vargus

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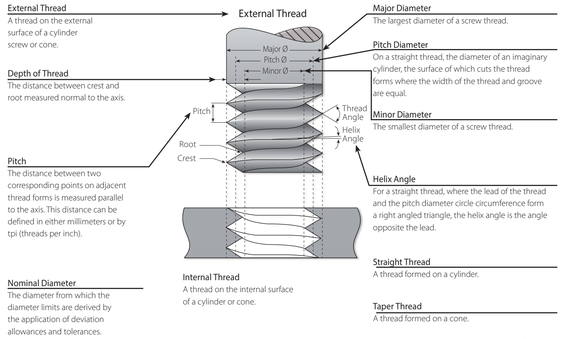
VARDEX | GROOVEX | SHAVIV

Thread Terminology



External Thread
A thread on the external surface of a cylinder screw or cone.

Depth of Thread
The distance between crest and root measured normal to the axis.

Pitch
The distance between two corresponding points on adjacent thread forms is measured parallel to the axis. This distance can be defined in either millimeters or by tpi (threads per inch).

Nominal Diameter
The diameter from which the diameter limits are derived by the application of deviation allowances and tolerances.

Major Diameter
The largest diameter of a screw thread.

Pitch Diameter
On a straight thread, the diameter of an imaginary cylinder, the surface of which cuts the thread forms where the width of the thread and groove are equal.

Minor Diameter
The smallest diameter of a screw thread.

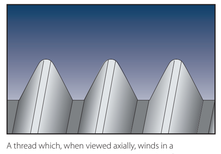
Helix Angle
For a straight thread, where the lead of the thread and the pitch diameter circle circumference form a right angled triangle, the helix angle is the angle opposite the lead.

Straight Thread
A thread formed on a cylinder.

Taper Thread
A thread formed on a cone.

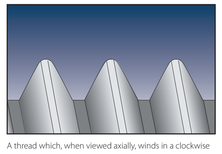
Internal Thread
A thread on the internal surface of a cylinder or cone.

Left-hand thread



A thread which, when viewed axially, winds in a counterclockwise and receding direction. All left-hand threads are designated LH.

Right-hand thread



A thread which, when viewed axially, winds in a clockwise and receding direction. Threads are always right-hand unless otherwise specified.

Grades and Applications

Material Group		P Steel	M Stainless Steel	K Cast Iron	N(K) Non-Ferrous Metals	S(M) Heat-Resistant Material	H(K) Hardened Material
Thread Turning	VRX	***	**	**	*	**	*
	VTX/VCB	**	*	*	*	*	*
	VKX	**	**	*	*	*	*
	VM7	*	***	*	*	**	*
	VK2	-	-	**	**	*	-
	VK2P	-	-	-	***	*	-
	VKP	***	*	*	*	*	*
	VHX	**	*	*	**	*	-
	XA03	**	**	*	*	***	*
	XC02	***	*	*	*	**	*
Grooving	VKX	***	**	**	*	*	*
	VTX	**	*	*	*	*	*
	VBX	***	*	*	*	*	*
	VMG M35	-	***	-	-	***	-
	VPG P20	***	-	-	-	-	-
	VKG K25	-	-	***	-	-	-
Thread Milling	VTX	***	***	***	*	**	*
	VBX	***	***	**	***	**	*
	VTH	***	***	***	***	***	***
	VTS	**	**	**	**	**	*
	VTN	*	*	***	***	*	*
Groove Milling	VTH	***	***	***	***	***	***
	VBX	***	***	**	***	**	*
	VTX	***	***	***	**	**	*
	VKX	***	***	***	*	**	*
Gear Milling	VBX	***	*	*	***	*	*
	VTX	***	*	*	*	*	*

*** Excellent; ** Good; * Fair

Anvils

Resultant Helix Angle			4.5°	3.5°	2.5°	1.5°	0.5°	0°	-0.5°	-1.5°
Insert Size		Holder	Ordering Code							
IC	L mm									
3/8"	16	ER / IL	YE3-3P	YE3-2P	YE3-1P	YE3	YE3-1N	YE3-1.5N	YE3-2N	YE3-3N
		EL / IR	YI3-3P	YI3-2P	YI3-1P	YI3	YI3-1N	YI3-1.5N	YI3-2N	YI3-3N
3/8" V6	16	ER	YE3-6C-3P	YE3-6C-2P	YE3-6C-1P	YE3-6C	YE3-6C-1N	YE3-6C-1.5N	YE3-6C-2N	YE3-6C-3N
		IR	YI3-6C-3P	YI3-6C-2P	YI3-6C-1P	YI3-6C	YI3-6C-1N	YI3-6C-1.5N	YI3-6C-2N	YI3-6C-3N
1/2"	22	ER / IL	YE4-3P	YE4-2P	YE4-1P	YE4	YE4-1N	YE4-1.5N	YE4-2N	YE4-3N
		EL / IR	YI4-3P	YI4-2P	YI4-1P	YI4	YI4-1N	YI4-1.5N	YI4-2N	YI4-3N
1/2"F	23	ER	YE4F-3P	YE4F-2P	YE4F-1P	YE4F	YE4F-1N	YE4F-1.5N		
		IR	YI4F-3P	YI4F-2P	YI4F-1P	YI4F	YI4F-1N	YI4F-1.5N		
1/2"U	22	ER / IL	YE4U-3P	YE4U-2P	YE4U-1P	YE4U	YE4U-1N	YE4U-1.5N	YE4U-2N	YE4U-3N
		EL / IR	YI4U-3P	YI4U-2P	YI4U-1P	YI4U	YI4U-1N	YI4U-1.5N	YI4U-2N	YI4U-3N
5/8"	27	ER / IL	YE5-3P	YE5-2P	YE5-1P	YE5	YE5-1N	YE5-1.5N	YE5-2N	YE5-3N
		EL / IR	YI5-3P	YI5-2P	YI5-1P	YI5	YI5-1N	YI5-1.5N	YI5-2N	YI5-3N
5/8"U	27	ER / IL	YE5U-3P	YE5U-2P	YE5U-1P	YE5U	YE5U-1N	YE5U-1.5N	YE5U-2N	YE5U-3N
		EL / IR	YI5U-3P	YI5U-2P	YI5U-1P	YI5U	YI5U-1N	YI5U-1.5N	YI5U-2N	YI5U-3N
3/8"M+	16	ER / IL			YE3M-1P	YE3M	YE3M-1N	YE3M-1.5N	YE3M-2N	
		EL / IR			YI3M-1P	YI3M	YI3M-1N	YI3M-1.5N		
1/2"M+	22	ER / IL			YE4M-1P	YE4M	YE4M-1N	YE4M-1.5N	YE4M-2N	
		EL / IR			YI4M-1P	YI4M	YI4M-1N	YI4M-1.5N		
1/2"F 2M+	23	ER			YE4M2F-1P	YE4M2F	YE4M2F-1N	YE4M2F-1.5N		
1/2"F 3M+					YE4M3F-1P	YE4M3F	YE4M3F-1N	YE4M3F-1.5N		
1/2"F 2M+		IR			YI4M2F-1P	YI4M2F	YI4M2F-1N	YI4M2F-1.5N		
5/8"M+	27	ER / IL				YE5M	YE5M-1N	YE5M-1.5N		
		EL / IR				YI5M	YI5M-1N	YI5M-1.5N		
1/2"Z+	22	ER / IL			YE4Z-1P	YE4Z	YE4Z-1N			
		EL / IR			YI4Z-1P	YI4Z	YI4Z-1N			
5/8"Z+	27	ER / IL				YE5Z				
		EL / IR				YI5Z				
1/2"T+	22	ER/IL EL/IR						Y4T		

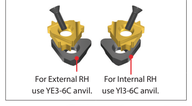
Standard Anvil		V6 Anvil		U Style Anvil		M+ Style Anvil		Z+ Style Anvil		T+ Style Anvil	
ER/IL	EL/IR	ER	IR	ER/IL	EL/IR	ER/IL	EL/IR	ER/IL	EL/IR	ER/IL	EL/IR
		V6 is indicated on the backside									Same anvil turned over

Anvil Kits

Anvil Size		Ordering Code	Included Anvils:
IC	L mm		
3/8"	16	ABY3	YE3-2P, 1P, 1N, 2N, 3N
			YI3-2P, 1P, 1N, 2N, 3N
3/8" V6	16	ABY3-6C	YE3-6C-2P, 1P, 1N, 2N, 3N
			YI3-6C-2P, 1P, 1N, 2N, 3N
1/2"	22	ABY4	YE4-2P, 1P, 1N, 2N, 3N
			YI4-2P, 1P, 1N, 2N, 3N
1/2"U	22	ABY4U	YE4U-2P, 1P, 1N, 2N, 3N
			YI4U-2P, 1P, 1N, 2N, 3N
5/8"	27	ABYE5	YE5-2P, 1P, 1N, 2N, 3N
		ABYI5	YI5-2P, 1P, 1N, 2N, 3N
5/8"U	27	ABYE5U	YE5U-2P, 1P, 1N, 2N, 3N
		ABYI5U	YI5U-2P, 1P, 1N, 2N, 3N

To ensure that you always have on hand an assortment of anvils for any job, we recommend that anvil kits be readily available.

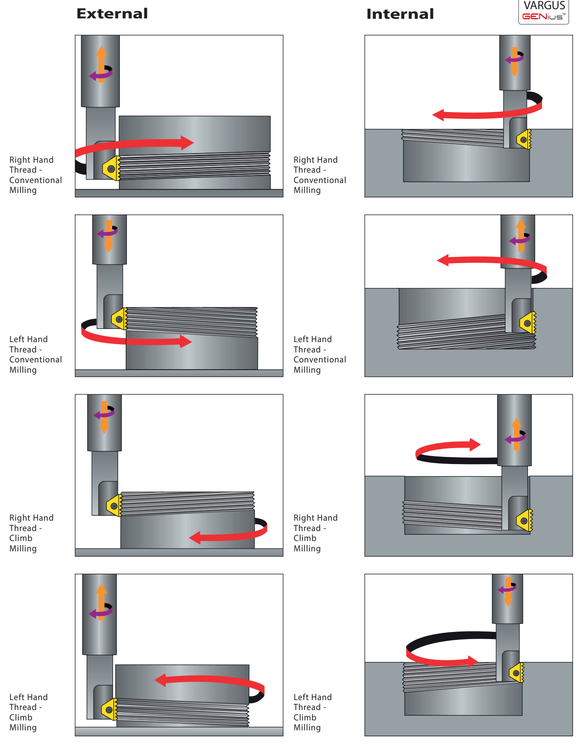
Important!
Use a V6 anvil when using a V6 insert.



For External RH use YE3-6C anvil.
For Internal RH use YI3-6C anvil.

Thread Milling Methods

(for RH Tools only)



Preparing for the Thread Milling Operation

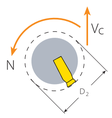
Calculation of Rotational Velocity and Feed at the Cutting Edge

$$N = \frac{x\,V\,1000}{\pi\,x\,D_2}$$

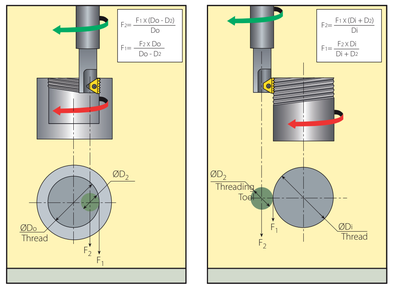
$$V = \frac{N\,x\,\pi\,x\,D_2}{1000}$$

$$F_1 = N\,x\,z\,x\,f$$

N - Rotational Velocity [R.P.M.]
V - Cutting Speed [m/min]
D_2 - Toolholder Cutting Dia. [mm]
F_1 - Tool Feed Rate at the Cutting Edge [mm/min]
z - No. of Cutting Edges
f - Feed per Tooth per Rotation [mm/tooth]



Calculation of Feed Rates at the Tool Center Line



The equations define the relationship between feed rates at the cutting edge and at the tool center line.
On most CNC machines the feed rate required for programming is that of the center-line of the tool. When dealing with linear tool movement the feed rate at the cutting edge and the center line are identical. This is not the case with circular tool movement.

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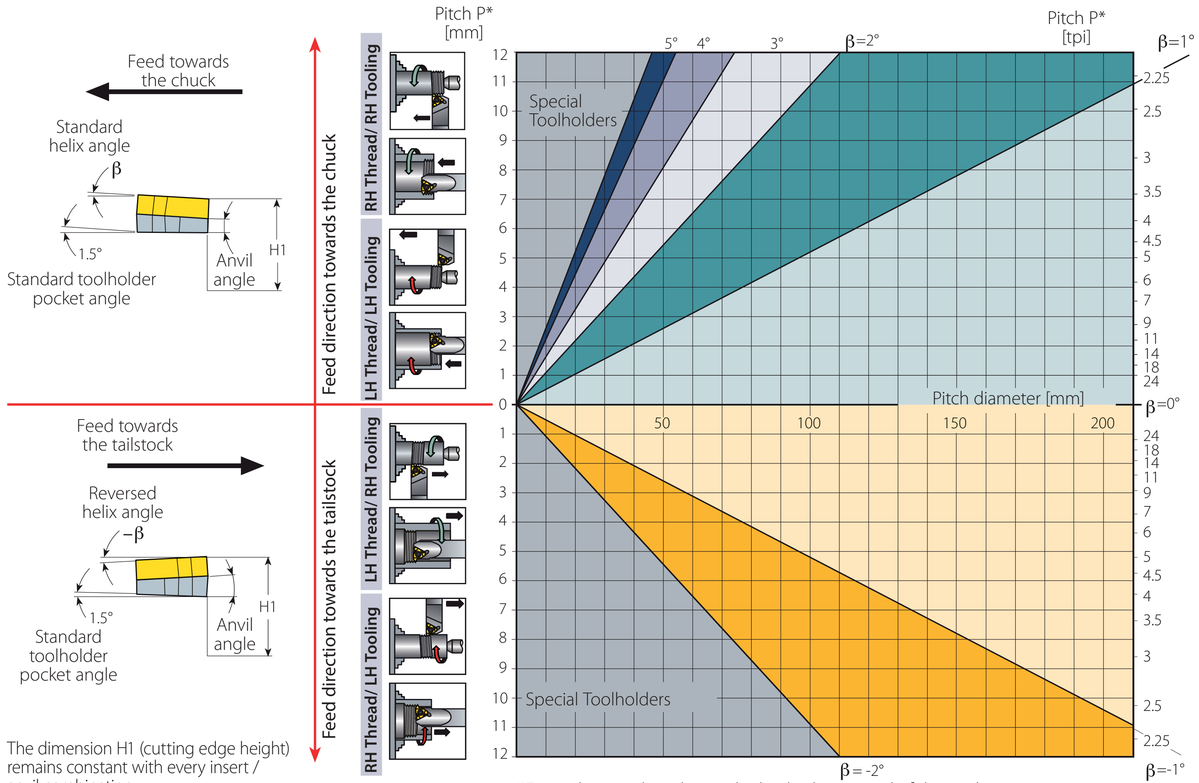
Helix Angle Diagram

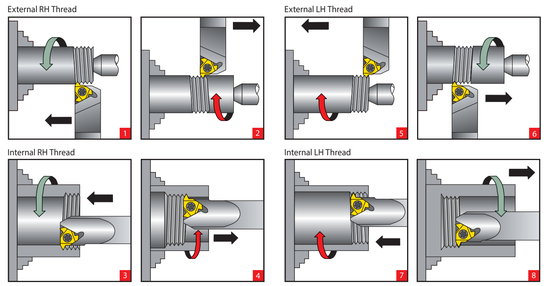


The dimension H1 (cutting edge height) remains constant with every insert / anvil combination.

*For Multi-start threads, use the lead value instead of the pitch

Thread Turning Methods for Symmetrical Inserts

Thread	Inserts & Toolholder	Rotation	Feed Direction	Helix Method	Drawing No.
Right Hand External	EX RH	Counterclockwise	Towards chuck	Regular	1
	EX LH	Clockwise	From chuck	Reversed	2
Right Hand Internal	IN RH	Counterclockwise	Towards chuck	Regular	3
	IN LH	Clockwise	From chuck	Reversed	4
Left Hand External	EX LH	Clockwise	Towards chuck	Regular	5
	EX RH	Counterclockwise	From chuck	Reversed	6
Left Hand Internal	IN LH	Clockwise	Towards chuck	Regular	7
	IN RH	Counterclockwise	From chuck	Reversed	8



Thread Infeed Methods

Radial Infeed
Radial infeed is the simplest and quickest method.
The feed is perpendicular to the turning axis, and both flanks of the insert perform the cutting operation.
Radial infeed is recommended in 3 cases:
- When the pitch is smaller than 16 tpi
- For material with short chips
- For work with hardened material

Flank Infeed (modified)
Flank infeed is recommended in the following cases:
- When the thread pitch is greater than 16 tpi, using the radial method, the effective cutting edge length is too large, resulting in chatter.
- For TRAPEZ and ACME. The radial method result in three cutting edges, making chip flow very difficult.

Alternate Flank Infeed
Use of the alternate flank method is recommended especially in large pitches and for materials with long chips.
This method divides the load equally on both flanks, resulting in equal wear along the cutting edges. Alternate flank infeed requires more complicated programming, and is not available on all lathes.

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