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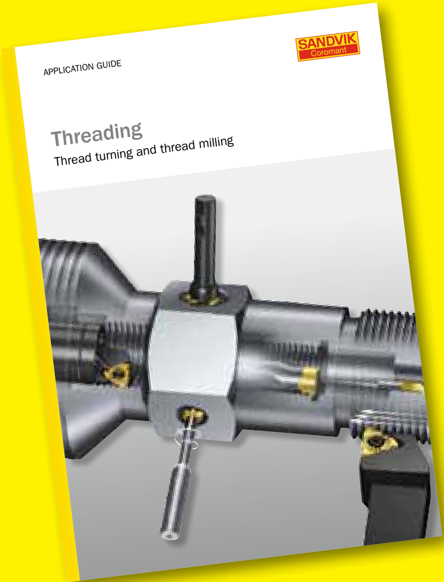


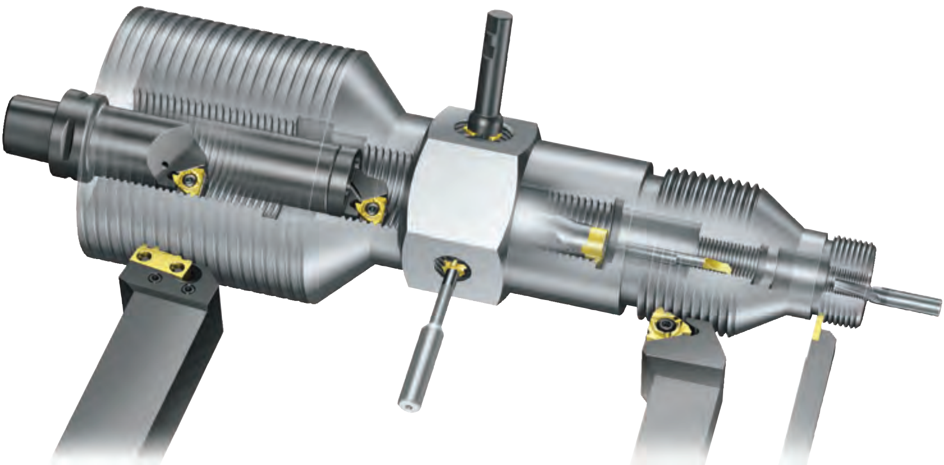
APPLICATION GUIDE
SANDVIK
Coromant
Threading
Thread turning and thread milling

Introduction

Modern threading tools can produce complex component features with relative ease, but to gain consistent results there are a number of considerations to be made.

In this application guide, we show you how to achieve threading success with Sandvik Coromant tools. Our aim is to help you to choose the right tooling combinations to produce consistent, high quality threads and guide you towards the most productive and problem-free threading performance.

This guide also includes information on basic threading principles - together with deeper application information, troubleshooting advice and finally, a technical reference section to cover all of your thread machining needs.



1. Basics in threads

What is a thread?

Threads are classified according to the main functions they perform in a component.

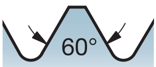
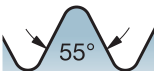
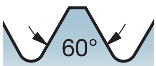
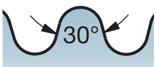
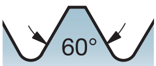
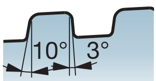
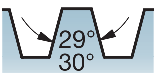
Primary functions of a thread:

- To form a mechanical coupling
- To transmit motion by converting a rotational movement into a linear movement, and vice versa.
- To obtain a mechanical advantage, by using a small force to create a larger force.

Threads are also classified into various profiles or forms. The selection of these forms will be influenced by many other secondary, but still vital, functions.

Thread forms

The thread profile defines the geometry of a thread and includes component diameters (major, pitch and minor), the thread profile angle, pitch and helix angle. The most common thread forms or profiles produced today are shown below.

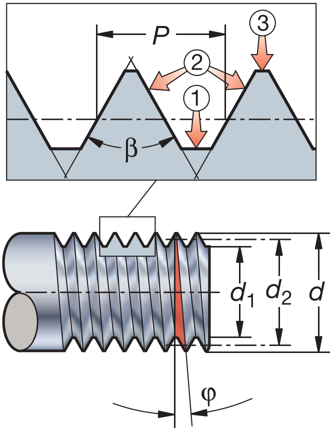
Application	Thread form	Thread type
Connecting General usage		ISO metric, American UN
Pipe threads	 	Whitworth, British Standard (BSPT), American National, Pipe Threads, NPT, NPTF
Food and fire		Round DIN 405
Aerospace		MJ, UNJ
Oil and gas		API Rounded, API Buttress, VAM
Motion General usage		Trapezoidal, ACME, Stub ACME

Threading terms and definitions

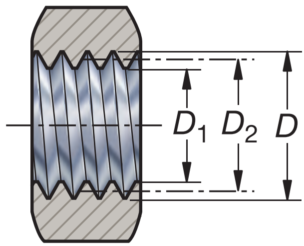
1. Root/bottom
The bottom surface joining the two adjacent flanks of the thread

2. Flank/side
The side of a thread surface connecting the crest and the root

3. Crest/top
The top surface joining the two sides, or flanks.



P = Pitch, mm or threads per inch (t.p.i.)
β = The profile angle
φ = The helix angle of the thread
d / *D* = The major diameter, external/internal
d_1 / D_1 = The minor diameter, external/internal
d_2 / D_2 = The pitch diameter, external/internal

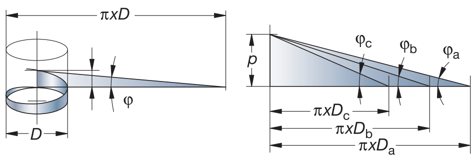


Pitch diameter, d_2 / D_2

This is the effective diameter of the screw thread; approximately half way between the major and minor diameters.

Helix angle

The helix angle (φ) is the geometrical shape of the screw thread, it is based on the pitch diameter of the thread (d_2, D_2), and the pitch (P) – the distance from one point on a thread profile to the corresponding point on the next.
This measurement can be represented by a triangle being unwound from the component.



The same pitch on different diameters gives a different helix angle, see example above.

Thread designations

International standards

To ensure that the two (internal and external) halves of a threaded joint fit together properly to produce a connection capable of bearing a specified load, threads must maintain certain standards. International standards for thread forms have therefore been established for all common thread types.

Below are examples of Metric, UN and Whitworth thread designations.

ISO metric thread designations

The complete thread designation is made up of values for the thread form and the tolerance. The tolerance is indicated by a number for the tolerance grade, and letters for the tolerance position.

Examples:

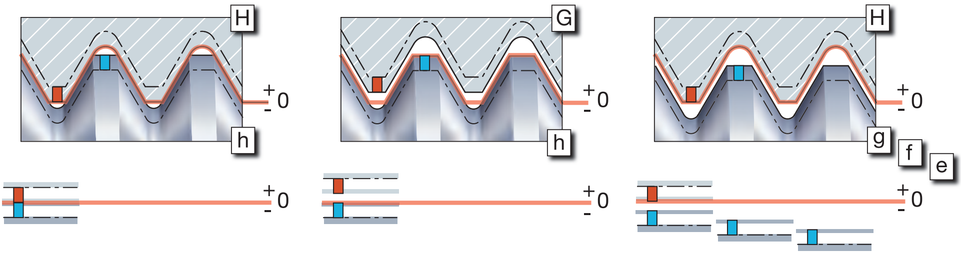
M16 - 6h
- M16: Thread designation and nominal dimension
- 6h: Tolerance class for pitch and crest position

M10 x 1.25 5g6g
- 1.25: Pitch
- 5g: Tolerance class for pitch diameter
- 6g: Tolerance class for crest diameter

A fit between threaded parts is indicated by the internal thread tolerance class followed by the external thread tolerance class, separated by an oblique stroke.

Tolerance positions

The tolerance position identifies the fundamental deviation and is indicated with an upper-case letter for internal threads and a lower case letter for external threads. A combination of tolerance grade and position give the tolerance class. The values of the tolerance classes are given in the standards for the different threading systems.



Tolerance positions	
Internal threads	H and G
External threads	h, g, f and e

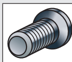
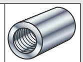
ISO inch threads (UNC, UNF, UNEF, UN)

The UN system has three tolerance classes, ranging from 1 (course) to 3 (fine). A typical UN thread is designated as follows:

¼”　20UNC – 2A

2A – Indicates a medium tolerance
UNC – Indicates a course pitch
20 – Pitch value: threads per inch (t.p.i.)
¼” – Major thread diameter

ISO - unified (UN):

		
Loose tolerance	1A	1B
Medium tolerance	2A	2B
Tight tolerance	3A	3B

Tolerance position

Types of UN thread

UNC	thread diameter with course pitch
UNF	thread diameter with fine pitch
UNEF	thread diameter with extra-fine pitch
UN	thread diameter with constant pitch

All of the above types of thread can be created using the UN insert from Sandvik Coromant

The pitch value is indicated in t.p.i. (threads per inch).
To convert to metric, this should be divided by 25.4 using the following equation:

20 t.p.i. ⇒ 25.4/20 = 1.27 mm.

Whitworth threads (G, R, BSW, BSF, BSPF)

Whitworth screw threads are now obsolete, but Whitworth pipe threads are a recognized international standard. There are two tolerance classes for external-, and one tolerance class for internal Whitworth pipe threads.

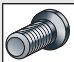
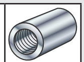
Whitworth pipe thread designations

These threads are divided into 2 groups:

- Pressure-tight joints not made on the thread, ISO 228/1
- Pressure-tight joints made on the thread, ISO 7/1

Whitworth pipe threads:

BSW
BSF
BSP.F

		
Fine	A	Only one class
Coarse	B	

Tolerance position

Examples of Whitworth pipe thread designations:

Pressure tight joints not made on the thread:

ISO 228/1	= G 1 ½ A (external)	**G**	= parallel thread
	= G 1 ½ (internal)	**1 ½**	= pipe diameter, not thread diameter
		A or B	= external tolerance class only

Pressure tight joints made on the thread:

ISO 7/1	= R_p 1 ½	$\mathbf{R_p}$	= parallel thread, internal
7/1	= R_c 1 ½	$\mathbf{R_c}$	= conical thread, internal
7/1	= R 1 ½	**R**	= conical thread, external

Sandvik Coromant's WH inserts are to be used for parallel threads.
The PT inserts are for the conical thread.

2. Applications

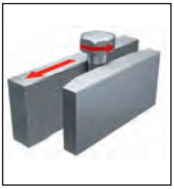
Threading methods

Various methods and applications exist for generating screw threads. The choice of application will be based on the time taken to produce the thread and the level of thread precision required.

Different ways of making threads

Metal cutting

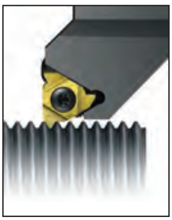
Molding



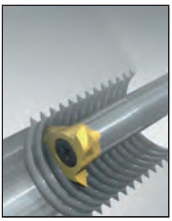
Rolling

Within the metal cutting area, thread turning, thread milling and thread tapping are common threading techniques using cemented carbide cutting tools. The design of component and machine tool are the main factors when deciding which technique to use, and there are a number of important considerations to be made in order to maximize success.

Metal cutting threading methods



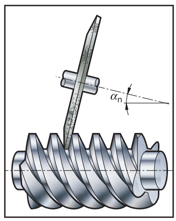
Thread turning



Thread milling

Thread tapping

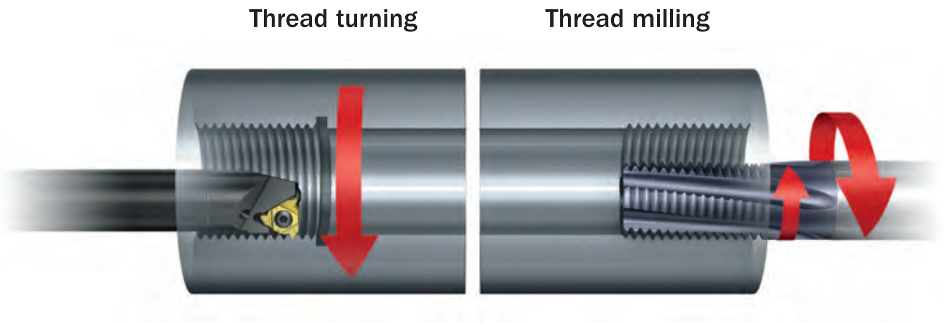
Thread whirling



Grinding

Thread milling vs. thread turning

This application guide focuses on thread turning and thread milling products and application techniques. Each technique has its own advantages in certain situations.



Thread turning

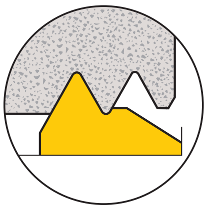
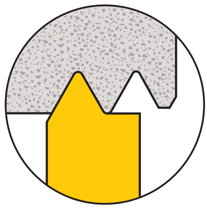
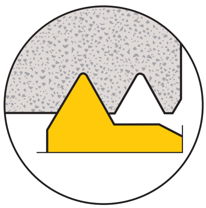
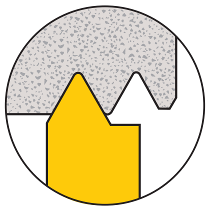
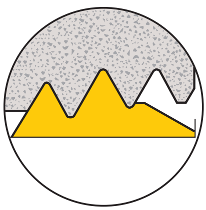
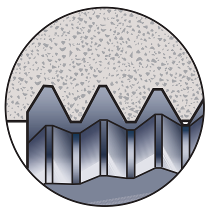
- Normally the most productive threading method
- Covers the largest number of thread profiles
- An easy and well known threading process
- Provides a better surface finish
- Can be used in deep holes with dampened bars
- Has dedicated thread programs in CNC machines

Thread milling

- Threading of non-rotating components
- Interrupted cuts offer good chip control in long-chipping materials
- Lower cutting forces make it possible to thread in long overhangs and thin-walled components
- Threads close to a shoulder or bottom, no need for a relief groove
- Enables machining of large workpieces which cannot be easily mounted on a lathe

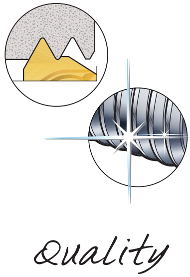
Insert types

Three main types of threading principle can be used to produce a thread. The different technical and economic arguments for each insert are the main guide in the choice of application.

	Thread turning	Thread milling
Full profile		
V-profile		
Multi-point		

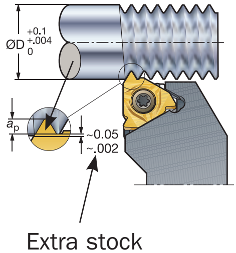
Full profile inserts – first choice for high quality thread forms

The most common insert type, used to form a complete thread profile, including the crest.



- Ensures correct depth, bottom and top profile for a stronger thread
- Extra stock should be 0.03 – 0.07 mm (0.001 – 0.003")
- No deburring required after threading operation
- Fewer passes required compared to a V-profile insert, due to the larger nose radius
- Separate insert required for each pitch and profile
- Productive threading performance

Extra stock should be left on the workpiece for topping the finish diameter of the thread.



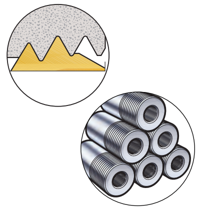
V-profile inserts – threading with minimum tool inventory

These inserts do not top the thread crests. Therefore, the outer diameter for screws and inner diameter for nuts must be turned to the right diameter prior to threading.

- Same insert can be used for a range of pitches - provided that the thread profile angle (60° or 55°) is the same
- Fewer inserts needed in stock
- The nose radii is designed to offer the smallest pitch, which reduces tool life

Multi-point inserts – productive, economic threading in mass production

Multi-point inserts are similar to full profile-, but have more than one insert point (two pointed inserts give double productivity, three pointed insert give triple etc.) Stable conditions are needed due to increased cutting forces as the cutting edge has a longer contact length.



Considerations should be made for thread turning and thread milling:

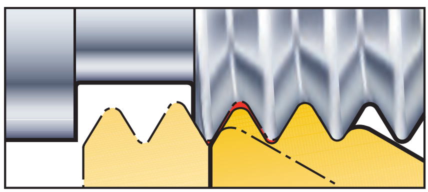
Productivity

Milling

- Completes the thread in one revolution, when using solid carbide thread mills.

Turning

- Requires fewer passes, giving better tool life, productivity and lower tool costs.
- Requires longer passes beyond the workpiece thread to accomodate the extra points.

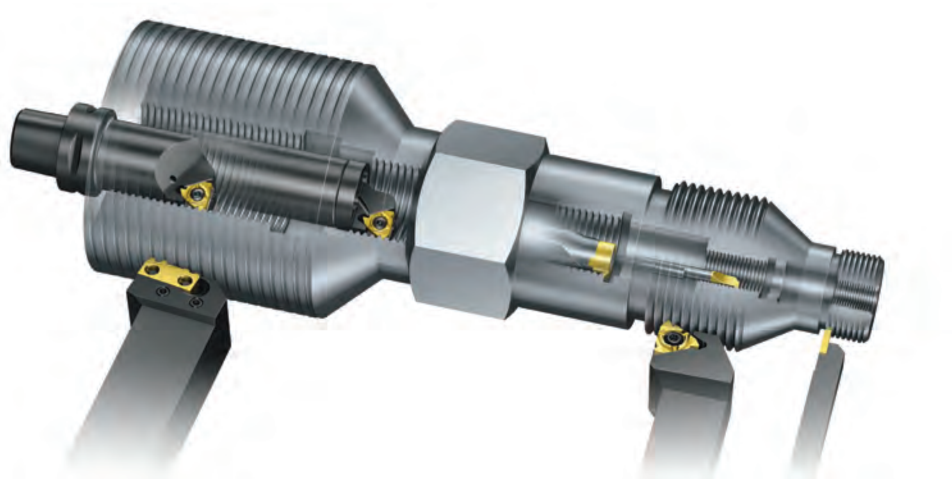


Thread turning with multi-point inserts requires longer passes beyond the workpiece.

Thread turning

Thread turning is the most common method of producing threads. The many tooling systems offered by Sandvik Coromant cover internal and external applications and make it possible to produce threads of all sizes and profiles, across all segments of the engineering industry.

Indexable-insert thread turning tools such as CoroThread 266 and others offer high quality performance, providing dampening against vibrations, security in small holes, and in the toughest materials.

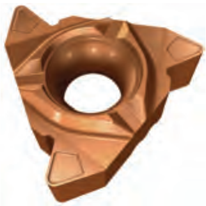


Insert geometries

Selecting the correct insert geometry is important in threading, especially in machines where there is limited supervision. Here, geometry A offers consistent tool life and quality and is the first choice for most applications, while geometry F is sharper, reducing cutting forces.

The chip-forming geometry C enables more continuous and unsupervised machining, free from sudden stoppages. This results in predictable tool life, and more active machining time.

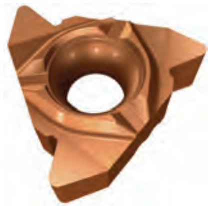
First choice



Geometry A

First choice

- First choice for most operations and materials
- Rounded cutting edge for safe and consistent tool life
- Good edge security



Geometry F

Sharp edge

- Sharp cutting edge
- Clean cuts in sticky or work-hardening materials
- Low cutting forces and good surface finish
- Reduced built-up edge

Geometry C

Chip-forming geometry

- Maximum chip control, minimum supervision required
- High security for all threading, particularly internal
- Optimized for low carbon- and low-alloyed steels
- To be used with 1° modified flank infeed only

Insert geometries

ISO	MC No.	CMC No.	Geometries A	Geometries F	Geometries C
P	P1.1.Z.AN P2.1.Z.AN P2.5.Z.HT P3.1.Z.HT	01.1 02.1 02.2 03.21	○ ● ●	◉ ○ ○	● ◉ ◉
M	M5.0.Z.AN M1.0.Z.AQ M3.1.Z.AQ	05.11 05.21 05.51	◉ ◉ ◉	● ● ●	○ ○ ○
K	K1.1.C.NS K2.2.C.UT K3.1.C.UT	07.2 08.2 09.1	● ● ●	○ ○ ○	
N	N1.2.Z.UT N3.2.C.UT	30.11 33.2	◉ ◉	● ●	○ ○
S	S1.0.U.AN S2.0.Z.AG S4.2.Z.AN	20.11 20.22 23.21	◉ ◉ ◉	● ● ●	

For ISO-H use CBN-insert, CB7015

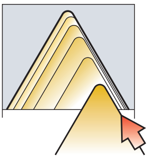
● First choice
◉ Second choice
○ Alternative choice

Infeed

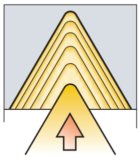
Infeed method dictates how the insert is applied to the workpiece to create the thread form. The three common infeed choices are modified-flank-, radial-, and incremental infeed.

The infeed method used in threading will directly influence:

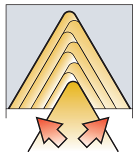
- Chip control
- Thread quality
- Insert wear
- Tool life



Modified flank infeed



Radial infeed

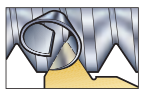


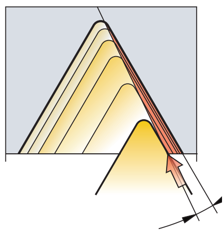
Incremental infeed

Modified flank infeed

Has many advantages over radial infeed, and most CNC machines are pre-programmed for this method which is modified (angled) slightly to avoid the insert edge rubbing on the component surface.

- Recommended for all operations and insert types
- Chip is easier to form or guide, compared to radial infeed
- Chip is thicker but generated only on one side of the insert, making it easier to cut
- Fewer passes than for radial infeed, as less heat is transferred to the insert
- Can be used on both flanks of the thread (opposite flanking) to steer the chip in best direction
- For larger threads, and to eliminate vibration problems
- Use 3-5° infeed angle for A- and F-geometries
- An infeed angle of 1° should be used for C-geometry.

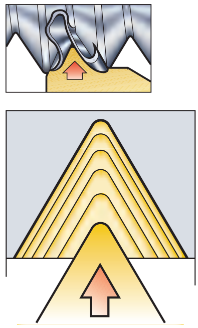




Radial infeed

The most commonly-used infeed method and the only one possible on many non-CNC lathes.

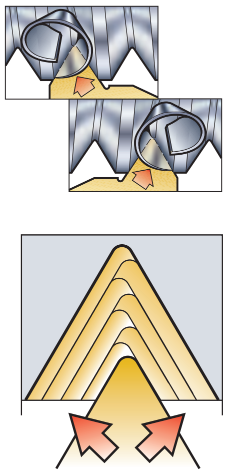
- Produces a stiff, V-shaped chip, which is difficult to form
- Insert wear is even on both flanks
- Suitable for fine pitches
- Insert tip is exposed to high temperatures, restricting the possible infeed depth
- Risk of vibration and poor chip control in large pitches



Incremental infeed - for pitches larger than 5 mm (5 t.p.i.)

This infeed type is the first choice for larger thread profiles.

- Even insert wear and long tool life
- A- and F-geometries should be used
- Special CNC machine programme is required



Very large thread profiles can be pre-machined with a turning tool, finishing passes can be made with the threading tool For more information see page 33 (Threading large profiles).

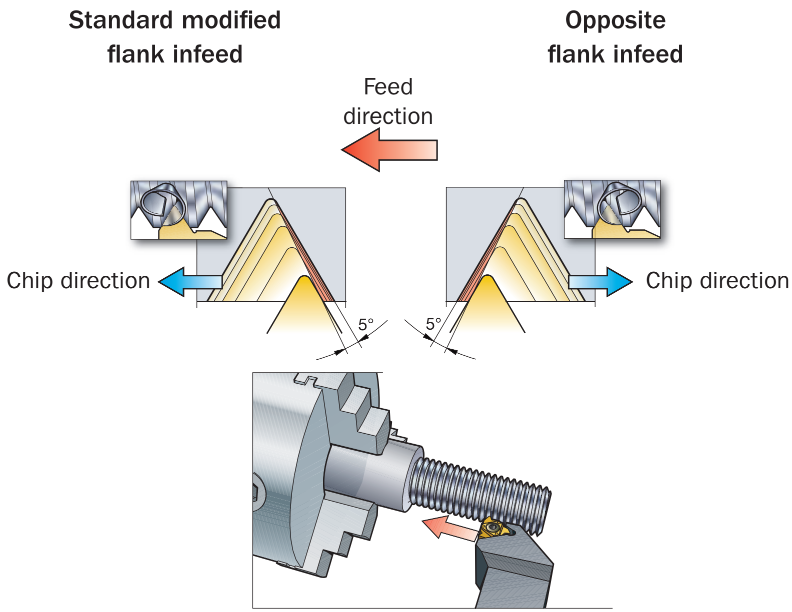
Successful chip control in thread turning

Threading can present problems in machines where there is limited supervision. Chips can get trapped in chucks, often resulting in tool damage and lost machining time.

To avoid these problems and achieve the best possible chip control, use modified-flank infeed, together with a C-geometry (chip-control) insert.

Opposite flank infeed

With this infeed type, the insert can cut using both flanks (opposite flanking) meaning that the chip can be steered in the right direction. This helps to ensure continuous, trouble-free machining, free from unplanned stoppages.



Infeed depths per pass

Decreasing depth per pass (constant chip area)

- First choice, most common
- First pass is deepest
- More ‘balanced’ chip area
- Even load on insert
- Last pass 0.07 mm (.003 inch)

First choice

Constant depth per pass

- Each pass is of equal depth, regardless of number of passes
- More demanding on the insert
- Can improve chip control
- Increases the required number of passes
- Should not be used for pitches larger than 1.5 mm or 16 t.p.i.
- A less-productive method

Normal CNC lathes are equipped with dedicated threading cycles, where pitch, thread depth and number of passes can be set in different ways – including the first and last passes.

For the last pass, we strongly recommend against using a spring pass (a cut without radial cutting depth). It is more beneficial to use the recommended infeed cycles to ensure better thread quality and longer insert tool life.

Number of passes and size of infeed per pass

The recommended depths of cut for the different passes are shown in the table below.

- These are recommended as starting values - the most suitable number of passes must be determined by trial and error.
- Infeeds of less than 0.05 mm (0.002 inch) should be avoided
- For Cubic Boron Nitride-tipped inserts, infeed should not exceed 0.10-0.12 mm (.004-.005 inch)
- For multi-point inserts, it is essential that the correct infeed recommendations are used

Infeed value recommendations

Number of infeeds and total depth of thread.

ISO Metric (MM). Internal																
		Pitch. mm														
		0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00
No. of infeeds	Unit	Radial infeed per pass														
1	mm	0.10	0.15	0.15	0.16	0.20	0.16	0.19	0.19	0.19	0.22	0.21	0.23	0.26	0.25	0.28
	inch	.004	.006	.006	.006	.008	.006	.007	.007	.007	.009	.008	.009	.010	.010	.011
2	mm	0.09	0.14	0.14	0.15	0.18	0.15	0.18	0.18	0.18	0.21	0.21	0.23	0.26	0.25	0.27
	inch	.004	.005	.006	.006	.007	.006	.007	.007	.007	.008	.008	.009	.010	.010	.011
3	mm	0.08	0.12	0.13	0.14	0.17	0.15	0.17	0.17	0.18	0.20	0.20	0.22	0.25	0.24	0.26
	inch	.003	.005	.005	.006	.007	.006	.007	.007	.007	.008	.008	.009	.010	.010	.010
4	mm	0.07	0.07	0.12	0.13	0.15	0.14	0.16	0.17	0.17	0.20	0.19	0.22	0.24	0.24	0.26
	inch	.003	.003	.005	.005	.006	.006	.006	.007	.007	.008	.008	.009	.010	.009	.010
[illegible]	mm			0.08	[illegible]	[illegible]	0.13	0.15	[illegible]	[illegible]	0.19	0.19	[illegible]	[illegible]	0.23	0.25
	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1b	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total infeed	mm	0.34	0.48	0.63	0.77	0.92	1.05	1.20	1.48	1.78	2.03	2.31	2.61	2.88	3.19	3.44
	inch	.013	.019	.025	.030	.036	.041	.047	.058	.063	.072	.078	.093	.104	.126	.135

For tables and recommendations see chapter 5, Technical reference (page 96) or use the Sandvik Coromant threading calculator for more values.

Tool holder selection

The choice of tool holder used in a threading operation is influenced by many factors:

- Component shape
- Tool availability
- Machine type and condition
- Chip control requirements
- Hand of thread
- Tool holder choice

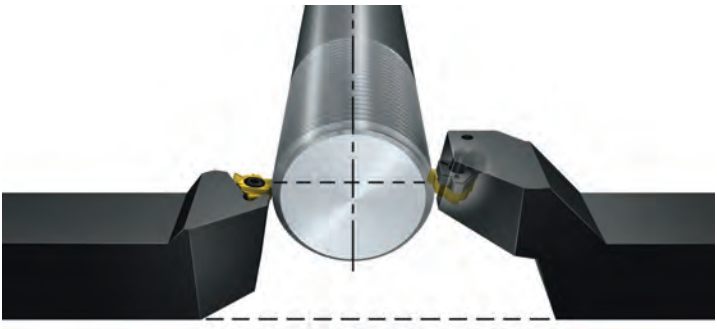
External thread turning

This is the most common thread turning method. It is often easier and less demanding on the tool and there are a number of different methods which can be used to achieve the desired results.

Upside-down tool holders

In many operations, it is beneficial to use a tool holder in an upside-down position, to help remove chips more effectively.

Drop-head tool holders are specially developed for threading upside-down and allow the correct centre height to be maintained, without having to change the clamping in the turret.



Conventional tool holder (right-hand)

Drop-head tool holder (right-hand)

Internal thread turning

Internal threading is more demanding than external threading, due to the increased need to evacuate chips effectively.

Chip evacuation, especially in blind holes, is helped by using left-hand tools for right-hand threads and vice versa (pull-threading). However, this also creates the greatest risk of insert movement.

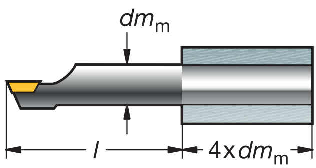
Modified flank infeed should always be used to generate a spiral chip, which is easy to guide towards the entry of the bore

Boring bar selection also has a strong influence on the effectiveness of internal threading. Three main bar types can be used for internal threading, depending on the length of overhang and level of stability required.

- Steel boring bars - maximum 2-3 x bore diameter overhang
- Steel dampened boring bars - maximum 5 x bore diameter overhang
- Carbide boring bars - maximum 5-7 x bore diameter overhang

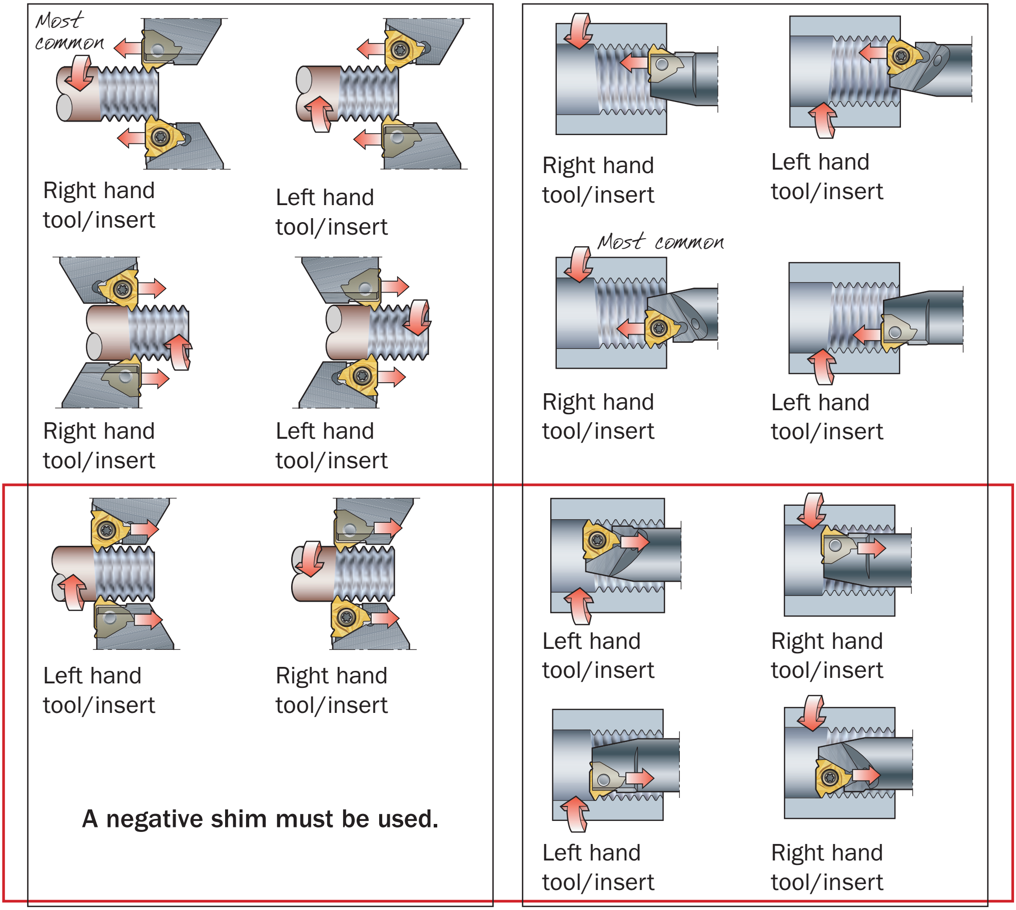
Boring bar type	**Max. overhang**
Steel	2-3 x dm_m
Steel dampened	5 x dm_m
Carbide	5-7 x dm_m

Boring bar deflection is influenced by the boring bar material, diameter, overhang and cutting forces. The recommended clamping length in a boring bar holder with a sleeve is 4 x bar diameter dm_m.



External — Right hand threads | Left hand threads

Internal — Right hand threads | Left hand threads



Thread turning methods

A thread can be produced in a number of ways. The spindle can rotate clockwise or anticlockwise, with the tool fed towards or away from the chuck. The thread turning tool can also be used in the normal- or upside-down position (the latter helps to remove chips).

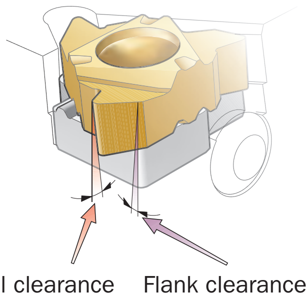
Working away from the chuck

Using right-hand tools for left-hand threads (and vice-versa) enables cost savings through tool inventory reduction (a negative shim must be used). Care must be taken due to the risk of insert movement, particularly at the beginning of the thread.

Insert clearance angles

Two types of angular clearance between the insert and thread are necessary for precise, accurate threading. These are:

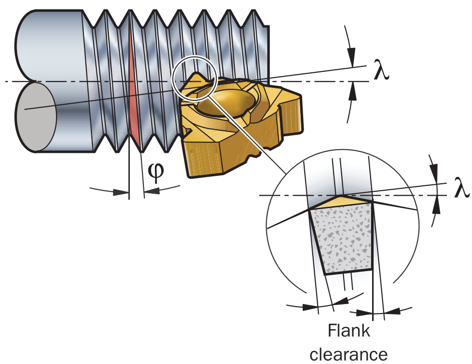
- Flank clearance
- Radial clearance



Flank clearance

Cutting edge clearance between the sides of the insert and thread flank is essential to ensure that tool wear develops evenly, to give consistent, high quality threads. The insert should therefore be tilted to gain maximum symmetrical clearance from the flanks (flank clearance angle).

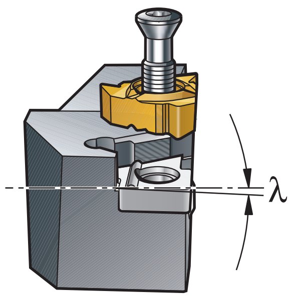
The tilt angle of the insert should be the same as the helix of the thread, to ensure success.



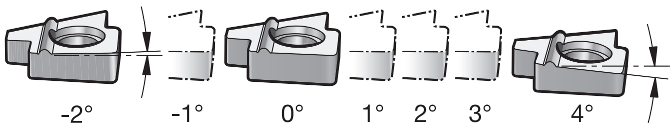
Selecting shims to tilt the insert for flank clearance

Insert shims are used to give different tilts to the insert, so that the angle of insert inclination is the same as the helix of the thread. See table opposite for methods of selecting the correct insert shim.

- The standard shim in the holder is 1°, the most common angle of inclination
- Shims are available in 1° steps, in the range -2° to 4°
- Negative-inclination shims are required when turning left-hand threads with right-hand tools, and vice versa



λ = the angle of insert inclination



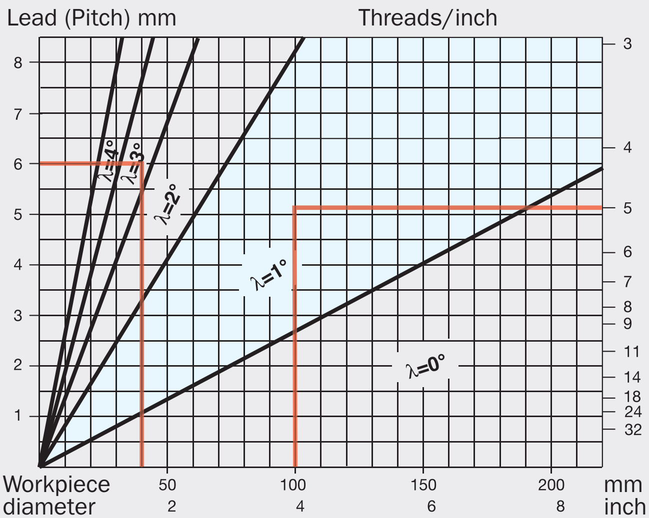
The flank clearance angle of the insert is adjusted by changing the shim under the insert in the tool holder. Standard tool holders have a 1° insert inclination angle.

Methods for selecting the correct shim

Two alternative ways to select the correct shim:

A. Use the diagram, selecting shims.
B. Use the formula to calculate the helix angle to choose the corresponding shim.

A. Workpiece diameter and pitch influence inclination angles



For a pitch of 6 mm and a workpiece diameter of 40 mm, a 3° shim is required. For a pitch of 5 threads per inch and a diameter of 4 inches, a 1° shim is required.

B.

$$\tan \lambda = \frac{P}{d_2 \times \pi}$$

P = Pitch

d_2 = Effective diameter of thread

λ =

P = 6 mm
d_2 = 40 mm

$$\lambda = \arctan\left(\frac{6\text{ mm}}{40\text{ mm} \times \pi}\right) = 2.7° \Rightarrow \text{use a 3° shim}$$

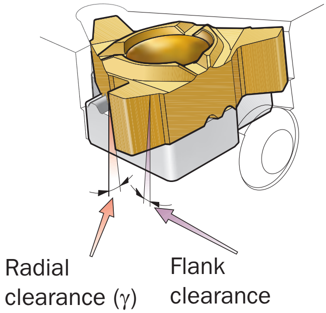
P = 5 t.p.i.
d_2 = 4"

$$\lambda = \arctan\left(\frac{\left(\frac{1}{5\text{ t.p.i.}}\right)}{4" \times \pi}\right) = .91° \Rightarrow \text{use a 1° shim}$$

Relationship between flank clearance, radial clearance and thread profile angle

The smaller the thread profile and radial clearance angles, the smaller the flank clearance angle (see table below for flank clearance values when the correct shim, equal to the helix angle, is used).

Please note that as the profile angle becomes smaller, it is more important to choose the correct shim.



Threads with small profile angles

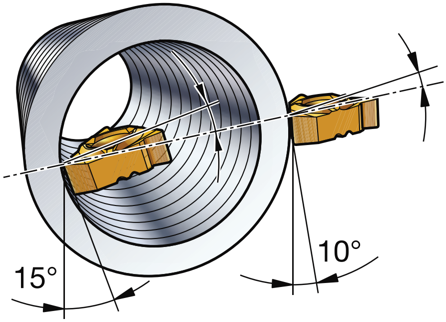
ACME, Stub ACME, trapezoidal and rounded threads fall into this category and put extra pressure on the cutting edge. To minimize this pressure, choose the correct shim to tilt the insert.

Thread Profile	Angle (β)	Internal 15° (γ)	External 10° (γ)
		Flank clearance	Flank clearance
Metric, UN	60°	7.6°	5°
Whitworth	55°	7.1°	4.7°
Trapezoidal	30°	4°	2.6°
ACME	29°	3.8°	2.5°
Buttress	10° / 3°	2.7° / 0.8°	1.8° / 0.5°

Radial clearance

To give adequate radial clearance, inserts are tilted in the tool holder 10° or 15°.

It is important to use internal inserts with internal tool holders, and vice-versa, to ensure that the correct thread form is achieved.

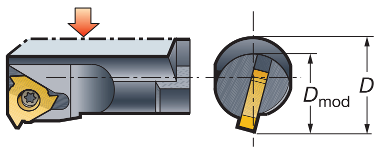


Insert sizes 11, 16 and 22 mm (1/4, 3/8 and 1/2 inch)

Insert size 27 mm (5/8 inch)

Modified bars for small holes

Internal boring bars can be modified to fit small holes and can be used in place of special tools. These modified bars retain their rigidity, as long as the recommended minimum dimension D_{min} is retained – see main catalogue for further information.

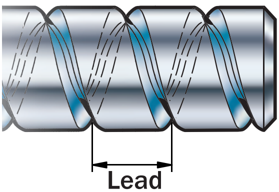


Multi-start threads

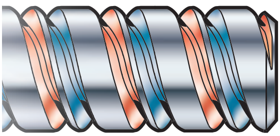
Threads with two or more parallel thread grooves require two or more starts. The lead of this type of thread will then be twice that of a single-start screw.

The lead increases relative to the pitch by a multiple equal to the number of starts. On a single-start thread, the lead and the pitch are equal; on a double start- the lead is twice the pitch, on a triple start- the lead is three times the pitch etc.

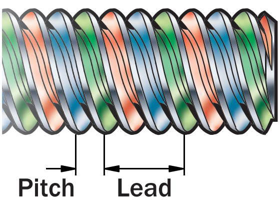
To produce a multi-start thread, make a single thread groove with a number of passes, followed by the second thread groove with a number of passes, then the third thread groove with a number of passes.



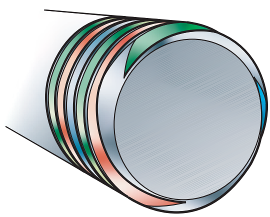
First threading groove



Second threading groove



Third threading groove



A multi-start thread with 3 starts

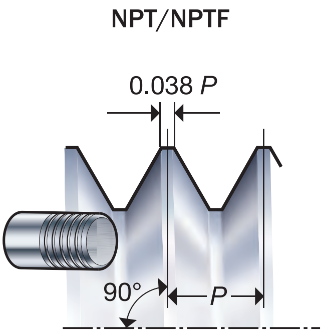
Insert nose radius and tool life

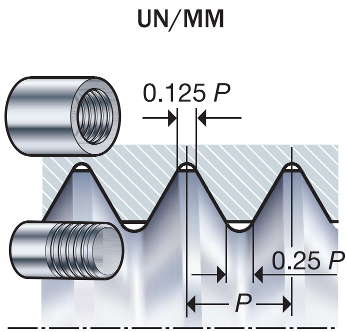
The nose radius is the smallest point on the insert and the most liable to break under the extreme pressure of a threading operation.

Nose radii differ considerably for different insert types and consideration should be made to the cutting speed and number of passes in order to optimize performance and machining security.

NPT and NPTF inserts have the smallest nose radii within the standard range. For optimized performance increase the number of passes and reduce cutting speed.

The internal insert has a significantly smaller nose radius than the external insert.

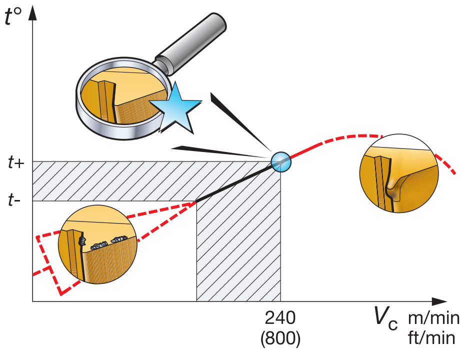




Insert tool life

Careful observation of the insert after threading will allow you to achieve optimum results regarding tool life, cutting speed and thread quality. The main points to consider are:

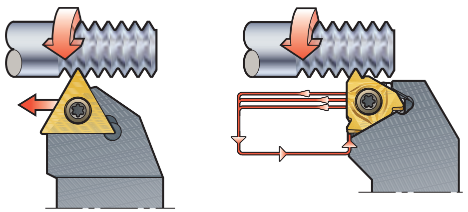
- When thread turning or thread milling at low speed, the main problem is built-up edge. To solve this, increase cutting speed
- When thread turning at high speed, plastic deformation of the tip is the main problem. To solve this, decrease cutting speed
- When thread milling, the main problem is terminal cracks on the insert. This can be addressed by increasing the coolant volume or reducing the cutting speed



For information on the causes and solutions to different forms of insert wear see chapter 4, Troubleshooting (page 76).

Threading large profiles

When threading large profiles, it is advisable to use a conventional turning tool to pre-machine the thread form before applying the threading tool. This will extend the life of the threading insert and give higher thread quality.



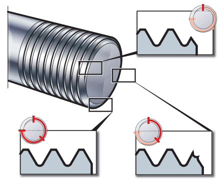
When machining threads with small-radius roots and crests, similar pre-machining can also be applied by rough threading using an insert with the same angle, but larger nose radius. Allowance is then left for the remaining finishing passes to be taken with the right insert.

Pre-machining with CoroTurn 107

Profiles	Recommended tool holder
60° MM, UN	STTCR/L
55° WH	SDNCR/L, TR-D13NCN

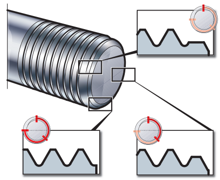
Thread deburring

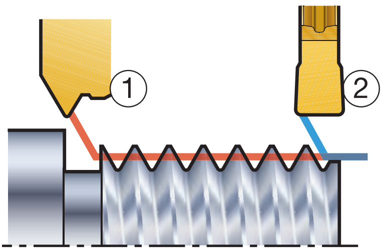
Burrs which appear at the start of the thread can cause problems and should be removed. This is especially important, for example, in the hydraulics and food processing industry where tolerance and quality demands are high.



Burrs tend to form at the start of a thread before the insert creates the full profile, mostly in diffficult stainless steels and duplex materials - thread deburring is achieved with standard turning tools (mainly CoroCut inserts).

An important consideration is correct positioning of the deburring insert in relation to the thread, pitch and thread cycle.

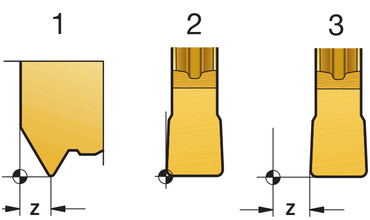




How to deburr a thread

1. Use a standard thread cycle with the recommended infeed data. The tool should enter the thread at a 45° angle.

2. Use the same thread program, with the same cutting speed and a CoroCut insert, at half the number of passes. Program the deburring length to 1 x pitch, and measure the zero-point according to the images below.



Setting instructions

1. Set the zero point of the threading insert.
2. Measure the zero point on the CoroCut insert.
3. Offset the CoroCut insert with z (see main catalogue).

Thread milling

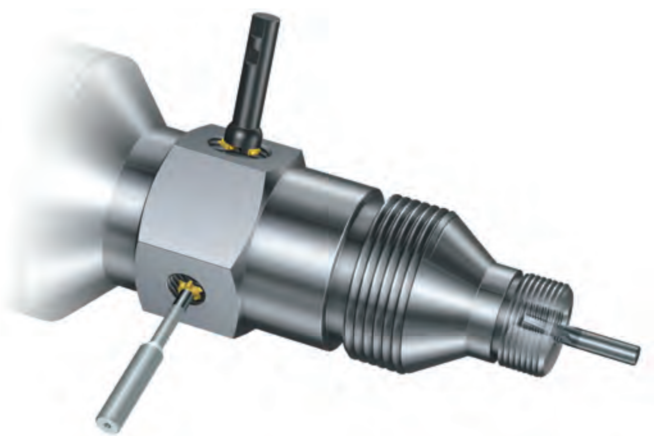
Thread milling produces threads with the circular ramping movement of a rotating tool. Here, the lateral movement of the tool in one revolution creates the thread pitch.

Although not as widely used as thread turning; thread milling achieves high productivity in certain applications and offers an advantageous alternative to thread tapping.

Thread milling should always be the application of choice when:

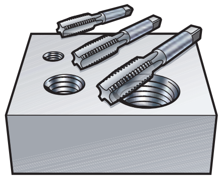
- Machining asymmetric/non-rotating components
- Machining materials causing chip breaking and chip evacuation problems
- Machining tough materials creating high cutting forces
- Machining against a shoulder or close to the bottom of a blind hole
- Machining thin-walled components
- Component set-ups are unstable
- You need to minimize tool inventory
- You do not want to risk tap breakage on expensive parts – as thread mills can always be removed from the component totally.

Thread milling requires a machine tool capable of simultaneous movement in the X, Y and Z-axis direction.

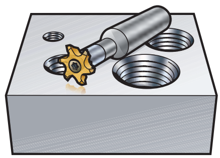


Benefits of thread milling vs. tapping

When deciding on the choice of threading method, the benefits of thread milling over thread tapping should be considered.



Separate tap needed for each hole



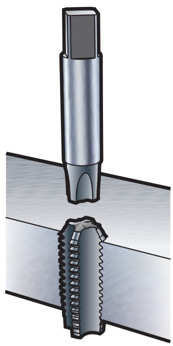
One thread mill for all holes

Tooling inventory

- Standard tool holders
- One thread mill tool covers different diameters
- Same thread milling insert for left- and right-hand threads
- Different pitches possible with one insert

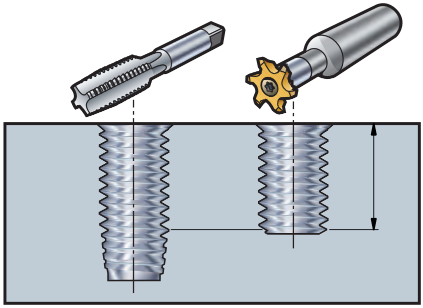
Tool breakage

- Easier to remove a broken tool from the component
- Maximum production security
- Reduced machine downtime
- Ideal for difficult materials
- First choice for expensive components/last stage machining



Chip control

- Better chip control, fewer machining stoppages
- Beneficial method in long-chipping materials



Thread quality

- Due to its shape, a thread mill can achieve full-bottom threading in a blind hole with no extra drill depth required
- A thread mill can be programmed with radius correction, allow-wing for easy adjustment of the thread tolerance
- A thread mill minimizes the pre-machined hole diameter, com-pared to a tap, so that threads can be produced with better thread coverage

Coolant

- A thread mill does not require coolant

Cutting force

- A thread mill can make large threads in smaller machines due to reduced cutting force
- Reduced cutting forces also make thread mills an ideal solution for machining thin-walled components

Thread milling – main considerations

To achieve the best results in a thread milling operation, always consider the following points.

- Choice of cutting diameter

A smaller cutting diameter will help to achieve higher quality threads.

- Tool path is important

- Tool path will give right or left hand threads, using down- or up-milling
- Always engage and retract the thread mill in a smooth path, i.e. roll in and out of cut

- Be aware of feed per tooth

Always work with small feed per tooth values (very small hex) to achieve best quality.

- Always calculate the correct feed required by the machine software

To ensure the correct insert load.

- Several infeed passes may be needed

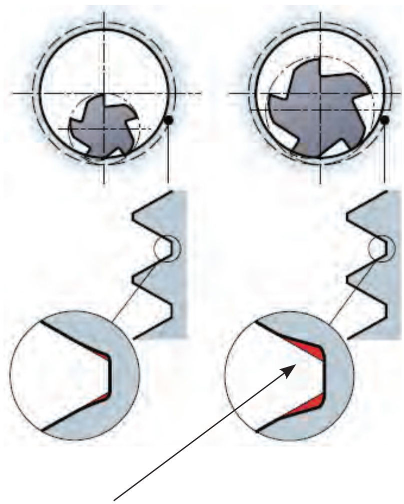
In difficult applications, it may be necessary to separate the operation into several infeed passes to achieve higher quality threads.

- Dry machining is the first choice

Choice of cutting diameter

The cutter engagement will create a minute form error on the root of the thread profile. In internal applications, the relationship between threading diameter, cutting diameter and pitch will affect the true radial depth of cut, a_e eff, which becomes much larger than the chosen radial depth of cut. A larger true ae will increase the deviation in the root of the thread.

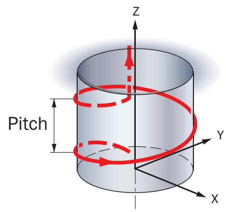
To minimize the profile deviation, the cutter diameter should be no greater than 70% of the threading diameter.



Ex M30x3
Dia 21.7 gives a profile deviation of 0.07 mm (.0027 inch)
Dia 11.7 gives a profile deviation of 0.01 mm (.0004 inch)

Tool path

Thread milling requires machine tools which are capable of simultaneous movements on the X, Y and Z axes. The thread diameter is determined by the X and Y axis, while pitch is controlled by the Z axis.

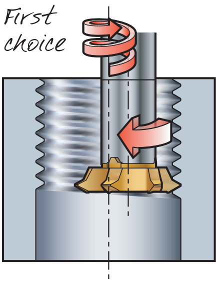
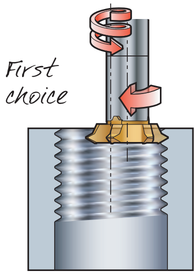
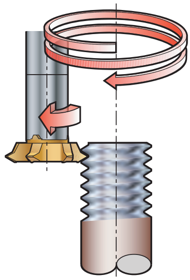
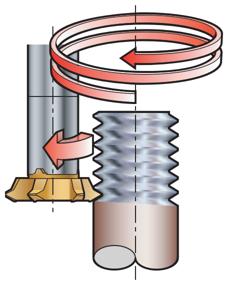
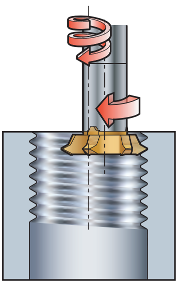
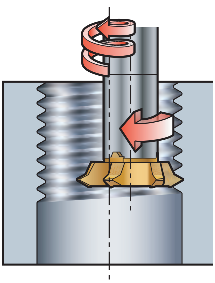
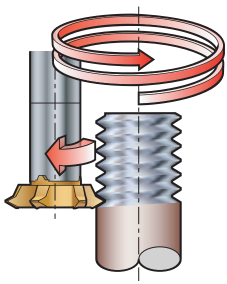
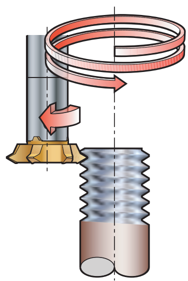


Right-hand internal threads

All cutters are initially positioned as close as possible to the bottom of the hole, and then move anticlockwise in an upwards direction to ensure that down milling is achieved.

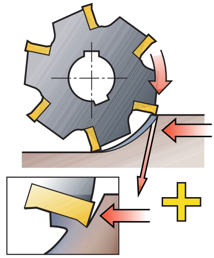
Left-hand internal threads

Milling a left-hand thread follows in the opposite direction, from top to bottom, also in an anticlockwise path to ensure that down milling is achieved.

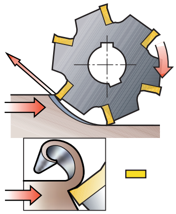
Internal		**External**	
Right-hand threads	Left-hand threads	Right-hand threads	Left-hand threads
Down-milling		Down-milling	
			
Up-milling		Up-milling	
			

Down milling and up milling

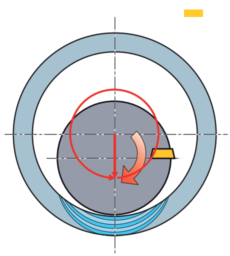
Down milling is when the tool is fed in the direction of tool rotation and is the preferred method of application - when machine tool, fixture and workpiece will allow. Chip thickness decreases from the start of cut, until reaching zero at the end, which stops the edge rubbing and burning against the surface before it is engaged into cut.



In up milling, the feed direction of the cutting tool is opposite to its rotation.



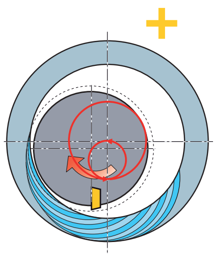
Entrance into cut – roll in



Make a soft entrance into the cut when circular milling or circular ramping. This can be done by performing an extra circle, which results in slow engagement into the material.

For each quarter revolution (90°) during the entrance into cut, the pitch should be divided by four.

Smooth entrances into the cut are also essential to avoid vibration and extend tool life.

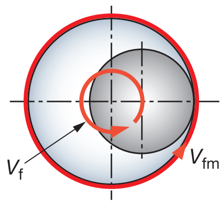


Feed per tooth

To avoid feed marks on the component surface, feed per tooth should not exceed 0.15 mm/tooth (.006 inch/tooth), therefore a small h_{ex} value is needed.

Always calculate the correct feed required by machine software

The feed value always depends on the h_{ex} value which corresponds with the peripheral feed rate, however many machines require a tool centre feed (v_f).



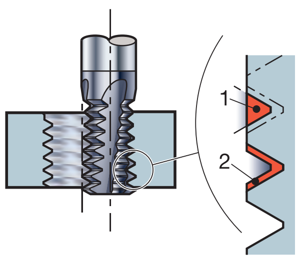
In internal applications, the tool path of the periphery is faster than the movement of the tool centre line. Feed rate programming on most milling machines is based on the centre line of the spindle and this must be included in thread milling calculations to maximize tool life and avoid vibration/tool breakdown.

For more formulas see chapter 5, Technical reference (page 117).

Machining with several infeed passes

Separating the thread milling operation into several infeed passes achieves larger thread pitches and improves security against tool breakage in difficult materials.

Thread milling with several infeed passes also improves thread tolerance, due to reduced tool deflection. This gives greater security in long overhangs and unstable conditions.



Wet or dry machining

Machining dry is always recommended as cutting fluid emphasizes temperature variations at entry and exit, creating thermal cracks.

Cutting fluid can be beneficial on certain occasions, such as when finishing stainless steels/aluminium, machining HRSA or machining cast iron (to reduce toxic dust). However, it is most beneficial to evacuate chips using compressed air.

Cutting data considerations

- In internal applications, a_e is increased relative to straight cutting, which reduces the chip thinning effect.
- In external applications, the radial depth becomes much smaller and a higher cutting speed can be used.
- CoroMill® Plura cutters have a larger surface contact area than end mills of equal length, and often a less favourable length-to-diameter ratio. This can be compensated by reducing a_e and performing one or two extra passes.
- Conventional end mills and CoroMill Plura thread milling cutters can use the same cutting speed.
- For CoroMill 327 and CoroMill 328, use the general recommendations for grooving and slotting.
- The entering angle for the nose radius is 90°. Since this is the most sensitive part of the insert, h_{ex} calculations should be made using entering angle 90°.

For cutting data and values see chapter 5, Technical reference (page 88) or use the Sandvik Coromant threading calculator/PluraGuide.

External threading with milling tools.

All thread milling inserts are designed for internal threads, however CoroMill 327 and CoroMill 328 inserts can also be used for external threading. Consider the size of insert nose radius for the two operations, as a larger nose radius needs to be chosen for the external thread (internal - pitch/8, external - pitch/4).

Thread root sizes differ slightly for internal and external threads. In the example below, a 2 mm (.078 inch) pitch insert, nose radius 0.25 mm (.0098 inch) fits a 2 mm (.078 inch) pitch internal thread, root 0.25 mm (.0098 inch). The corresponding external thread has a larger root, 0.50 mm (.019 inch) and therefore a 4 mm (.157 inch) pitch insert with larger nose radius should be chosen to fit this thread.

Internal thread

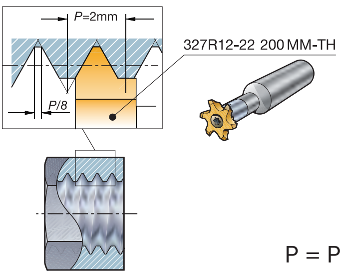
Pitch 2 mm
Height 1.08 mm
Root 0.25 mm

Insert 327R12-22 200MM-TH
Pitch 2
Max depth of cut 1.08 mm
Nose radius 0.25 mm

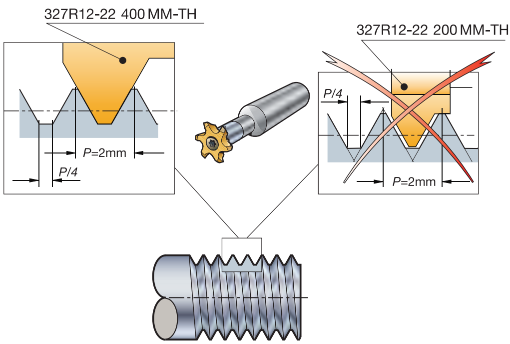
External thread

Pitch 2 mm
Height 1.08 mm
Root 0.50 mm

Insert 327R12-22 400MM-TH
Pitch 4
Max depth of cut 2.17 mm
Nose radius 0.50 mm



P = Pitch



For external thread milling recommendations see chapter 5, Technical reference (page 112).

3. Products

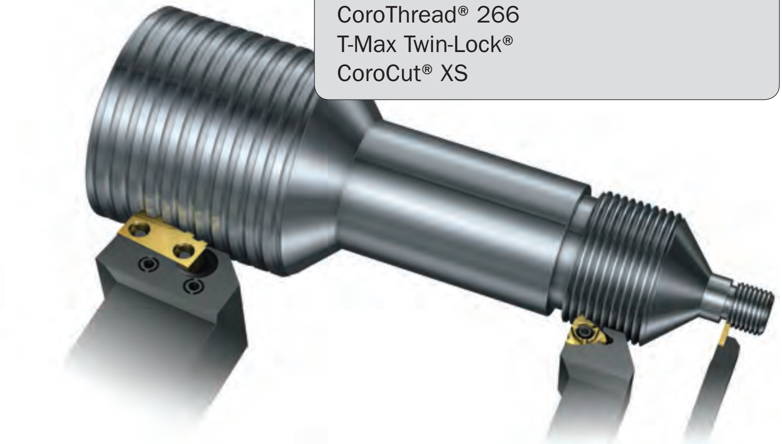
Thread turning

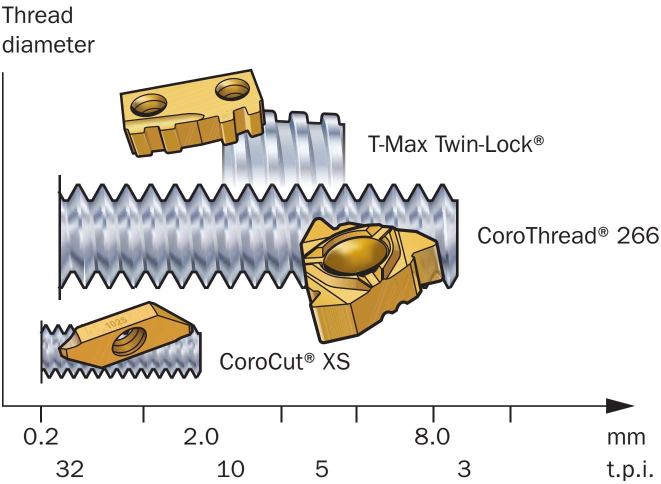
The turning of threads is a common operation, with a wide range of systems available to help achieve high standards of productivity and effectiveness. Thread turning tools can be separated into two main areas - tools for external- and internal threading.

External thread turning

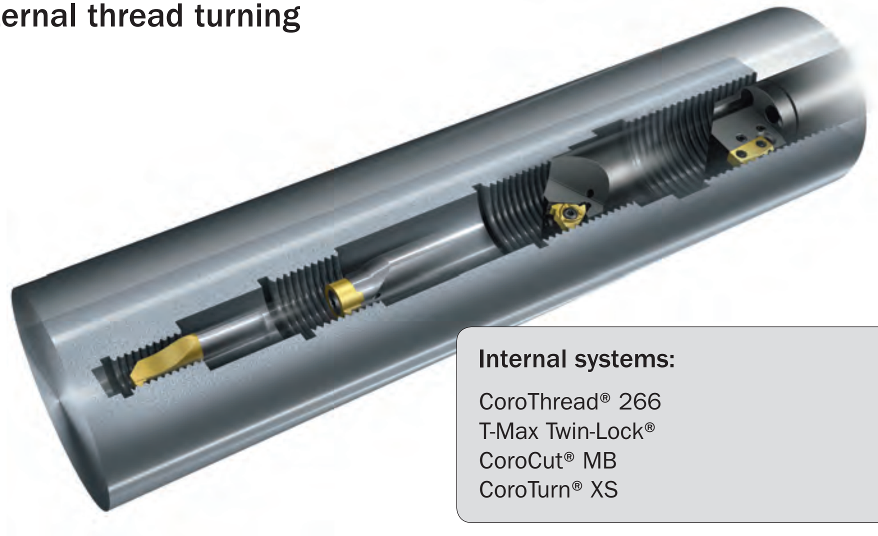
External systems:

CoroThread® 266
T-Max Twin-Lock®
CoroCut® XS



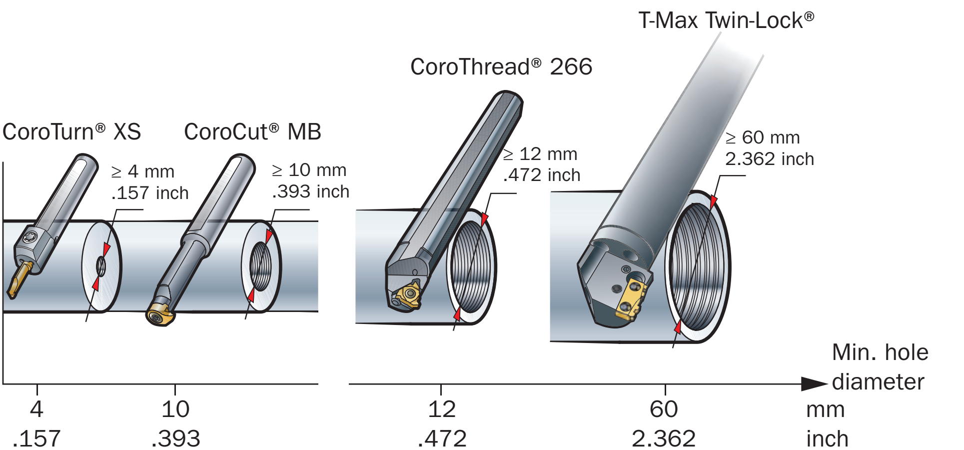


Internal thread turning



Internal systems:

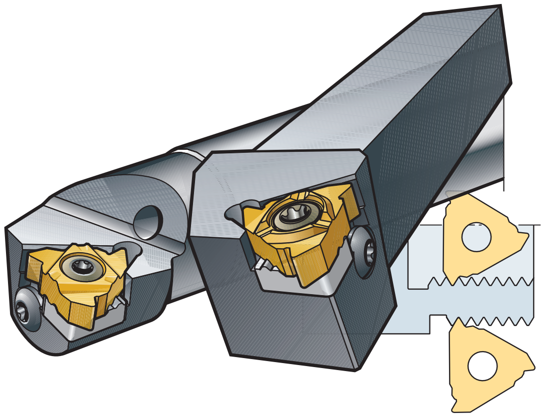
CoroThread® 266
T-Max Twin-Lock®
CoroCut® MB
CoroTurn® XS



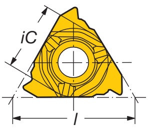
CoroThread® 266 – external and internal threading

The first choice, indexable insert threading tool. Inserts are located on a guide rail on the shim, for high stability and precise, predictable machining.

- First choice system for all thread turning
- Large assortment of internal and external tools
- High stability
- Easy edge-indexing capability
- Easy insert mounting
- Reduced downtime



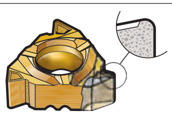
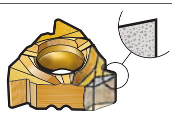
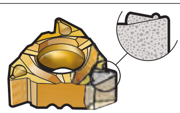
Insert sizes



iC		*l*	
mm	inch	mm	inch
6.350	1/4	11*	.039*
9.525	3/8	16	.630
12.70	1/2	22	.866
15.875	5/8	27	1.063

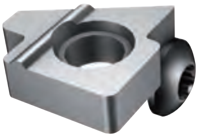
***) No insert guide rail**

Geometries

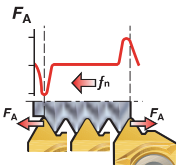
A	F	C
		

The unique guide-rail interface between the insert and tip seat eliminates insert movement caused by cutting force variation. CoroThread 266 therefore provides accurate and repeatable thread profiles as a result of rigid insert stability.

Insert with slots for rail guide



Shim with rail guide



The insert-rail support system solves the problem of insert movement, which is often caused by substantial forward- and reverse cutting forces when entering and exiting the thread.

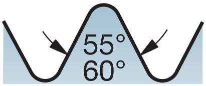
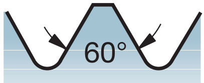
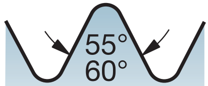
The interface: holder - shim

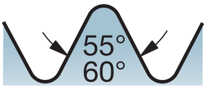
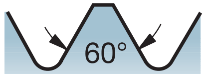
The screw locks the insert securely in the pocket, at the blue contact faces.

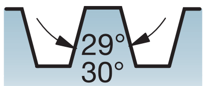
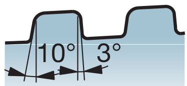
The interface: shim - insert

Cutting forces are distributed along the back wall of the tool holder, indicated in red.

Assortment - CoroThread® 266

			
	VW – VM	**MM – UN**	**WH – NT**
	V-profile 55° (VW) Pitch: 28 – 4 t.p.i. V-profile 60° (VM) Pitch: 1 – 6 mm 24 – 4 t.p.i.	Metric 60° (MM) Pitch: 0.5 – 6 mm UN 60° (UN) Pitch: 32 – 4 t.p.i.	Whitworth 55° (WH) Pitch: 28 – 4 t.p.i. NPT 60° (NT) Pitch: 27 – 8 t.p.i.
Type of insert			
A (all-round)	•	•	•
F (sharp)	•	•	•
C (chip breaking)	•	•	•
Multi-point		•	•

			
	PT – NF	**RN**	**MJ – NJ**
	BSPT 55° (PT) Pitch: 28 – 8 t.p.i. NPTF 60° (NF) Pitch: 27 – 8 t.p.i.	Round 30° (RN) Pitch: 10 – 4 t.p.i.	MJ 60° (MJ) Pitch: 1.5 – 2 mm UNJ 60° (NJ) Pitch: 32 – 8 t.p.i.
Type of insert			
A (all-round)	•	•	•
F (sharp)		•	
C (chip breaking)			

		
	TR – AC – SA	**V – RD – BU**
	Trapezoidal 30° (TR) Pitch: 1.5 – 8 mm ACME 29° (AC) Pitch: 16 – 3 t.p.i. STUB-ACME 29° (SA) Pitch: 16 – 3 t.p.i.	API 60° Pitch: 5 – 4 t.p.i. API Round 60° (RD) Pitch: 10 – 8 t.p.i. APT Buttress (BU) Pitch: 5 t.p.i.
Type of insert		
A (all-round)		•
F (sharp)	•	
C (chip breaking)		•

CoroThread® 266 – grade recommendations

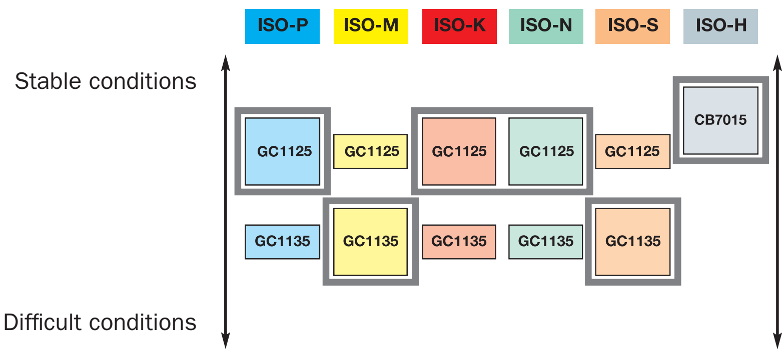
Two unique grades offer the chance to boost threading performance with CoroThread 266.

GC1125

Optimized for steel and cast-iron threading with high wear resistance. Can also be applied in ISO M, -N and -S materials

GC1135

Optimized for stainless steel and HRSA and the best choice for sharp geometries, with high toughness and safe edges. Can also be applied in ISO P and -K materials.



For cutting data information, refer to chapter 5, Technical reference (page 86) and for infeed recommendations see chapter 5, Technical reference (page 96).

CoroThread® 266 – tool holder assortment

The wide CoroThread 266 programme is available in the following tool holder versions.

- Coromant Capto®, internal and external (C3 – C8)
- Shanks (up to 40x40 mm, 1½ inch)
- Bars (up to 50 mm, 2 inches)
- SL-cutting heads, internal and external (up to 40 mm, 1½ inch)
- SL-quick change, internal
- Shanks for small part machining (up to 16x16 mm, ¾ inch)
- Short holders for QS™ holding system (up to 16x16 mm, ¾ inch)
- Cartridges

Tolerance classes with CoroThread® 266

CoroThread 266 turns threads in the following tolerance classes, in metric, inch and Whitworth systems by concentrating only on the pitch diameter.

Thread	External/Internal	Tolerance classes
ISO metric	External	6h – 6e
ISO metric	Internal	6H – 6G
ISO inch	External	2A
ISO inch	Internal	2B
Whitworth	External	A
Whitworth	Internal	—

Other tolerances available with CoroThread® 266

It is possible to turn threads to finer and courser tolerances with CoroThread 266. However, additional measurements of external major and pitch diameter, and internal minor and pitch-line diameters must then be made.

To accurately measure the pitch diameter, use a wire thread placed in a normal micrometer. The most commonly used is a ‘stop and go’ gauge which gives an accurate reading of the level of diameter or profile error.

Dampened 4C Silent Tools bars – vibration-free internal threading

For internal threading operations - where radial forces are higher than in external threading - the recommended bar type is 570-4C.

570-4C bars are developed primarily for internal threading applications. The combination of Silent Tools adaptor and flank infeed is recommended for overhangs of up to 5 x D, to combat axial and radial cutting forces.

- Unique dampening - reduces largest vibration
- Coromant Capto Coupling
- Flexible SL system
- Excellent surface finish
- Handles directional cutting forces

The 4C system is available as standard. The SL coupling at the front end enables a large number of cutting tool combinations from a small tool inventory, and is to be used primarily with CoroThread 266 cutting heads.

It is recommended to minimize the tool overhang and select the largest possible tool diameter for best stability and accuracy.

QS™ holding system for sliding head machines – external threading

The QS holding system fits in the sliding head machine tool post to provide a quick-changing alternative to conventional gang tool racks. Tool holders are available for threading, turning and parting and grooving.

- Saves time compared to conventional tool post systems
- Reduces tool indexing time from 3 minutes to 1 minute
- Exact tool position guaranteed with every set-up

The system of stops, wedges and short tool holders is compatible with Citizen, Star, Tsugami, Nexturn and Tornos sliding head machines

Quicker tool changes and higher precision are the primary benefits of this system, which offers CoroThread size 16 inserts.

CoroThread 266 short holders with size 16 inserts are available in size 10, 12, and 16 shanks (3/8, 1/2 and 5/8 inch).

CoroCut® XS – external threading

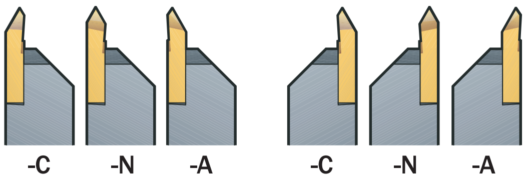
For precision threading in small part machining, up to 32 mm (1.26 inch) diameter. CoroCut XS is used ideally where the tool is close to the shoulder of the workpiece and in sliding head machines. Also for parting, grooving and turning.

- All inserts fit into the same tool holder
- Easy indexing and good accessibility when changing inserts
- Sharp cutting edges
- Low cutting forces

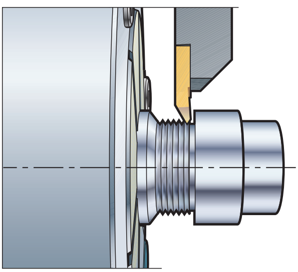
All inserts fit into CoroCut XS shank holders. Three types of insert: C, N and A.

MATR right-hand cutting insert/tool holder.

MATL left-hand cutting insert/tool holder.



C = Left hand
N = Neutral
A = Right hand

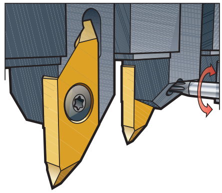


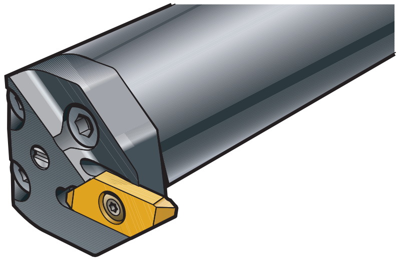
With insert types A and C, threads can be machined very close to the component.

Tool holder recommendations

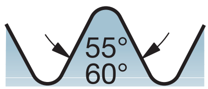
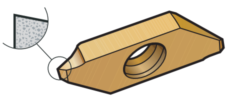
All inserts fit into the same tool holder and also with CoroTurn SL cutting heads.

Good accessibility is achieved when changing inserts, as the insert screw can be reached from both sides – to reduce downtime.





Assortment - CoroCut® XS

	 VM V-profile 60° (VM) Pitch: 0.2 – 2 mm 12 – 80 t.p.i.	
Type of insert		
F-sharp	•	
Geometry	F-sharp 	
Grade	ISO P M N S	GC1025 GC1105 H13A

For cutting data information, refer to chapter 5, Technical reference (page 86) and for infeed recommendations see chapter 5, Technical reference (page 109).

CoroTurn® XS – internal precision threading

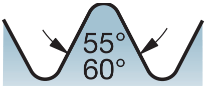
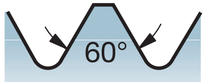
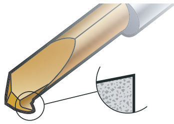
CoroTurn XS has an insert in the form of a rod, mounted in an easily-indexable adaptor. The tool is intended for precision machining in hole diameters from 0.3 – 12 mm (.012 – .412 inch), with extremely sharp cutting edges giving good results at low feeds.

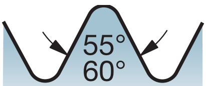
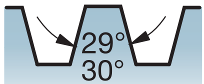
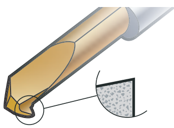
Threading inserts are available for UN, Whitworth, metric, TR and NPT thread forms.

CBN inserts
CB7015

For cutting data information, refer to chapter 5, Technical reference (page 86) and for infeed recommendations see chapter 5, Technical reference (page 110).

Assortment - CoroTurn® XS

		
	VM	**MM – UN**
	V-profile 60° (VM) Pitch: 0.5 – 1.5 mm 48 – 16 t.p.i.	Metric: 60° (MM) Pitch: 0.5 – 2.0 mm UN 60° (UN) Pitch: 32 – 16 t.p.i.
Type of insert		
F-sharp	•	•
Geometry	F-sharp	
Grade	ISO P M N S	GC1025 (VM, MM-UN)
	H	CB7015 (VM)

		
	WH – NT	**AC – SA**
	Whitworth 55° Pitch: 28 – 19 t.p.i. NPT 60° (NT) Pitch: 27 – 18 t.p.i.	ACME 29° (AC) Pitch: 1.5 – 3 mm STUB-ACME 29° (SA) Pitch: 16 – 8 t.p.i.
Type of insert		
F-sharp	•	•
Geometry	F-sharp	
Grade	ISO P M N S	GC1025

CoroCut® MB – internal threading

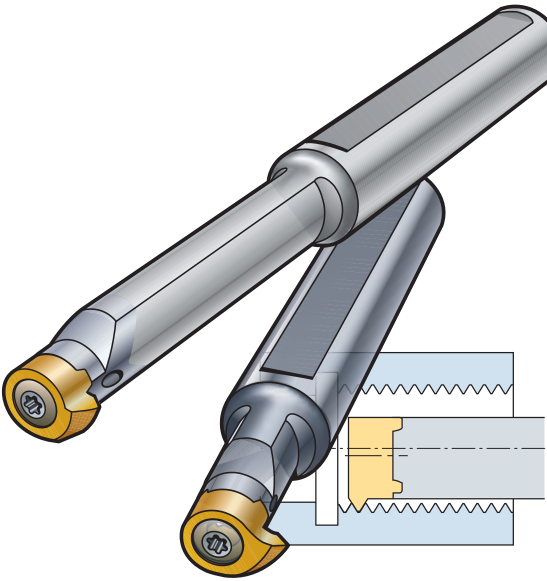
CoroCut MB has front-mounted exchangeable inserts for internal machining in hole diameters from 10 – 25 mm (.394 – .984 inch). Its sharp cutting edges give good results at low feeds.

Boring bars are available in steel and carbide, with through coolant. The bars are to be used together with EasyFix clamping in up to 6 x bar diameter overhang.

- Sharp cutting edges
- Accurate clamping for correct orientation
- Round mounted exchangeable insert
- EasyFix for fewer vibrations and fast set-up

Assortment

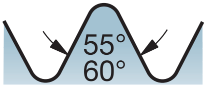
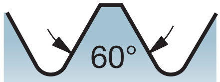
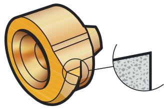
Steel bars - for up to 3 x bar diameter overhang
Carbide bars - for up to 6 x bar diameter overhang

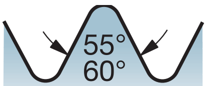
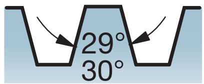
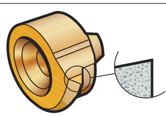


For cutting data information, refer to chapter 5, Technical reference (page 86) and for infeed recommendations see chapter 5, Technical reference (page 111).

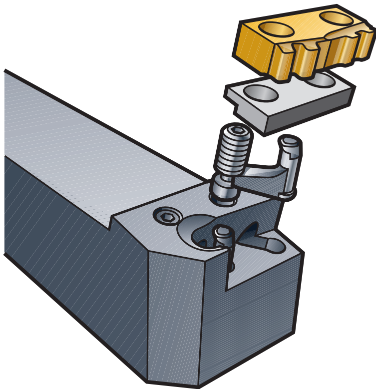
SANDVIK Coromant

Assortment - CoroCut® MB

		
	VM	MM – UN
	V-profile 60° (VM) Pitch: 0.5 – 2.5 mm 32 – 10 t.p.i.	Metric: 60° (MM) Pitch: 0.5 – 2.5 mm UN 60° (UN) Pitch: 18 – 14 t.p.i.
Type of insert		
F (sharp)	•	•
Geometry	F-geometry	
Grade	ISO P M N S H	GC1025 (VM, MM-UN) CB7015 (MM)

		
	WH – NT	AC – SA
	Whitworth 55° Pitch: 19 – 11 t.p.i. NPT 60° (NT) Pitch: 18 – 14 t.p.i.	ACME 29° (AC) Pitch: 16 – 8 t.p.i. STUB-ACME 29° (SA) Pitch: 16 – 8 t.p.i.
Type of insert		
F (sharp)	•	•
Geometry	F-geometry	
Grade	ISO P M N S	GC1025

T-Max Twin-Lock® – internal and external threading



Designed for threading in high volume areas of the oil and gas industry. Examples of applications are tubing, casing and coupling production.

The system also covers connection threads, where indexing accuracy, insert edge reliability and repeatability are essential.

- Productive threading with multi-tooth inserts
- Minimum hole diameter 60 mm (.2.36 inch)
- ISO-M, -S, -P, -K, -N materials
- Optimized for steel

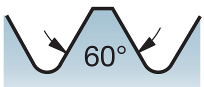
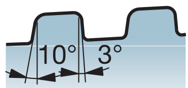
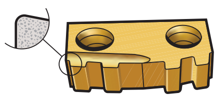
Tool holders

- SL-cutting head 40 mm
- Shank tool 32x32 mm
- Cartridge

Inserts

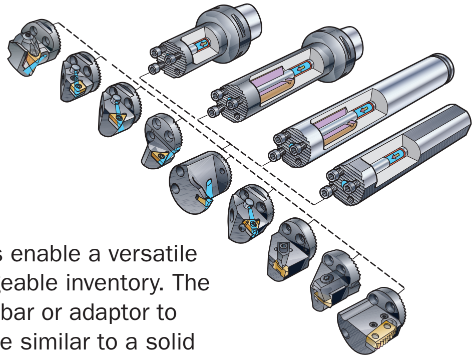
- API Round 10 – 8 t.p.i.
- API Buttress 3/4 – 1 i.p.f.

Assortment - T-Max Twin-Lock®

		
	RD	V – RD – BU
	API 60° (RD) Pitch: 10 – 8 t.p.i.	API Buttress (BU) Pitch: 5 t.p.i.
Type of insert		
A (all-round)	•	•
No. of points	3 or 4	2
Geometry	All-round	
Grade	ISO P M K N S	GC1125

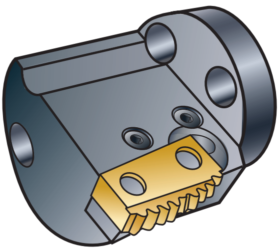
For cutting data recommendations see chapter 5, Technical reference (page 86).

CoroTurn® SL cutting heads – internal and external threading

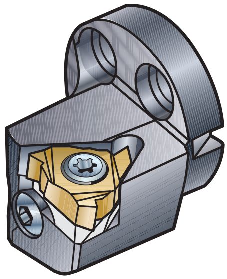


SL (serration lock) exchangeable cutting heads enable a versatile range of cutting units to be built from a manageable inventory. The tools can be attached to a CoroTurn SL boring bar or adaptor to provide added tooling flexibility, with performace similar to a solid tool regarding deflection and vibration.

For threading, exchangeable cutting heads are available for CoroThread® 266 and T-Max® Twin Lock.



T-Max Twin Lock®



CoroThread® 266

Choice of bar

The CoroTurn SL assortment includes:

- Coromant Capto and conventional shank design
- Solid steel bars and dampened Silent Tools
- Through coolant with every bar type

Vibration energy is absorbed by the tool bar making productive cutting data possible.

Extended offer

Due to the wide range of thread styles with different shapes and pitches, Sandvik Coromant have prepared special insert types for CoroThread 266, outside the standard range. These inserts ensure high thread quality, productivity and flexibility and are available for the following thread designations:

CoroThread 266 threading inserts

11 – 27 mm (1/4” – 5/8”)

General threading profiles:
- MJ, ISO5855
- UNJ, ISO3166 (internal)
- American Buttress, ANSI B1.9

Oil pipe threading
- Hughes H90
- Big Omega

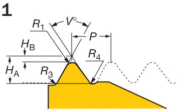
Tailor Made

In the Tailor Made system, additional tool options are available for your specific requirements - in grades GC1125, GC1135 and H13A.

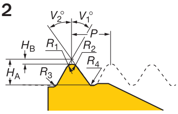
Simply provide us with information regarding flank angles, profile height and radius - to design your individual profile. See below for further information.

Profile options

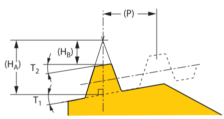
1



2



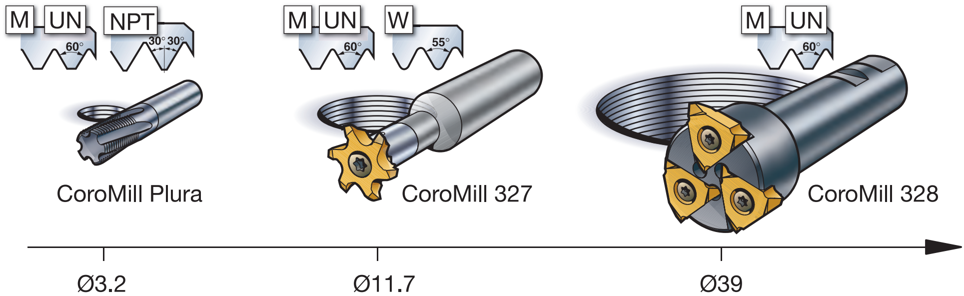
Taper angles



Contact your local Sandvik Coromant representative for more details and a quotation.

Thread Milling

The main options for thread milling using Sandvik Coromant tools are single-point threading with CoroMill® 327 and CoroMill® 328, and multi-point threading with CoroMill® Plura.



	CoroMill® Plura	CoroMill® 327	CoroMill® 328
Pitch	0.7 – 3 mm 28 – 10 t.p.i.	1 – 4.5 mm 24 – 5 t.p.i.	1.5 – 6 mm 16 – 4 t.p.i.
Cutter dia (D_c), mm (inch)	3.2 – 19 (.189 – .783)	11.7 – 21.7 (.461 – .854)	39 – 80 (1.535 – 2.480)
ISO	P M K N S H	P M K N S H	P M K N S H

- CoroMill 327 and CoroMill 328 are first choice for large threads and difficult materials
- CoroMill Plura is first choice for smaller threads and easier materials

CoroMill® 327 and CoroMill® 328 – Single-point threading

CoroMill tools offer many advantages for thread milling. For single-point threading, use CoroMill 327 and CoroMill 328.

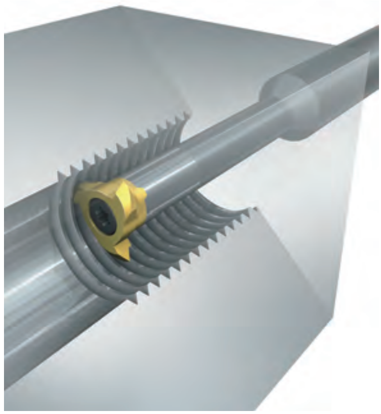
These versatile tools have different diameters and pitches, and are designed for non-rotating components:

- Same inserts (V-profile) can be used for different pitches
- Low cutting forces make CoroMill 327 and CoroMill 328 the first choice for internal, medium to large threads and also when stability is bad, such as milling threads in long overhangs and in thin-walled components
- CoroMill 328 offers indexable cutting edges for productive, cost-effective machining
- Can be used in low-power machines
- First choice for large, threads on asymmetric components
- For small batch sizes and mixed production
- No risk for conical threads caused by bending
- High productivity due to many teeth
- One grade for both tools (GC1025) covers all ISO material types

CoroMill® 327

Designed for holes over 12 mm (.472 inch), CoroMill 327 offers inserts for metric, UN and Whitworth threads. The front-mounted inserts are positioned in grooves for secure mounting, and through-tool coolant aids chip evacuation, giving secure and continuous performance.

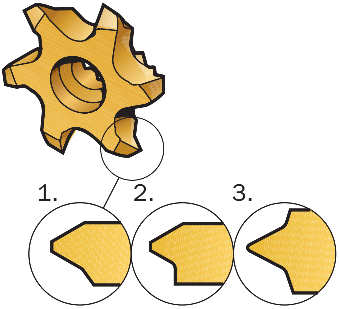
CoroMill 327 is available in versatile grade GC1025, for all material types.



Weldon shank

Use CoroMill 327 with steel or solid carbide shanks, available in four diameters, and in overhangs from 74 – 160 mm (2.193 – 6.3 inch).

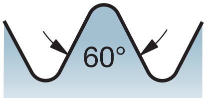
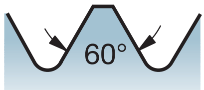
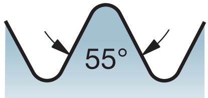
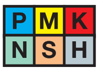
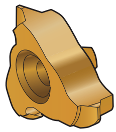
- Steel shanks - for general machining, when milling conditions are good
- Solid carbide shanks - provide lower deflection, enabling longer overhangs and tougher machining with minimized vibration.



1. V-profile 60°
*2. Full profile 60°
3. Full profile 55° (Whitworth)

* Compared to full profile turning inserts, full profile (60°) milling inserts top only one side of the thread form.

Assortment - CoroMill® 327

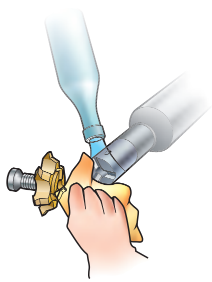
			
	MM	**VM**	**WH**
	Metric 60° (MM) Pitch: 1.50 – 4.50 mm	V-profile 60° (VM) Pitch: 1.00 – 4.50 mm 24 – 5 t.p.i.	Whitworth 55° (WH) 19 – 11 t.p.i.
Diameter (D_c) mm, (inch)	21.7 (.854)	11.7 – 21.7 (.461 – .854)	11.7 (.461)
No. of teeth (z_n)	3	3, 6	3
Grade	ISO 	GC1025	

h_{ex}	0.05 mm .002 inch	(0.02 – 0.07) (.0008 – .003)
Max rec. f_z	0.15 mm .006 inch	

Handling

For best performance, always clean the tip seat before use. Pre-load the tip-seat on a new tool by mounting and un-mounting the screw. Use the correct torque for mounting the insert.

Insert size	Torque
6	1.8
9	4.3
12	6.5
14	6.5

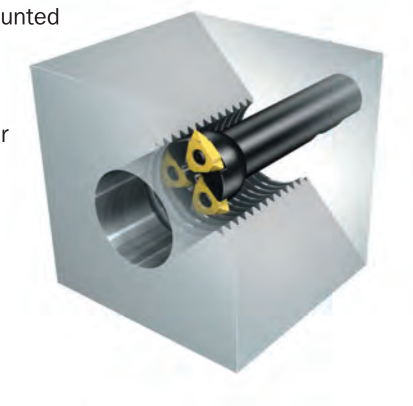


CoroMill® 328

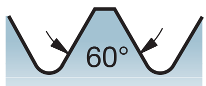
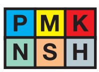
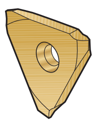
For larger holes over 39 mm (1.535 inch), CoroMill 328 offers inserts for metric and UN threads. Inserts are pocket-mounted for safe and stable positioning, with 3 cutting edges per insert and high-pitch cutter bodies.

CoroMill 328 is available in versatile grade GC1025, for all material types.

Weldon, arbor and bore with keyway mounting.



Assortment - CoroMill® 328

		
	VM	
	V-profile 60° (VM) Pitch: 1.50 – 6.00 mm 16 – 4 t.p.i.	
Diameter (D_c) mm, (inch)	39 – 100 (1.535 – 2.480)	
No. of teeth (z_n)	2 – 8	
Grade	ISO 	GC1025 

h_{ex}	0.10 mm .004 inch	(0.05 - 0.15) (.002 - .006)
Max rec. f_z	0.15 mm .006 inch	

SANDVIK Coromant

CoroMill® Plura – Multi-point threading

CoroMill Plura solid carbide thread mills produce different threads of the same pitch with one tool. Threads are milled in one pass and this multi-point tool gives a true full-profile thread form, with 60° metric, UNC/UNF and NPT/NPTF options available

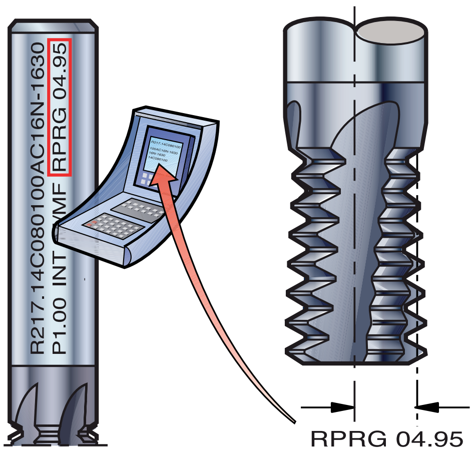
CoroMill Plura is designed for smaller thread sizes in diameters down to 3.2 mm (.126 inch) and in two optimized grade choices, with or without through coolant. It is the ideal tool for mass production.

Easy programming

The cutting diameter of each tool has to be considered carefully when the operation is programmed, and programming with radius correction allows easy adjustment of thread tolerances. CoroMill Plura has an individual radius programming (RPRG) value marked on the shank, to indicate the exact pitch diameter and radius correction required for optimum thread quality.

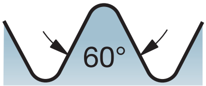
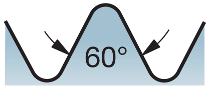
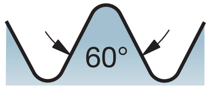
The RPRG value is normally entered into the tool radius offset, and using this will prevent the first thread from being too large, as long as the operational conditions are good.

For more information see chapter 5, Technical reference (page 93).



Tool radius programming value.

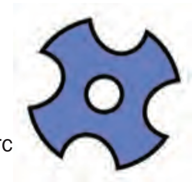
Assortment - CoroMill® Plura

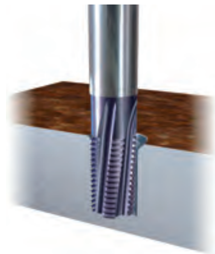
			
	MM	**UNC/UNCF**	**NPT/NPTF**
	Metric 60° (MM) Pitch: 0.7 – 3.0 mm	UN 60° (UN) 28 – 10 t.p.i.	NPT/NPTF 60° 27 – 11.5 t.p.i.
Type of insert			
Full-profile	•	•	•
Diameter (D_c) mm, (inch)	3.2 – 19	(.189 – .551)	(.311 – .783)
No. of teeth (z_n)	3 – 5	3 – 5	3 – 5
ISO	P M K N S H	GC1620 GC1630	

CoroMill Plura – grade selection

GC1630
With internal coolant

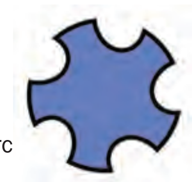
≤48 Hrc

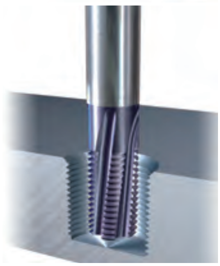




GC1620
Without internal coolant

≤56 Hrc





Cutting data and programming

Use PluraGuide for tool selection, cutting data and programming information.

SANDVIK
Coromant

Grade information

The wide range of carbide threading grades from Sandvik Coromant offers high productivity for many materials and applications. Once you have selected the most suitable tool for the threading operation, simply choose the available grade which most closely matches your application requirements.

Grades available for each tooling system

	GC1125	GC1135	GC1020	GC4125	GC1025	H13A	GC1105	GC1620	GC1630	CB7015
CoroThread® 266	•	•	•							
T-Max Twin-Lock®	•			•						
CoroCut® XS					•	•	•			
CoroCut® MB					•					•
CoroTurn® XS					•					•
CoroMill® 327					•					
CoroMill® 328					•					
CoroMill® Plura								•	•	

See chapter 4. Troubleshooting, for tips on how to optimize tool life and manage different forms of insert wear.

Grades overview by ISO material type

	P	M	K	N	S	H
CB7015						•
GC1105		•			•	
H13A		•	•	•	•	
GC1125	•	•	•	•	•	•
GC1620	•					•
GC1630	•	•	•	•	•	
GC4125	•	•	•		•	•
GC1025	•	•	•	•	•	•
GC1020	•	•	•	•	•	•
GC1135	•	•	•	•	•	

Wear resistance (Hard grade)

↕

Toughness (Soft grade)

P ISO P = Steel

M ISO M = Stainless steel

K ISO K = Cast iron

N ISO N = Non-ferrous material

S ISO S = Heat resistant super alloys

H ISO H = Hardened materials

GC1125

Coating: PVD TiCrAlN
Tools: CoroThread 266. T-Max Twin-Lock

PVD grade for ISO P, -M, -K, -N materials. Combines the superior wear resistance of a coated grade with the edge sharpness and toughness of an uncoated grade. Optimized for steel threading and for speeds from medium to high.

GC1125 makes it possible to decrease the number of passes or increase cutting speed, compared to CoroThread 266 GC1020.

GC1135

Coating: PVD TiCrAl
Tools: CoroThread 266

PVD grade for ISO M, -S, -P and -K materials, optimized for stainless steel and heat resistant super alloys. The best choice for sharp profiles in all materials and at speeds from medium to low.

GC1135 makes it possible to decrease the number of passes or increase cutting speed, compared to CoroThread 266 GC1020.

GC1020

Coating: PVD TiN
Tools: CoroThread 266

Competitive, all-round threading grade. Works best at medium to low cutting speeds, with a thin coating ideal for sharp cutting edges.

GC4125

Coating: PVD TiAlN
Tools: T-Max Twin-Lock

Thick, PVD coating which is more wear resistant than GC1020 – and enables higher cutting speeds, especially in the ISO P area.

GC1025

Coating: PVD TiAlN coating (thin)

Tools: CoroCut XS, CoroCut MB, CoroTurn XS, CoroMill 327 and CoroMill 328.

All-round grade for all materials and applications, with thin PVD TiAlN coating ideal for sharp edges.

H13A

Coating: Uncoated
Tools: CoroCut XS, CoroThread 266

Uncoated grade for all materials. Good wear resistance, toughness and edge sharpness for the ISO N area. The first choice grade for titanium.

CB7015

Coating: CBN-tipped
Tools: CoroCut MB

Inserts with brazed CBN tips, ideal for threading hardened components. Can be applied in the hardness range HRc 55 – 62 and for finishing at limited cutting depths. Eliminates the need for grinding operations

GC1105

Coating: PVD TiAlN coating (thin)
Tools: CoroCut XS

First-choice grade for the ISO M and -S area. A hard substrate with a thin coating ideal for sharp edges makes it first choice for threading in medical components. Also with high plastic deformation resistance.

GC1620

Coating: PVD TiAlN (thin)
Tools: CoroMill Plura

CoroMill Plura grade for semi-finishing to finishing operations demanding wear resistance, especially in dry machining. Also performs well when machining stainless steels in wet conditions.

Covers ISO P -M -K -S -H materials, with grade hardness ≤56 HRc.

GC1630

Coating: PVD TiAlN
Tools: CoroMill Plura

CoroMill Plura grade for roughing to semi-finishing operations demanding edge line toughness. Also performs well when machining very soft- and smearing steels.

Covers ISO P -M -K -N -S materials, with grade hardness ≤48 HRc.

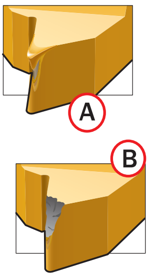
4. Troubleshooting

Careful observation of the insert/cutting edge after machining can help to optimize results regarding tool life, thread quality and cutting speed. Use this list of causes and solutions to different forms of insert wear as a reference for successful threading.

Thread turning

Problem	Cause	Solution

Plastic deformation



Starts as plastic deformation (A).

Leads to edge chipping (B)

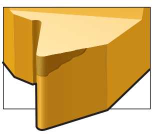
Cause

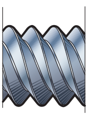
- Excessive temperature in cutting zone
- Inadequate supply of coolant
- Wrong grade

Solution

- Reduce the cutting speed, increase the number of infeeds
- Reduce the largest infeed depth, check the diameter before threading
- Improve coolant supply
- Choose a grade with better resistance to plastic deformation

Rapid flank wear



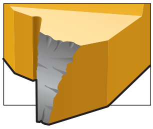
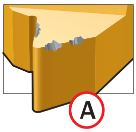
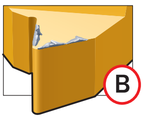


Cause

- Highly abrasive material
- Cutting speed too high
- Infeed depths too shallow
- Insert is above centre line

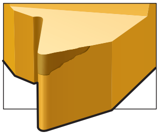
Solution

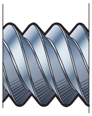
- Choose a more wear resistant grade
- Reduce cutting speed
- Reduce number of infeeds
- Adjust to correct centre height

Problem	Cause	Solution
Insert breakage 	• Wrong turned diameter prior to threading • Infeed series too tough • Wrong grade • Poor chip control • Incorrect centre height	• Turn to correct diameter before threading operation (0.03 – 0.07 mm, .001 – .003 inch) radially larger than max. diameter for thread • Increase number of infeeds. Reduce size of the largest infeeds • Choose a tougher grade • Change to C-geometry and use modified flank infeed • Adjust to correct centre height
Built-up edge (BUE)   BUE (A) and edge frittering (B) often occur in combination. Accumulated BUE is then ripped away together with small amounts of insert material, which causes frittering.	• Often occurs in stainless material • Often occurs in low carbon steel • Unsuitable grade • Cutting edge temperature too low	• Increase cutting speed • Choose a grade with good toughness

Problem	Cause	Solution

Abnormal flank wear



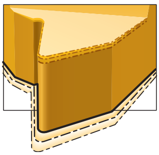


Poor surface on one flank of thread.

Cause:
- Incorrect method for flank infeed
- Insert inclination angle does not agree with the lead angle of the thread

Solution:
- Change method of flank infeed for F- and A-geometry to 3 - 5° from flank. For C-geometry to 1° from flank
- Change shim to obtain correct angle of inclination

Vibration



Cause:
- Incorrect workpiece clamping
- Incorrect tool set-up
- Incorrect cutting data
- Incorrect centre height

Solution:
- Use soft jaws
- Optimize centre hole and check pressure of face driver
  Minimize overhang of tool
  Check that the clamping sleeve for bars is not worn
  Use 4C anti-vibration bars
- Increase cutting speed; if this does not help, lower the speed dramatically. Try F-geometry
- Adjust to correct centre height
- Use solid carbide shanks

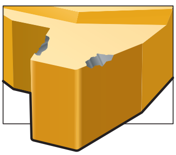
Problem	Cause	Solution
Poor surface finish		
	• Cutting speed too low • The insert is above the centre height • Uncontrolled chips • Re-cutting of chips	• Increase cutting speed • Adjust centre height • Use C-geometry and modified flank infeed • Use compressed air for evacuation
Poor chip control		
	• Incorrect method of infeed • Incorrect thread geometry	• For modified flank infeed use 3 - 5° • Use C-geometry with modified flank infeed 1°
Shallow profile		
	• Wrong centre height • Insert breakage • Excessive wear	• Adjust centre height • Change cutting edge • Increase radial infeed

Problem	Cause	Solution

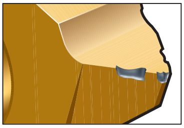
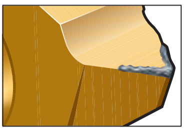
Incorrect thread profile

	• Unsuitable thread profile (angle of thread and nose radius) external inserts used for internal operation or vice versa • Wrong centre height • Holder not 90° to centre line • Pitch error in machine	• Adjust to correct tool, shim and insert combination • Adjust centre height • Adjust holder to 90° • Correct the machine

Excessive edge pressure

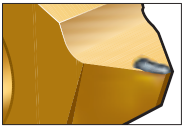
	• Work hardening material in combination with infeed depths which are too shallow • Excessive pressure on cutting edge • Insert thread profile angle too small	• Reduce the number of infeeds • Change to F-geometry • Change to a tougher grade • Use modified flank infeed

Thread milling

Problem	Cause	Solution
Chipping 	• The part of the cutting edge which is not in cut is damaged by chip hammering, leading to poor surface and excessive flank wear	• Increase cutting speed • Reduce feed at the beginning of the cut • Improve stability • Increase number of infeed passes • Use a full-profile insert
Built-up edge (B.U.E) 	Poor surface finish and cutting edge frittering when the built-up edge is torn away. • Cutting zone temperature is too low. • Very sticky material, such as low-carbon steel, stainless steels, and aluminium.	• Increase cutting speed or feed • Use oil mist or cutting fluid

Problem	Cause	Solution

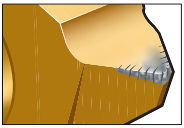
Crater wear



Cause
- Excessive wear causing a weakened edge
- Cutting edge breakthrough on the trailing edge leading to poor surface finish

Solution
- Reduce speed to reduce temperature
- Reduce feed

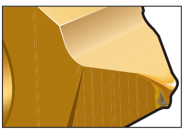
Thermal cracks



Cause
- Temperature variations from varying cutting fluid supply or intermittent machining leading to small cracks perpendicular to the cutting edge, insert frittering and poor surface finish

Solution
- Apply cutting fluid in large amounts, or not at all
- Reduce cutting speed

Plastic deformation



Cause

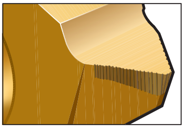
Plastic deformation of edge, depression or flank impression, leading to poor chip control, poor surface finish and insert breakage.

- Cutting temperature and pressure too high

Solution
- Reduce cutting speed
- Reduce feed

Problem	Cause	Solution

Flank wear

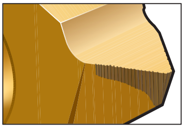


Rapid wear causing poor surface finish or out of tolerance.

- Cutting speed too high
- Insufficient wear resistance
- Feed, f_z, too low

Solution:

- Reduce cutting speed, v_c
- Increase feed, f_z

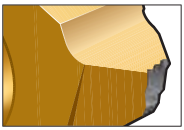


Excessive wear causing short tool life.

- Vibration
- Re-cutting of chips
- Burr formation on component
- Poor surface finish
- Heat generation
- Excessive noise

Solution:

- Increase feed, f_z
- Reduce speed
- Down milling
- Evacuate chips effectively using compressed air
- Check recommended cutting data

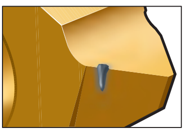


Uneven wear causing corner damage.

- Tool run-out
- Vibration
- Short tool life
- Bad surface finish
- High noise level
- Radial forces too high

Solution:

- Check chuck and collet
- Minimize tool overhang
- Fewer teeth in cut
- Split axial cutting depth, a_p, into more than one pass
- Reduce feed, f_z
- Reduce cutting speed, v_c
- HSM requires shallow passes
- Improve clamping of tool and workpiece

Problem	Cause	Solution
Vibration		
	• Weak fixturing • Tool overhang too long	• Check clamping of workpiece and tool • Minimize overhang • Check tool holder run out • Choose a tool with fewer teeth • Increase number of infeed passes • Increase feed per tooth • Reduce cutting speed • Use up-milling in finishing
Re-cutting of chips		
	• Insufficient chip evacuation	• Use compressed air or large amounts of cutting fluid, preferably through the tool • Reduce feed per tooth • Increase number of infeed passes
Notch wear		
	• Machining work-hardening materials • Components with skin and scale.	• Reduce cutting speed • Select a tougher grade • Increase cutting speed

Problem	Cause	Solution
Machine inefficiency		
	• Machine RPM's too low	• Reduce cutting speed before table speed • Use a smaller cutter and make several infeed passes • If using CoroMill Plura, change to CoroMill 327
Conical threads		
	• Cutting forces too high	• Reduce tool length • Use conventional milling • Reduce feed • Increase number of infeed passes

5. Technical reference

CoroThread® 266

Thread turning cutting speed recommendations, metric

ISO	MC No.	CMC No.	Material	Hardness Brinell HB	Grades GC1125 Cutting speed (v_c) m/min	GC1135	H13A
P	P1.1.Z.AN	01.1	**Steel** **Unalloyed** C = 0.1–0.25%	125	230	205	160
	P2.1.Z.AN	02.1	**Low alloyed (alloying elements ≤ 5%)** Non-hardened	180	155	140	115
	P3.0.Z.AN	03.21	**High alloyed (alloying elements > 5%)** Hardened tool steel	325	115	100	70
M	P5.0.Z.AN	05.11	**Stainless steel** **Ferritic/matensitic** Non-hardened	200	160	145	90
	M1.0.Z.AQ	05.21	**Austentic** Non-hardened	180	140	130	75
	M3.1.Z.AQ	05.51	**Austenitic-ferritic (Duplex)** Non-weldable ≥ 0.05%C	230	110	100	-
K	K1.1.C.NS	07.2	**Malleable cast iron** Pearlitic (long chipping)	230	125	110	70
	K2.2.C.UT	08.2	**Grey cast iron** High tensile strength	220	140	130	80
	K3.1.C.UT	09.1	**Nodular cast iron** Ferritic	160	140	135	110
N	N1.2.Z.UT	30.11	**Aluminium alloys** Wrought or wrought and coldworked. non-aging	60	500	500	500
	N1.3.C.UT	30.21	**Aluminium alloys** Cast. non-aging	75	500	500	425
	N3.2.C.UT	33.2	**Copper and copper alloys** Brass. leaded bronzes. ≤1% Pb	90	300	270	210
S	S1.0.U.AN	20.11	**Heat resistant super alloys** Iron base Annealed or solution treated	200	55	50	45
	S2.0.Z.AG	20.22	Nickel base Aged or solution treated and aged	350	15	15	13
	S4.2.Z.AN	23.21	**Titanium alloys** α. near α and $\alpha + \beta$ alloys. annealed	950 Rm	70	65	50
H	H1.3.Z.HA H1.3.Z.HA	04.1 04.1	**Extra hard steel** Hardened and tempered	46 HRC 60 HRC	60 39	50 32	50 45

For more information about grades and material. see Main catalogue.
Note: Most cutting speeds are recommended for a tool life of 15 minutes.

CoroTurn® XS

Cutting speed (v_c). m/min

GC1025

P	M	N	S
60-200	60-180	90-400	20-50

GC7015

H
60-200

CoroCut® MB

Cutting speed (v_c). m/min

GC1025

P	M	N	S
60-200	60-180	90-400	20-50

GC7015

H
60-200

CoroCut® XS

Cutting speed (v_c). m/min

GC1025/GC1105

P	M	N	S
60-200	60-180	90-400	20-50

CoroThread® 266

Thread turning cutting speed recommendations. inch

ISO	MC No.	CMC No.	Material	Hardness Brinell HB	Grades / Cutting speed (v_c) ft/min GC1125	GC1135	H13A
P	P1.1.Z.AN	01.1	**Steel** **Unalloyed** C = 0.1–0.25%	125	760	670	510
	P2.1.Z.AN	02.1	**Low alloyed (alloying elements ≤ 5%)** Non-hardened	180	510	460	380
	P3.0.Z.AN	03.21	**High alloyed (alloying elements ≤ 5%)** Hardened tool steel	325	375	320	230
M	P5.0.Z.AN	05.11	**Stainless steel** **Ferritic/matensitic** Non-hardened	200	520	475	295
	M1.0.Z.AQ	05.21	**Austentic** Non-hardened	180	460	425	250
	M3.1.Z.AQ	05.51	**Austenitic-ferritic (Duplex)** Non-weldable ≥ 0.05%C	230	360	330	-
K	K1.1.C.NS	07.2	**Malleable cast iron** Pearlitic (long chipping)	230	410	360	230
	K2.2.C.UT	08.2	**Grey cast iron** High tensile strength	220	460	425	265
	K3.1.C.UT	09.1	**Nodular cast iron** Ferritic	160	460	450	355
N	N1.2.Z.UT	30.11	**Aluminium alloys** Wrought or wrought and coldworked. non-aging	60	1650	1650	1650
	N1.3.C.UT	30.21	**Aluminium alloys** Cast. non-aging	75	1650	1650	1400
	N3.2.C.UT	33.2	**Copper and copper alloys** Brass. leaded bronzes. ≤1% Pb	90	980	890	490
S	S1.0.U.AN	20.11	**Heat resistant super alloys** Iron base Annealed or solution treated	200	180	165	145
	S2.0.Z.AG	20.22	Nickel base Aged or solution treated and aged	350	50	50	45
	S4.2.Z.AN	23.21	**Titanium alloys** α. near α and α + β alloys. annealed	950 Rm	560	520	-
H	H1.3.Z.HA H1.3.Z.HA	04.1 04.1	**Extra hard steel** Hardened and tempered	46 HRC 60 HRC	200 125	165 105	- -

For more information about grades and material. see Main catalogue.
Note: Most cutting speeds are recommended for a tool life of 15 minutes.

CoroTurn® XS

Cutting speed (v_c). ft/min

GC1025

P	M	N	S
196-656	196-590	295-1312	65-164

GC7015

H
196-656

CoroCut® MB

Cutting speed (v_c). ft/min

GC1025

P	M	N	S
196-656	196-590	295-1312	65-164

GC7015

H
196-656

CoroCut® XS

Cutting speed (v_c). ft/min

GC1025/GC1105

P	M	N	S
196-656	196-590	295-1312	65-164

CoroMill® 327 and CoroMill® 328

Thread milling cutting speed recommendations with grade GC1025, metric

ISO	MC No.	CMC No.	Material	Specific cutting force k_c N/mm²	Hardness Brinell HB	mc	Max chip thickness. h_{ex} mm 0.05–0.1–0.15 Cutting speed v_c. m/min
P	P1.1.Z.AN	01.1	**Steel** **Unalloyed** C = 0.1–0.25%	1500	125	0.25	365–360–345
	P2.1.Z.AN	02.1	**Low alloyed (alloying elements ≤ 5%)** Non-hardened	1700	175	0.25	300–295–285
	P3.0.Z.AN	03.21	**High alloyed (alloying elements ≤ 5%)** Hardened tool steel	2900	300	0.25	140–140–135
M	P5.0.Z.AN	05.11	**Stainless steel** **Ferritic/matensitic** Non-hardened	1800	200	0.21	255–225–180
	M1.0.Z.AQ	05.21	**Austentic** Non-hardened	1950	200	0.21	250–225–180
	M3.1.Z.AQ	05.51	**Austenitic-ferritic (Duplex)** Non-weldable ≥ 0.05%C	2000	230	0.21	205–185–145
K	K1.1.C.NS	07.2	**Malleable cast iron** Pearlitic (long chipping)	900	230	0.28	240–195–160
	K2.2.C.UT	08.2	**Grey cast iron** High tensile strength	1100	245	0.28	255–210–170
	K3.1.C.UT	09.1	**Nodular cast iron** Ferritic	900	160	0.28	200–165–135
N	N1.2.Z.UT	30.11	**Aluminium alloys** Wrought or wrought and coldworked. non-aging	400	60		990–910–850
	N1.3.C.UT	30.21	**Aluminium alloys** Cast. non-aging	600	75	0.25	990–910–850
	N3.2.C.UT	33.2	**Copper and copper alloys** Brass. leaded bronzes. ≤1% Pb	550	90		495–460–425
S	S1.0.U.AN	20.11	**Heat resistant super alloys** Iron base Annealed or solution treated	2400	200	0.25	65–60–55
	S2.0.Z.AG	20.22	Nickel base Aged or solution treated and aged	2900	350	0.25	37–34–32
	S4.2.Z.AN	23.21	**Titanium alloys** α. near α and $\alpha + \beta$ alloys. annealed	1400	950	0.23	70–65–60
H	H1.3.Z.HA	04.1	**Extra hard steel** Hardened and tempered	4200	59 HRC	0.25	40–36–29

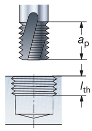
CoroMill® 327 and CoroMill® 328

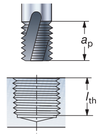
Thread milling cutting speed recommendations with grade GC1025, inch

ISO	MC No.	CMC No.	Material	Specific cutting force k_c lbs/in²	Hardness Brinell HB	mc	Max chip thickness. h_{ex} inch .002-.004-.008 Cutting speed v_c, ft/min
P	P1.1.Z.AN	01.1	**Steel** **Unalloyed** C = 0.1–0.25%	216,500	125	0.25	1200-1200-1150
	P2.1.Z.AN	02.1	**Low alloyed (alloying elements ≤ 5%)** Non-hardened	246,500	175	0.25	990-970-930
	P3.0.Z.AN	03.21	**High alloyed (alloying elements ≤ 5%)** Hardened tool steel	420,000	300	0.25	465-455-435
M	P5.0.Z.AN	05.11	**Stainless steel** **Ferritic/matensitic** Non-hardened	262,000	200	0.21	910-890-840
	M1.0.Z.AQ	05.21	**Austentic** Non-hardened	285,000	200	0.21	890-870-830
	M3.1.Z.AQ	05.51	**Austenitic-ferritic (Duplex)** Non-weldable ≥ 0.05%C	286,500	230	0.21	740-720-680
K	K1.1.C.NS	07.2	**Malleable cast iron** Pearlitic (long chipping)	131,000	230	0.28	970-950-900
	K2.2.C.UT	08.2	**Grey cast iron** High tensile strength	159,500	245	0.28	1000-1000-960
	K3.1.C.UT	09.1	**Nodular cast iron** Ferritic	130,000	160	0.28	800-780-750
N	N1.2.Z.UT	30.11	**Aluminium alloys** Wrought or wrought and coldworked. non-aging	58,000	60		3650-3600-3500
	N1.3.C.UT	30.21	**Aluminium alloys** Cast. non-aging	87,000	75	0.25	3650-3600-3500
	N3.2.C.UT	33.2	**Copper and copper alloys** Brass. leaded bronzes. ≤1% Pb	80,000	90		1850-1800-1750
S	S1.0.U.AN	20.11	**Heat resistant super alloys** Iron base Annealed or solution treated	348,000	200	0.25	220-215-215
	S2.0.Z.AG	20.22	Nickel base Aged or solution treated and aged	420,500	350	0.25	130-130-125
	S4.2.Z.AN	23.21	**Titanium alloys** α. near α and α + β alloys. annealed	203,000	950	0.23	185-180-175
H	H1.3.Z.HA	04.1	**Extra hard steel** Hardened and tempered	606,500	59 HRC	0.25	215-215-195

CoroMill® Plura

Thread milling cutting data recommendations. metric

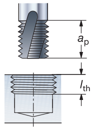
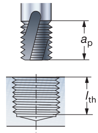




ISO	Material CMC No.	Hardness HB	HRC	Thread mill Thread	Dimensions, mm D_c	z_n	With internal coolant supply	Cutting speed v_c, m/min	Feed/tooth f_z, mm	Cutting speed v_c, m/min	Feed/tooth f_z, mm
P	Unalloyed steel			M4	3.2	3	–	152	0.030	141	0.018
	01.1	125		M10	8.2	4	•	132	0.052	124	0.029
				M20	16	5	•	141	0.130	131	0.069
	Low alloy steel			M4	3.2	3	–	147	0.012	137	0.006
	02.2	300		M10	8.2	4	•	164	0.086	153	0.05
				M20	16	5	•	173	0.089	162	0.118
	High alloy steel			M4	3.2	3	–	163	0.035	151	0.015
	03.21	450		M10	8.2	4	•	164	0.061	153	0.049
				M20	16	5	•	173	0.012	162	0.118
M	Stainless steel			M4	3.2	3	–	81	0.024	75	0.009
	05.11	200		M10	8.2	4	•	82	0.052	76	0.036
				M20	16	5	•	86	0.089	93	0.089
				M4	3.2	3	–	53	0.018	49	0.007
	05.21	200		M10	8.2	4	•	53	0.052	50	0.027
				M20	16	5	•	56	0.089	53	0.072
				M4	3.2	3	–	53	0.018	49	0.007
	05.51	230		M10	8.2	4	•	53	0.052	50	0.027
				M20	16	5	•	56	0.131	53	0.074
K	Malleable cast iron			M4	3.2	3	–	80	0.020	77	0.016
	07.2			M10	8.2	4	•	89	0.061	83	0.036
				M20	16	5	•	82	0.084	83	0.089
	Nodular cast iron			M4	3.2	3	–	76	0.018	73	0.014
	08.2			M10	8.2	4	•	86	0.038	79	0.034
				M20	16	5	•	79	0.075	80	0.080
	Grey cast iron			M4	3.2	3	–	101	0.027	97	0.020
	09.1			M10	8.2	4	•	104	0.047	105	0.048
				M20	16	5	•	104	0.089	97	0.067
N	Aluminium			M4	3.2	3	–	503	0.040	503	0.035
	30.11	60		M10	8.2	4	•	1120	0.089	1060	0.061
				M20	16	5	•	1130	0.089	1060	0.089
				M4	3.2	3	–	434	0.040	404	0.014
	30.21	95		M10	8.2	4	•	461	0.061	432	0.061
				M20	16	5	•	467	0.089	436	0.089
				M4	3.2	3	–	273	0.028	262	0.021
	33.2	150		M10	8.2	4	•	278	0.053	260	0.026
				M20	16	5	•	282	0.089	263	0.071
S	Heat resistant alloys			M4	3.2	3	–	35	0.006	35	0.003
	20.11	200		M10	8.2	4	•	37	0.023	35	0.013
				M20	16	5	•	38	0.066	38	0.063
	Titanium alloys			M4	3.2	3	–	30	0.030	29	0.020
	20.22	300		M10	8.2	4	•	32	0.013	30	0.007
				M20	16	5	•	32	0.037	30	0.018
	23.21	300		M4	3.2	3	–	55	0.012	51	0.060
				M10	8.2	4	•	58	0.037	54	0.020
				M20	12	6	•	59	0.089	55	0.051
H	Hardened steel			M4	4.5	4	–	43	0.010	40	0.005
	04.1		55	M10	8.2	5	–	42	0.022	45	0.035
				M20	12	5	–	45	0.042	42	0.021
	04.1		60	M4	4.5	4	–	30	0.005	30	0.003
				M10	8.2	5	–	29	0.011	28	0.006
				M20	12	5	–	30	0.022	28	0.010

CoroMill® Plura

Thread milling cutting data recommendations. inch

ISO	Material	CMC No.	Hardness HB	Hardness HRC	Thread mill Thread	Dimensions, inch D_c	z_n	With internal coolant supply	 Cutting speed v_c, ft/min	Feed/tooth f_z, mm	 Cutting speed v_c, ft/min	Feed/tooth f_z, mm
P	Unalloyed steel				M4	.126	3	–	500	.0012	465	.0007
		01.1	125		M10	.323	4	•	435	.0020	410	.0012
					M20	.630	5	•	465	.0051	430	.0028
	Low alloy steel				M4	.126	3	–	485	.0005	440	.0003
		02.2	300		M10	323	4	•	540	.0034	500	.0020
					M20	.630	5	•	570	.0036	535	.0046
	High alloy steel				M4	.126	3	–	540	.0014	500	.0006
		03.21	450		M10	.323	4	•	550	.0024	520	.0020
					M20	.630	5	•	570	.0005	540	.0046
M	Stainless steel				M4	.126	3	–	265	.0010	245	.0004
		05.11	200		M10	.323	4	•	270	.0020	250	.0014
					M20	.630	5	•	280	.0036	310	.0036
					M4	.126	3	–	175	.0007	160	.0007
		05.21	200		M10	.323	4	•	175	.0020	165	.0012
					M20	.630	5	•	185	.0036	170	.0029
					M4	.126	3	–	175	.0008	160	.0003
		05.51	230		M10	.323	4	•	175	.0020	165	.0012
					M20	.630	5	•	185	.0052	175	.0030
K	Malleable cast iron				M4	.126	3	–	265	.0008	260	.0006
		07.2			M10	.323	4	•	290	.0022	275	.0014
					M20	.630	5	•	270	.0032	275	.0036
	Nodular cast iron				M4	.126	3	–	260	.0007	250	.0006
		08.2			M10	.323	4	•	310	.0014	285	.0013
					M20	.630	5	•	285	.0030	290	.0032
	Grey cast iron				M4	.126	3	–	340	.0012	330	.0008
		09.1			M10	.323	4	•	345	.0020	340	.0020
					M20	.630	5	•	345	.0036	330	.0026
N	Aluminium				M4	.126	3	–	1660	.0016	1660	.0014
		30.11	60		M10	.323	4	•	3700	.0036	3500	.0024
					M20	.630	5	•	3750	.0036	3500	.0036
					M4	.126	3	–	1430	.0016	1330	.0007
		30.21	95		M10	.323	4	•	1520	.0025	1420	.0034
					M20	.630	5	•	1540	.0036	1445	.0036
					M4	.126	3	–	900	.0011	890	.0009
		33.2	150		M10	.323	4	•	920	.0021	870	.0012
					M20	.630	5	•	930	.0036	880	.0028
S	Heat resistant alloys				M4	.126	3	–	115	.0002	115	.0001
		20.11	200		M10	.323	4	•	120	.0011	115	.0006
					M20	.630	5	•	125	.0026	125	.0025
	Titanium alloys				M4	.126	3	–	100	.0012	100	.0008
		20.22	300		M10	.323	4	•	105	.0006	100	.0003
					M20	.630	5	•	105	.0015	100	.0007
		23.21	300		M4	.126	3	–	180	.0005	165	.0002
					M10	.323	4	•	190	.0015	175	.0008
					M20	.630	6	•	195	.0036	180	.0022
H	Hardened steel				M4	.177	4	–	140	.0004	130	.0002
		04.1		55	M10	.323	5	–	135	.0010	150	.0014
					M20	.427	5	–	150	.0017	135	.0009
		04.1		60	M4	.177	4	–	100	.0002	100	.0001
					M10	.323	5	–	100	.0005	100	.0002
					M20	.472	5	–	100	.0010	100	.0004

Programming

Modern machine tools use computer numerical control (CNC) methods to produce complex parts in a consistent and automated manner. This capability is especially important when producing threads.

CNC machines can process 2-dimensional and 3-dimensional shapes using their coordinate axes, with each machine typically having 3-axis (X, Y, Z) - though machines with up to 12-axes do exist. For threading, the methods of CNC programming differ in lathes and machining centres and dedicated CNC programs exist for threading and turning.

Programming – lathe

When thread turning, it is important to use the correct CNC code to ensure good tool life, chip control, surface and tolerance. Fixed cycles, or the dialog system are common ways to program a lathe for threading. However, line programming (long-hand code) is the optimum method and can be used with all CNC systems.

Obtaining the correct infeed (thread turning)

Modified-flank infeed and radial infeed are the preferred methods of achieving good threading results. Line programming is recommended to accurately control the infeed angle and number of passes.

Recommendations (thread turning)

- Correct thread programming is important - especially for large threads and pitches.
- Use the recommended infeed depth in CoroGuide to ensure the correct number of passes.
- With flank infeed, the angular displacement must also be calculated.

Example ISO longhand code (lathe)

```
T0101 (THREADING TOOL)
G97 S2103 M3
G0 X26.0 Z8.5 M8
G0 X23.623 Z4.5
G32 Z-26.5 F2.0
G0 X26.0
G0 Z4.404
G0 X23.083
G32 Z-26.5 F2.0
```

G32 is the command for the threading movement in the machine. This code can differ depending of the CNC system (check your machine manual to confirm). If the start point for the threading operation varies in the z-axis, the thread should be programmed with flank infeed.

Programming – machining centre

In thread milling; rolling in and out of cut achieves good tool life and high thread quality
When programming a large thread profile, it may be necessary to split up the machining into at least two passes.

The most useful software for selection of cutting data, tool and programming a thread with a milling cutter is PluraGuide (non-CAM software).

The only difference between programming CoroMill Plura and CoroMill 327/CoroMill 328 is the need to repeat the circular motion until the correct thread depth has been reached (circular ramping).

Programming the feed rate on most machining centres is based on the centre line of the spindle. This must be taken into account to avoid shortened tool life, vibration or tool breakdown.

CoroMill® Plura

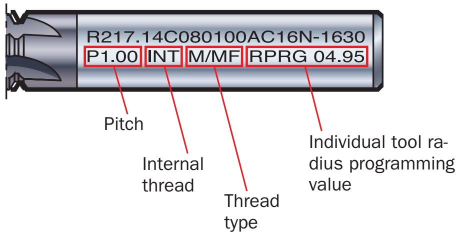
CoroMill Plura has an individual radius programming value (RPRG) marked on the shank of the tool.

The RPRG value indicates each cutter's exact pitch diameter and the radius required for optimum thread quality.
The RPRG value is normally entered into the tool memory offset.

Using the RPRG will prevent the first thread from being too large, as long as the operational conditions are good.

Climb milling

Cutting speed v_c	127 m/min 5000 inch/min
Feed per tooth	0.059 mm .0023 inch
Time/thread	6
6H	"Rprg" - 0.053 mm



Example CNC code (machining centre)

CNC programme - FANUC

(M6) T

Tool call-in

G90 G17

Selection of working plane

S3369 M3

G00 G43H...X0.000 Y0.000 Z2.000

2 mm "above" workpiece surface on centerline of thread

G00 Z-21.000

Move to required depth on centerline of the pre-drilled hole

G41 D... G01 X0.000 Y6.000 F994

Set approach path for entry loop

G03 X0.000 Y-8.000 Z-20.000 10.000 J-7.000 F121

Move to the contour starting point

G03 X0.000 Y-8.000 Z-18.000 10.000 J8.000 F249

Thread milling

G03 X0.000 Y-6.000 Z-17.000 10.000 J7.000

Move clear of the contour

G40 G01 X0.000 Y0.000

Re-set to centerline

G00 Z2.000

Retract from thread

Repeat this program for CoroMill 327/CoroMill 328. until the right thread depth is achieved.

You can use the RPRG value marked on the tool as starting value for new thread milling cutters.

The feed rates of the radii have already been adjusted. If your control reduces the feed rate for concave forms automatically, the additionally reduced values for the circular path are not needed. If you need to recalculate the feed for thread milling, see recommendations on page 88-91.

Thread turning infeed recommendations

ISO Metric (MM), external

		Pitch, mm														
		0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00
No. of infeeds	**Unit**	**Radial infeed per pass**														
1	mm	0.10	0.16	0.16	0.17	0.20	0.17	0.20	0.20	0.20	0.24	0.24	0.27	0.29	0.27	0.30
	inch	.004	.006	.006	.007	.008	.007	.008	.008	.008	.009	.009	.011	.011	.011	.012
2	mm	0.09	0.15	0.15	0.15	0.19	0.17	0.19	0.19	0.19	0.23	0.22	0.25	0.28	0.26	0.29
	inch	.004	.006	.006	.006	.007	.007	.007	.007	.007	.009	.009	.010	.011	.010	.011
3	mm	0.08	0.12	0.14	0.14	0.18	0.16	0.18	0.18	0.19	0.22	0.22	0.24	0.27	0.26	0.29
	inch	.003	.005	.006	.006	.007	.006	.007	.007	.007	.009	.009	.009	.011	.010	.260
4	mm	0.07	0.07	0.12	0.13	0.16	0.15	0.17	0.17	0.18	0.21	0.21	0.23	0.26	0.25	0.28
	inch	.003	.003	.005	.005	.006	.006	.007	.007	.007	.008	.008	.009	.010	.010	.011
5	mm			0.08	0.12	0.14	0.14	0.16	0.17	0.17	0.21	0.21	0.23	0.25	0.25	0.27
	inch			.003	.005	.006	.006	.006	.007	.007	.008	.008	.009	.010	.010	.011
6	mm				0.08	0.08	0.13	0.15	0.16	0.17	0.20	0.20	0.22	0.25	0.24	0.26
	inch				.003	.003	.005	.006	.006	.160	.008	.008	.009	.010	.009	.010
7	mm						0.11	0.13	0.15	0.16	0.18	0.19	0.21	0.24	0.23	0.26
	inch						.004	.005	.006	.006	.007	.007	.008	.009	.009	.010
8	mm						0.08	0.08	0.14	0.15	0.17	0.18	0.20	0.23	0.23	0.25
	inch						.003	.003	.006	.006	.007	.007	.008	.009	.009	.010
9	mm								0.12	0.14	0.16	0.17	0.19	0.22	0.22	0.24
	inch								.005	.006	.006	.007	.007	.009	.009	.009
10	mm								0.08	0.13	0.15	0.16	0.18	0.20	0.21	0.23
	inch								.003	.005	.006	.006	.007	.008	.008	.009
11	mm									0.12	0.13	0.15	0.17	0.19	0.20	0.22
	inch									.005	.005	.006	.007	.007	.008	.009
12	mm									0.08	0.08	0.14	0.16	0.17	0.19	0.20
	inch									.003	.003	.006	.006	.007	.007	.008
13	mm											0.12	0.14	0.15	0.18	0.19
	inch											.005	.006	.006	.007	.007
14	mm											0.08	0.10	0.10	0.16	0.17
	inch											.003	.004	.004	.006	.007
15	mm														0.14	0.15
	inch														.006	.006
16	mm														0.10	0.10
	inch														.004	.004
	mm	**0.34**	**0.50**	**0.65**	**0.79**	**0.95**	**1.11**	**1.26**	**1.56**	**1.88**	**2.18**	**2.49**	**2.79**	**3.10**	**3.39**	**3.70**
Total infeed	**inch**	**.013**	**.020**	**.026**	**.031**	**.037**	**.044**	**.050**	**.061**	**.227**	**.086**	**.098**	**.110**	**.122**	**.133**	**.146**

Extra stock is included in the total infeed	0.05 mm
	.002 inch
Reference material	
CMC	02.1
MC	P2.1.Z.AN

Thread turning infeed recommendations

ISO Metric (MM), internal

No. of infeeds	Unit	Pitch, mm 0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00
		Radial infeed per pass														
1	mm	0.10	0.15	0.15	0.16	0.20	0.16	0.19	0.19	0.19	0.22	0.21	0.23	0.26	0.25	0.28
	inch	.004	.006	.006	.006	.008	.006	.007	.007	.007	.009	.008	.009	.010	.010	.011
2	mm	0.09	0.14	0.14	0.15	0.18	0.15	0.18	0.18	0.18	0.21	0.21	0.23	0.26	0.25	0.27
	inch	.004	.005	.006	.006	.007	.006	.007	.007	.007	.008	.008	.009	.010	.010	.011
3	mm	0.08	0.12	0.13	0.14	0.17	0.15	0.17	0.17	0.18	0.20	0.20	0.22	0.25	0.24	0.26
	inch	.003	.005	.005	.006	.007	.006	.007	.007	.007	.008	.008	.009	.010	.010	.010
4	mm	0.07	0.07	0.12	0.13	0.15	0.14	0.16	0.17	0.17	0.20	0.19	0.22	0.24	0.24	0.26
	inch	.003	.003	.005	.005	.006	.006	.006	.007	.007	.008	.008	.009	.010	.009	.010
5	mm			0.08	0.11	0.13	0.13	0.15	0.16	0.16	0.19	0.19	0.21	0.24	0.23	0.25
	inch			.003	.005	.005	.005	.006	.006	.006	.007	.007	.008	.009	.009	.010
6	mm				0.08	0.08	0.12	0.14	0.15	0.16	0.18	0.18	0.20	0.23	0.22	0.24
	inch				.003	.003	.005	.005	.006	.006	.007	.007	.008	.009	.009	.010
7	mm						0.11	0.12	0.14	0.15	0.17	0.18	0.20	0.22	0.22	0.24
	inch						.004	.005	.006	.006	.007	.007	.008	.009	.009	.009
8	mm						0.08	0.08	0.13	0.14	0.16	0.17	0.19	0.21	0.21	0.23
	inch						.003	.003	.005	.006	.006	.007	.007	.008	.008	.009
9	mm								0.12	0.14	0.15	0.16	0.18	0.20	0.20	0.22
	inch								.005	.005	.006	.006	.007	.008	.008	.009
10	mm								0.08	0.12	0.14	0.15	0.17	0.19	0.20	0.21
	inch								.003	.005	.005	.006	.007	.007	.008	.008
11	mm									0.11	0.12	0.14	0.16	0.18	0.19	0.20
	inch									.004	.005	.006	.006	.007	.007	.008
12	mm									0.08	0.08	0.13	0.15	0.16	0.18	0.19
	inch									.003	.003	.005	.006	.006	.007	.008
13	mm											0.12	0.14	0.15	0.17	0.18
	inch											.005	.005	.006	.007	.007
14	mm											0.08	0.10	0.10	0.16	0.16
	inch											.003	.004	.004	.006	.006
15	mm														0.14	0.15
	inch														.005	.006
16	mm														0.10	0.10
	inch														.004	.004
Total infeed	**mm**	**0.34**	**0.48**	**0.63**	**0.77**	**0.92**	**1.05**	**1.20**	**1.48**	**1.78**	**2.03**	**2.31**	**2.61**	**2.88**	**3.19**	**3.44**
	inch	**.013**	**.019**	**.025**	**.030**	**.036**	**.041**	**.047**	**.058**	**.070**	**.080**	**.091**	**.103**	**.113**	**.126**	**.135**

Extra stock is included in the total infeed	0.05 mm
	.002 inch
Reference material	
CMC	02.1
MC	P2.1.Z.AN

Thread turning infeed recommendations

ISO inch (UN), external

		Pitch, t.p.i.																	
		32	28	24	20	18	16	14	13	12	11	10	9	8	7	6	5	4.5	4
No. of infeeds	**Unit**	**Radial infeed per pass**																	
1	mm	0.17	0.15	0.18	0.18	0.20	0.19	0.18	0.20	0.22	0.21	0.21	0.21	0.22	0.25	0.24	0.29	0.28	0.32
	inch	.007	.006	.007	.007	.008	.007	.007	.008	.009	.008	.008	.008	.009	.010	.009	.012	.011	.013
2	mm	0.16	0.14	0.16	0.17	0.18	0.18	0.18	0.19	0.21	0.20	0.20	0.20	0.21	0.24	0.23	0.29	0.28	0.32
	inch	.006	.005	.006	.007	.007	.007	.007	.007	.008	.008	.008	.008	.008	.009	.009	.011	.011	.012
3	mm	0.13	0.13	0.15	0.15	0.17	0.17	0.17	0.18	0.20	0.19	0.19	0.19	0.20	0.23	0.23	0.28	0.27	0.31
	inch	.005	.005	.006	.006	.007	.007	.007	.007	.008	.008	.008	.008	.008	.009	.009	.011	.011	.012
4	mm	0.08	0.11	0.13	0.14	0.15	0.16	0.16	0.17	0.19	0.18	0.18	0.19	0.20	0.22	0.22	0.27	0.26	0.30
	inch	.003	.004	.005	.006	.006	.006	.006	.007	.007	.007	.007	.007	.008	.009	.009	.011	.010	.012
5	mm		0.08	0.08	0.12	0.13	0.14	0.15	0.16	0.17	0.17	0.17	0.18	0.19	0.21	0.21	0.26	0.26	0.29
	inch		.003	.003	.005	.005	.006	.006	.006	.007	.007	.007	.007	.007	.008	.008	.010	.010	.011
6	mm				0.08	0.08	0.12	0.14	0.14	0.15	0.16	0.16	0.17	0.18	0.20	0.21	0.25	0.25	0.28
	inch				.003	.003	.005	.005	.006	.006	.006	.006	.007	.007	.008	.008	.010	.010	.011
7	mm						0.08	0.12	0.12	0.13	0.15	0.15	0.16	0.17	0.19	0.20	0.24	0.24	0.27
	inch						.003	.005	.005	.005	.006	.006	.006	.007	.008	.008	.010	.010	.011
8	mm							0.08	0.08	0.08	0.13	0.14	0.15	0.16	0.18	0.19	0.23	0.23	0.26
	inch							.003	.003	.003	.005	.006	.006	.006	.007	.008	.009	.009	.010
9	mm										0.08	0.12	0.14	0.15	0.17	0.18	0.22	0.22	0.25
	inch										.003	.005	.005	.006	.007	.007	.009	.009	.010
10	mm											0.08	0.12	0.14	0.15	0.18	0.21	0.22	0.24
	inch											.003	.005	.005	.006	.007	.008	.008	.010
11	mm												0.08	0.12	0.13	0.17	0.19	0.21	0.23
	inch												.003	.005	.005	.007	.008	.008	.009
12	mm													0.08	0.08	0.15	0.18	0.19	0.22
	inch													.003	.003	.006	.007	.008	.008
13	mm															0.14	0.15	0.18	0.20
	inch															.005	.006	.007	.008
14	mm															0.10	0.10	0.17	0.18
	inch															.004	.004	.007	.007
15	mm																	0.15	0.16
	inch																	.006	.006
16	mm																	0.10	0.10
	inch																	.004	.004
	mm	**0.54**	**0.60**	**0.70**	**0.84**	**0.92**	**1.04**	**1.17**	**1.24**	**1.35**	**1.47**	**1.62**	**1.79**	**2.02**	**2.26**	**2.64**	**3.17**	**3.51**	**3.94**
Total infeed	**inch**	**.021**	**.024**	**.028**	**.033**	**.036**	**.041**	**.046**	**.049**	**.053**	**.058**	**.064**	**.070**	**.080**	**.089**	**.104**	**.125**	**.138**	**.155**

Extra stock is included in the total infeed	0.05 mm
	.002 inch

Reference material

CMC	02.1
MC	P2.1.Z.AN

Thread turning infeed recommendations

ISO inch (UN), internal

		Pitch, t.p.i.																	
		32	28	24	20	18	16	14	13	12	11	10	9	8	7	6	5	4.5	4
No. of infeeds	**Unit**	**Radial infeed per pass**																	
1	mm	0.16	0.14	0.16	0.16	0.18	0.17	0.16	0.18	0.20	0.19	0.19	0.19	0.19	0.23	0.21	0.27	0.28	0.30
	inch	.006	.005	.006	.006	.007	.007	.006	.007	.008	.008	.007	.007	.008	.009	.008	.011	.011	.012
2	mm	0.14	0.13	0.15	0.15	0.17	0.16	0.16	0.17	0.19	0.18	0.18	0.18	0.19	0.22	0.21	0.26	0.27	0.29
	inch	.006	.005	.006	.006	.007	.006	.006	.007	.008	.007	.007	.007	.007	.009	.008	.010	.011	.011
3	mm	0.13	0.12	0.14	0.14	0.16	0.15	0.15	0.16	0.18	0.18	0.17	0.18	0.18	0.21	0.20	0.25	0.27	0.28
	inch	.005	.005	.006	.006	.006	.006	.006	.006	.007	.007	.007	.007	.007	.008	.008	.010	.010	.011
4	mm	0.08	0.11	0.12	0.13	0.14	0.14	0.14	0.16	0.17	0.17	0.17	0.17	0.18	0.21	0.20	0.25	0.26	0.27
	inch	.003	.004	.005	.005	.006	.006	.006	.006	.007	.007	.007	.007	.007	.008	.008	.010	.010	.011
5	mm		0.08	0.08	0.12	0.13	0.13	0.14	0.15	0.16	0.16	0.16	0.16	0.17	0.20	0.19	0.24	0.25	0.27
	inch		.003	.003	.005	.005	.005	.005	.006	.006	.006	.006	.006	.007	.008	.008	.009	.010	.011
6	mm				0.08	0.08	0.12	0.13	0.13	0.14	0.15	0.15	0.16	0.16	0.19	0.19	0.23	0.25	0.26
	inch				.003	.003	.005	.005	.005	.006	.006	.006	.006	.006	.007	.007	.009	.010	.010
7	mm						0.08	0.11	0.12	0.13	0.14	0.14	0.15	0.16	0.18	0.18	0.22	0.24	0.25
	inch						.003	.004	.005	.005	.005	.006	.006	.006	.007	.007	.009	.009	.010
8	mm							0.08	0.08	0.08	0.12	0.13	0.14	0.15	0.17	0.18	0.21	0.23	0.24
	inch							.003	.003	.003	.005	.005	.005	.006	.007	.007	.008	.009	.010
9	mm										0.08	0.12	0.13	0.14	0.16	0.17	0.20	0.22	0.23
	inch										.003	.005	.005	.006	.006	.007	.008	.009	.009
10	mm											0.08	0.11	0.13	0.14	0.16	0.19	0.21	0.22
	inch											.003	.004	.005	.006	.006	.008	.008	.009
11	mm												0.08	0.11	0.12	0.15	0.18	0.20	0.21
	inch												.003	.005	.005	.006	.007	.008	.008
12	mm													0.08	0.08	0.14	0.17	0.19	0.20
	inch													.003	.003	.006	.007	.008	.008
13	mm															0.13	0.15	0.18	0.19
	inch															.005	.006	.007	.007
14	mm															0.10	0.10	0.16	0.17
	inch															.004	.004	.006	.007
15	mm																	0.15	0.15
	inch																	.006	.006
16	mm																	0.10	0.10
	inch																	.004	.004
Total infeed	**mm**	**0.51**	**0.58**	**0.66**	**0.78**	**0.86**	**0.96**	**1.07**	**1.15**	**1.25**	**1.36**	**1.48**	**1.64**	**1.85**	**2.10**	**2.43**	**2.92**	**3.46**	**3.64**
	inch	**.020**	**.023**	**.026**	**.031**	**.034**	**.038**	**.042**	**.045**	**.049**	**.054**	**.058**	**.065**	**.073**	**.083**	**.096**	**.115**	**.136**	**.143**

Extra stock is included in the total infeed	0.05 mm
	.002 inch

Reference material

CMC	02.1
MC	P2.1.Z.AN

Thread turning infeed recommendations

Whitworth (WH), external and internal

No. of infeeds	Unit	Pitch, t.p.i. 28	26	20	19	18	16	14	12	11	10	9	8	7	6	5	4.5	4
		Radial infeed per pass																
1	mm	0.16	0.17	0.19	0.20	0.17	0.17	0.20	0.23	0.22	0.22	0.22	0.23	0.26	0.25	0.31	0.30	0.34
	inch	.006	.007	.007	.008	.007	.007	.008	.009	.009	.009	.009	.009	.010	.010	.012	.012	.013
2	mm	0.15	0.16	0.18	0.18	0.16	0.16	0.19	0.22	0.21	0.21	0.21	0.22	0.26	0.25	0.30	0.29	0.33
	inch	.006	.006	.007	.007	.006	.006	.007	.009	.008	.008	.008	.009	.010	.010	.012	.012	.013
3	mm	0.14	0.14	0.16	0.17	0.16	0.15	0.18	0.21	0.20	0.20	0.20	0.21	0.25	0.24	0.29	0.29	0.32
	inch	.005	.006	.006	.007	.006	.006	.007	.008	.008	.008	.008	.008	.010	.009	.012	.011	.013
4	mm	0.12	0.13	0.15	0.15	0.15	0.15	0.17	0.20	0.19	0.19	0.20	0.21	0.24	0.23	0.28	0.28	0.31
	inch	.005	.005	.006	.006	.006	.006	.007	.008	.008	.008	.008	.008	.009	.009	.011	.011	.012
5	mm	0.08	0.08	0.13	0.13	0.13	0.14	0.16	0.18	0.18	0.18	0.19	0.20	0.23	0.23	0.28	0.27	0.30
	inch	.003	.003	.005	.005	.005	.005	.006	.007	.007	.007	.007	.008	.009	.009	.011	.011	.012
6	mm			0.08	0.08	0.12	0.13	0.14	0.16	0.17	0.17	0.18	0.19	0.22	0.22	0.27	0.26	0.29
	inch			.003	.003	.005	.005	.006	.006	.007	.007	.007	.007	.008	.009	.010	.010	.012
7	mm					0.08	0.11	0.12	0.14	0.15	0.16	0.17	0.18	0.20	0.21	0.25	0.25	0.28
	inch					.003	.004	.005	.005	.006	.006	.007	.007	.008	.008	.010	.010	.011
8	mm						0.08	0.08	0.08	0.13	0.15	0.16	0.17	0.19	0.20	0.24	0.25	0.27
	inch						.003	.003	.003	.005	.006	.006	.007	.008	.008	.010	.010	.011
9	mm									0.08	0.13	0.14	0.16	0.18	0.19	0.23	0.24	0.26
	inch									.003	.005	.006	.006	.007	.008	.009	.009	.010
10	mm										0.08	0.12	0.14	0.16	0.18	0.22	0.23	0.25
	inch										.003	.005	.006	.006	.007	.009	.009	.010
11	mm											0.08	0.12	0.14	0.17	0.20	0.22	0.24
	inch											.003	.005	.005	.007	.008	.008	.009
12	mm												0.08	0.08	0.16	0.18	0.20	0.22
	inch												.003	.003	.006	.007	.008	.009
13	mm														0.14	0.16	0.19	0.21
	inch														.006	.006	.007	.008
14	mm														0.10	0.10	0.17	0.19
	inch														.004	.004	.007	.007
15	mm																0.15	0.16
	inch																.006	.006
16	mm																0.10	0.10
	inch																.004	.004
Total infeed	**mm**	**0.64**	**0.68**	**0.88**	**0.92**	**0.97**	**1.08**	**1.23**	**1.42**	**1.54**	**1.70**	**1.87**	**2.10**	**2.39**	**2.78**	**3.32**	**3.69**	**4.06**
	inch	**.025**	**.027**	**.035**	**.036**	**.038**	**.043**	**.048**	**.056**	**.061**	**.067**	**.074**	**.083**	**.094**	**.109**	**.131**	**.145**	**.160**

BSPT (PT), external and internal

No. of infeeds	Unit	Pitch, t.p.i. 28	19	14	11	8
		Radial infeed per pass				
1	mm	0.15	0.19	0.19	0.22	0.22
	inch	.006	.008	.007	.009	.009
2	mm	0.14	0.18	0.18	0.21	0.21
	inch	.006	.007	.007	.008	.008
3	mm	0.13	0.17	0.17	0.20	0.21
	inch	.005	.007	.007	.008	.008
4	mm	0.12	0.15	0.16	0.19	0.20
	inch	.005	.006	.006	.007	.008
5	mm	0.08	0.13	0.15	0.18	0.19
	inch	.003	.005	.006	.007	.008
6	mm		0.08	0.14	0.16	0.18
	inch		.003	.005	.006	.007
7	mm			0.12	0.15	0.17
	inch			.005	.006	.007
8	mm			0.08	0.13	0.16
	inch			.003	.005	.006
9	mm				0.08	0.15
	inch				.003	.006
10	mm					0.14
	inch					.006
11	mm					0.12
	inch					.005
12	mm					0.08
	inch					.003
Total infeed	**mm**	**0.62**	**0.90**	**1.20**	**1.51**	**2.05**
	inch	**.024**	**.035**	**.047**	**.059**	**.081**

Extra stock is included in the total infeed	0.05 mm
	.002 inch

Reference material

CMC	02.1
MC	P2.1.Z.AN

SANDVIK Coromant

Thread turning infeed recommendations

Round 30° Din405 (RN),external

No. of infeeds	Unit	Pitch, t.p.i. 10	8	6	4
		Radial infeed per pass			
1	mm	0.21	0.21	0.24	0.30
	inch	.008	.008	.009	.012
2	mm	0.20	0.20	0.23	0.29
	inch	.008	.008	.009	.011
3	mm	0.19	0.19	0.22	0.28
	inch	.007	.008	.009	.011
4	mm	0.18	0.19	0.21	0.27
	inch	.007	.007	.008	.011
5	mm	0.16	0.18	0.20	0.26
	inch	.006	.007	.008	.010
6	mm	0.15	0.17	0.19	0.25
	inch	.006	.007	.008	.010
7	mm	0.13	0.15	0.18	0.24
	inch	.005	.006	.007	.010
8	mm	0.08	0.14	0.17	0.23
	inch	.003	.006	.007	.009
9	mm		0.12	0.16	0.22
	inch		.005	.006	.009
10	mm		0.08	0.15	0.21
	inch		.003	.006	.008
11	mm			0.13	0.19
	inch			.005	.008
12	mm			0.08	0.18
	inch			.003	.007
13	mm				0.15
	inch				.006
14	mm				0.10
	inch				.004
	mm	**1.30**	**1.63**	**2.17**	**2.95**
Total infeed	**inch**	**.051**	**.064**	**.085**	**.116**

Round 30° Din405 (RN), internal

No. of infeeds	Unit	Pitch, t.p.i. 10	8	6	4
		Radial infeed per pass			
1	mm	0.22	0.21	0.24	0.30
	inch	.009	.008	.009	.012
2	mm	0.21	0.20	0.23	0.29
	inch	.008	.008	.009	.012
3	mm	0.20	0.20	0.22	0.29
	inch	.008	.008	.009	.011
4	mm	0.18	0.19	0.21	0.28
	inch	.007	.007	.008	.011
5	mm	0.17	0.18	0.21	0.27
	inch	.007	.007	.008	.011
6	mm	0.15	0.17	0.20	0.26
	inch	.006	.007	.008	.010
7	mm	0.13	0.16	0.19	0.25
	inch	.005	.006	.007	.010
8	mm	0.08	0.14	0.17	0.24
	inch	.003	.006	.007	.009
9	mm		0.12	0.16	0.23
	inch		.005	.006	.009
10	mm		0.08	0.15	0.21
	inch		.003	.006	.008
11	mm			0.13	0.20
	inch			.005	.008
12	mm			0.08	0.18
	inch			.003	.007
13	mm				0.16
	inch				.006
14	mm				0.10
	inch				.004
	mm	**1.34**	**1.64**	**2.18**	**2.98**
Total infeed	**inch**	**.053**	**.065**	**.086**	**.117**

NPT (NT), external and Internal

No. of infeeds	Unit	Pitch, t.p.i. 27	18	14	11½	8
		Radial infeed per pass				
1	mm	0.15	0.17	0.18	0.18	0.21
	inch	.006	.007	.007	.007	.008
2	mm	0.15	0.17	0.17	0.17	0.21
	inch	.006	.007	.007	.007	.008
3	mm	0.14	0.16	0.16	0.17	0.20
	inch	.005	.006	.006	.007	.008
4	mm	0.13	0.15	0.16	0.16	0.20
	inch	.005	.006	.006	.006	.008
5	mm	0.11	0.14	0.15	0.16	0.19
	inch	.004	.006	.006	.006	.008
6	mm	0.08	0.13	0.14	0.15	0.18
	inch	.003	.005	.006	.006	.007
7	mm		0.11	0.14	0.15	0.18
	inch		.005	.005	.006	.007
8	mm		0.08	0.13	0.14	0.17
	inch		.003	.005	.006	.007
9	mm			0.11	0.13	0.17
	inch			.004	.005	.007
10	mm			0.08	0.12	0.16
	inch			.003	.005	.006
11	mm				0.11	0.15
	inch				.004	.006
12	mm				0.08	0.14
	inch				.003	.006
13	mm					0.13
	inch					.005
14	mm					0.11
	inch					.005
15	mm					0.08
	inch					.003
	mm	**0.76**	**1.11**	**1.42**	**1.73**	**2.48**
Total infeed	**inch**	**.030**	**.044**	**.056**	**.068**	**.098**

Extra stock is included in the total infeed	0.05 mm
	.002 inch

Reference material

CMC	02.1
MC	P2.1.Z.AN

SANDVIK Coromant

Thread turning infeed recommendations

ACME (AC), external

		Pitch, t.p.i.								
		16	14	12	10	8	6	5	4	3
No. of infeeds	**Unit**	**Radial infeed per pass**								
1	mm	0.22	0.20	0.20	0.20	0.20	0.24	0.26	0.28	0.31
	inch	.009	.008	.008	.008	.008	.009	.010	.011	.012
2	mm	0.20	0.19	0.19	0.20	0.20	0.23	0.25	0.28	0.31
	inch	.008	.008	.008	.008	.008	.009	.010	.011	.012
3	mm	0.19	0.18	0.18	0.19	0.19	0.23	0.25	0.27	0.30
	inch	.007	.007	.007	.007	.008	.009	.010	.011	.012
4	mm	0.17	0.17	0.17	0.18	0.18	0.22	0.24	0.26	0.30
	inch	.007	.007	.007	.007	.007	.009	.010	.010	.012
5	mm	0.14	0.15	0.16	0.17	0.18	0.21	0.23	0.26	0.29
	inch	.006	.006	.006	.007	.007	.008	.009	.010	.011
6	mm	0.08	0.13	0.15	0.16	0.17	0.20	0.23	0.25	0.28
	inch	.003	.005	.006	.006	.007	.008	.009	.010	.011
7	mm		0.08	0.13	0.15	0.16	0.20	0.22	0.24	0.28
	inch		.003	.005	.006	.006	.008	.009	.010	.011
8	mm			0.08	0.14	0.15	0.19	0.21	0.23	0.27
	inch			.003	.005	.006	.007	.008	.009	.011
9	mm				0.12	0.14	0.18	0.20	0.22	0.26
	inch				.005	.006	.007	.008	.009	.010
10	mm				0.08	0.13	0.17	0.19	0.22	0.25
	inch				.003	.005	.007	.007	.008	.010
11	mm					0.12	0.16	0.18	0.21	0.24
	inch					.005	.006	.007	.008	.010
12	mm					0.08	0.14	0.16	0.19	0.23
	inch					.003	.005	.006	.008	.009
13	mm						0.10	0.14	0.18	0.22
	inch						.004	.006	.007	.009
14	mm							0.10	0.17	0.21
	inch							.004	.007	.008
15	mm								0.15	0.20
	inch								.006	.008
16	mm								0.10	0.19
	inch								.004	.007
17	mm									0.17
	inch									.007
18	mm									0.15
	inch									.006
19	mm									.100
	inch									.004
	mm	**0.99**	**1.10**	**1.26**	**1.60**	**1.91**	**2.46**	**2.87**	**3.51**	**4.57**
Total infeed	**inch**	**.039**	**.043**	**.050**	**.063**	**.075**	**.097**	**.113**	**.138**	**.180**

Extra stock is included in the total infeed	0.05 mm
	.002 inch
Reference material	
CMC	02.1
MC	P2.1.Z.AN

SANDVIK Coromant

Thread turning infeed recommendations

ACME (AC), internal

		Pitch, t.p.i.								
		16	14	12	10	8	6	5	4	3
No. of infeeds	**Unit**	**Radial infeed per pass**								
1	mm	0.22	0.21	0.21	0.21	0.21	0.24	0.26	0.29	0.31
	inch	.009	.008	.008	.008	.008	.009	.010	.011	.012
2	mm	0.21	0.20	0.20	0.20	0.20	0.23	0.26	0.28	0.31
	inch	.008	.008	.008	.008	.008	.009	.010	.011	.012
3	mm	0.19	0.19	0.19	0.20	0.20	0.23	0.25	0.27	0.30
	inch	.008	.007	.007	.008	.008	.009	.010	.011	.012
4	mm	0.17	0.17	0.18	0.19	0.19	0.22	0.24	0.27	0.29
	inch	.007	.007	.007	.007	.007	.009	.010	.010	.012
5	mm	0.14	0.16	0.16	0.18	0.18	0.21	0.24	0.26	0.29
	inch	.006	.006	.006	.007	.007	.008	.009	.010	.011
6	mm	0.08	0.13	0.15	0.17	0.17	0.21	0.23	0.25	0.28
	inch	.003	.005	.006	.007	.007	.008	.009	.010	.011
7	mm		0.08	0.13	0.16	0.17	0.20	0.22	0.24	0.27
	inch		.003	.005	.006	.007	.008	.009	.010	.011
8	mm			0.08	0.14	0.16	0.19	0.21	0.24	0.27
	inch			.003	.006	.006	.007	.008	.009	.011
9	mm				0.12	0.15	0.18	0.20	0.23	0.26
	inch				.005	.006	.007	.008	.009	.010
10	mm				0.08	0.13	0.17	0.19	0.22	0.25
	inch				.003	.005	.007	.008	.009	.010
11	mm					0.12	0.16	0.18	0.21	0.24
	inch					.005	.006	.007	.008	.010
12	mm					0.08	0.14	0.16	0.20	0.23
	inch					.003	.006	.006	.008	.009
13	mm						0.10	0.15	0.18	0.22
	inch						.004	.006	.007	.009
14	mm							0.10	0.17	0.21
	inch							.004	.007	.008
15	mm								0.15	0.20
	inch								.006	.008
16	mm								0.10	0.19
	inch								.004	.007
17	mm									0.17
	inch									.007
18	mm									0.15
	inch									.006
19	mm									.100
	inch									.004
	mm	**1.02**	**1.14**	**1.30**	**1.64**	**1.95**	**2.48**	**2.90**	**3.54**	**4.56**
Total infeed	**inch**	**.040**	**.045**	**.051**	**.065**	**.077**	**.098**	**.114**	**.139**	**.180**

Extra stock is included in the total infeed	0.05 mm
	.002 inch
Reference material	
CMC	02.1
MC	P2.1.Z.AN

Thread turning infeed recommendations

Stub-ACME (SA), external and Internal

		Pitch, t.p.i.								
		16	14	12	10	8	6	5	4	3
No. of infeeds	Unit	Radial infeed per pass								
1	mm	0.18	0.20	0.18	0.21	0.22	0.24	0.25	0.24	0.25
	inch	.007	.008	.007	.008	.008	.009	.010	.010	.010
2	mm	0.16	0.18	0.17	0.20	0.21	0.23	0.24	0.24	0.24
	inch	.006	.007	.007	.008	.008	.009	.009	.009	.010
3	mm	0.15	0.17	0.16	0.19	0.19	0.22	0.23	0.23	0.24
	inch	.006	.007	.006	.007	.008	.009	.009	.009	.009
4	mm	0.13	0.14	0.15	0.17	0.18	0.21	0.22	0.22	0.23
	inch	.005	.006	.006	.007	.007	.008	.009	.009	.009
5	mm	0.08	0.08	0.13	0.15	0.17	0.19	0.21	0.21	0.22
	inch	.003	.003	.005	.006	.007	.008	.008	.008	.009
6	mm			0.08	0.13	0.15	0.18	0.19	0.20	0.22
	inch			.003	.005	.006	.007	.008	.008	.009
7	mm				0.08	0.13	0.16	0.18	0.19	0.21
	inch				.003	.005	.006	.007	.008	.008
8	mm					0.08	0.14	0.16	0.18	0.20
	inch					.003	.005	.006	.007	.008
9	mm						0.08	0.14	0.17	0.19
	inch						.003	.006	.007	.008
10	mm							0.09	0.16	0.18
	inch							.004	.006	.007
11	mm								0.14	0.17
	inch								.005	.007
12	mm								0.09	0.16
	inch								.004	.006
13	mm									0.15
	inch									.006
14	mm									0.13
	inch									.005
15	mm									0.09
	inch									.004
Total infeed	**mm**	**0.70**	**0.77**	**0.87**	**1.13**	**1.33**	**1.64**	**1.90**	**2.27**	**2.90**
	inch	**.028**	**.030**	**.034**	**.044**	**.052**	**.065**	**.075**	**.089**	**.114**

Extra stock is included in the total infeed	0.05 mm
	.002 inch
Reference material	
CMC	02.1
MC	P2.1.Z.AN

Thread turning infeed recommendations

Trapezoidal (TR), external and Internal

		Pitch, mm							
		1.5	2	3	4	5	6	7	8
No. of infeeds	**Unit**	**Radial infeed per pass**							
1	mm	0.22	0.22	0.20	0.24	0.27	0.29	0.34	0.32
	inch	.009	.009	.008	.009	.011	.012	.013	.013
2	mm	0.21	0.21	0.19	0.23	0.27	0.29	0.33	0.31
	inch	.008	.008	.007	.009	.010	.011	.013	.012
3	mm	0.19	0.20	0.18	0.22	0.26	0.28	0.32	0.31
	inch	.008	.008	.007	.009	.010	.011	.013	.012
4	mm	0.17	0.19	0.18	0.22	0.25	0.27	0.32	0.30
	inch	.007	.007	.007	.009	.010	.011	.012	.012
5	mm	0.14	0.17	0.17	0.21	0.24	0.27	0.31	0.29
	inch	.006	.007	.007	.008	.009	.010	.012	.012
6	mm	0.08	0.16	0.17	0.20	0.23	0.26	0.30	0.29
	inch	.003	.006	.007	.008	.009	.010	.012	.011
7	mm		0.13	0.16	0.19	0.22	0.25	0.29	0.28
	inch		.005	.006	.008	.009	.010	.011	.011
8	mm		0.08	0.15	0.18	0.21	0.24	0.28	0.27
	inch			.006	.007	.008	.010	.011	.011
9	mm			0.14	0.17	0.20	0.23	0.26	0.26
	inch			.006	.007	.008	.009	.010	.010
10	mm			0.13	0.16	0.19	0.22	0.25	0.25
	inch			.005	.006	.007	.009	.010	.010
11	mm			0.11	0.14	0.17	0.21	0.24	0.25
	inch			.005	.006	.007	.008	.009	.010
12	mm			0.08	0.13	0.16	0.20	0.22	0.24
	inch			.003	.005	.006	.008	.009	.009
13	mm				0.08	0.13	0.19	0.21	0.23
	inch				.003	.005	.007	.008	.009
14	mm					0.08	0.17	0.19	0.22
	inch					.003	.007	.007	.008
15	mm						0.15	0.16	0.20
	inch						.006	.006	.008
16	mm						0.10	0.10	0.19
	inch						.004	.004	.007
17	mm								0.17
	inch								.007
18	mm								0.15
	inch								.006
19	mm								0.10
	inch								.004
	mm	**1.02**	**1.36**	**1.86**	**2.37**	**2.88**	**3.63**	**4.12**	**4.63**
Total infeed	**inch**	**.040**	**.050**	**.073**	**.093**	**.113**	**.143**	**.162**	**.182**

Extra stock is included in the total infeed	0.05 mm
	.002 inch

Reference material

CMC	02.1
MC	P2.1.Z.AN

Thread turning infeed recommendations

UNJ, external

No. of infeeds	Unit	Pitch, t.p.i. 32	28	24	20	18	16	14	12	10	8
		Radial infeed per pass									
1	mm	0.16	0.14	0.16	0.16	0.18	0.17	0.17	0.20	0.19	0.20
	inch	.006	.005	.006	.006	.007	.007	.007	.008	.008	.008
2	mm	0.14	0.13	0.15	0.15	0.17	0.16	0.16	0.19	0.19	0.20
	inch	.006	.005	.006	.006	.007	.006	.006	.008	.007	.008
3	mm	0.13	0.12	0.14	0.14	0.16	0.16	0.16	0.18	0.18	0.19
	inch	.005	.005	.006	.006	.006	.006	.006	.007	.007	.007
4	mm	0.08	0.11	0.12	0.13	0.15	0.15	0.15	0.17	0.17	0.18
	inch	.003	.004	.005	.005	.006	.006	.006	.007	.007	.007
5	mm		0.08	0.08	0.12	0.13	0.13	0.14	0.16	0.16	0.18
	inch		.003	.003	.005	.005	.005	.005	.006	.006	.007
6	mm				0.08	0.08	0.12	0.13	0.15	0.15	0.17
	inch				.003	.003	.005	.005	.006	.006	.007
7	mm						0.08	0.11	0.13	0.14	0.16
	inch						.003	.004	.005	.006	.006
8	mm							0.08	0.08	0.13	0.15
	inch							.003	.003	.005	.006
9	mm									0.12	0.14
	inch									.005	.006
10	mm									0.08	0.13
	inch									.003	.005
11	mm										0.12
	inch										.005
12	mm										0.08
	inch										.003
Total infeed	**mm**	**0.51**	**0.57**	**0.66**	**0.78**	**0.87**	**0.97**	**1.10**	**1.27**	**1.52**	**1.90**
	inch	.020	.022	.026	.031	.034	.038	.043	.050	.060	.075

MJ, external

No. of infeeds	Unit	Pitch, mm 1.5	2
		Radial infeed per pass	
1	mm	0.20	0.19
	inch	.008	.008
2	mm	0.18	0.18
	inch	.007	.007
3	mm	0.17	0.17
	inch	.007	.007
4	mm	0.15	0.16
	inch	.006	.006
5	mm	0.13	0.15
	inch	.005	.006
6	mm	0.08	0.14
	inch	.003	.006
7	mm		0.12
	inch		.005
8	mm		0.08
	inch		.003
Total infeed	**mm**	**0.92**	**1.21**
	inch	**.036**	**.048**

NPTF (NT), external and Internal

No. of infeeds	Unit	Pitch, t.p.i. 27	18	14	11½	8
		Radial infeed per pass				
1	mm	0.14	0.16	0.17	0.17	0.19
	inch	.005	.006	.007	.007	.008
2	mm	0.13	0.16	0.17	0.17	0.19
	inch	.005	.006	.007	.007	.007
3	mm	0.13	0.15	0.16	0.16	0.18
	inch	.005	.006	.006	.006	.007
4	mm	0.12	0.14	0.16	0.16	0.18
	inch	.005	.006	.006	.006	.007
5	mm	0.11	0.13	0.15	0.15	0.18
	inch	.004	.005	.006	.006	.007
6	mm	0.08	0.12	0.14	0.15	0.17
	inch	.003	.005	.006	.006	.007
7	mm		0.11	0.13	0.14	0.17
	inch		.004	.005	.006	.007
8	mm		0.08	0.12	0.14	0.16
	inch		.003	.005	.005	.006
9	mm			0.11	0.13	0.16
	inch			.004	.005	.006
10	mm			0.08	0.12	0.15
	inch			.003	.005	.006
11	mm				0.11	0.14
	inch				.004	.006
12	mm				0.08	0.14
	inch				.003	.005
13	mm					0.13
	inch					.005
14	mm					0.12
	inch					.005
15	mm					0.11
	inch					.004
16	mm					0.08
	inch					.003
Total infeed	**mm**	**0.70**	**1.06**	**1.41**	**1.69**	**2.36**
	inch	**.028**	**.042**	**.056**	**.067**	**.093**

Extra stock is included in the total infeed	0.05 mm
	.002 inch
Reference material	
CMC	02.1
MC	P2.1.Z.AN

Thread turning infeed recommendations

API thread forms

Insert	Pitch	Unit	No. of infeed Radial infeed per pass 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total infeed
API 60° V-0.038R																		
266RG-22V381A0402E	4	mm	0.36	0.35	0.33	0.32	0.30	0.29	0.27	0.25	0.23	0.20	0.16	0.08				3.08
	t.p.i.	inch	.014	.014	.013	.013	.012	.011	.011	.010	.009	.008	.006	.003				.121
266RL-22V381A0402E	4	mm	0.36	0.35	0.33	0.32	0.30	0.29	0.27	0.25	0.23	0.20	0.16	0.08				3.08
	t.p.i.	inch	.014	.014	.013	.013	.012	.011	.011	.010	.009	.008	.006	.003				.121
266RG-22V381A0403E	4	mm	0.36	0.34	0.33	0.32	0.30	0.29	0.27	0.25	0.23	0.20	0.16	0.08				3.07
	t.p.i.	inch	.014	.013	.013	.013	.012	.011	.011	.010	.009	.008	.006	.003				.121
266RL-22V381A0403E	4	mm	0.36	0.34	0.33	0.32	0.30	0.29	0.27	0.25	0.23	0.20	0.16	0.08				3.07
	t.p.i.	inch	.014	.013	.013	.013	.012	.011	.011	.010	.009	.008	.006	.003				.121
API 60° V-0.040																		
266RG-22V401A0503E	5	mm	0.35	0.33	0.32	0.31	0.29	0.28	0.26	0.24	0.22	0.19	0.16	0.08				2.98
	t.p.i.	inch	.014	.013	.013	.012	.012	.011	.010	.009	.009	.008	.006	.003				.117
266RL-22V401A0503E	5	mm	0.35	0.33	0.32	0.31	0.29	0.28	0.26	0.24	0.22	0.19	0.16	0.08				2.98
	t.p.i.	inch	.014	.013	.013	.012	.012	.011	.010	.009	.009	.008	.006	.003				.117
API 60° V-0.050																		
266RG-22V501A0402E	4	mm	0.34	0.34	0.33	0.31	0.30	0.29	0.28	0.27	0.25	0.24	0.22	0.20	0.18	0.15	0.08	3.74
	t.p.i.	inch	.014	.013	.013	.012	.012	.012	.011	.011	.010	.009	.009	.008	.007	.006	.003	.147
266RL-22V501A0402E	4	mm	0.34	0.34	0.33	0.31	0.30	0.29	0.28	0.27	0.25	0.24	0.22	0.20	0.18	0.15	0.08	3.74
	t.p.i.	inch	.014	.013	.013	.012	.012	.012	.011	.011	.010	.009	.009	.008	.007	.006	.003	.147
266RG-22V501A0403E	4	mm	0.34	0.34	0.32	0.31	0.30	0.29	0.28	0.27	0.25	0.24	0.22	0.20	0.18	0.15	0.08	3.73
	t.p.i.	inch	.014	.013	.013	.012	.012	.012	.011	.011	.010	.009	.009	.008	.007	.006	.003	.147
266RL-22V501A0403E	4	mm	0.34	0.34	0.32	0.31	0.30	0.29	0.28	0.27	0.25	0.24	0.22	0.20	0.18	0.15	0.08	3.73
	t.p.i.	inch	.014	.013	.013	.012	.012	.012	.011	.011	.010	.009	.009	.008	.007	.006	.003	.147
API Round 60°																		
266RG-22RD01A100E	10	mm	0.18	0.18	0.17	0.16	0.16	0.15	0.14	0.13	0.11	0.08						1.40
	t.p.i.	inch	.007	.007	.007	.006	.006	.006	.005	.005	.004	.003						.055
266RL-22RD01A100E	10	mm	0.18	0.18	0.17	0.16	0.16	0.15	0.14	0.13	0.11	0.08						1.40
	t.p.i.	inch	.007	.007	.007	.006	.006	.006	.005	.005	.004	.003						.055
266RG-22RD01A080E	8	mm	0.19	0.19	0.18	0.18	0.17	0.16	0.16	0.15	0.14	0.13	0.11	0.08				1.80
	t.p.i.	inch	.008	.007	.007	.007	.007	.006	.006	.006	.006	.005	.005	.003				.071
266RL-22RD01A080E	8	mm	0.20	0.19	0.18	0.18	0.17	0.16	0.16	0.15	0.14	0.13	0.11	0.08				1.81
	t.p.i.	inch	.008	.007	.007	.007	.007	.006	.006	.006	.006	.005	.005	.003				.071
API Buttress																		
266RG-22BU01A050E	5	mm	0.20	0.19	0.18	0.18	0.17	0.16	0.15	0.14	0.13	0.12	0.08					1.65
	t.p.i.	inch	.008	.007	.007	.007	.007	.006	.006	.006	.005	.005	.003					.065
266RL-22BU01A050E	5	mm	0.20	0.19	0.18	0.18	0.17	0.16	0.15	0.14	0.13	0.12	0.08					1.65
	t.p.i.	inch	.008	.007	.007	.007	.007	.006	.006	.006	.005	.005	.003					.065
266RG-22BU01A0501E	5	mm	0.20	0.19	0.18	0.18	0.17	0.16	0.15	0.14	0.13	0.12	0.08					1.65
	t.p.i.	inch	.008	.007	.007	.007	.007	.006	.006	.006	.005	.005	.003					.065
266RL-22BU01A0501E	5	mm	0.20	0.19	0.18	0.18	0.17	0.16	0.15	0.14	0.13	0.12	0.08					1.65
	t.p.i.	inch	.008	.007	.007	.007	.007	.006	.006	.006	.005	.005	.003					.065

Extra stock is included in the total infeed	0.05 mm .002 inch

Reference material

CMC	02.1
MC	P2.1.Z.AN

Thread turning infeed recommendations

Multi-point

		ISO Metric (MM)					ISO inch (UN) External				Whitworth (WH)			NPT (NT)
		Pitch, mm					Pitch, t.p.i.				Pitch, t.p.i.			Pitch, t.p.i.
		1.00	1.50	2.00	2.50	3.00	18	16	14	12	19	14	11	11 ½
External														
No. of infeeds	**Unit**	**Radial infeed per pass**												
1	mm	0.34	0.36	0.47	0.46	0.55	0.49	0.39	0.44	0.52	0.49	0.47	0.45	0.50
	inch	.013	.014	.019	.018	.022	.019	.015	.017	.020	.019	.019	.018	.020
2	mm	0.31	0.33	0.46	0.43	0.52	0.43	0.36	0.41	0.47	0.43	0.43	0.43	0.48
	inch	.012	.013	.018	.017	.020	.017	.014	.016	.019	.017	.017	.017	.019
3	mm		0.26	0.33	0.40	0.48		0.29	0.32	0.36		0.33	0.39	0.44
	inch		.010	.013	.016	.019		.011	.013	.014		.013	.015	.017
4	mm				0.27	0.33							0.27	0.31
	inch				.011	.013							.011	.012
	mm	**0.65**	**0.95**	**1.26**	**1.56**	**1.88**	**0.92**	**1.04**	**1.17**	**1.35**	**0.92**	**1.23**	**1.54**	**1.73**
Total infeed	**inch**	**.026**	**.037**	**.050**	**.061**	**.074**	**.036**	**.041**	**.046**	**.053**	**.036**	**.048**	**.061**	**.068**
Internal														
No. of infeeds	**Unit**	**Radial infeed per pass**												
1	mm	0.33	0.35	0.46	0.45	0.52				0.47		0.45	0.43	0.50
	inch	.013	.014	.018	.018	.020				.019		.018	.017	.020
2	mm	0.30	0.32	0.42	0.42	0.49				0.44		0.41	0.41	0.48
	inch	.012	.013	.017	.017	.019				.017		.016	.016	.019
3	mm		0.25	0.32	0.36	0.45				0.34		0.32	0.39	0.44
	inch		.010	.013	.014	.018				.013		.013	.015	.017
4	mm				0.25	0.32							0.27	0.31
	inch				.010	.013							.011	.012
	mm	**0.63**	**0.92**	**1.20**	**1.48**	**1.78**				**1.25**		**1.18**	**1.50**	**1.73**
Total infeed	**inch**	**.025**	**.036**	**.047**	**.058**	**.070**				**.049**		**.046**	**.059**	**.068**

Extra stock is included in the total infeed	0.05 mm
	.002 inch

Reference material

CMC	02.1
MC	P2.1.Z.AN

Thread turning infeed recommendations, CoroCut® XS

ISO Metric (MM)

Unit	Pitch, mm	Total infeed	nap
mm	0.20	0.12	4
inch		.005	4
mm	0.25	0.15	4
inch		.006	4
mm	0.30	0.18	4
inch		.007	4
mm	0.35	0.21	4
inch		.008	4
mm	0.40	0.25	4
inch		.010	4
mm	0.45	0.28	4
inch		.011	4
mm	0.50	0.29	4
inch		.011	4
mm	0.75	0.45	4
inch		.018	4
mm	1.00	0.60	5
inch		.024	5
mm	1.25	0.74	6
inch		.029	6
mm	1.50	0.90	6
inch		.035	6
mm	1.75	1.06	8
inch		.042	8
mm	2.00	1.21	8
inch		.048	8

ISO inch (UN)

Unit	Pitch, t.p.i.	Total infeed	nap
mm	56	0.28	4
inch		.011	4
mm	48	0.33	4
inch		.013	4
mm	44	0.36	4
inch		.014	4
mm	40	0.40	4
inch		.016	4
mm	36	0.43	4
inch		.017	4
mm	32	0.49	5
inch		.019	5
mm	28	0.56	5
inch		.022	5
mm	24	0.65	5
inch		.026	5
mm	20	0.80	6
inch		.031	6
mm	18	0.86	6
inch		.034	6
mm	16	0.97	7
inch		.038	7
mm	14	1.12	8
inch		.044	8
mm	13	1.19	8
inch		.047	8
mm	12	1.30	9
inch		.051	9

Can be used for thread types:
ISO Metric (MM)
ISO inch (UN)
NPTF, MJ, UNJ

No extra stock added

Thread turning infeed recommendations, CoroTurn® XS

ISO Metric (MM)

Unit	Pitch, mm	Total infeed	nap
mm	0.50	0.34	7
inch		.013	7
mm	0.70	0.43	8
inch		.017	8
mm	0.75	0.48	8
inch		.019	8
mm	0.80	0.53	8
inch		.021	8
mm	1.00	0.63	11
inch		.025	11
mm	1.25	0.77	11
inch		.030	11
mm	1.50	0.92	13
inch		.036	13
mm	1.75	1.05	14
inch		.041	14
mm	2.00	1.20	18
inch		.047	18

ISO inch (UN)

Unit	Pitch, t.p.i.	Total infeed	nap
mm	48	0.33	7
inch		.013	7
mm	36	0.43	8
inch		.017	8
mm	32	0.51	8
inch		.020	8
mm	28	0.58	9
inch		.023	9
mm	24	0.66	11
inch		.026	11
mm	20	0.69	11
inch		.027	11
mm	18	0.86	12
inch		.034	12
mm	16	0.96	13
inch		.038	13

Whitworth (WH)

Unit	Pitch, t.p.i.	Total infeed	nap
mm	28	0.64	10
inch		.025	10
mm	26	0.68	11
inch		.027	11
mm	24	0.71	11
inch		.028	11
mm	22	0.77	12
inch		.030	12
mm	20	0.88	14
inch		.035	14
mm	19	0.92	14
inch		.036	14

NPT (NT)

Unit	Pitch, t.p.i.	Total infeed	nap
mm	27	0.76	12
inch		.030	12
mm	18	1.11	18
inch		.044	18

Trapezoidal (TR)

Unit	Pitch, mm	Total infeed	nap
mm	1.50	0.92	6
inch		.036	6
mm	2.00	1.22	8
inch		.048	8
mm	3.00	1.76	12
inch		.069	12

Extra stock is included in the total infeed	0.05 mm
	.002 inch

Reference material

CMC	02.1
MC	P2.1.Z.AN

Thread turning infeed recommendations, CoroCut® MB

ISO Metric (MM)

Unit	Pitch, mm	Total infeed	nap
mm	0.50	0.34	4
inch		.013	4
mm	1.00	0.63	5
inch		.025	5
mm	1.50	0.92	6
inch		.036	6
mm	1.75	1.05	8
inch		.041	8
mm	2.00	1.20	8
inch		.047	8
mm	2.50	1.48	10
inch		.058	10

ISO inch (UN)

Unit	Pitch, t.p.i.	Total infeed	nap
mm	32	0.51	4
inch		.020	4
mm	28	0.58	5
inch		.023	5
mm	24	0.66	5
inch		.026	5
mm	20	0.78	6
inch		.031	6
mm	18	0.86	6
inch		.034	6
mm	16	0.96	7
inch		.038	7
mm	14	1.07	8
inch		.042	8

Whitworth (WH)

Unit	Pitch, t.p.i.	Total infeed	nap
mm	19	0.92	6
inch		.036	6
mm	14	1.23	8
inch		.048	8
mm	11	1.54	9
inch		.061	9

NPT (NT)

Unit	Pitch, t.p.i.	Total infeed	nap
mm	18	1.11	8
inch		.044	8
mm	14	1.42	10
inch		.056	10

ACME (AC)

Unit	Pitch, t.p.i.	Total infeed	nap
mm	16	1.02	6
inch		.040	6
mm	14	1.14	7
inch		.045	7
mm	12	1.30	8
inch		.051	8
mm	10	1.64	10
inch		.065	10
mm	8	1.95	12
inch		.077	12

Stub-ACME (AC)

Unit	Pitch, t.p.i.	Total infeed	nap
mm	16	0.70	5
inch		.028	5
mm	14	0.77	5
inch		.030	5
mm	12	0.87	6
inch		.034	6
mm	10	1.13	7
inch		.044	7
mm	8	1.33	8
inch		.052	8

Extra stock is included in the total infeed	0.05 mm
	.002 inch
Reference material	
CMC	02.1
MC	P2.1.Z.AN

External thread milling recommendations

All values are based on the theoretical base profile to which tolerances are added

CoroMill 327, metric

		Internal					External				
Pitch	Thread height, 5H/8	Root	Insert	a_r max	Nose radii	a_r re-quired	Root	Insert	a_r max	Nose radii	a_r required
1	0.54	0.13	327Rxx-xx100VM-THx	1.20	0.13	0.54	0.25	327Rxx-xx100VM-TH 327R12-22200MM-TH	1.2 1.08	0.13 0.25	0.65 0.54
1.5	0.81	0.19	327Rxx-xx100VM-THx 327R12-22150MM-TH	1.20 0.81	0.13 0.19	0.87 0.81	0.38	327Rxx-xx100VM-TH 327Rxx-xx250VM-THx 327R12-22300MM-TH	1.2 1.69/2/2.65 1.62	0.13 0.31 0.38	1.03 0.87 0.81
1.75	0.95	0.22	327Rxx-xx100VM-THx 327R12-22175MM-TH	1.20 0.95	0.13 0.22	1.03 0.95	0.44	327Rxx-xx250VM-THx 327R12-22350MM-TH	1.69/2/2.65 1.89	0.31 0.44	1.06 0.95
2	1.08	0.25	327Rxx-xx100VM-THx 327R12-22200MM-TH	1.20 1.08	0.13 0.25	1.19 1.08	0.50	327R12-22250VM-THx 327R12-22400MM-TH	2.65 2.17	0.31 0.50	1.24 1.08
2.5	1.35	0.31	327R06-12250VM-TH 327R09-18250VM-TH 327R12-22250VM-THx	1.69 2.00 2.65	0.31 0.31 0.31	1.35 1.35 1.35	0.63	327R06-12250VM-TH 327R09-18250VM-TH 327R12-22250VM-THX 327R12-22450MM-TH	1.69 2.00 2.65 2.44	0.31 0.31 0.31 0.56	1.62 1.62 1.62 1.41
3	1.62	0.38	327R06-12250VM-TH 327R09-18250VM-TH 327R12-22250VM-THx 327R12-22300MM-TH	1.69 2.00 2.65 1.62	0.31 0.31 0.31 0.38	1.68 1.68 1.68 1.62	0.75	327R09-18250VM-TH 327R12-22250VM-THx 327R12-22450MM-TH	2.00 2.65 2.44	0.31 0.31 0.56	2.00 2.00 1.79
3.5	1.89	0.44	327R09-18250VM-TH 327R12-22250VM-THx 327R12-22350MM-TH	2.00 2.65 1.89	0.31 0.31 0.44	2.00 2.00 1.89	0.88	327R12-22250VM-THx 327R12-22450MM-TH	2.65 2.44	0.31 0.56	2.38 2.17
4	2.17	0.50	327R12-22250VM-THx 327R12-22400MM-TH	2.65 2.17	0.31 0.50	2.33 2.17	1.00	Not possible with CoroMill 327			
4.5	2.44	0.56	327R12-22250VM-THx 327R12-22450MM-TH	2.65 2.44	0.31 0.56	2.65 2.44	1.13				

CoroMill 327, inch

		Internal					External				
Pitch	Thread height, 5H/8	Root	Insert	a_r max	Nose radii	a_r required	Root	Insert	a_r max	Nose radii	a_r required
24	.0226	.0052	327Rxx-xx100VM-THx	.0472	.0049	.0227	.0104	327Rxx-xx100VM-TH	.0472	.0049	.0273
16	.0338	.0078	327Rxx-xx100VM-THx	.0472	.0049	.0363	.0156	327Rxx-xx100VM-TH 327Rxx-xx250VM-THx	.0472 .067/.079/ .104	.0049 .0123	.0431 .0367
14	.0387	.0089	327Rxx-xx100VM-THx	.0472	.0049	.0421	.0179	327Rxx-xx250VM-THx	.067/.079/ .104	.0123	.0435
12	.0451	.0104	Not possible with CoroMill 327				.0208	327R12-22250VM-THx	.1043	.0123	.0525
10	.0541	.0125	327R06-12250VM-TH 327R09-18250VM-TH 327R12-22250VM-THx	.0665 .0787 .1043	.0123 .0123 .0123	.0543 .0543 .0543	.0250	327R06-12250VM-TH 327R09-18250VM-TH 327R12-22250VM-THX	.0665 .0787 .1043	.0123 .0123 .0123	.0651 .0651 .0651
8	.0677	.0156	327R09-18250VM-TH 327R12-22250VM-THx	.0787 .1043	.0123 .0123	.0706 .0706	.0313	327R12-22250VM-THx	.1043	.0123	.0841
7	.0773	.0179	327R12-22250VM-THx	.1043	.0123	.0822	.0357	327R12-22250VM-THx	.1043	.0123	.0976
6	.0902	.0208	327R12-22250VM-THx	.1043	.0123	.0976	.0417	Not possible with CoroMill 327			
5	.1083	.0250	Not possible with oroMill 327				.0500				

External thread milling recommendations

All values are based on the theoretical base profile to which tolerances are added

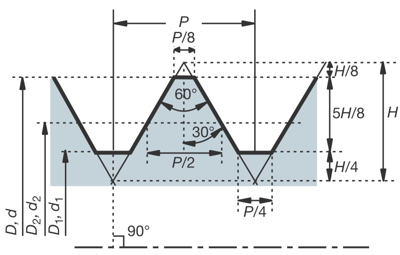
CoroMill 328, metric

		Internal					External				
Pitch	Thread height, 5H/8	Root	Insert	a_r max	Nose radii	a_r required	Root	Insert	a_r max	Nose radii	a_r required
1.5	0.81	0.19	328R13-150VM-TH	2.11	0.19	0.81	0.38	328R13-150VM-TH	2.11	0.19	0.97
1.75	0.95	0.22	328R13-150VM-TH	2.11	0.19	0.97	0.44	328R13-150VM-TH	2.11	0.19	1.11
2	1.08	0.25	328R13-150VM-TH	2.11	0.19	1.14	0.50	328R13-150VM-TH 328R13-400VM-TH	2.11 3.46	0.19 0.50	1.35 1.08
2.5	1.35	0.31	327R13-150VM-TH	2.11	0.19	1.46	0.63	328R13-150VM-TH 328R13-400VM-TH	2.11 3.46	0.19 0.50	1.73 1.46
3	1.62	0.38	327R13-150VM-TH	2.11	0.19	1.79	0.75	328R13-150VM-TH 328R13-400VM-TH	2.11 3.46	0.19 0.50	2.11 1.84
3.5	1.89	0.44	327R13-150VM-TH	2.11	0.19	2.11	0.88	328R13-400VM-TH	3.46	0.50	2.22
4	2.17	0.50	327R13-400VM-TH	3.46	0.50	2.17	1.00	328R13-400VM-TH	3.46	0.50	2.60
4.5	2.44	0.56	327R13-400VM-TH	3.46	0.50	2.49	1.13	328R13-400VM-TH	3.46	0.50	2.98
5	2.71	0.63	327R13-400VM-TH	3.46	0.50	2.81	1.25	328R13-400VM-TH	3.46	0.50	3.36
5.5	2.98	0.69	327R13-400VM-TH	3.46	0.50	3.14	1.38	Not possible with CoroMill 328			
6.0	3.25	0.75	327R13-400VM-TH	3.46	0.50	3.46	1.50				

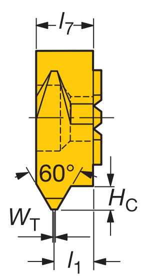
CoroMill 328, inch

		Internal					External				
Pitch	Thread height, 5H/8	Root	Insert	H_c/a_r max	W_T	a_r required	Root	Insert	H_c/a_r max	W_T	a_r required
16	.0338	.0078	328R13-150VM-TH	.0831	.0074	.0343	.0156	328R13-150VM-TH	.0831	.0074	.0410
14	.0387	.0089	328R13-150VM-TH	.0831	.0074	.0401	.0179	328R13-150VM-TH	.0831	.0074	.0477
12	.0451	.0104	328R13-150VM-TH	.0831	.0074	.0478	.0208	328R13-150VM-TH 328R13-400VM-TH	.0831 .1362	.0074 .0197	.0568 .0461
10	.0541	.0125	327R13-150VM-TH	.0831	.0074	.0587	.0250	328R13-150VM-TH 328R13-400VM-TH	.0831 .1362	.0074 .0197	.0694 .0587
8	.0677	.0156	327R13-150VM-TH	.0831	.0074	.0749	.0313	328R13-400VM-TH	.1362	.0197	.0777
7	.0773	.0179	Not possible with CoroMill 328				.0357	328R13-400VM-TH	.1362	.0197	.0912
6	.0902	.0208	327R13-400VM-TH	.1362	.0197	.0913	.0417	328R13-400VM-TH	.1362	.0197	.1092
5	.1083	.0250	327R13-400VM-TH	.1362	.0197	.1130	.0500	328R13-400VM-TH	.1362	.0197	.1345
4	.1353	.0313	Not possible with CoroMill 328				.0625	Not possible with CoroMill 328			

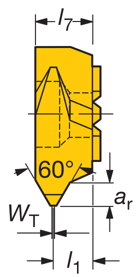
Theoretical base profile



Full profile



V-profile



Formulas

Use the following formulas as a reference for successful thread machining.

Thread turning formulas

Infeed

(Manual formulas, when not using the Sandvik Coromant calculator)

$$\Delta_{apx} = \frac{a_p}{\sqrt{nap - 1}} \times \sqrt{\varphi}$$

Δap = Radial infeed

X = Actual pass (in a series from 1 to nap)

a_p = Total depth of thread + extra stock

nap = Number of passes

φ = 1st pass = 0.3
2nd pass = 1
3rd and higher = x-1

Pitch 1.5 mm
a_p = 0.94 mm (.037 inch)
nap = 6

φ1 = 0.3
φ2 =1
φn = x-1

$$\Delta_{apx}1 = \frac{0.94}{\sqrt{5}} \times \sqrt{0.3} = 0.23$$

$$\Delta_{apx}1 = \frac{.037}{\sqrt{5}} \times \sqrt{0.3} = .009$$

1st pass, infeed

= 0.23 mm

= .009 inch

$$\Delta_{apx}2 = \frac{0.94}{\sqrt{5}} \times \sqrt{1} = 0.42$$

$$\Delta_{apx}2 = \frac{.037}{\sqrt{5}} \times \sqrt{1} = .017$$

2nd pass, infeed

0.42 – 0.23 = 0.19 mm

.017 – .009 = .008 inch

$$\Delta_{apx}3 = \frac{0.94}{\sqrt{5}} \times \sqrt{2} = 0.59$$

$$\Delta_{apx}3 = \frac{.037}{\sqrt{5}} \times \sqrt{2} = .023$$

3rd pass, infeed

0.59 – 0.42 = 0,17 mm

.023 – .017 = .006 inch

$$\Delta_{apx}4 = \frac{0.94}{\sqrt{5}} \times \sqrt{3} = 0.73$$

$$\Delta_{apx}4 = \frac{.037}{\sqrt{5}} \times \sqrt{3} = .029$$

4th pass, infeed

0.73 – 0.59 = 0.14 mm

.029 – .023 = .006 inch

$$\Delta_{apx}5 = \frac{0.94}{\sqrt{5}} \times \sqrt{4} = 0.84$$

$$\Delta_{apx}5 = \frac{.037}{\sqrt{5}} \times \sqrt{4} = .033$$

5th pass, infeed

0.84 – 0.73 = 0.11 mm

.033 – .029 = .004 inch

$$\Delta_{apx}6 = \frac{0.94}{\sqrt{5}} \times \sqrt{5} = 0.94$$

$$\Delta_{apx}6 = \frac{.037}{\sqrt{5}} \times \sqrt{5} = .037$$

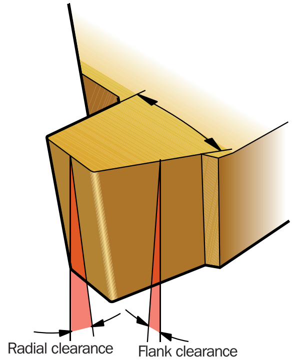
6th pass, infeed

0.94 – 0.84 = 0.10 mm

.037 – .033 = .004 inch

Flank clearance depending on profile

$$\alpha = \arctan\left(\sin\left(\frac{\beta}{2}\right) \times \tan(\gamma)\right)$$



Tread profile	Angle (β)	Internal 15° (γ)	External 10° (γ)
Metric. UN	60°	8.5°	6°
Whitworth	55°	7.5°	5°
Trapezoidal	30°	4°	2.5°
ACME	29°	4°	2.5°
Buttress	10° / 3°	2° / 0.5°	2.5° / 0.5°

Angle of insert inclination

$$\varphi = \arctan\left(\frac{P}{d_2 \times \pi}\right)$$

Multi-start threads

If the thread has multi-starts, calculate the helix angle with this formula.

$$\varphi = \arctan\left(\frac{(\text{number of starts}) \times P}{d_2 \times \pi}\right)$$

Thread milling formulas

Cutting speed (v_c)
(m/min)

$$v_c = \frac{D_{cap} \times \pi \times n}{1000}$$

Internal thread milling

Calculated version

Peripheral feed (mm/min)

$$v_{fm} = n \times f_z \times z_c$$

Tool centre feed (mm/min)

$$v_f = \frac{v_{fm} \times (D_m - D_{cap})}{D_m}$$

Radial depth of cut (mm)

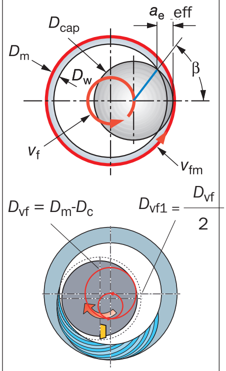
$$a_{e\ eff} = \frac{D_m^2 - D_w^2}{4\ (D_m - D_{cap})}$$

Feed per tooth (mm)

$$f_z = \frac{h_{ex}}{\sqrt{1 - \cos^2 \beta}} = \frac{h_{ex}}{\sin \beta}$$

$$\beta = \arccos \left(1 - \frac{2 \times a_{e\ eff}}{D_{cap}} \right)$$

Thread milling



Thread milling with a roll into cut tool path, D_{vf1}

External thread milling

Calculated version

Peripheral feed (mm/min)

$$v_{fm} = n \times f_z \times z_c$$

Tool centre feed (mm/min)

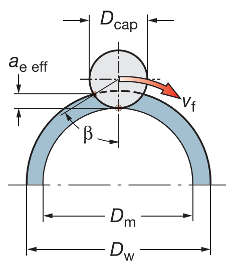
$$v_f = \frac{v_{fm} \times (D_m + D_{cap})}{D_m}$$

Feed per tooth (mm)

$$f_z = \frac{h_{ex}}{\sin \beta}$$

$$a_{e\ eff} = \frac{D_w^2 - D_m^2}{4\ (D_m + D_{cap})}$$

$$\beta = \arccos \left(1 - \frac{2 \times a_{e\ eff}}{D_{cap}} \right)$$



Inch/mm conversion table

Conversion			
t.p.i. to pitch in mm		Pitch in mm to t.p.i.	
t.p.i.	Pitch mm	Pitch mm	t.p.i.
32	0.794	0.50	50.80
28	0.907	0.75	33.87
27	0.941	1.00	25.40
24	1.058	1.25	20.32
20	1.270	1.50	16.93
19	1.337	1.75	14.51
18	1.411	2.00	12.70
16	1.587	2.50	10.16
14	1.814	3.00	8.47
13	1.954	3.50	7.26
12	2.117	4.00	6.35
11.5	2.209	4.50	5.64
11	2.309	5.00	5.08
10	2.540	5.50	4.62
9	2.822	6.00	4.23
8	3.175	7.00	3.63
7	3.629	8.00	3.14
6	4.233		
5	5.080		
4	6.350		
3	8.467		

From t.p.i. to mm

20 t.p.i. ⇒ 25.4/20 = 1.27 mm.

From mm to t.p.i.

1.27 mm ⇒ 25.4/1.27 mm = 20 .t.p.i.