LINE. A generator of the imaginary cylinder or cone specified in the definition of PITCH DIAMETER.

RAKE. On a tap, any deviation of a straight cutting face of the tooth from a radial line. Positive rake means that the crest of the cutting face is angularly advanced ahead of the balance of the face of the tooth. Negative rake means that the same point is angularly behind the balance of the cutting face of the tooth. Zero rake means that the cutting face is directly on the center line.

Rake Angles



Pitch Dimensions

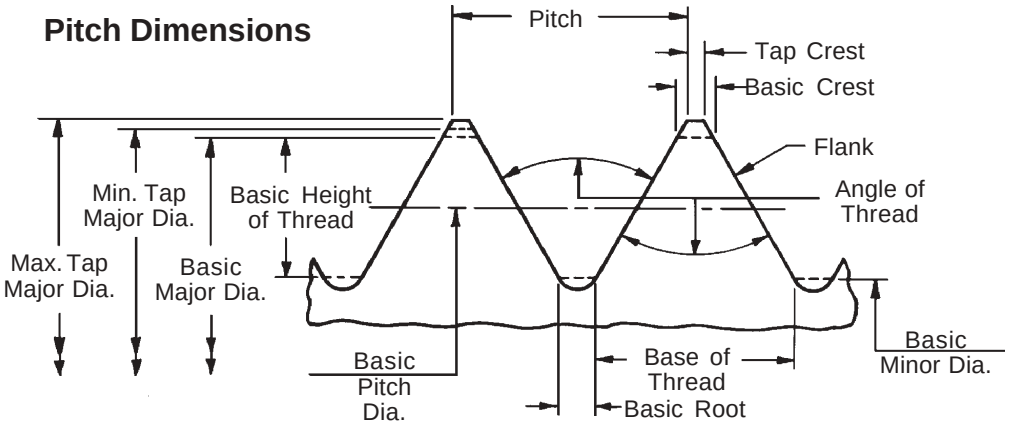
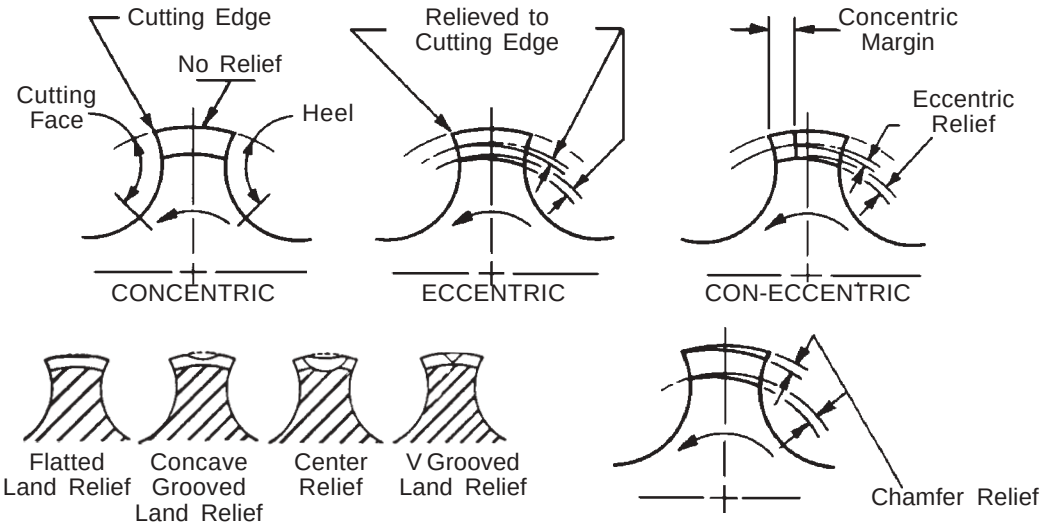


TABLE #27 WORD AND TERM DEFINITIONS APPLYING TO SCREW THREADS, TAPS AND DIES (continued)

RELIEF—RADIAL. The clearance produced by removal of metal from behind the cutting edge. Taps should have the chamfer relieved and should have back taper, but may or may not have relief in the angle and on the major diameter of the threads. When the thread angle is relieved from heel to cutting edge, the tap is said to have "eccentric" relief. If relieved from heel for only a portion of land width (usually 2/3) the tap is said to have "con-eccentric" relief. (See BACK TAPER)

Relief Styles



ROOT. The bottom surface joining the flanks of two adjacent threads. The root of an external thread is at its minor diameter, while the root of an internal thread is at its major diameter.

SCREW THREAD. A ridge of uniform section in the form of a helix on the external or internal surface of a cylinder, or in the form of a conical spiral on the external or internal surface of a cone or frustum of a cone. A thread formed on a cylinder is known as a "straight" or "parallel" thread, to distinguish it from a "taper" thread which is formed on a cone or frustum of a cone. All left-hand threads are designated LH.

SPIRAL POINT. A supplementary fluting, cut at an angle to the main fluting in the cutting face of the land. It is slightly longer than the chamfer on the tap and in the opposite hand to that of cutting rotation.

SIZE—BASIC. The theoretical size from which the limits of size for that dimension are derived by the application of the allowance and tolerances.

SIZE—NOMINAL. The designation used for general identification.

THREAD—SINGLE. A thread in which the lead is equal to the pitch.

THREAD—MULTIPLE. A thread in which the lead is an integral multiple of the pitch. On a double thread, the lead is equal to twice the pitch; on a triple thread, the lead is equal to three times the pitch, etc. Such threads have starting points relative to their multiple equally spaced around their circumference. For example, a double thread has two starting points 180° apart, etc.

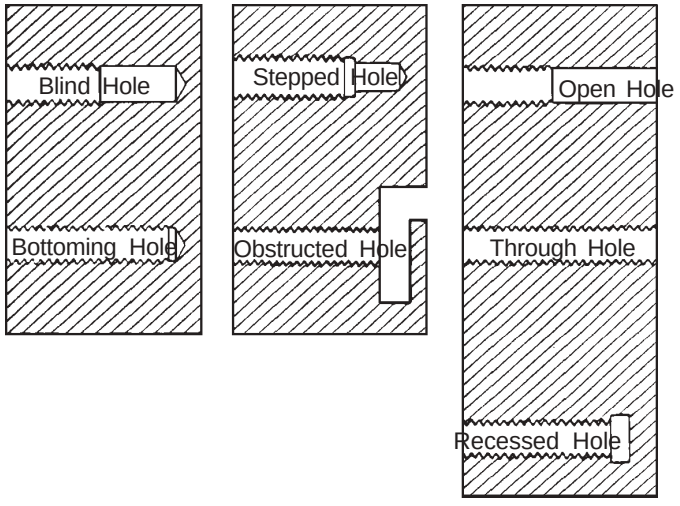
THREAD—DRUNKEN. A thread in which the advance of the thread helix is irregular.

TOLERANCE. The amount of variation permitted in any dimension. Tolerance may be expressed as plus, minus, or both. A total tolerance is the sum of a plus and minus tolerance. Complete tolerances on threads include those for major diameter, minor diameter, pitch diameter, lead, half angle, and full angle. (See ALLOWANCE and LIMITS)

TRUNCATION—CREST. The distance measured perpendicular to the axis, between the sharp crest (or crest apex) and the cylinder or cone which bounds the crest.

TRUNCATION—ROOT. The distance, measured perpendicular to the axis, between the sharp root (or root apex) and the cylinder or cone which bounds the root.

Types of Tapped Holes



THREADING DIES

Vermont Tap and Die offers a complete line of the most commonly used threading dies. These dies are available as standard with right hand thread and Unified Thread Form, and in most cases are available from stock in both high speed steel and carbon steel.

Vermont Tap and Die offers a wide range of sizes in the Round Adjustable type of die, the outside diameters of which include 13/16", 1", 15/16", 1-1/2", 2", 2-1/2", and 3" in order to fit all standard die stocks and power threading equipment holders. All of these dies are provided with adjusting screws to be used in increasing or decreasing pitch diameter. Although the adjusting range hereby provided is relatively small, it is sufficient to produce all standard classes of fit. (Caution: if too large an adjustment is attempted, the cutting efficiency of the die will be reduced, and pressure applied on the die by the adjusting screw may cause the die to break.)

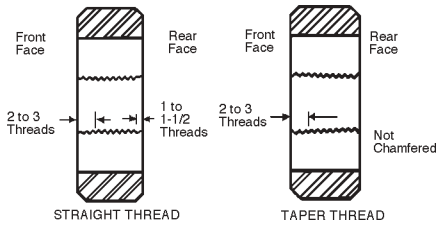
The Vermont threading die line also includes solid round taper pipe (NPT) dies, hexagon rethreading dies (bolt type only), and 2-piece dies.

All Vermont threading dies are designed and manufactured to conform to standards established by ANSI, USCTI, and all federal services, and can be expected to perform satisfactorily under most conditions of industrial use. Dies manufactured to closer tolerances than these standards are available as special.

All types of dies listed here are available as special in left hand thread and in non-standard sizes. In addition, Acme Thread Dies and locknut thread dies, sizes N-00 through AN-40 are available in round adjustable (full thread cutting) styles as special.

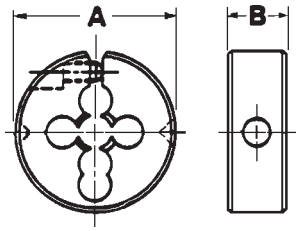
Vermont round adjustable dies are available as special in larger thread sizes and outside diameters than listed here. Dies up to 4" in thread size and up to 8" in outside diameter can be produced. It should be considered that there may be better and less expensive means to produce such large external threads, however. For advice, consult your Vermont representative.

TABLE #28 STANDARD CHAMFERS



TYPE OF DIE	APPROXIMATE NUMBER OF THREADS CHAMFER	
	FRONT FACE	REAR FACE
Adjustable Round Split, Straight Thread	2 to 3	1 to 1-1/2
Adjustable Round Split, Taper Thread	2 to 3	0
Hexagon Rethreading, Straight Thread	1	1

TABLE #29 STANDARD TOLERANCES



DIMENSIONS INCHES		TOLERANCES INCHES	
A	B	A	B
13/16	1/4	+.000 -.008	+.005 -.005
1	3/8	+.000 -.008	+.005 -.005
1 - 1/2	1/2	+.000 -.008	+.010 -.010
2	5/8	+.000 -.008	+.010 -.010
2 - 1/2	3/4	+.000 -.010	+.010 -.010
3	1	+.000 -.010	+.010 -.010

2 - PIECE DIES

ILLUSTRATION #6 SCHEMATIC ILLUSTRATION OF DIE BLANKS AND COLLETS

This illustration graphically shows the complete range of Vermont 2-piece die collets and corresponding die blank sizes. Collets of a given outside diameter are furnished with different size slots to accommodate 2-piece dies made from blanks of corresponding width dimensions. Reference to this chart will help to clarify this numbering system when ordering Vermont 2-piece dies or collets. See page 52-53 for the complete listing of Vermont 2-piece die collets and page 54 for die stocks.

DIE BLANK:	V-1	1/4	3/8	1/2	7/8	1-1/8	1-3/8
BLANK WIDTH:	23/64”	1/2”	19/32”	27/32”	1-1/32”	1-1/4”	1-1/2”
FOR CUTTING THREAD SIZES:	No. 2-12 1/16” - 1/4”	3/16” 15/16”	No. 1 collet: 3/8”, 7/16”, 1/2” No. 5 collet: 3/8” - 7/16”	No. 5 collet: 1/2”, 3/4” No. 20 collet: 5/8”, 3/4”	7/8” - 1”	1-1/8” - 1-1/4”	1-3/8” - 1-1/2”
NO. V-1 COLLET: 1 - 1/4” O.D.							
NO. 1 COLLET 2” O.D.							
NO. 5 COLLET 2-3/4” O.D.							

ILLUSTRATION #7 DIE AND COLLET ASSEMBLY

The illustration at right shows the correct assembly of a 2-piece die. For normal threading note that the end surface of each die half is adjusted to the witness lines of the cap by adjusting screws. Tightening of the guide with a wrench secures the die in place.

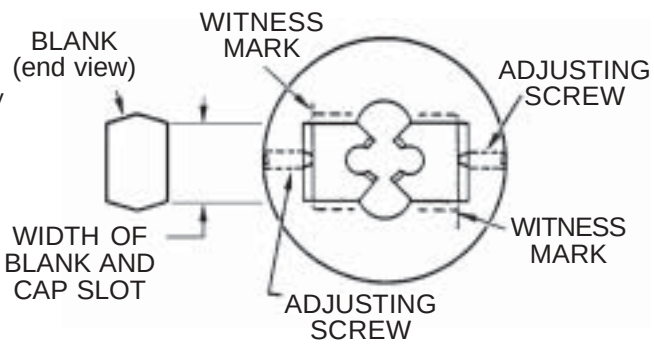


TABLE #30 SUGGESTED SPEEDS FOR HIGH SPEED STEEL AND VERTANIUM DRILLS

The speeds shown in the following table include a range in feet-per-minute. On most jobs, it is usually better to start with a slower speed and build up to the maximum after trials indicate the job can be run faster.

MATERIAL	SPEED IN FEET-PER-MINUTE UNCOATED	VERTANIUM
Aluminum and its alloys	200-300	*300-450
Brass and Bronze (ordinary)	150-300	*300-450
Bronze (high tensile)	70-150	*140-300
Die Castings (Zinc base)	300-400	*450-600
High Temperature alloys: (solution treated & aged)		
Cobalt Base HS25, S816, V36	10-20	*20-40
Iron Base INCO 800, A286, N155	10-20	20-40
Nickel Base INCONEL 700, U500, Rene 41	7-15	15-30
Iron:		
Cast (soft)	75-125	150-250
Cast (medium hard)	50-100	100-200
Hard Chilled	10-20	20-40
Malleable	80-90	160-180
Magnesium and its alloys	250-400	*400-600
Monel Metal or High-Nickel Steel	30-50	60-100
Plastics or Similar Materials (Bakelite)	100-300	200-600
Steels:		
Mild .2 to .3 carbon	80-110	120-220
Steel .4 to .5 carbon	70-80	100-160
Tool 1.2 carbon	50-60	75-120
Forgings	40-50	60-100
Alloy - 300 to 400 Brinell	20-30	30-60
High Tensile Steels (heat treated):		
35 to 40 Rockwell C	30-40	45-80
40 to 45 Rockwell C	25-35	40-70
45 to 50 Rockwell C	15-25	25-50
50 to 55 Rockwell C	7-15	10-30
Maraging Steel:		
Heat treated	7-20	15-40
Annealed	40-55	60-110
Stainless Steels:		
Free machining group		
303, 303SE, 430F, 416F, 420F	30-100	60-150
Chromium-Nickel group (non-hardenable)		
300 Series (Austenitic), 400 Series (Ferritic)	20-60	40-120
Straight Chromium group (heat treated)		
400 Series (Martensitic)	10-30	20-60
Titanium alloys:		
Commercially pure	50-60	*100-120
5AL-2Sn, 8AL-1, Mo-IV 2Fe-2Cr-Mo (annealed)	30-40	*45-80
6AL-4V, 4AL-4Mn, 7AL-4Mo (annealed)	25-35	*40-70
6AL-4V, 4AL-4Mn, 7AL-4Mo		
2Fe-2Cr-2Mo (solution treated & aged)	15-20	*20-40
Wood	300-400	450-600

** Success of VERTANIUM™ drills in nonferrous materials depends on the machining conditions used.*

See pages 183-184 for speed conversion to RPM values.

TABLE #31 FEEDS FOR DRILLING

Feed rates for drilling are governed by the size of the drill, machinability of the material being drilled, and depth of the drilled hole.

Small drills, harder materials, and hole depths in excess of 3 to 4 drill diameters require additional consideration in selecting appropriate feeds.

Since the feed partially determines the rate of production and also is a factor in tool life, it should be chosen carefully for each particular job. In general, the most effective feeds will be found in the following ranges.

DRILL DIAMETER (INCHES)	FEED IN INCHES PER REVOLUTION
1/16 to 1/8	.001-.003
Over 1/8 to 1/4	.002-.006
Over 1/4 to 1/2	.004-.010
Over 1/2 to 1	.007-.015
Over 1	.015-.025

A drill split up the web is evidence of too much feed or insufficient lip relief at the center due to improper sharpening. The rapid wearing away of the extreme outer corners of the lips indicates that the speed is too high. A drill chipping or breaking out at the lips indicates that either the feed is too heavy or the drill has been sharpened with too much lip relief. See the drill resharpening instructions on page 176.

TABLE #32 CUTTING FLUIDS SELECTION GUIDE

MATERIAL	ORDER OF DECREASING EFFECTIVENESS
Aluminum and alloys	Soluble oil
Brass and bronze	Dry
Deep holes	Cutting oil Soluble oil
Magnesium & alloys	Cutting oil Soluble oil Dry
Copper	Soluble oil Dry
Monel metal	Cutting oil
Mild steels	Soluble oil
Tough alloy steels	Soluble oil
Steel forgings	Cutting oil
Cast steel	Soluble oil
Wrought iron	Soluble oil
High tensile steels	Soluble oil
Manganese steel	Dry
Cast iron	Dry
Malleable iron	Soluble oil Dry
Stainless steel	Soluble oil
Titanium alloys	Soluble oil
Tool steel	Mineral lard oil
Abrasives, plastics	Dry
Fibre, asbestos, wood	Dry
Hard rubber	Dry

DRILL RESHARPENING - HIGH SPEED STEEL DRILLS

Proper drill reconditioning is one of the most important factors affecting overall drill economy. There are three separate steps to successfully recondition a worn drill.

1. Removal of worn section.

Drill wear usually starts at the corners of the drill as shown at “A” in Figure 1 of Illustration #8. This wear starts as a slight rounding as shown in Figure 2. At the same time, the cutting edges or lips, as well as the chisel edge, start to wear away. This conical surface has no clearance and tends to rub in the hole rather than cut. The power and thrust required to force this slightly dulled edge into the work increases resulting in greater heat generation at the cutting edges and a faster rate of wear. Regardless of the amount of wear at the corners, the drill should be shortened to remove this excessively worn portion.

2. Web — thinning.

The second step of proper reconditioning is to restore approximately the original web-thickness of the drill which has been shortened. Most drills are made with webs which increase in thickness towards the shank of the drill (see Figure 3). After shortening the drill to remove the worn portion, it will appear as in Figure 4. The long chisel edge in Figure 4 will require a great deal of power and will generate much heat, resulting in shorter drill life. To recondition the drill properly, it is necessary to reduce the web thickness so that the chisel edge is restored to its normal length. This operation is called web-thinning. Under normal conditions, the following approximate web-thickness, expressed as a percentage of drill diameter, will be satisfactory:

Diameter of Drill (in.)	Web Thickness (expressed as % of drill dia.)
1/8	20
1/4	17
1/2	14
1	12
Over 1	11

The thinning of webs can be done by either machine grinding or hand grinding. However, machine grinding is preferred because of its greater accuracy and reliability.

It is important that web-thinning be done evenly on both sides of the web in order to ensure that the web will be central. Care must also be taken that the thinning operation is not carried too far up the web, thereby weakening the drill.

Grinding wheels should be soft enough to remove stock without the danger of burning the cutting edges. It should always be remembered that chips must form on the drill cutting lips and flow into the flutes, and the shape of the thinning should be such that it does not interfere in any way with this chip-flow.

3. Regrinding the surface of the point.

Besides removing the worn portion of the drill and thinning the web, it is necessary that the surfaces of the point be reground. These two conical surfaces intersect the faces of the flutes to form the cutting lips. They also intersect with each other in the center to form the chisel edge as shown in Figure 5. As with other cutting tools, the surface back of these cutting lips must not rub on the work, but must be relieved to permit the edge to penetrate. Without relief, the drill would only rub around and not penetrate.

The relief of the cutting edges is called lip relief, and is illustrated in Figures 6 and 7. The lip relief angle is measured at the periphery of the drill. It is increased towards the center of the drill in order to obtain the correct chisel edge angle shown in Figure 8. Point grinding by hand requires great skill and care on the part of an operator. In order to maintain necessary accuracy of point angles, lip relief angles, and chisel edge angle, the use of a point grinding is recommended.

ILLUSTRATION #8 DRILL RESHARPENING FIGURES

FIGURE 1
Wear starts at the corner of the drill point.

FIGURE 2
The cutting edges continue to wear with use.

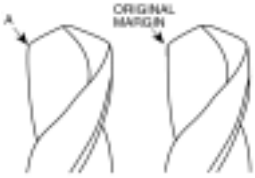


FIGURE 3
The web is the metal column which separates the flutes.

FIGURE 4
At left is shown a cross section of a drill near the shank. The cross section on the right is near the point.

FIGURE 5

FIGURE 6
The proper way to grind lip relief angle. The angle indicated is the angle at the periphery of the drill.

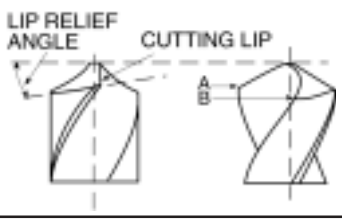


FIGURE 7
Proper lip relief. Note how much lower the heel line B is than the cutting lip line A. This difference indicates clearance on the drill point.

FIGURE 8
Chisel edge angle bears a relationship to lip relief angle and should be about 120° for lip reliefs 6° to 9°, and about 135° for lip reliefs 12° to 15°.

TABLE #33 COMMON DRILL TROUBLES AND THEIR CAUSES

INDICATIONS	CAUSES
Outer corners break down	Cutting speed too high Hard spots in material No cutting compound at drill point
Cutting edges chip	Too much feed Lip clearance too great
Checks or cracks in cutting edges	Overheated or too quickly cooled while sharpening or drilling
Margin chips	Oversize jig bushing
Drill breaks	Point improperly ground Feed too heavy Spring or back lash in drill press, fixture or work Drill is dull Flutes clogged with chips
Tang Breaks	Imperfect fit between taper shank and socket caused by dirt or chips or burred or badly worn sockets

INDICATIONS	CAUSES
Drill breaks when drilling brass or wood	Flutes clogged with chips Improper type drill
Drill splits up center	Lip clearance too small Too much feed
Drill will not enter work	Drill is dull Lip clearance too small Too heavy a web
Hole rough	Point improperly ground or dull No cutting compound at drill point Feed too great
Hole oversize	Fixture not rigid
Chip shape changes while drilling	Drill point improperly ground Drill becomes dull or cutting edges chipped
Large chip coming out of one flute, small chip out of other flute	Point improperly ground, one lip doing all the cutting

TABLE #34 GENERAL MANUFACTURING TOLERANCES FOR STANDARD TWIST DRILLS

DIAMETER AT POINT

DRILL DIA. RANGE (inclusive)	DEC. EQUIV.	TOLERANCE
#97 to #81	.0059 to .0130	+.0002 to -.0002
Over #81 to 1/8"	.0130 to .1250	+.0000 to -.0005
Over 1/8 to 1/4"	.1250 to .2500	+.0000 to -.0007
Over 1/4 to 1/2"	.2500 to .5000	+.0000 to -.0010
Over 1/2 to 1"	.5000 to 1.0000	+.0000 to -.0012
Over 1 to 2"	1.0000 to 2.0000	+.0000 to -.0015
Over 2 to 3-1/2"	2.0000 to 3.5000	+.0000 to -.0020

SHANK DIAMETER (Straight Shank Drills)

DRILL DIA. RANGE (inclusive)	DEC. EQUIV.	TOLERANCE
#97 to #81	.0059 to .0130	+.0002 to -.0002
Over #81 to 1/8"	.0130 to .1250	-.0000 to -.0025
Over 1/8 to 1/4"	.1250 to .2500	-.0005 to -.0030
Over 1/4 to 1/2"	.2500 to .5000	-.0005 to -.0045
Over 1/2 to 2"	.5000 to 2.0000	-.0005 to -.0030

BACK TAPER

DRILL DIA. RANGE (inclusive)	DEC. EQUIV.	TOLERANCE
#97 to #81	.0059 to .0130	none
Over #81 to 1/8"	.0130 to .1250	.0000 to .0008 per inch
Over 1/8 to 1/4"	.1250 to .2500	.0002 to .0008 per inch
Over 1/4 to 1/2"	.2500 to .5000	.0002 to .0009 per inch
Over 1/2 to 1"	.5000 to 1.0000	.0003 to .0011 per inch
Over 1 to 3-1/2"	1.0000 to 3.5000	.0004 to .0015 per inch

LENGTH OF FLUTE

DRILL DIA. RANGE (inclusive)	DEC. EQUIV.	TOLERANCE
#97 to #81	.0059 to .0130	+1/64 to -1/64"
Over #81 to 1/8"	.0130 to .1250	+1/8 to -1/16"
Over 1/8 to 1/2"	.1250 to .5000	+1/8 to -1/8"
Over 1/2 to 1"	.5000 to 1.0000	+1/4 to -1/8"
Over 1 to 2"	1.0000 to 2.0000	+1/4 to -1/4"
Over 2 to 3-1/2"	2.0000 to 3.5000	+3/8 to -3/8"

LENGTH OVERALL

DRILL DIA. RANGE (inclusive)	DEC. EQUIV.	TOLERANCE
#97 to #81	.0059 to .0130	+1/32 to -1/32
Over #81 to 1/8"	.0130 to .1250	+1/8 to -1/16
Over 1/8 to 1/2"	.1250 to .5000	+1/8 to -1/8
Over 1/2 to 1"	.5000 to 1.0000	+1/4 to -1/8
Over 1 to 2"	1.0000 to 2.0000	+1/4 to -1/4
Over 2 to 3-1/2"	2.0000 to 3.5000	+3/8 to -3/8

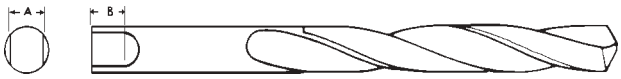
INCLUDED ANGLE OF POINT

DRILL DIA. RANGE (inclusive)	DEC. EQUIV.	INCLUDED ANGLE	TOLERANCE
1/16 to 1/2" inclusive	.0625 to .5000	118°	± 5°
Over 1/2 to 1-1/2" inclusive	.5000 to 1.5000	118°	± 3°
Over 1-1/2 to 3-1/2" inclusive	1.5000 to 3.5000	118°	±2°

LIP HEIGHT

DRILL DIA. RANGE (inclusive)	DEC. EQUIV.	TIV (TOTAL INDICATOR VARIATION)
1/16 to 1/8 inclusive	.0625 to .1250	.0020
Over 1/8 to 1/4" inclusive	.1250 to .2500	.0030
Over 1/4 to 1/2" inclusive	.2500 to .5000	.0040
Over 1/2 to 1" inclusive	.5000 to 1.0000	.0050
Over 1 to 3-1/2" inclusive	1.0000 to 3.5000	.0060

ILLUSTRATION #9 DIMENSIONS OF TANGS



SHANK DIAMETER (in.)				DECIMAL EQUIV. (in.)	DIMENSION A THICKNESS OF TANG (in.) MAX	DIMENSION A THICKNESS OF TANG (in.) MIN	DIMENSION B LENGTH OF TANG (in.)
From	1/8	through	3/16	.1875	.094	.090	9/32
Over	3/16	through	1/4	.2500	.122	.118	5/16
Over	1/4	through	5/16	.3125	.162	.158	11/32
Over	5/16	through	3/8	.3750	.203	.199	3/8
Over	3/8	through	15/32	.4688	.243	.239	7/16
Over	15/32	through	9/16	.5625	.303	.297	1/2
Over	9/16	through	21/32	.6562	.373	.367	9/16
Over	21/32	through	3/4	.7500	.443	.437	5/8
Over	3/4	through	7/8	.8750	.514	.508	11/16
Over	7/8	through	1	1.0000	.609	.601	3/4
Over	1	through	1-3/16	1.1875	.700	.692	13/16
Over	1-3/16	through	1-3/8	1.3750	.817	.809	7/8

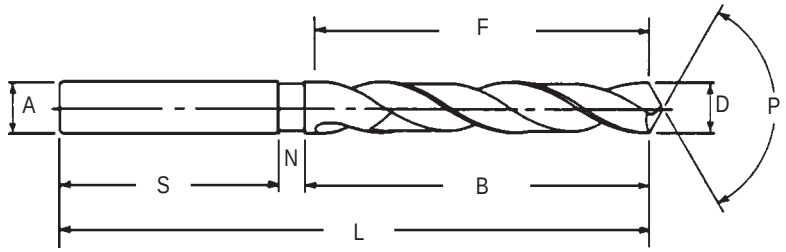
INSTRUCTIONS FOR ORDERING SPECIAL PURPOSE DRILLS

Let Vermont be your complete drill line source. It is always good practice to examine the possibilities of regular standard items before selecting special drills. However, if specials are required, information covering drill detail as shown below will be helpful to us in furnishing the most suitable drills.

Vermont will be pleased to quote on your special needs and designs. Whether it is extra length, multi-diameter, double margin, subland, piloted, etc., our engineers can help you design the best drill for your application.

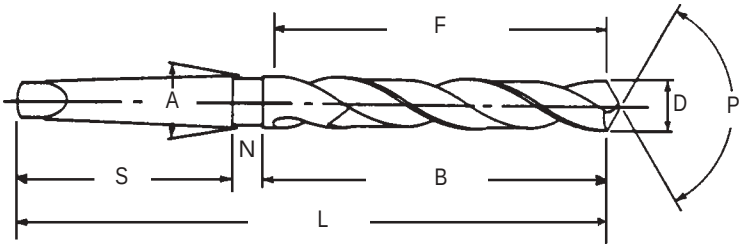
Please specify type of material being drilled, depth of hole, and whether drilling in a vertical or horizontal position.

ILLUSTRATION #10 DIMENSIONS OF STRAIGHT SHANK DRILLS



D = Diameter of fluted section
A = Diameter of shank
L = Length overall
F = Length of flute
B = Length of body
S = Length of shank
N = Length of neck (if required)
P = Point angle

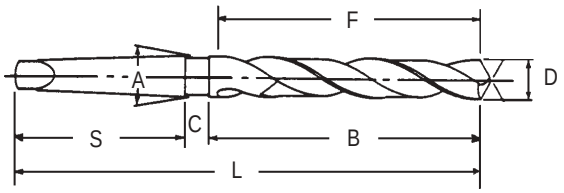
ILLUSTRATION #11 DIMENSIONS OF TAPER SHANK DRILLS



D = Diameter of fluted section
A = Size of shank. If standard shank is ordered,
S = specify as No. 2 Morse, No. 3 Morse, etc.
For special Taper Shanks, furnish drawing or gage.
L = Length overall
F = Length of flute
B = Length of body
N = Length of neck (if required)
P = Point angle

TABLE #35 LENGTHS FOR SPECIAL DRILLS WITH TAPER OR STRAIGHT SHANKS

To obtain overall length L when only flute length F is specified, add figures in column 5 to flute length F. To obtain overall length L when only body length B (length exclusive of taper and neck) is specified, add figures in column 6. To obtain overall length L when both body length B and Taper S are specified, add figures in column 4.



A= Size of Shank B = Body Length C = Neck Length D = Drill Diameter
F = Flute Length L - Overall Length S = Length of Taper

COLUMN 1 MORSE TAPER SHANK NUMBER	COLUMN 2 LENGTH OF TAPER (IN.)	COLUMN 3 DRILL SIZE	COLUMN 4 NECK LENGTH (IN.)	COLUMN 5 AMOUNT TO ADD TO FLUTE LENGTH (IN.)	COLUMN 6 AMOUNT TO ADD TO BODY LENGTH (IN.)
	2-9/16	All sizes under 3/8" diameter	—	3-1/4	2-9/16
No. 1	2-9/16	3/8" diameter	9/16	3-1/4	3-1/8
	2-9/16	Larger sizes	9/16	3-3/8	3-1/8
No. 2	3-1/8	All sizes through 19/64" diameter	—	3-5/8	3-1/8
	3-1/8	Larger sizes	9/16	3-7/8	3-11/16
No. 3	3-7/8	All sizes	5/8	4-5/8	4-1/2
	4-7/8	All sizes through 1-19/64"	5/8	5-5/8	5-1/2
No. 4	4-7/8	Sizes over 1-19/64" through 1-23/32"	1/2	5-5/8	5-3/8
	5	Sizes over 1-23/32" through 1-27/32"	5/8	5-7/8	5-5/8
	5	Larger sizes	3/4	6	5-3/4
	6-1/8	All sizes through 1-59/64"	5/8	7	6-3/4
	6-1/4	Sizes over 1-59/64" through 2-3/16"	1/2	7-1/8	6-3/4
No. 5	6-1/4	Sizes over 2-3/16" through 2-3/8"	3/4	7-1/4	7
	6-1/4	Sizes over 2-3/8" through 2-1/2"	1	7-1/2	7-1/4
	6-1/4	Sizes over 2-1/2" through 2-3/4"	1-1/8	7-5/8	7-3/8
	6-1/4	Larger sizes	1-1/4	7-3/4	7-1/2
	8-9/16	All sizes through 3-3/16"	1	9-7/8	9-9/16
No. 6	8-9/16	Sizes over 3-3/16" through 3-7/16"	1-1/8	10	9-11/16
	8-9/16	Larger sizes	1-1/4	10-1/8	9-13/16

ILLUSTRATION #12 ILLUSTRATION OF DRILL NOMENCLATURE

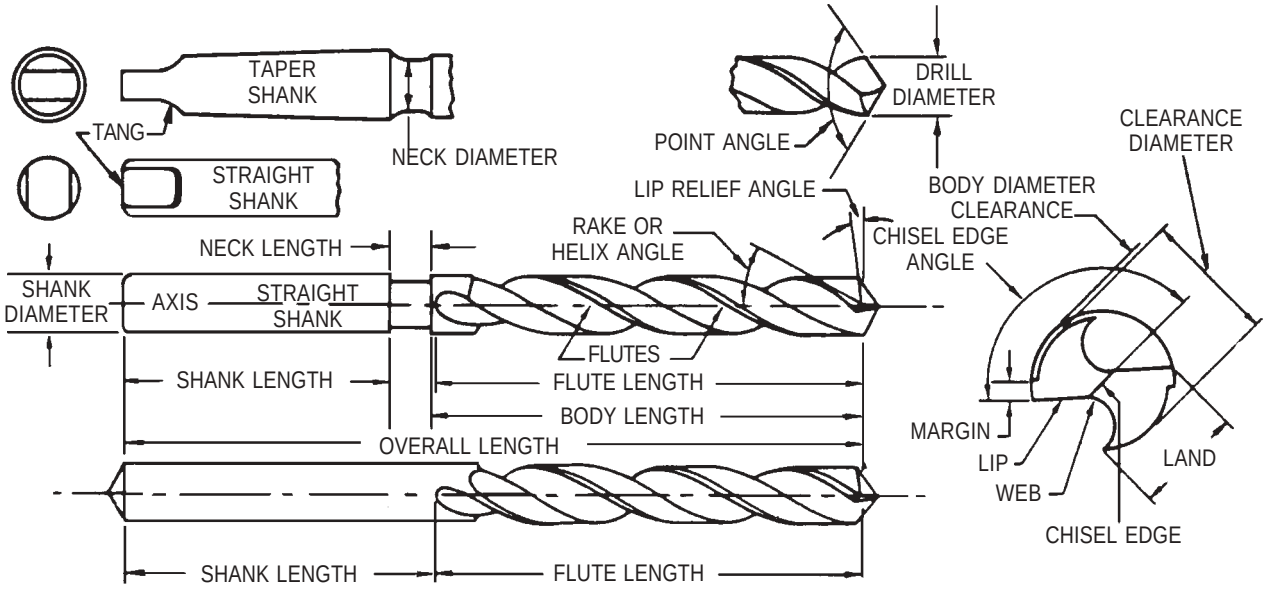


TABLE #36 DRILL NOMENCLATURE AND DEFINITIONS

AXIS. The imaginary straight line which forms the longitudinal center line of the drill.

BACK TAPER. A slight decrease in diameter from front to back in the body of the drill.

BODY. The portion of the drill extending from the shank or neck to the outer corners of the cutting lips.

BODY DIAMETER CLEARANCE. That portion of the land that has been cut away so it will not rub against the walls of the hole.

CHIP BREAKER. Nicks or grooves designed to reduce the size of chips. They may be steps or grooves in the cutting lip or in the leading face of the land at or adjacent to the cutting lips.

CHIP PACKING. The failure of chips to pass through the flute during the cutting action, generally resulting in tool failure.

CHIPPING. The breakdown of a cutting lip or margin by loss of fragments broken away during the cutting action.

CHISEL EDGE. The edge at the end of the web that connects the cutting lips.

CHISEL EDGE ANGLE. The angle included between the chisel edge and the cutting lip, as viewed from the end of the drill.

CLEARANCE. The space provided to eliminate undesirable contact between the drill and the workpiece.

CLEARANCE DIAMETER. The diameter over the cut away portion of the drill lands.

CRANKSHAFT OR DEEP HOLE DRILLS. Drills designed for drilling oil holes in crankshafts, connecting rods, and similar deep holes. They are generally made with heavy webs and higher helix angles than normal.

CUTTING EDGES. See preferred term LIPS.

DOUBLE MARGIN DRILL. A drill whose body diameter clearance is produced to leave more than one margin on each land and is normally made with a margin on the leading edge and on the heel of the land.

DRIFT. A flat tapered bar for forcing a taper shank out of its socket.

DRIFT SLOT. A slot through a socket at the small end of the tapered hole to receive a drift for forcing a taper shank out of the socket.

DRILL DIAMETER. The diameter over the margins of the drill measured at the point.

FLUTES. Helical or straight grooves cut or formed in the body of the drill to provide cutting lips, to permit removal of chips, and to allow cutting fluid to reach the cutting lips.

FLUTE LENGTH. The length from the outer corners of the cutting lips to the extreme back end of the flutes. It includes the sweep of the tool used to generate the flutes and therefore, does not indicate the usable length of flutes.

HALF-ROUND DRILL. A drill with a transverse cross-section of approximately half a circle and having one cutting lip.

HEEL. The trailing edge of the land.

HELICAL FLUTES. Flutes which are formed in a helical path around the axis.

HELIX ANGLE. The angle made by the leading edge of the land with a plane containing the axis of the drill.

LAND. The peripheral portion of the body between adjacent flutes.

LAND CLEARANCE. See preferred term BODY DIAMETER CLEARANCE.

LAND WIDTH. The distance between the leading edge and the heel of the land measured at a right angle to the leading edge.

LENGTH OF TWIST. See preferred term FLUTE LENGTH.

LIPS. The cutting edges of a two flute drill extending from the chisel edge to the periphery. [Core Drills] The cutting edges extending from the bottom of the chamfer to the periphery.

LIP RELIEF. The axial relief of the drill point.

LIP RELIEF ANGLE. The axial relief angle at the outer corner of the lip. It is measured by projection into a plane tangent to the periphery at the outer corner of the lip.

MARGIN. The cylindrical portion of the land which is not cut away to provide clearance.

NECK. The section of reduced diameter between the body and the shank of a drill.

NOTCHES. See preferred term CHIP BREAKERS.

OIL GROOVES. Longitudinal straight or helical grooves in the shank, or grooves in the lands of a drill to carry cutting fluid to the cutting lips.

OIL HOLES OR TUBES. Holes through the lands or web of a drill for passage of cutting fluid to the cutting lips.

OVERALL LENGTH. The length from the extreme end of the shank to the outer corners of the cutting lips. It does not include the conical shank end often used on straight shank drills, nor does it include the conical cutting point used on both straight and taper shank drills. [Core Drills] For drills with an external center on the cutting end, same as for two flute drills. For those with internal centers on the cutting end, the overall length is from the extreme end of the tool.

TABLE #36 DRILL NOMENCLATURE AND DEFINITIONS (continued)

PERIPHERY. The outside circumference of a drill.

PERIPHERAL RAKE ANGLE. The angle between the leading edge of the land and an axial plane at the drill point.

POINT. The cutting end of a drill, made up of the ends of the lands and the web. In form it resembles a cone, but departs from a true cone to furnish clearance behind the cutting lips.

POINT ANGLE. The angle included between the cutting lips projected upon a plane parallel to the drill axis and parallel to the two cutting lips.

RAKE ANGLE. See preferred term PERIPHERAL RAKE ANGLE.

RELIEF. The result of the removal of tool material behind or adjacent to the cutting lip and leading edge of the land to provide clearance and prevent rubbing (heel drag).

SHANK. The part of the drill by which it is held and driven.

SLEEVE. A tapered shell designed to fit into a specified socket and to receive a taper shank smaller than the socket.

SOCKET. The tapered hole in a spindle, adaptor, or sleeve designed to receive, hold, and drive a tapered shank.

SPIRAL ANGLE. See preferred term HELIX ANGLE.

SPIRAL FLUTES. See preferred term HELICAL FLUTES.

STEP DRILL. A multiple diameter drill with one set of drill lands which are ground to different diameters.

STRAIGHT FLUTES. Flutes which form lands lying in an axial plane.

STRAIGHT SHANK DRILLS. Those having cylindrical shanks which may be the same or different diameter than the body of the drill. The shank may be made with or without driving flats, tang, grooves or thread.

SUBLAND DRILL. A type of multiple diameter drill which has independent sets of lands in the same body section for each diameter.

TANG. The flattened end of a taper shank intended to fit into a driving slot in a socket.

TANG DRIVE. Two opposite parallel driving flats on the extreme end of a straight shank.

TAPER SHANK DRILLS. Those having conical shanks suitable for direct fitting into tapered holes in machine spindles, driving sleeves or sockets. Tapered shanks generally have a tang.

TWIST DRILL. A rotary end cutting tool having one or more cutting lips, and having one or more helical or straight flutes for the passage of chips and the admission of a cutting fluid.

WEB. The central portion of the body that joins the lands. The extreme end of the web forms the chisel edge on a two-flute drill.

WEB THICKNESS. The thickness of the web at the point, unless another specific location is indicated.

WEB THINNING. The operation of reducing the web thickness at the point to reduce drilling thrust.

TABLE #37 DECIMAL EQUIVALENTS FOR FRACTIONAL, LETTER, WIRE AND MILLIMETER SIZES

Drill Size	Dec. Equiv.	Drill Size	Dec. Equiv.	Drill Size	Dec. Equiv.	Drill Size	Dec. Equiv.	Drill Size	Dec. Equiv.
97	**.0059**	1.35mm	**.0531**	*24*	**.1520**	6.90mm	**.2717**	12.00mm	**.4724**
96	**.0063**	*54*	**.0550**	3.90mm	**.1535**	**I**	**.2720**	12.20mm	**.4803**
95	**.0067**	1.40mm	**.0551**	*23*	**.1540**	7.00mm	**.2756**	**31/64**	**.4844**
94	**.0071**	1.45mm	**.0571**	**5/32**	**.1562**	**J**	**.2770**	12.50mm	**.4921**
93	**.0075**	1.50mm	**.0591**	*22*	**.1570**	7.10mm	**.2795**	**1/2**	**.5000**
92	**.0079**	*53*	**.0595**	4.00mm	**.1575**	**K**	**.2810**	12.80mm	**.5039**
0.20mm	**.0079**	1.55mm	**.0610**	*21*	**.1590**	**9/32**	**.2812**	13.00mm	**.5118**
91	**.0083**	**1/16**	**.0625**	*20*	**.1610**	7.20mm	**.2835**	**33/64**	**.5156**
90	**.0087**	1.60mm	**.0630**	4.10mm	**.1614**	7.25mm	**.2854**	13.20mm	**.5197**
0.22mm	**.0087**	*52*	**.0635**	4.20mm	**.1654**	7.30mm	**.2874**	**17/32**	**.5312**
89	**.0091**	1.65mm	**.0650**	*19*	**.1660**	**L**	**.2900**	13.50mm	**.5315**
88	**.0095**	1.70mm	**.0669**	4.25mm	**.1673**	7.40mm	**.2913**	13.80mm	**.5433**
0.25mm	**.0098**	*51*	**.0670**	4.30mm	**.1693**	**M**	**.2950**	**35/64**	**.5469**
87	**.0100**	1.75mm	**.0689**	*18*	**.1695**	7.50mm	**.2953**	14.00mm	**.5512**
86	**.0105**	*50*	**.0700**	**11/64**	**.1719**	**19/64**	**.2969**	14.25mm	**.5610**
85	**.0110**	1.80mm	**.0709**	*17*	**.1730**	7.60mm	**.2992**	**9/16**	**.5625**
0.28mm	**.0110**	1.85mm	**.0728**	4.40mm	**.1732**	**N**	**.3020**	14.50mm	**.5709**
84	**.0115**	*49*	**.0730**	*16*	**.1770**	7.70mm	**.3031**	**37/64**	**.5781**
0.30mm	**.0118**	1.90mm	**.0748**	4.50mm	**.1772**	7.75mm	**.3051**	14.75mm	**.5807**
83	**.0120**	*48*	**.0760**	*15*	**.1800**	7.80mm	**.3071**	15.00mm	**.5906**
82	**.0125**	1.95mm	**.0768**	4.60mm	**.1811**	7.90mm	**.3110**	**19/32**	**.5938**
0.32mm	**.0126**	**5/64**	**.0781**	*14*	**.1820**	**5/16**	**.3125**	15.25mm	**.6004**
81	**.0130**	*47*	**.0785**	*13*	**.1850**	8.00mm	**.3150**	**39/64**	**.6094**
80	**.0135**	2.00mm	**.0787**	4.7mm	**.1850**	**O**	**.3160**	15.50mm	**.6102**
0.35mm	**.0138**	2.05mm	**.0807**	4.75mm	**.1870**	8.10mm	**.3189**	15.75mm	**.6201**
79	**.0145**	*46*	**.0810**	**3/16**	**.1875**	8.20mm	**.3228**	**5/8**	**.6250**
0.38mm	**.0150**	*45*	**.0820**	4.8mm	**.1890**	**P**	**.3230**	16.00mm	**.6299**
1/64	**.0156**	2.10mm	**.0827**	*12*	**.1890**	8.25mm	**.3248**	16.25mm	**.6398**
0.40mm	**.0157**	2.15mm	**.0846**	*11*	**.1910**	8.30mm	**.3268**	**41/64**	**.6406**
78	**.0160**	*44*	**.0860**	4.90mm	**.1929**	**21/64**	**.3281**	16.50mm	**.6496**
0.42mm	**.0165**	2.20mm	**.0866**	*10*	**.1935**	8.40mm	**.3307**	**21/32**	**.6562**
0.45mm	**.0177**	2.25mm	**.0886**	*9*	**.1960**	**Q**	**.3320**	16.75mm	**.6594**
77	**.0180**	*43*	**.0890**	5.00mm	**.1969**	8.50mm	**.3346**	17.00mm	**.6693**
0.48mm	**.0189**	2.30mm	**.0906**	*8*	**.1990**	8.60mm	**.3386**	**43/64**	**.6719**
0.50mm	**.0197**	2.35mm	**.0925**	5.10mm	**.2008**	**R**	**.3390**	17.25mm	**.6791**
76	**.0200**	*42*	**.0935**	*7*	**.2010**	8.70mm	**.3425**	**11/16**	**.6875**
75	**.0210**	**3/32**	**.0938**	**13/64**	**.2031**	**11/32**	**.3438**	17.50mm	**.6890**
0.55mm	**.0217**	2.40mm	**.0945**	*6*	**.2040**	8.75mm	**.3445**	**45/64**	**.7031**
74	**.0225**	*41*	**.0960**	5.20mm	**.2047**	8.80mm	**.3465**	18.00mm	**.7087**
0.60mm	**.0236**	2.45mm	**.0965**	*5*	**.2055**	**S**	**.3480**	**23/32**	**.7188**
73	**.0240**	*40*	**.0980**	5.25mm	**.2067**	8.90mm	**.3504**	18.50mm	**.7283**
0.62mm	**.0244**	2.50mm	**.0984**	5.30mm	**.2087**	9.00mm	**.3543**	**47/64**	**.7344**
72	**.0250**	*39*	**.0995**	*4*	**.2090**	**T**	**.3580**	19.00mm	**.7480**
0.65mm	**.0256**	*38*	**.1015**	5.40mm	**.2126**	9.10mm	**.3583**	**3/4**	**.7500**
71	**.0260**	2.60mm	**.1024**	*3*	**.2130**	**23/64**	**.3594**	**49/64**	**.7656**
0.70mm	**.0276**	*37*	**.1040**	5.50mm	**.2165**	9.20mm	**.3622**	19.50mm	**.7677**
70	**.0280**	2.70mm	**.1063**	**7/32**	**.2188**	9.25mm	**.3642**	**25/32**	**.7812**
69	**.0292**	*36*	**.1065**	5.60mm	**.2205**	9.30mm	**.3661**	20.00mm	**.7874**
0.75mm	**.0295**	2.75mm	**.1083**	*2*	**.2211**	**U**	**.3680**	**51/64**	**.7969**
68	**.0310**	**7/64**	**.1094**	5.70mm	**.2244**	9.40mm	**.3701**	20.50mm	**.8071**
1/32	**.0312**	*35*	**.1100**	5.75mm	**.2264**	9.50mm	**.3740**	**13/16**	**.8125**
0.80mm	**.0315**	2.80mm	**.1102**	*1*	**.2280**	**3/8**	**.3750**	21.00mm	**.8268**
67	**.0320**	*34*	**.1110**	5.80mm	**.2283**	**V**	**.3770**	**53/64**	**.8281**
66	**.0330**	*33*	**.1130**	5.90mm	**.2323**	9.60mm	**.3780**	**27/32**	**.8438**
0.85mm	**.0335**	2.90mm	**.1142**	**A**	**.2340**	9.70mm	**.3819**	21.50mm	**.8465**
65	**.0350**	*32*	**.1160**	**15/64**	**.2344**	9.75mm	**.3839**	**55/64**	**.8594**
0.90mm	**.0354**	3.00mm	**.1181**	6.00mm	**.2362**	9.80mm	**.3858**	22.00mm	**.8661**
64	**.0360**	*31*	**.1200**	**B**	**.2380**	**W**	**.3860**	**7/8**	**.8750**
63	**.0370**	3.10mm	**.1220**	6.10mm	**.2402**	9.90mm	**.3898**	22.50mm	**.8858**
0.95mm	**.0374**	**1/8**	**.1250**	**C**	**.2420**	**25/64**	**.3906**	**57/64**	**.8906**
62	**.0380**	3.20mm	**.1260**	6.20mm	**.2441**	10.00mm	**.3937**	23.00mm	**.9055**
61	**.0390**	3.25mm	**.1280**	**D**	**.2460**	**X**	**.3970**	**29/32**	**.9062**
1.00mm	**.0394**	*30*	**.1285**	6.25mm	**.2461**	10.20mm	**.4016**	**59/64**	**.9219**
60	**.0400**	3.30mm	**.1299**	6.30mm	**.2480**	**Y**	**.4040**	23.50mm	**.9252**
59	**.0410**	3.40mm	**.1339**	**E**	**.2500**	**13/32**	**.4062**	**15/16**	**.9375**
1.05mm	**.0413**	*29*	**.1360**	**1/4**	**.2500**	**Z**	**.4130**	24.00mm	**.9449**
58	**.0420**	3.50mm	**.1378**	6.40mm	**.2520**	10.50mm	**.4134**	**61/64**	**.9531**
57	**.0430**	*28*	**.1405**	6.50mm	**.2559**	**27/64**	**.4219**	24.50mm	**.9646**
1.10mm	**.0433**	**9/64**	**.1406**	**F**	**.2570**	10.80mm	**.4252**	**31/32**	**.9688**
1.15mm	**.0453**	3.60mm	**.1417**	6.60mm	**.2598**	11.00mm	**.4331**	25.00mm	**.9843**
56	**.0465**	*27*	**.1440**	**G**	**.2610**	**7/16**	**.4375**	**63/64**	**.9844**
3/64	**.0469**	3.70mm	**.1457**	6.70mm	**.2638**	11.20mm	**.4409**	**1"**	**1.0000**
1.20mm	**.0472**	*26*	**.1470**	**17/64**	**.2656**	11.50mm	**.4528**		
1.25mm	**.0492**	3.75mm	**.1476**	6.75mm	**.2657**	**29/64**	**.4531**		
1.30mm	**.0512**	*25*	**.1495**	**H**	**.2660**	11.80mm	**.4646**		
55	**.0520**	3.80mm	**.1496**	6.80mm	**.2677**	**15/32**	**.4688**		

TABLE #38 CUTTING SPEEDS FOR FRACTIONAL, LETTER, AND WIRE SIZE DRILLS

	SURFACE SPEED IN FEET PER MINUTE														
	10'	20'	30'	40'	50'	60'	70'	80'	90'	100'	110'	120'	130'	140'	150'
FRACTIONAL SIZES – REVOLUTIONS PER MINUTE															
1/16	611	1222	1833	2445	3056	3667	4278	4889	5550	6111	6722	7334	7945	8556	9167
1/8	306	611	917	1222	1528	1833	2139	2445	2750	3056	3361	3667	3973	4278	4584
3/16	204	407	611	815	1019	1222	1426	1630	1833	2037	2241	2445	2648	2852	3056
1/4	153	306	458	611	764	917	1070	1222	1375	1528	1681	1833	1986	2139	2292
5/16	122	244	367	489	611	733	856	978	1100	1222	1345	1467	1589	1711	1833
3/8	102	204	306	407	509	611	713	815	917	1019	1120	1222	1324	1426	1528
7/16	87	175	262	349	437	524	611	698	786	873	960	1048	1135	1222	1310
1/2	76	153	229	306	382	458	535	611	688	764	840	917	993	1070	1146
5/8	61	122	183	244	306	367	428	489	550	611	672	733	794	856	917
3/4	51	102	153	203	255	306	357	407	458	509	560	611	662	713	764
7/8	44	87	131	175	218	262	306	349	393	436	480	524	568	611	655
1	38	76	115	153	191	229	267	306	344	382	420	458	497	535	573
1 1/8	34	68	102	136	170	204	238	272	306	340	373	407	441	475	509
1 1/4	31	61	92	122	153	183	214	244	275	306	336	367	397	428	458
1 3/8	28	56	83	111	139	167	194	222	250	278	306	333	361	389	417
1 1/2	26	51	76	102	127	153	178	204	229	255	280	306	331	357	382
1 5/8	24	47	70	94	117	141	165	188	212	235	259	282	306	329	353
1 3/4	22	44	65	87	109	131	153	175	196	218	240	262	284	306	327
1 7/8	20	41	61	81	102	122	143	163	183	204	224	244	265	285	306
2	19	38	57	76	95	115	134	153	172	191	210	229	248	267	287
2 1/4	17	34	51	68	85	102	119	136	153	170	187	204	221	238	255
2 1/2	15	31	46	61	76	92	107	122	137	153	168	183	199	214	229
2 3/4	14	28	42	56	69	83	97	111	125	139	153	167	181	194	208
3	13	25	38	51	64	76	89	102	115	127	140	153	166	178	191
LETTER SIZES – REVOLUTIONS PER MINUTE															
A	163	326	491	654	818	982	1145	1309	1472	1636	1796	1959	2122	2285	2448
B	161	321	482	642	803	963	1124	1284	1445	1605	1765	1926	2086	2247	2407
C	158	316	473	631	789	947	1105	1262	1420	1578	1736	1894	2052	2210	2368
D	155	311	467	622	778	934	1089	1245	1400	1556	1708	1863	2018	2174	2329
E	153	306	458	611	764	917	1070	1222	1375	1528	1681	1834	1968	2139	2292
F	149	297	446	594	743	892	1040	1189	1337	1486	1635	1784	1932	2081	2229
G	146	293	440	585	732	878	1024	1170	1317	1463	1610	1756	1903	2049	2195
H	144	287	430	574	718	862	1005	1149	1292	1436	1580	1723	1867	2010	2154
I	140	281	421	562	702	842	983	1123	1264	1404	1545	1685	1826	1966	2106
J	138	276	414	552	690	827	965	1103	1241	1379	1517	1655	1793	1930	2068
K	136	272	408	544	680	815	951	1087	1223	1359	1495	1631	1767	1903	2039
L	132	263	395	527	659	790	922	1054	1185	1317	1449	1581	1712	1844	1976
M	129	259	389	518	648	777	907	1036	1166	1295	1424	1554	1683	1813	1942
N	126	253	380	506	633	759	886	1012	1139	1265	1391	1518	1644	1771	1897
O	121	242	363	484	605	725	846	967	1088	1209	1330	1450	1571	1692	1813
P	118	237	355	473	592	710	828	946	1065	1183	1301	1419	1537	1657	1774
Q	115	230	345	460	575	690	805	920	1035	1150	1266	1384	1496	1611	1726
R	113	225	338	451	564	676	789	902	1014	1127	1239	1355	1465	1577	1690
S	110	220	329	439	549	659	769	878	988	1098	1207	1317	1427	1537	1646
T	107	213	320	426	533	640	746	853	959	1066	1173	1280	1387	1494	1600
U	104	208	311	415	519	623	727	830	934	1038	1142	1246	1349	1453	1557
V	101	203	304	405	507	608	709	810	912	1013	1114	1219	1317	1418	1520
W	99	198	297	396	495	594	693	792	891	989	1088	1188	1286	1385	1484
X	96	192	289	385	481	576	672	769	865	962	1058	1155	1251	1347	1443
Y	95	189	284	378	473	567	662	756	851	945	1040	1135	1229	1324	1418
Z	92	185	277	370	462	555	647	740	832	925	1017	1110	1202	1295	1387
WIRE SIZES – REVOLUTIONS PER MINUTE															
1	168	335	503	670	838	1005	1173	1340	1508	1675	1843	2010	2179	2346	2513
2	173	345	518	691	864	1037	1210	1382	1555	1728	1901	2074	2247	2420	2593
3	179	359	538	717	897	1076	1255	1434	1614	1793	1974	2152	2331	2511	2690
4	183	365	548	731	914	1097	1280	1462	1645	1828	2010	2193	2376	2560	2741
5	186	372	558	744	930	1115	1301	1487	1673	1859	2045	2230	2416	2602	2788
6	187	374	562	749	936	1123	1310	1498	1685	1872	2060	2247	2434	2621	2809
7	190	380	570	760	950	1140	1330	1520	1710	1900	2090	2281	2470	2660	2850
8	192	384	576	768	960	1151	1343	1535	1727	1919	2111	2303	2495	2687	2879
9	195	390	585	780	975	1169	1364	1559	1754	1949	2144	2339	2534	2728	2923
10	197	395	592	790	987	1184	1382	1579	1777	1974	2171	2369	2566	2764	2961
11	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800	3001
12	202	404	606	808	1010	1213	1415	1617	1819	2021	2223	2425	2627	2829	3032

continued on next page

TABLE #38 CUTTING SPEEDS FOR FRACTIONAL, LETTER, AND WIRE SIZE DRILLS (cont'd.)

SURFACE SPEED IN FEET PER MINUTE

WIRE SIZES – REVOLUTIONS PER MINUTE (continued)

	10'	20'	30'	40'	50'	60'	70'	80'	90'	100'	110'	120'	130'	140'	150'
13	206	413	620	826	1032	1239	1450	1652	1859	2065	2271	2479	2684	2891	3097
14	210	420	630	840	1050	1259	1469	1679	1889	2099	2309	2518	2728	2938	3148
15	213	425	638	851	1064	1276	1489	1702	1914	2127	2334	2546	2759	2971	3183
16	216	432	647	863	1079	1295	1511	1726	1942	2158	2374	2590	2806	3021	3237
17	221	442	662	883	1104	1325	1546	1766	1987	2208	2429	2650	2870	3091	3313
18	226	452	678	904	1130	1356	1582	1808	2034	2260	2479	2704	2930	3155	3380
19	230	460	690	920	1151	1381	1611	1841	2071	2301	2531	2761	2991	3222	3453
20	237	475	712	949	1186	1423	1660	1898	2135	2372	2610	2847	3084	3322	3559
21	240	480	721	961	1201	1441	1681	1922	2162	2402	2644	2883	3123	3363	3604
22	243	487	730	973	1217	1460	1703	1946	2190	2433	2676	2920	3164	3406	3649
23	248	496	744	992	1240	1488	1736	1984	2232	2480	2728	2976	3224	3472	3720
24	251	503	754	1005	1257	1508	1759	2010	2262	2513	2764	3016	3267	3518	3769
25	256	511	767	1022	1276	1533	1789	2044	2300	2555	2810	3066	3322	3577	3832
26	260	520	779	1039	1299	1559	1819	2078	2338	2598	2858	3118	3378	3638	3898
27	265	531	796	1061	1327	1592	1857	2122	2388	2653	2919	3183	3448	3714	3979
28	272	544	816	1088	1360	1631	1903	2175	2447	2719	2990	3262	3534	3806	4078
29	281	562	843	1124	1405	1685	1966	2247	2528	2890	3090	3370	3651	3932	4213
30	297	595	892	1189	1487	1784	2081	2378	2676	2973	3270	3567	3864	4162	4459
31	318	637	955	1273	1592	1910	2228	2546	2865	3183	3501	3821	4138	4456	4775
32	329	659	988	1317	1647	1976	2305	2634	2964	3293	3622	3951	4281	4610	4939
33	338	676	1014	1352	1690	2028	2366	2704	3042	3380	3718	4056	4394	4732	5070
34	344	688	1032	1376	1721	2065	2409	2753	3097	3442	3785	4129	4474	4818	5162
35	347	694	1042	1389	1736	2083	2430	2778	3125	3472	3821	4167	4514	4861	5209
36	359	717	1076	1435	1794	2152	2511	2870	3228	3587	3945	4304	4663	5021	5380
37	367	735	1102	1469	1837	2204	2571	2938	3306	3673	4040	4407	4775	5142	5509
38	376	753	1129	1505	1882	2258	2634	3010	3387	3763	4140	4516	4892	5269	5645
39	384	768	1152	1536	1920	2303	2687	3071	3455	3839	4222	4607	4991	5374	5758
40	390	780	1169	1559	1949	2339	2729	3118	3508	3898	4287	4677	5067	5457	5846
41	398	796	1194	1592	1990	2387	2785	3183	3581	3979	4377	4775	5172	5570	5968
42	408	817	1226	1634	2043	2451	2860	3268	3677	4085	4494	4902	5311	5719	6128
43	429	858	1288	1717	2146	2575	3004	3434	3863	4292	4721	5150	5579	6008	6438
44	444	888	1333	1777	2221	2665	3109	3554	3999	4442	4886	5330	5774	6218	6662
45	466	932	1397	1863	2329	2795	3261	3726	4192	4658	5124	5590	6056	6522	6987
46	472	943	1415	1886	2358	2830	3301	3773	4244	4716	5187	5659	6130	6602	7074
47	487	973	1460	1946	2433	2920	3406	3893	4379	4866	5352	5839	6326	6812	7299
48	503	1005	1508	2010	2513	3016	3518	4021	4532	5026	5528	6031	6534	7036	7539
49	523	1047	1570	2093	2617	3140	3663	4186	4710	5233	5756	6279	6808	7326	7849
50	546	1091	1637	2183	2729	3274	3820	4366	4911	5457	6002	6548	7094	7640	8185
51	570	1140	1710	2280	2851	3421	3991	4561	5131	5701	6271	6841	7413	7982	8552
52	602	1230	1805	2406	3008	3609	4211	4812	5414	6015	6619	7218	7820	8421	9023
53	641	1283	1924	2566	3207	3848	4490	5131	5773	6414	7062	7704	8346	8988	9630
54	694	1389	2084	2778	3473	4167	4862	5556	6251	6945	7639	8334	9028	9723	10417
55	735	1469	2204	2938	3673	4408	5142	5877	6611	7346	8080	8815	9549	10284	11028
56	821	1643	2465	3286	4108	4929	5751	6572	7394	8215	9036	9857	10678	11500	12322
57	888	1777	2671	3561	4452	5342	6232	7122	8013	8903	9771	10660	11548	12436	13325
58	910	1819	2729	3637	4547	5456	6367	7275	8186	9095	10004	10913	11823	12732	13642
59	932	1863	2795	3726	4658	5590	6512	7453	8388	9316	10248	11180	12111	13043	13975
60	955	1910	2865	3820	4775	5729	6684	7639	8594	9549	10504	11459	12414	13369	14324
61	979	1959	2938	3918	4897	5876	6856	7835	8815	9794	10774	11753	12732	13712	14691
62	1005	2010	3015	4020	5025	6030	7035	8040	9045	10050	11057	12060	13068	14073	15078
63	1032	2064	3096	4128	5160	6192	7224	8256	9288	10320	11366	12398	13421	14453	15485
64	1061	2122	3183	4244	5305	6366	7427	8488	9549	10610	11671	12732	13793	14854	15915
65	1091	2182	3273	4364	5455	6546	7637	8728	9819	10910	12005	13096	14187	15279	16370
66	1158	2316	3474	4632	5790	6948	8106	9264	10422	11580	12732	13890	15047	16205	17362
67	1194	2388	3582	4776	5970	7164	8358	9552	10746	11940	13130	14324	15517	16712	17905
68	1232	2465	3696	4928	6160	7392	8624	9856	11088	12320	13554	14786	16018	17250	18482
69	1308	2616	3918	5224	6530	7836	9142	10488	11754	13060	14389	15697	17006	18314	19622
70	1364	2729	4091	5456	6820	8184	9548	10912	12276	13640	15006	16370	17734	19099	20463
71	1469	2938	4419	5892	7365	8838	10311	11784	13257	14730	16160	17629	19099	20568	22037
72	1528	3056	4584	6112	7640	9186	10696	12224	13752	15280	16807	18335	19836	21390	22918
73	1592	3183	4776	6368	7960	9552	11144	12736	14328	15920	17507	19099	20690	22282	23873
74	1698	3396	5106	6808	8510	10212	11914	13616	12318	17020	18674	20372	22069	23767	25465
75	1819	3638	5457	7276	9095	10914	12733	14552	16371	18190	20008	21827	23646	25465	27284
76	1910	3820	5730	7640	9550	11460	13370	15280	17190	19100	21008	22918	24828	26738	28648
77	2122	4244	6366	8488	10610	12732	14854	16976	19098	21220	23343	25465	27587	29709	31831
78	2388	4775	7161	9548	11935	14322	16709	19096	21483	23870	26260	28648	31035	33422	35810
79	2634	5269	7902	10536	13170	15804	18438	21072	23706	26340	28988	31611	34246	36880	39514
80	2830	5659	8490	11320	14150	16980	19810	22640	25470	28300	31123	33953	36782	39612	42441

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Metalcutting Safety (read this before using VERMONT TAP & DIE products)

Modern metalcutting operations involve high energy, high spindle or cutter speeds, and high temperatures and cutting forces. Hot, flying chips may be projected from the workpiece during metalcutting. Although advanced cutting tool materials are designed and manufactured to withstand the high cutting forces and temperatures that normally occur in these operations, they are susceptible to fragmenting in service, particularly if they are subjected to over-stress, severe impact or otherwise abused. Therefore, precautions should be taken to adequately protect workers, observers and equipment against hot, flying chips, fragmented cutting tools, broken workpieces or other similar projectiles. Machines should be fully guarded and personal protective equipment should be used at all times.

When grinding advanced cutting tool materials, a suitable means for collection and disposal of dust, mist or sludge should be provided. Overexposure to dust or mist containing metallic particles can be hazardous to health particularly if exposure continues over an extended period of time and may cause eye, skin and mucous membrane irritation and temporary or permanent respiratory disease. Certain existing pulmonary and skin conditions may be aggravated by exposure to dust or mist. Adequate ventilation, respiratory protection and eye protection should be provided when grinding and workers should avoid breathing of and prolonged skin contact with dust or mist. General Industry Safety and Health Regulations, Part 1910. U.S. Department of Labor, published in Title 29 of the Code of Federal Regulations should be consulted. Obtain from VERMONT TAP & DIE and read the applicable Material Safety Data Sheet before grinding.

Cutting tools are only one part of the worker-machine-tool system. Many variables exist in machining operations, including the metal removal rate; the workpiece size, shape, strength and rigidity; the chucking and fixturing; the load carrying capability of centers; the cutter and spindle speed and torque limitations; the holder and boring bar overhang; the available power; and the condition of the tooling and the machine. A safe metalcutting operation must take all of these variables, and others, into consideration.

VERMONT TAP & DIE has no control over the end use of its products or the environment into which those products are placed. VERMONT TAP & DIE urges that its customers adhere to the recommended standards of use of their metalcutting machines and tools, and that they follow procedures that ensure safe metalcutting operations. The information included throughout this catalog under the heading “Technical Data” and other recommendations on machining practices referred to herein are only advisory in nature and ***do not*** constitute representations or warranties and are not necessarily appropriate for any particular work environment or application.

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