WIDIA™ Laydown Threading

For increased reliability and productivity, look no further than the WIDIA Laydown Threading System for all of your I.D. and O.D. threading applications. The Laydown Threading System maximises tool life and thread quality.

Laydown

This specially engineered system meets all modern production standards. With an extensive range of inserts and toolholders available, the Laydown Threading platform is ideal for all of your threading requirements.

Laydown Insert Technology

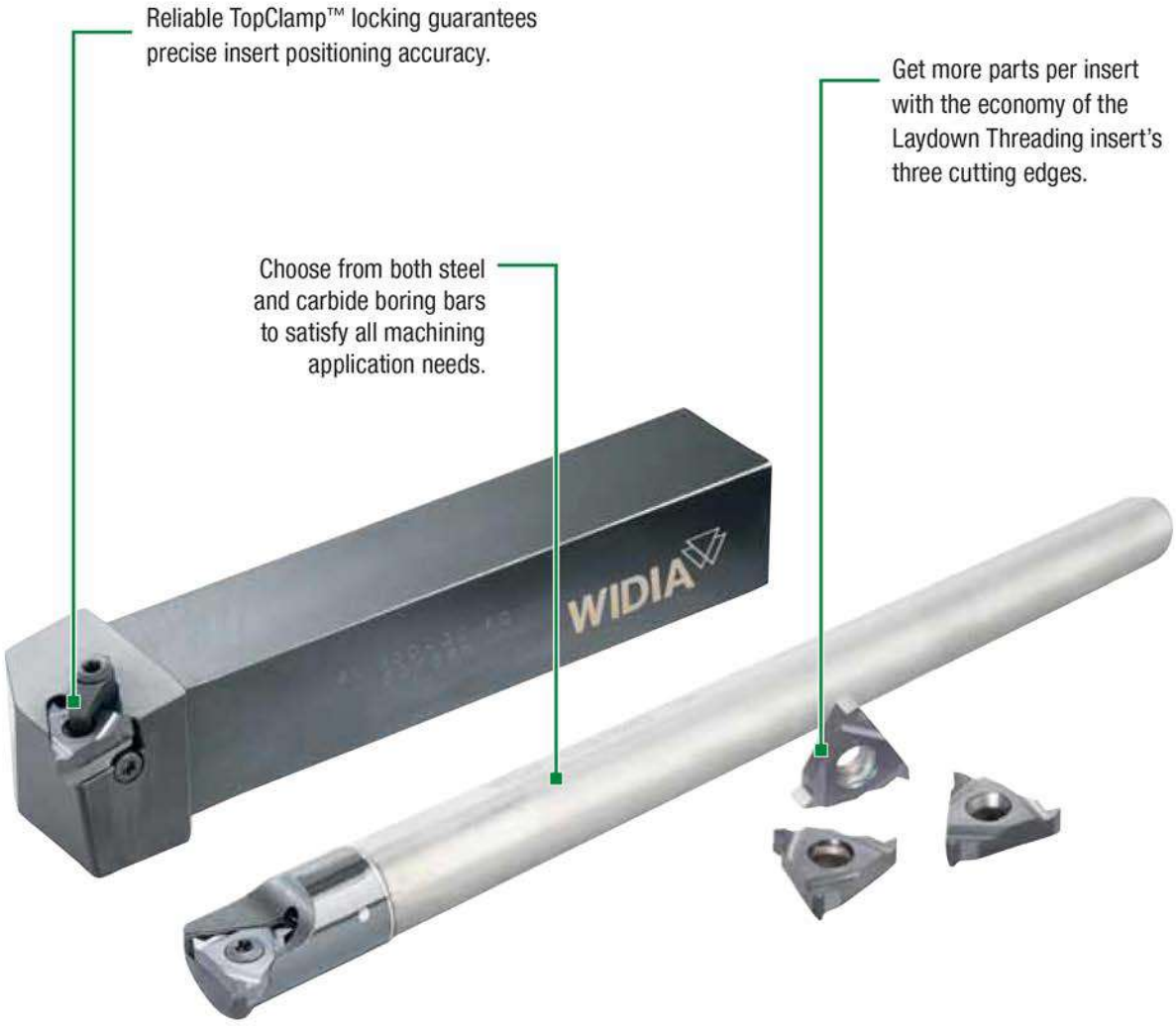
Laydown insert technology, with its wide range of available tools and inserts, guarantees increased tool life, minimised built-up edges, and precise cuts of most common materials.

- TN6025™ premium PVD TiAlN-coated grade outperforms conventional PVD grades.
- Enables superior chip control and reduced cutting forces.
- Partial and full profile insert options available for all common thread forms.

The Laydown Threading Solution

With the WIDIA™ Laydown Threading System, you experience reliable countersunk screw locking for unhindered chip flow and precise insert positioning accuracy.

- Industry-leading thread quality.
- Four insert sizes available to cover a wide range of thread-making operations.
- Ideal for high-helix/multi-start threads and single-point threading in small-diameter bores.
- Maximised tool life and low-profile design for unhindered chip flow and superior performance.

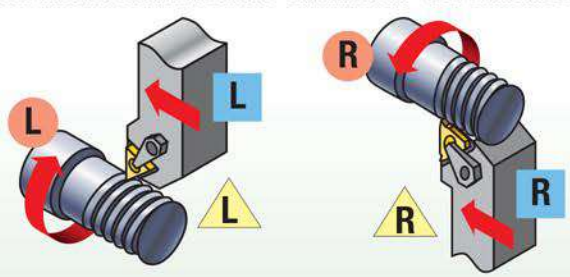

Reliable TopClamp™ locking guarantees precise insert positioning accuracy.
Get more parts per insert with the economy of the Laydown Threading insert's three cutting edges.
Choose from both steel and carbide boring bars to satisfy all machining application needs.
WIDIA

Step 1 • Select Threading Method and Hand of Tooling

Required Information:
- External/internal operation.
- Spindle rotation/hand of thread.
- Feed direction.

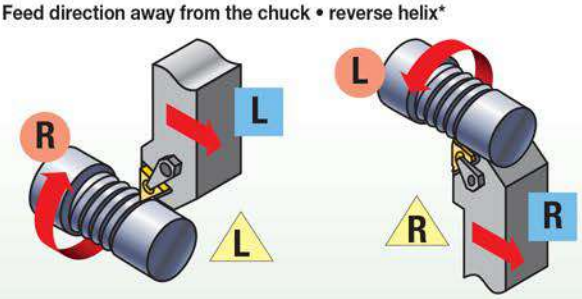
hand of thread | hand of toolholder | hand of insert

Feed direction toward the chuck • standard helix • RECOMMENDED



external left-hand thread | external right-hand thread | internal left-hand thread | internal right-hand thread

Feed direction away from the chuck • reverse helix*



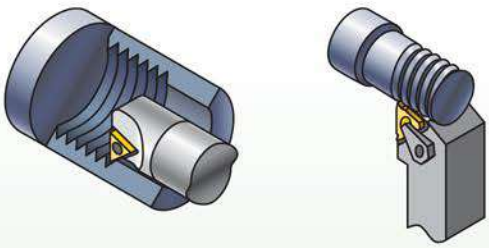
external right-hand thread | external left-hand thread | internal right-hand thread | internal left-hand thread

**Negative shim required*

Step 2 • Select Holder from Catalogue Page

Required Information:
- External/internal operation.
- Minimum bore diameter (for internal operations).
- Hand of tool.
- Insert size (gage insert).

Select the appropriate holder for the insert size and hand:

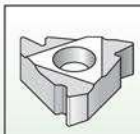


The insert size must match the gage insert size of your toolholder selection:

catalogue number	gage insert	minimum bore diameter	shim
S0812LSER2	2IRA60	16,5mm	–
S2020LSER3	3IR...	36,8mm	SM-YI3

Step 3 • Choose Insert for Application

- Select cresting inserts for fully controlled thread form including diameter.
- Cresting inserts eliminate the need for deburring and are optimised for the best tool life at that pitch.
- Non-cresting partial profile inserts offer the flexibility to cut a variety of thread pitches with one insert.
- Note insert size for toolholder selection.



insert size	catalogue number	TN6025
11	2IRA60	•
16	3IRAG60	•

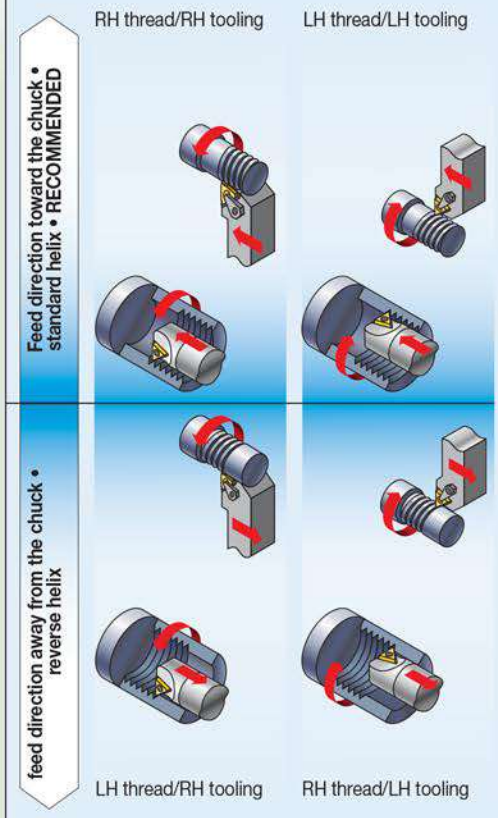
See threading insert overview on page F42.

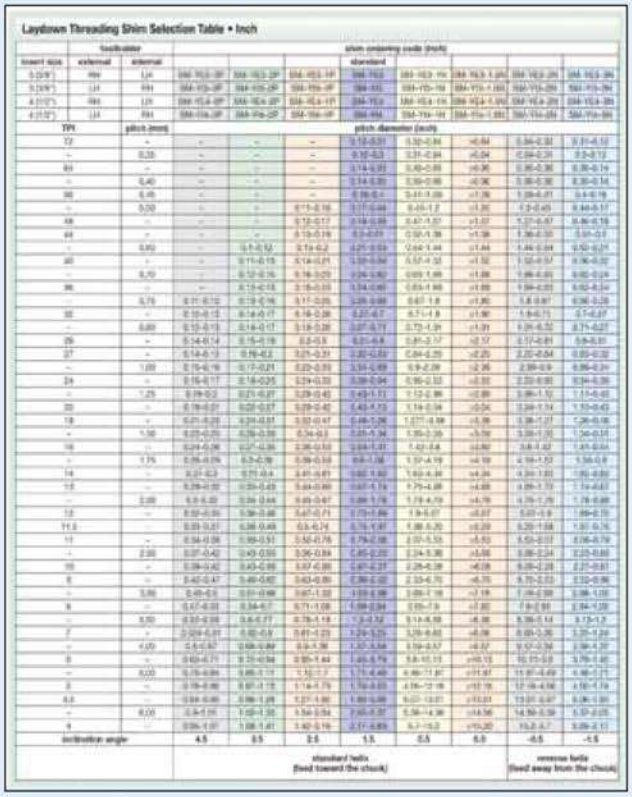
Step 4 • Select Appropriate Shim

Required Information:

- Thread form (TPI or pitch).
- Pitch diameter.
- Helix method (hand of tool, feed direction, hand of thread).
- Number of starts.

Select the proper shim: SMYE... for external RH or internal LH
SMYI... for internal RH or external LH



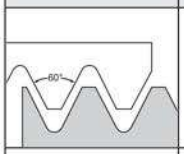
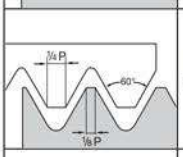
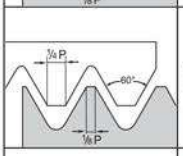
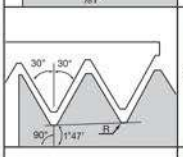
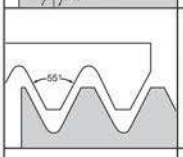
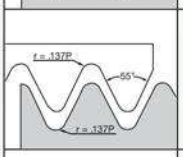
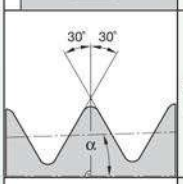
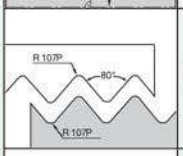
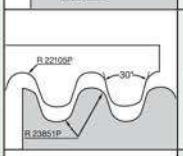
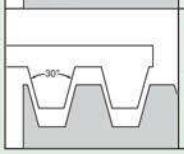


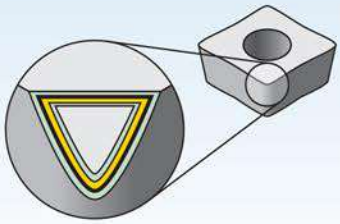
If recommended shim is different from shim supplied with toolholder, order shim separately.
NOTE: Optimise your threading operation by using the proper infeed angle and the recommended infeed values. See the Technical Section on pages F83–F105. Also see detailed shim selection information on pages F104–F105.

Step 5 • Select Grade and Speed

Recommendations for Grade and Speed Selection — m/min

workpiece material	steel	stainless steel	cast iron	non-ferrous metals	high-temp alloys
insert style	 precision ground				
first choice	TN6025	TN6025	TN6025	TN6025	TN6025
	40–200 (130–650)	40–135 (130–450)	60–145 (200–475)	50–360 (160–1150)	10–100 (35–330)

style			thread profile	standard	tolerance class	cresting	application	page(s)
	flat top							
	60		Partial profile 60°	–	–	N	General use for 60° thread forms, such as ISO and UN, where non-cresting inserts are desired to cut a variety of pitches.	**F46–F47**
	ISO		Metric ISO	ISO R262, DIN 13	6g/6H	Y	Widely used metric 60° V-form for all industries.	**F48–F53**
	UN		American UN	ANSI B1.1:74	2A/2B	Y	Widely used inch-based 60° V-form for all industries.	**F54–F57**
	NPT		NPT	ANSI/ASME B1.20.1S1983	Standard NPT	N	National Pipe Thread standard 60° thread form for pipe fittings.	**F58–F59**
	55		Partial profile 55°	–	–	N	General use for 55° thread forms such as Whitworth, BSW, and BSP where non-cresting inserts are desired to cut a variety of pitches.	**F60–F61**
	W		Whitworth, BSW, BSF, BSP	BS 84:1956, ISO 228/1:1982, DIN 259	Medium Class A	Y	Widely used 55° form for gas and water connections.	**F62–F63**
	API-RD		API round	API STD. 5B:1979	Standard API RD	Y	60° V-form with large radius for casing, tubing, and line pipe in the oil and gas industry, including 8 and 10 round forms.	**F64**
	PG		PG	DIN 404B0		Y	80° steel conduit thread.	**F65**
	RD		Round	DIN 405	7e/7H	Y	Round thread form for tube fittings in the chemical and food industries.	**F65–F66**
	TR		Trapez	DIN 103	7e/7H	N	30° truncated metric thread form for motion applications.	**F67–F68**

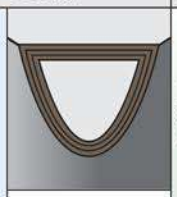


Coatings provide high-speed capability and are engineered for finishing to heavy roughing.

- Reduce cycle times — high speed capability.
- Longer tool life — new multilayer coating provides better wear resistance.

P	Steel
M	Stainless Steel
K	Cast Iron
N	Non-Ferrous
S	High-Temp Alloys
H	Hardened Materials

wear resistance ← → toughness

Grade	Coating	Grade Description		05	10	15	20	25	30	35	40	45
TN6025	 HC-P25	PVD-TiAlN Nano-multilayer coated carbide. General-purpose machining for steels, stainless steels, cast irons, non-ferrous materials, and difficult-to-machine materials. Recommended at low to medium cutting speeds when higher toughness is required.	P				■	■	■			
			M				■	■	■			
			K				■	■	■			
			N				■	■	■			
			S				■	■	■			

Laydown Threading Thread Form Guide

- All Laydown Threading inserts are precision ground to provide accurate thread forms and indexing.
- Both cresting and non-cresting partial profile inserts are specifically designed for either external or internal threading operations.
- Cresting inserts provide a fully controlled thread form, including diameter for a given pitch. The need for deburring is eliminated and the inserts are optimised for the best tool life at that pitch.
- Non-cresting partial profile inserts offer the flexibility to cut a variety of thread pitches with one insert.
- Right-hand Laydown Threading toolholders use right-hand inserts. Left-hand Laydown Threading toolholders use left-hand inserts.
- Right-hand Laydown Threading boring bars use right-hand inserts. Left-hand Laydown Threading boring bars use left-hand inserts.

Laydown Threading
Insert Identification System

3	E	R	A	ISO	
Insert Size	Insert Type	Hand of Insert	Thread Pitch	Thread Profile	Number of Teeth

E – External thread

I – Internal thread

R – Right-hand thread

L – Left-hand thread

Single tooth profile – No symbol

Multi-tooth profile – Number of teeth (cutting edge and symbol)

Multi-tooth profile with two teeth – 2M

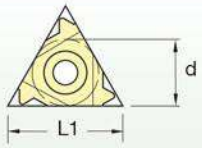
55	Partial Profile 55°
60	Partial Profile 60°
ISO	ISO Metric 60°
TR	ISO Metric 60°
UN	ISO Inch/American UN 60°
W	Whitworth 55°
NPT	American National Pipe Thread 60°
RD	Round
PG	Steel Conduit
APIRD	API Round

Partial profile inserts

symbol	mm
A	0,5–1,5
AG	0,5–3,0
G	1,7–3,0
N	3,5–5,0
Q	5,5–6,0

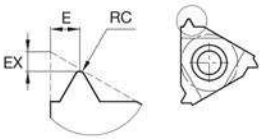
Full profile inserts

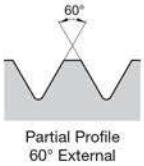
symbol	mm
Actual TPI	0,5–0,4



symbol	d	L1
2	0.250	11
3	0.375	16
4	0.500	22
5	0.625	27

Material Group		Cutting Speed — vc m/min		
		TN6025		
		min	Start	max
P	0/1	130	140	150
	2	110	145	175
	3	110	145	175
	4	75	95	115
	5	100	125	145
	6	40	55	65
M	1	60	75	90
	2	40	50	55
	3	40	50	60
K	1	60	80	90
	2	60	75	85
	3	60	75	90
N	1	600	750	900
	2	535	685	835
	3	230	300	370
	4	135	180	225
	5	70	90	110
	6	445	565	690
	7	550	700	850
S	1	25	35	40
	2	15	20	20
	3	40	60	70
	4	20	30	35





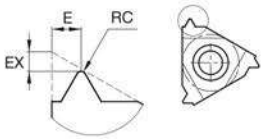
Partial Profile
60° External

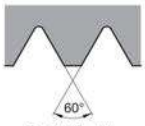
● first choice
○ alternate choice

P		●
M		●
K		●
N		○
S		●
H		

■ ER/L-60

catalogue number	RC	EX	E	insert size	thread pitch mm	TPI	TPF	TN6025
right hand								
2ERA60	0,05	0,9	0,8	2	0,50-1,5	48-16	–	2007404
3ERA60	0,05	0,8	0,9	3	0,50-1,5	48-16	–	2018214
3ERAG60	0,08	1,2	1,7	3	0,50-3,0	48-8	–	2018246
3ERG60	0,28	1,2	1,7	3	1,75-3,0	14-8	–	2018222
4ERN60	0,53	1,7	2,5	4	3,5-5,0	7-5	–	2018252
5ERQ60	0,64	2,1	3,1	5	5,5-6,0	4.5-4	–	2018256
left hand								
3ELAG60	0,08	1,2	1,7	3	0,50-3,0	48-8	–	2071904
3ELG60	0,28	1,2	1,7	3	1,75-3,0	14-8	–	2018236





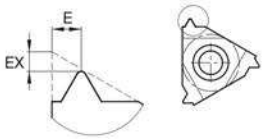
Partial Profile
60° Internal

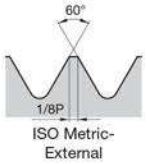
● first choice
○ alternate choice

P		●
M		●
K		●
N		○
S		●
H		

■ IR/L-60

catalogue number	RC	EX	E	insert size	thread pitch mm	TPI	TPF	TN6025
right hand								
2IRA60	0,05	0,8	0,9	2	0,50-1,5	48-16	–	2018262
3IRA60	0,05	0,8	0,9	3	0,50-1,5	48-16	–	2018272
3IRAG60	0,05	1,2	1,7	3	0,50-3,0	48-8	–	2018284
3IRG60	0,15	1,2	1,7	3	1,75-3,0	14-8	–	2018278
4IRN60	0,31	1,7	2,5	4	3,5-5,0	7-5	–	2018290
5IRQ60	0,30	1,8	2,7	5	5,5-6,0	4.5-4	–	2018295
left hand								
2ILA60	0,05	0,8	0,9	2	0,50-1,5	48-16	–	2021656
3ILAG60	0,05	1,2	1,7	3	0,50-3,0	48-8	–	2008275
3ILG60	0,15	1,2	1,7	3	1,75-3,0	14-8	–	2007419
4ILN60	0,31	1,7	2,5	4	3,5-5,0	7-5	–	2100489





● first choice
○ alternate choice

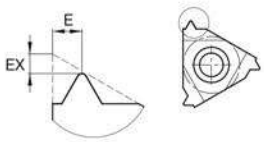
P		●
M		●
K		●
N		○
S		●
H		

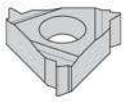
■ ER/L-ISO

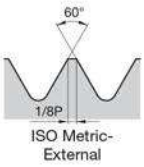
catalogue number	EX	E	insert size	thread pitch mm	TPI	TPF	TN6025
right hand							
2ER15ISO	1,0	0,8	2	1,50	–	–	2007542
3ER05ISO	0,6	0,4	3	0,50	–	–	2018377
3ER07ISO	0,6	0,6	3	0,70	–	–	2018389
3ER075ISO	0,6	0,6	3	0,75	–	–	2018395
3ER08ISO	0,6	0,6	3	0,80	–	–	2018403
3ER10ISO	0,7	0,7	3	1,00	–	–	2018411
3ER125ISO	0,8	0,9	3	1,25	–	–	2018421
3ER15ISO	0,8	1,0	3	1,50	–	–	2018429
3ER175ISO	0,9	1,2	3	1,75	–	–	2018445
3ER20ISO	1,0	1,3	3	2,00	–	–	2018460
3ER25ISO	1,1	1,5	3	2,50	–	–	2018472
3ER30ISO	1,2	1,6	3	3,00	–	–	2008256
4ER40ISO	1,6	2,3	4	4,00	–	–	2018501
4ER35ISO	1,6	2,3	4	4,50	–	–	2018495
4ER45ISO	1,7	2,4	4	4,50	–	–	2018508

(continued)

(ER/L-ISO – continued)





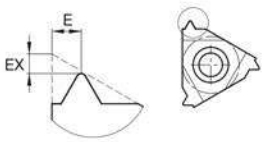


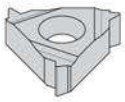
● first choice
○ alternate choice

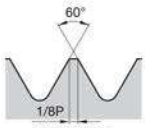
P	●
M	●
K	●
N	○
S	●
H	

catalogue number	EX	E	insert size	thread pitch mm	TPI	TPF	TN6025
4ER50ISO	1,7	2,5	4	5,00	–	–	2018517
5ER55ISO	2,7	1,9	5	5,50	–	–	2018522
5ER60ISO	2,9	2,0	5	6,00	–	–	2018528
left hand							
2EL05ISO	0,6	0,4	2	0,50	–	–	3118234
2EL06ISO	0,6	0,6	2	0,60	–	–	3118236
2EL07ISO	0,6	0,6	2	0,70	–	–	3118240
2EL075ISO	0,6	0,6	2	0,75	–	–	3118238
2EL08ISO	0,6	0,6	2	0,80	–	–	3118242
2EL10ISO	0,7	0,7	2	1,00	–	–	3118374
2EL125ISO	0,8	0,9	2	1,25	–	–	3118376
2EL15ISO	0,8	1,0	2	1,50	–	–	3118378
2EL175ISO	0,8	1,1	2	1,75	–	–	3118380
3EL035ISO	0,8	0,4	3	0,35	–	–	3122015
3EL04ISO	0,7	0,4	3	0,40	–	–	3122018
3EL045ISO	0,7	0,4	3	0,45	–	–	3122017

(ER/L-ISO — continued)



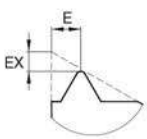


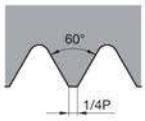


● first choice
○ alternate choice

P	●
M	●
K	●
N	○
S	●
H	

catalogue number	EX	E	insert size	thread pitch mm	TPI	TPF	TN6025
3EL06ISO	0,6	0,6	3	0,60	–	–	3122021
3EL10ISO	0,7	0,7	3	1,00	–	–	2008187
3EL15ISO	0,8	1,0	3	1,50	–	–	2018435
3EL175ISO	0,9	1,2	3	1,75	–	–	2018447
3EL20ISO	1,3	1,0	3	2,00	–	–	2018466
3EL30ISO	1,2	1,6	3	3,00	–	–	2018489
4EL40ISO	1,6	2,3	4	4,00	–	–	2101539
4EL50ISO	1,7	2,5	4	5,00	–	–	2101597





ISO Metric-Internal

● first choice
○ alternate choice

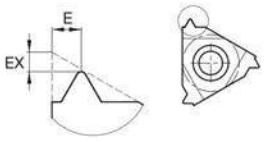
P		●
M		●
K		●
N		○
S		●
H		

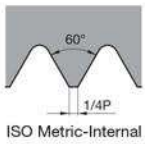
IR/L-ISO

catalogue number	EX	E	insert size	thread pitch mm	TPI	TPF	TN6025
right hand							
2IR075ISO	0,6	0,3	2	0,75	–	–	2007585
2IR10ISO	0,6	0,7	2	1,00	–	–	2007613
2IR125ISO	0,6	0,7	2	1,25	–	–	2007622
2IR15ISO	0,8	1,0	2	1,50	–	–	2018550
2IR175ISO	0,9	1,1	2	1,75	–	–	2018564
3IR05ISO	0,6	0,6	3	0,50	–	–	2018582
3IR075ISO	0,6	0,6	3	0,75	–	–	2018596
3IR10ISO	0,6	0,7	3	1,00	–	–	2018612
3IR125ISO	0,8	0,9	3	1,25	–	–	2018626
3IR15ISO	0,8	1,0	3	1,50	–	–	2018636
3IR175ISO	0,9	1,2	3	1,75	–	–	2018652
3IR20ISO	1,0	1,3	3	2,00	–	–	2018663
3IR25ISO	1,1	1,5	3	2,50	–	–	2018674
3IR30ISO	1,1	1,5	3	3,00	–	–	2018684
4IR35ISO	1,6	2,3	4	3,50	–	–	2018695

(continued)

(IR/L-ISO — continued)





ISO Metric-Internal

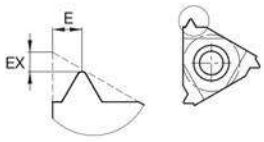
● first choice
○ alternate choice

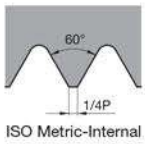
P	●
M	●
K	●
N	○
S	●
H	

catalogue number	EX	E	insert size	thread pitch mm	TPI	TPF	TN6025
4IR40ISO	1,6	2,3	4	4,00	–	–	2018702
4IR45ISO	1,6	2,4	4	4,50	–	–	2018708
4IR50ISO	1,6	2,3	4	5,00	–	–	2018714
5IR55ISO	1,6	2,3	5	5,50	–	–	2021597
5IR60ISO	1,8	2,5	5	6,00	–	–	2018720
left hand							
2IL035ISO	0,8	0,4	2	0,35	–	–	3118382
2IL04ISO	0,7	0,4	2	0,40	–	–	3118384
2IL05ISO	0,6	0,4	2	0,50	–	–	3118386
2IL06ISO	0,6	0,6	2	0,60	–	–	3118387
2IL07ISO	0,6	0,6	2	0,70	–	–	3118390
2IL075ISO	0,6	0,6	2	0,75	–	–	3118389
2IL08ISO	0,6	0,6	2	0,80	–	–	3118392
2IL125ISO	0,8	0,9	2	1,25	–	–	3123198
2IL15ISO	0,8	1,0	2	1,50	–	–	2018557
2IL20ISO	0,9	1,1	2	2,00	–	–	2071923

(continued)

(IR/L-ISO — continued)



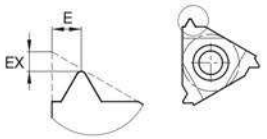


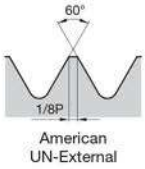
ISO Metric-Internal

● first choice
○ alternate choice

P		●
M		●
K		●
N		○
S		●
H		

catalogue number	EX	E	insert size	thread pitch mm	TPI	TPF	TN6025
3IL035ISO	0,8	0,3	3	0,35	–	–	3124269
3IL04ISO	0,8	0,4	3	0,40	–	–	3124271
3IL05ISO	0,6	0,4	3	0,50	–	–	3124272
3IL06ISO	0,6	0,6	3	0,60	–	–	3124274
3IL07ISO	0,6	0,6	3	0,70	–	–	3124276
3IL075ISO	0,6	0,6	3	0,75	–	–	2018598
3IL15ISO	0,8	1,0	3	1,50	–	–	2018642
3IL20ISO	1,0	1,3	3	2,00	–	–	2018667
3IL25ISO	1,1	1,5	3	2,50	–	–	2018678
3IL30ISO	1,1	1,5	3	3,00	–	–	2018688
4IL40ISO	1,6	2,3	4	4,00	–	–	2102322
4IL45ISO	1,6	2,4	4	4,50	–	–	2102347
4IL50ISO	1,6	2,3	4	5,00	–	–	2076776
5IL55ISO	1,6	2,3	5	5,50	–	–	2642318
5IL60ISO	1,8	2,5	5	6,00	–	–	2642319





● first choice
○ alternate choice

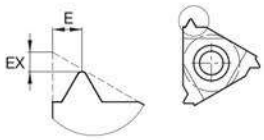
P	●
M	●
K	●
N	○
S	●
H	

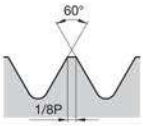
■ ER/L-UN

catalogue number	EX	E	insert size	thread pitch mm	TPI	TPF	TN6025
right hand							
3ER48UN	0,6	0,6	3	–	48	–	2018736
3ER40UN	0,6	0,6	3	–	40	–	2018744
3ER36UN	0,6	0,6	3	–	36	–	2018748
3ER32UN	0,6	0,6	3	–	32	–	2018752
3ER28UN	0,6	0,7	3	–	28	–	2018756
3ER27UN	0,8	0,7	3	–	27	–	2018760
3ER24UN	0,7	0,8	3	–	24	–	2018766
3ER20UN	0,8	0,9	3	–	20	–	2018772
3ER18UN	0,8	1,0	3	–	18	–	2018778
3ER16UN	0,9	1,1	3	–	16	–	2018782
3ER14UN	1,0	1,2	3	–	14	–	2018790

(continued)

(ER/L-UN — continued)



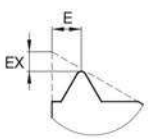


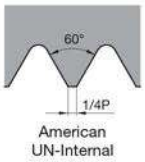
American
UN-External

● first choice
○ alternate choice

P	●
M	●
K	●
N	○
S	●
H	

catalogue number	EX	E	insert size	thread pitch mm	TPI	TPF	TN6025
3ER13UN	1,3	1,0	3	–	13	–	2018796
3ER12UN	1,1	1,4	3	–	12	–	2018802
3ER11UN	1,1	1,5	3	–	11	–	2018808
3ER10UN	1,1	1,5	3	–	10	–	2018814
3ER8UN	1,2	1,6	3	–	8	–	2018824
left hand							
3EL13UN	1,0	1,3	3	–	13	–	3122039
3EL12UN	1,1	1,4	3	–	12	–	2192607
3EL11UN	1,1	1,5	3	–	11	–	3122032
3EL10UN	1,1	1,5	3	–	10	–	3122028





● first choice
○ alternate choice

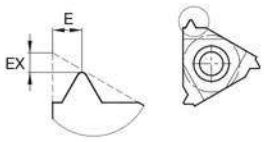
P		●
M		●
K		●
N		○
S		●
H		

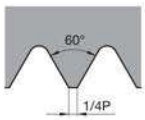
■ IR/L-UN

catalogue number	EX	E	insert size	thread pitch mm	TPI	TPF	TN6025
right hand							
2IR32UN	0,6	0,6	2	–	32	–	2018860
3IR32UN	0,6	0,6	3	–	32	–	2018918
3IR28UN	0,6	0,7	3	–	28	–	2018922
3IR24UN	0,7	0,8	3	–	24	–	2018932
3IR20UN	0,8	0,9	3	–	20	–	2018938
2IR20UN	0,8	0,9	2	–	20	–	2018876
3IR18UN	0,8	1,0	3	–	18	–	2018944
2IR18UN	0,8	1,0	2	–	18	–	2018882
3IR16UN	0,9	1,1	3	–	16	–	2018950
2IR16UN	0,9	1,1	2	–	16	–	2018886
3IR14UN	0,9	1,2	3	–	14	–	2018955

(continued)

(IR/L-UN – continued)



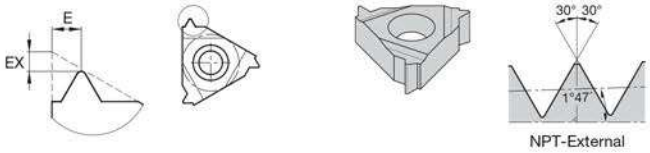


American
UN-Internal

● first choice
○ alternate choice

P	●
M	●
K	●
N	○
S	●
H	

catalogue number	EX	E	insert size	thread pitch mm	TPI	TPF	TN6025
3IR12UN	1,1	1,4	3	–	12	–	2018966
3IR10UN	1,1	1,5	3	–	10	–	2018979
3IR8UN	1,1	1,5	3	–	8	–	2018990
left hand							
3IL64UN	0,8	0,4	3	–	64	–	3122416
3IL56UN	0,7	0,4	3	–	56	–	3122414
2IL32UN	0,6	0,6	2	–	32	–	2102653
3IL12UN	1,1	1,4	3	–	12	–	2102749
3IL9UN	1,2	1,7	3	–	9	–	3122446
3IL8UN	1,1	1,5	3	–	8	–	3122444

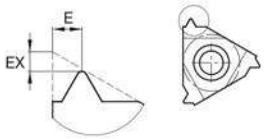


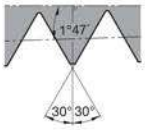
● first choice
○ alternate choice

P	●
M	●
K	●
N	○
S	●
H	

■ ER/L-NPT

catalogue number	EX	E	insert size	thread pitch mm	TPI	TPF	TN6025
right hand							
3ER115NPT	1,1	1,5	3	–	11.5	.7500	2019298
3ER14NPT	0,9	1,2	3	–	14	.7500	2019288
3ER18NPT	0,8	1,0	3	–	18	.7500	2019278
3ER8NPT	1,3	1,8	3	–	8	.7500	2019305





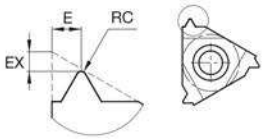
NPT-Internal

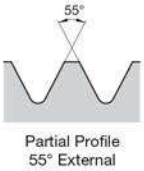
● first choice
○ alternate choice

P		●
M		●
K		●
N		○
S		●
H		

■ IR/L-NPT

catalogue number	EX	E	insert size	thread pitch mm	TPI	TPF	TN6025
right hand							
3IR115NPT	1,1	1,5	3	–	11.5	.7500	2019335
3IR14NPT	0,9	1,2	3	–	14	.7500	2019329
3IR18NPT	0,8	1,0	3	–	18	.7500	2019323
3IR8NPT	1,3	1,8	3	–	8	.7500	2019339





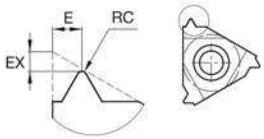
Partial Profile
55° External

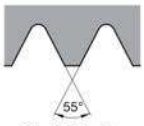
● first choice
○ alternate choice

P		●
M		●
K		●
N		○
S		●
H		

■ ER/L-55

catalogue number	RC	EX	E	insert size	thread pitch mm	TPI	TPF	TN6025
right hand								
3ERA55	0,05	0,8	0,9	3	0,50-1,5	48-16	–	2018301
3ERAG55	0,08	1,2	1,7	3	0,50-3,0	48-8	–	2018314
3ERG55	0,20	1,2	1,7	3	1,75-3,0	14-8	–	2018308
4ERN55	0,43	1,7	2,5	4	3,5-5,0	7-5	–	2018320
left hand								
3ELG55	0,20	1,2	1,7	3	1,75-3,0	14-8	–	2008190





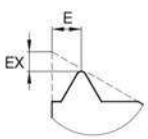
Partial Profile
55° Internal

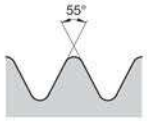
● first choice
○ alternate choice

P		●
M		●
K		●
N		○
S		●
H		

IR/L-55

catalogue number	RC	EX	E	insert size	thread pitch mm	TPI	TPF	TN6025
right hand								
2IRA55	0,05	0,8	0,9	2	0,50-1,5	48-16	–	2018328
3IRA55	0,05	0,8	0,9	3	0,50-1,5	48-16	–	2018334
3IRAG55	0,07	1,2	1,7	3	0,50-3,0	48-8	–	2018346
3IRG55	0,21	1,2	1,7	3	1,75-3,0	14-8	–	2018340
4IRN55	0,43	1,7	2,5	4	3,5-5,0	7-5	–	2018354
left hand								
3ILA55	0,05	0,8	0,9	3	0,50-1,5	48-16	–	3122449
3ILAG55	0,07	1,2	1,7	3	0,50-3,0	48-8	–	2018348





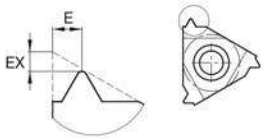
Whitworth BSW, BSF, BSP-External

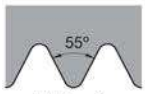
● first choice
○ alternate choice

P		●
M		●
K		●
N		○
S		●
H		

■ ER/L-W

catalogue number	EX	E	insert size	thread pitch mm	TPI	TPF	TN6025
right hand							
3ER32W	0,6	0,6	3	–	32	–	2019023
3ER28W	0,6	0,7	3	–	28	–	2019029
3ER19W	0,8	1,0	3	–	19	–	2019055
3ER18W	0,8	1,0	3	–	18	–	2021677
3ER16W	0,9	1,1	3	–	16	–	2019061
3ER14W	1,0	1,2	3	–	14	–	2019071
3ER12W	1,1	1,4	3	–	12	–	2019077
3ER11W	1,1	1,5	3	–	11	–	2019083
3ER10W	1,1	1,5	3	–	10	–	2019089
3ER8W	1,2	1,5	3	–	8	–	2019101
4ER6W	1,6	2,3	4	–	6	–	2021725
left hand							
3EL11W	1,1	1,5	3	–	11	–	2065289
3EL8W	1,2	1,5	3	–	8	–	2103046





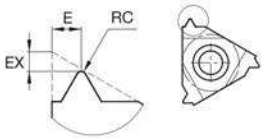
Whitworth
BSW, BSF,
BSP-Internal

● first choice
○ alternate choice

P		●
M		●
K		●
N		○
S		●
H		

IR/L-W

catalogue number	EX	E	insert size	thread pitch mm	TPI	TPF	TN6025
right hand							
2IR19W	0,8	1,0	2	–	19	–	2019121
2IR14W	0,9	1,1	2	–	14	–	2019136
3IR19W	0,8	0,9	3	–	19	–	2019172
3IR16W	0,9	1,1	3	–	16	–	2019178
3IR14W	1,0	1,2	3	–	14	–	2019189
3IR12W	1,1	1,4	3	–	12	–	2019195
3IR11W	1,1	1,5	3	–	11	–	2019205
3IR8W	1,2	1,5	3	–	8	–	2019224
4IR6W	1,6	2,3	4	–	6	–	2019234



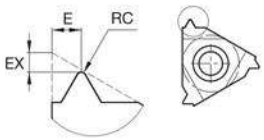
API Round-External

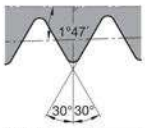
● first choice
○ alternate choice

P		●
M		●
K		●
N		○
S		●
H		

■ ER-APIRD

catalogue number	RC	EX	E	insert size	thread pitch mm	TPI	TPF	TN6025
right hand								
3ER10APIRD	0,34	1,2	1,4	3	–	10	.750	2019608

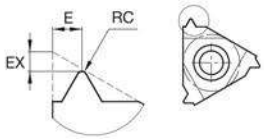


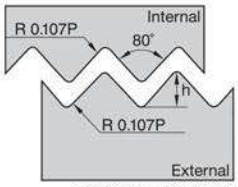


API Round-Internal

■ IR-APIRD

catalogue number	RC	EX	E	insert size	thread pitch mm	TPI	TPF	TN6025
right hand								
3IR10APIRD	0,34	1,2	1,4	3	–	10	.750	2019618
3IR8APIRD	0,40	1,3	1,5	3	–	8	.750	2019622





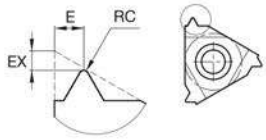
Defined by: DIN 40430

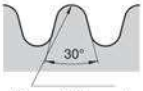
● first choice
○ alternate choice

P		●
M		●
K		●
N		○
S		●
H		

■ IR-PG

catalogue number	RC	EX	E	insert size	thread pitch mm	TPI	TPF	TN6025
right hand								
3IR16PG	0,11	1,1	0,8	3	–	16	–	2019441

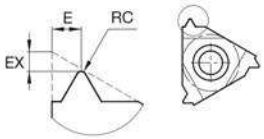


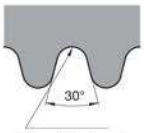


Round External

■ ER/L-RD

catalogue number	RC	EX	E	insert size	thread pitch mm	TPI	TPF	TN6025
right hand								
3ER8RD	0,76	1,4	1,3	3	–	8	–	2019347
4ER6RD	1,01	1,5	1,7	4	–	6	–	2019359
left hand								
3EL8RD	0,76	1,4	1,3	3	–	8	–	2071943





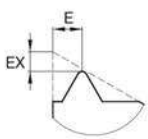
Round-Internal
R = 0,221P

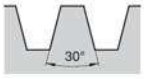
● first choice
○ alternate choice

P		●
M		●
K		●
N		○
S		●
H		

■ IR/L-RD

catalogue number	RC	EX	E	insert size	thread pitch mm	TPI	TPF	TN6025
right hand								
3IR10RD	0,70	1,1	1,2	3	–	10	–	2019375
3IR8RD	0,70	1,4	1,4	3	–	8	–	2019381
4IR6RD	0,93	1,5	1,7	4	–	6	–	2019394
4IR4RD	1,40	2,3	2,2	4	–	4	–	2019400
left hand								
3IL8RD	0,06	1,4	1,4	3	–	8	–	3122422





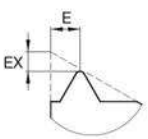
Trapez-External

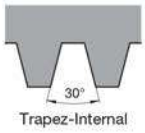
● first choice
○ alternate choice

P		●
M		●
K		●
N		○
S		●
H		

■ ER/L-TR

catalogue number	EX	E	insert size	thread pitch mm	TPI	TPF	TN6025
right hand							
3ER2TR	1,1	1,3	3	2,00	–	–	2019453
3ER3TR	1,3	1,5	3	3,00	–	–	2019461
4ER4TR	1,7	1,9	4	4,00	–	–	2019469
4ER5TR	2,1	2,5	4	5,00	–	–	2019479
5ER6TR	2,3	2,7	5	6,00	–	–	2019487
left hand							
3EL3TR	1,3	1,5	3	3,00	–	–	2019463
4EL4TR	1,7	1,9	4	4,00	–	–	2019471





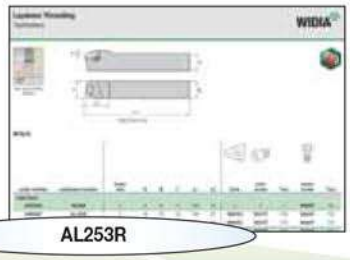
● first choice
○ alternate choice

P		●
M		●
K		●
N		○
S		●
H		

■ IR/L-TR

catalogue number	EX	E	insert size	thread pitch mm	TPI	TPF	TN6025
right hand							
3IR3TR	1,3	1,5	3	3,00	–	–	2019511
4IR4TR	1,7	1,9	4	4,00	–	–	2019520
4IR5TR	2,1	2,5	4	5,00	–	–	2019528
5IR6TR	2,3	2,7	5	6,00	–	–	2019534

Laydown Threading
Toolholder Identification System



AL253R

A	L	25	3	R
Toolholder Construction	Tool Type	Shank Size	Insert Size	Hand of Tool

A –
Shim required

N –
Without shim

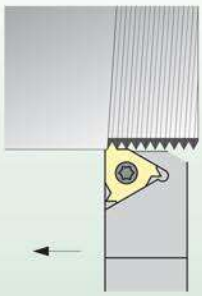
Toolholders

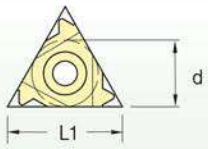
- First two numbers are shank height in mm.

RH –
Thread symbol R

LH –
Thread symbol L

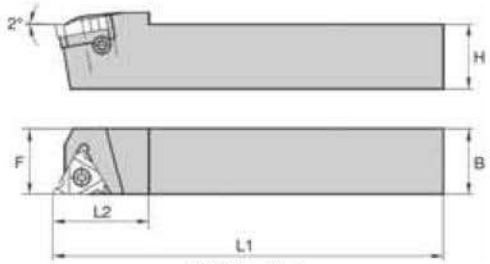
L – External Thread





symbol	d	L1
2	6,35	11
3	9,52	16
4	12,7	22
5	15,88	27

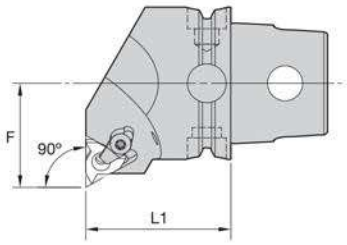
See page F42 for inserts.

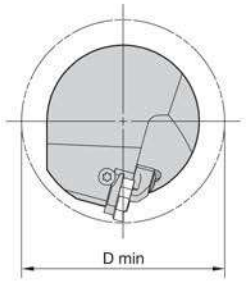


Right Hand Tool

■ N/A

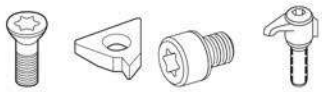
order number	catalogue number	insert size	H	B	F	L1	L2	shim	shim screw	Torx	insert screw	Torx
right hand												
2022340	NL82R	2	8	8	11	136	18	–	–	–	SSN2T	T8
2009587	AL163R	3	16	16	16	100	25	SMYE3	SSY3T	T10	SSA3T	T10
2009591	AL203R	3	20	20	20	128	30	SMYE3	SSY3T	T10	SSA3T	T10
2009594	AL253R	3	25	25	25	153	30	SMYE3	SSY3T	T10	SSA3T	T10
2009597	AL254R	4	25	25	25	155	36	SMYE4	SSY4T	T20	SSA4T	T20
2009600	AL323R	3	32	32	32	173	30	SMYE3	SSY3T	T10	SSA3T	T10
2009603	AL324R	4	32	32	32	175	36	SMYE4	SSY4T	T20	SSA4T	T20
2022589	AL325R	5	32	32	32	176	40	SMYE5	SSY5T	T25	SSA5T	T25
2016118	AL404R	4	40	40	40	205	36	SMYE4	SSY4T	T20	SSA4T	T20
2016122	AL405R	5	40	40	40	206	40	SMYE5	SSY5T	T25	SSA5T	T25
left hand												
2071294	AL163L	3	16	16	16	100	25	SMYI3	SSY3T	T10	SSA3T	T10
2071295	AL203L	3	20	20	20	125	30	SMYI3	SSY3T	T10	SSA3T	T10
2114772	AL254L	4	25	25	25	150	36	SMYI4	SSY4T	T20	SSA4T	T20





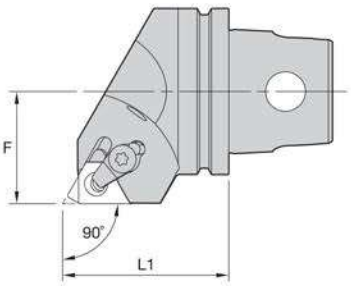
KM QUICK CHANGE

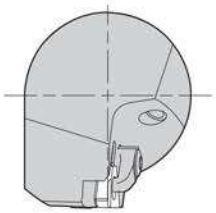
■ LSE-N 90° • Internal Only



order number	catalogue number	L1 mm	L1 in	F mm	F in	D min mm	D min in	gage insert	insert screw	shim	shim screw	clamp assembly	kg	lbs
right hand														
3950832	**KM40TSLSER16N**	40	1.575	27	1.063	54	2.126	LT16NR	**SSA3T**	**SMYI3**	**SSY3T**	**CKC3**	0,35	.77
3950854	**KM40TSLSER22N**	40	1.575	27	1.063	54	2.126	LT22NR	**SSA4T**	**SMYI4**	**SSY4T**	**CKC4**	0,35	.77
3959399	**KM40TSLSER27N**	45	1.772	27	1.063	54	2.126	LT27NR	**SSA5T**	**SMYI5**	**SSY5T**	**CKC5**	0,39	.86
left hand														
3950831	**KM40TSLSEL16N**	40	1.575	27	1.063	54	2.126	LT16NL	**SSA3T**	**SMYE3**	**SSY3T**	**CKC3**	0,35	.77
3950853	**KM40TSLSEL22N**	40	1.575	27	1.063	54	2.126	LT22NL	**SSA4T**	**SMYE4**	**SSY4T**	**CKC4**	0,35	.77
3959398	**KM40TSLSEL27N**	45	1.772	27	1.063	54	2.126	LT27NL	**SSA5T**	**SMYE5**	**SSY5T**	**CKC5**	0,39	.86

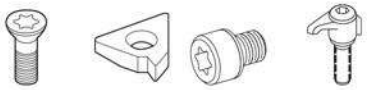
NOTE: Cutting units are supplied with insert screw and clamp assembly. However, tools are designed to use either the insert screw or the clamp assembly, not both.





KM QUICK CHANGE

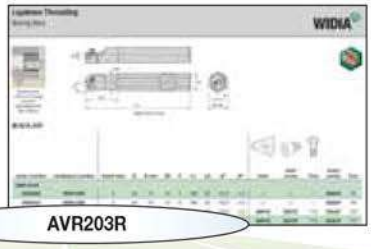
LSS 90°



order number	catalogue number	L1 mm	L1 in	F mm	F in	gage insert	insert screw	shim	shim screw	clamp assembly	kg	lbs
right hand												
3950857	**KM40TSLSSR16**	40	1.575	27	1.063	LT16ER	**SSA3T**	**SMYE3**	**SSY3T**	**CKC3**	0,31	.68
3950858	**KM40TSLSSR22**	40	1.575	27	1.063	LT22ER	**SSA4T**	**SMYE4**	**SSY4T**	**CKC4**	0,30	.66
3959401	**KM40TSLSSR27**	45	1.772	27	1.063	LT27ER	**SSA5T**	**SMYE5**	**SSY5T**	**CKC5**	0,37	.82
left hand												
3950855	**KM40TSLSSL16**	40	1.575	27	1.063	LT16EL	**SSA3T**	**SMYI3**	**SSY3T**	**CKC3**	0,32	.70
3950856	**KM40TSLSSL22**	40	1.575	27	1.063	LT22EL	**SSA4T**	**SMYI4**	**SSY4T**	**CKC4**	0,31	.68
3959400	**KM40TSLSSL27**	45	1.772	27	1.063	LT27EL	**SSA5T**	**SMYI5**	**SSY5T**	**CKC5**	0,37	.82

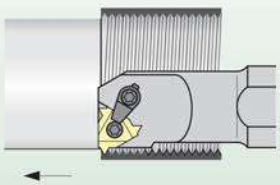
NOTE: Cutting units are supplied with insert screw and clamp assembly. However, tools are designed to use either the insert screw or the clamp assembly, not both.

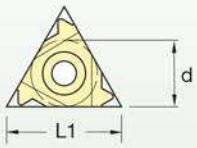
Laydown Threading
Boring Bar Identification System



A	VR		20	3	R
Shim Requirement	Tool Type	Coolant Capability	Shank Head Diameter	Insert Size	Hand of Tool
A – Shim required **N** – No shim required **O** – Miniature holder		**C** – With coolant	10, 12, 13, 16, 20, 25, 32, 40, 50 6.2 (Mini adjust) 8.0 (Mini adjust)		**RH** – Thread symbol R **LH** – Thread symbol L

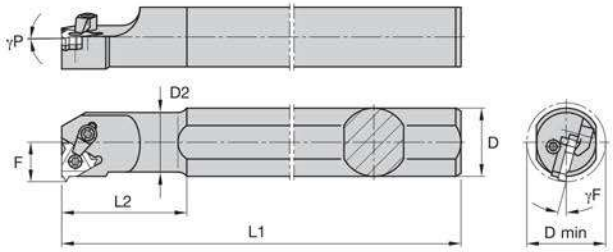
VR – Internal round shank





symbol	d	L1
2	6,35	11
3	9,52	16
4	12,7	22
5	15,88	27

Steel shank without through coolant.
See page F42 for inserts.

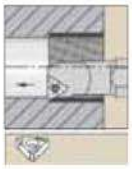


Right Hand Tool

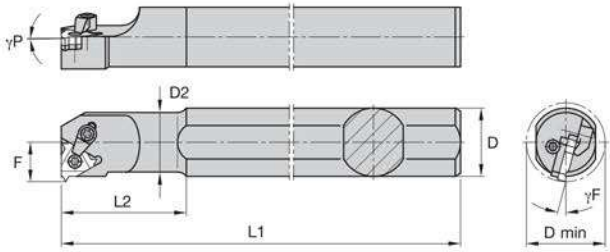
N/A-VR

order number	catalogue number	insert size	D	D min	D2	F	L1	L2	γF°	γP°	shim	shim screw	Torx	insert screw	Torx
right hand															
2025828	**NVR102R**	2	20	13	10	7	180	25	-15,0°	-1,5	–	–	–	**SSN2T**	T8
2022342	**NVR132R**	2	20	16	13	9	180	32	-15,0°	-1,5	–	–	–	**SSN2T**	T8
2012307	**NVR163R**	3	20	20	16	12	180	40	-15,0°	-1,5	**SMYI3**	**SSY3T**	T10	**SSA3T**	T10
2009609	**AVR203R**	3	20	24	20	13	180	50	-15,0°	-1,5	**SMYI3**	**SSY3T**	T10	**SSA3T**	T10
2022343	**NVR204R**	4	20	27	20	16	180	50	-15,0°	-1,5	**SMYI4**	**SSY4T**	T20	**SSA4T**	T20
2009628	**AVR25D3R**	3	25	29	25	16	200	45	-15,0°	-1,5	**SMYI3**	**SSY3T**	T10	**SSA3T**	T10
2009631	**AVR25D4R**	4	25	32	25	17	200	45	-15,0°	-1,5	**SMYI4**	**SSY4T**	T20	**SSA4T**	T20
2009612	**AVR253R**	3	32	29	25	16	250	60	-15,0°	-1,5	**SMYI3**	**SSY3T**	T10	**SSA3T**	T10
2009625	**AVR254R**	4	32	32	25	17	250	60	-15,0°	-1,5	**SMYI4**	**SSY4T**	T20	**SSA4T**	T20
2009640	**AVR32D3R**	3	32	36	32	20	250	60	-15,0°	-1,5	**SMYI3**	**SSY3T**	T10	**SSA3T**	T10
2009634	**AVR324R**	4	32	39	32	22	250	60	-15,0°	-1,5	**SMYI4**	**SSY4T**	T20	**SSA4T**	T20
2009637	**AVR325R**	5	32	40	32	22	250	60	-15,0°	-1,5	**SMYI5**	**SSY5T**	T25	**SSA5T**	T25
2009643	**AVR403R**	3	40	44	40	24	300	60	-15,0°	-1,5	**SMYI3**	**SSY3T**	T10	**SSA3T**	T10
2009646	**AVR405R**	5	40	48	40	26	300	60	-15,0°	-1,5	**SMYI5**	**SSY5T**	T25	**SSA5T**	T25
2009649	**AVR505R**	5	50	58	50	31	350	75	-15,0°	-1,5	**SMYI5**	**SSY5T**	T25	**SSA5T**	T25
left hand															
2071317	**NVR163L**	3	20	20	16	12	180	40	-15,0°	-1,5	**SMYE3**	**SSY3T**	–	**SSA3T**	T10
2071318	**AVR203L**	3	20	24	20	13	180	40	-15,0°	-1,5	**SMYE3**	**SSY3T**	T10	**SSA3T**	T10
2065134	**AVR25D3L**	3	25	29	25	16	200	45	-15,0°	-1,5	**SMYE3**	**SSY3T**	T10	**SSA3T**	T10
2065135	**AVR25D4L**	4	25	32	25	17	200	45	-15,0°	-1,5	**SMYE4**	**SSY4T**	T20	**SSA4T**	T20
2114832	**AVR253L**	3	32	29	25	16	250	60	-15,0°	-1,5	**SMYE3**	**SSY3T**	T10	**SSA3T**	T10

NOTE: Items listed without a shim are designed for a 1,5° inclination angle.



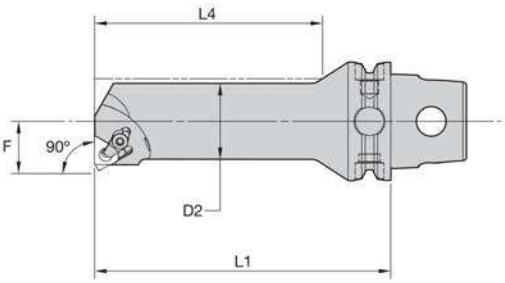
See page F42
for inserts.

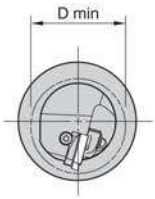


OVR

order number	catalogue number	insert size	D	D min	D2	F	L1	L2	γF°	γP°	screw	Torx driver	Torx
right hand													
2012325	**OVR122R**	2	12	13	10	7	100	25	-15,0°	-0,5	**12147789100**	**12148001100**	T8
2022345	**OVR152R**	2	15	16	13	9	100	32	-15,0°	-0,5	**12147789100**	**12148001100**	T8

NOTE: WIDIA™ miniature holders are for use on automatic machines as used in the optical and precision mechanics industries. The shank dimensions correspond to conventional hardmetal or HSS tools. Holders with round or square shanks are available. An internal RH tool can also be used for external LH threads in the same way an internal LH tool can be used for external RH threads. Please use correct inserts. The inclination angle on this tool is 0,5°. Tools are always clamped with the shank parallel to the part.





KM QUICK CHANGE

LSE 90°

order number	catalogue number	D min mm	D min in	D 2 mm	D 2 in	F mm	F in	L4 mm	L4 in	L1 mm	L1 in	gage insert	kg	lbs
right hand														
3955464	KM40TSS10DLSER11	13	.51	10	.39	7	.276	35	1.38	60	2.362	LT11NR	0,22	.49
3955466	KM40TSS12ELSER11	16	.63	12	.47	9	.354	42	1.66	70	2.756	LT11NR	0,25	.56
3955468	KM40TSS16FLSER16	20	.79	16	.63	11	.433	56	2.21	80	3.150	LT16NR	0,28	.61
3955470	KM40TSS20GLSER16	25	.98	20	.79	13	.512	70	2.76	90	3.543	LT16NR	0,34	.75
3955472	KM40TSS25HLSER16	32	1.26	25	.98	17	.669	75	2.95	100	3.937	LT16NR	0,50	1.11
3955474	KM40TSS32JLSER16	40	1.57	32	1.26	22	.866	96	3.78	110	4.331	LT16NR	0,72	1.58
3955476	KM40TSS32JLSER22	40	1.57	32	1.26	22	.866	96	3.78	110	4.331	LT22NR	0,71	1.56
left hand														
3955463	KM40TSS10DLSEL11	13	.51	10	.39	7	.276	35	1.38	60	2.362	LT11NL	0,22	.49
3955465	KM40TSS12ELSEL11	16	.63	12	.47	9	.354	42	1.65	70	2.756	LT11NL	0,25	.55
3955467	KM40TSS16FLSEL16	20	.79	16	.63	11	.433	56	2.21	80	3.150	LT16NL	0,28	.61
3955469	KM40TSS20GLSEL16	25	.98	20	.79	13	.512	70	2.76	90	3.543	LT16NL	0,34	.75
3955471	KM40TSS25HLSEL16	32	1.26	25	.98	17	.669	75	2.95	100	3.937	LT16NL	0,50	1.11
3955473	KM40TSS32JLSEL16	40	1.57	32	1.26	22	.866	96	3.78	110	4.331	LT16NL	0,72	1.58
3955475	KM40TSS32JLSEL22	40	1.57	32	1.26	22	.866	96	3.78	110	4.331	LT22NL	0,71	1.56

(continued)

(LSE 90° — continued)

Spare Parts

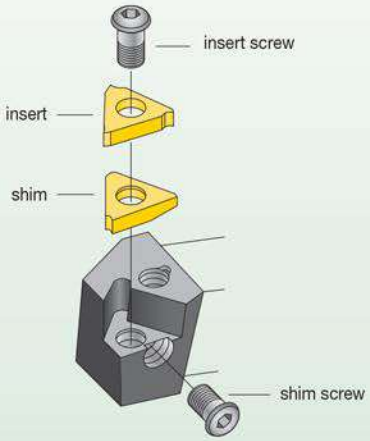
catalogue number	 insert screw	 shim	 shim screw	 clamp assembly
right hand				
KM40TSS10DLSER11	SSN2T	–	–	–
KM40TSS12ELSER11	SSN2T	–	–	–
KM40TSS16FLSER16	SN3TPKG	–	–	–
KM40TSS20GLSER16	SSA3T	SMYI3	SSY3T	CKC3
KM40TSS25HLSER16	SSA3T	SMYI3	SSY3T	CKC3
KM40TSS32JLSER16	SSA3T	SMYI3	SSY3T	CKC3
KM40TSS32JLSER22	SSA4T	SMYI4	SSY4T	CKC4
left hand				
KM40TSS10DLSEL11	SSN2T	–	–	–
KM40TSS12ELSEL11	SSN2T	–	–	–
KM40TSS16FLSEL16	SN3TPKG	–	–	–
KM40TSS20GLSEL16	SSA3T	SMYE3	SSY3T	CKC3
KM40TSS25HLSEL16	SSA3T	SMYE3	SSY3T	CKC3
KM40TSS32JLSEL16	SSA3T	SMYE3	SSY3T	CKC3
KM40TSS32JLSEL22	SSA4T	SMYE4	SSY4T	CKC4

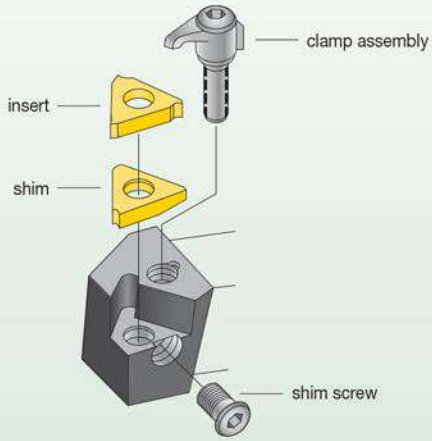
NOTE: Items listed without a shim are designed for a 1,5° inclination angle.
Cutting units are supplied with insert screw and clamp assembly. However, tools are designed to use either the insert screw or the clamp assembly, not both.

Laydown Threading Toolholders

In all cases, the proper shim selection is important.

WIDIA™ toolholders are supplied with a shim for a 1,5° lead angle. Change the shim if your thread is more than 1° different. For more details on proper shim selections, see pages F100–F101.





insert size and screw		insert screw	shim	shim screw and washer	clamp assembly
3ER		S-SA3T	SM-YIE3	S-SY3T	CK-C3
3EL		S-SA3T	SM-YI3	S-SY3T	CK-C3
4ER		S-SA4T	SM-YIE4	S-SY4T	CK-C4
4EL		S-SA4T	SM-YI4	S-SY4T	CK-C4
Laydown Threading boring bars					
2IR		S-SN2T	–	–	–
2IL		S-SN2T	–	–	–
3IR		S-SA3T	SM-YI3	S-SY3T	CK-C3
3IL		S-SA3T	SM-YIE3	S-SY3T	CK-C3
4IR		S-SA4T	SM-YI4	S-SY4T	CK-C4
4IL		S-SA4T	SM-YIE4	S-SY4T	CK-C4

SM	—	Y	E	3	—	2N
Shim		Y-shim for Laydown standard inserts	**E** — External **I** — Internal	**iC** — 16mm		Shim Angle

2P	2° positive
1P	1° positive
–	0°
1N	1° negative
2N	2° negative
3N	3° negative

resultant angle		3.5°	2.5°	1.5°	0.5°	-0.5°	-1.5°
insert size (iC)	toolholder	shim ordering code					
16mm	ex. RH/in. LH ex. LH/in. RH	SM-YE3-2P SM-YI3-2P	SM-YE3-1P SM-YI3-1P	SM-YE3 SM-YI3	SM-YE3-1N SM-YI3-1N	SM-YE3-2N SM-YI3-2N	SM-YE3-3N SM-YI3-3N
22mm	ex. RH/in. LH ex. LH/in. RH	SM-YE4-2P SM-YI4-2P	SM-YE4-1P SM-YI4-1P	SM-YE4 SM-YI4	SM-YE4-1N SM-YI4-1N	SM-YE4-2N SM-YI4-2N	SM-YE4-3N SM-YI4-3N

Slanted Shim Kit

Because you might occasionally need different shims than those supplied with our standard toolholders, we strongly recommend that shim kits be readily available in every tool shop.

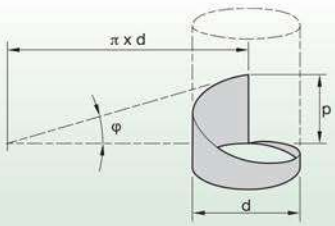
insert size	shim size (D)	ordering code	contains slanted shims
3x	16mm	ABY3	SM-YE3-2P, 1P, 1N, 2N, 3N SM-YI3-2P, 1P, 1N, 2N, 3N
4x	22mm	ABY4	SM-YE4-2P, 1P, 1N, 2N, 3N SM-YI4-2P, 1P, 1N, 2N, 3N

The Helix Angle

Example:
d = 48,06mm (1.892")
p = 3,175mm (.125")

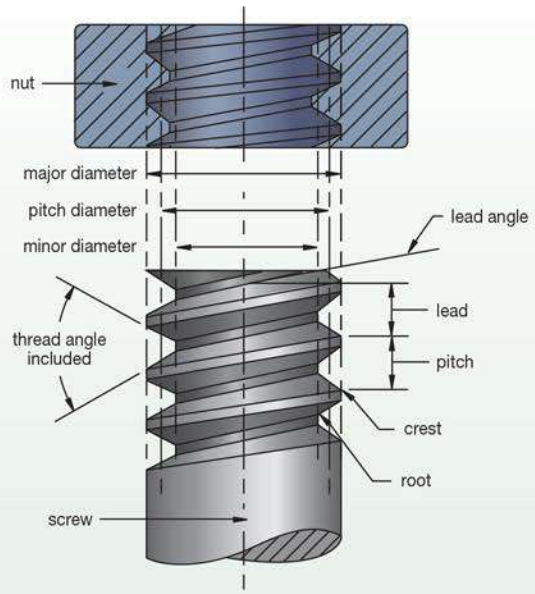
ϕ = Helix angle
p = pitch
d = pitch diameter

$$\phi = \arctan\left(\frac{p * starts}{\pi * \varnothing}\right) = 1.13°$$



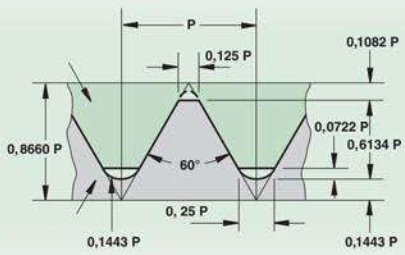
Screw Thread Definitions

1. Major diameter — The largest diameter of a straight screw thread. This applies to both internal and external threads.
2. Pitch diameter — On a straight thread, it is the diameter which passes through the thread profiles at such points which make the thread width of the groove equal to one-half of the basic pitch. On a "perfect thread," this occurs at the point where the widths of the thread and groove are equal.
3. Thread angle (included) — The included angle between the individual flanks of the thread form.
4. Minor diameter — The smallest diameter of a straight screw thread. This applies to both internal and external threads.
5. Lead angle — On a straight thread, the lead angle is the angle created by the helix of the thread at the pitch diameter with a plane perpendicular to the axis.
6. Lead — The distance a screw thread advances axially in one revolution. On a single start, the pitch and lead are identical. The lead is equal to the pitch times the number of starts.
7. Pitch — The distance from a point on a screw thread to a corresponding point on the next thread measured parallel to the thread axis.
8. Crest — The outer most surface of the thread form which joins the flanks.
9. Root — The inner most surface of the thread form which joins the flanks.



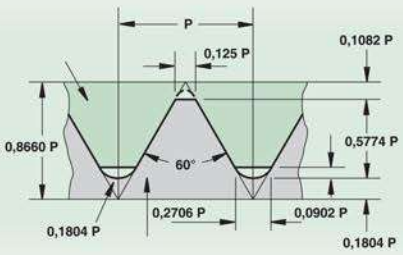
NOTE: Threads per inch (TPI) not shown:
The number of threads per inch measured axially.
The terms pitch and TPI are often used interchangeably. TPI = 1/pitch

ISO M (Metric) and UN (Unified National)



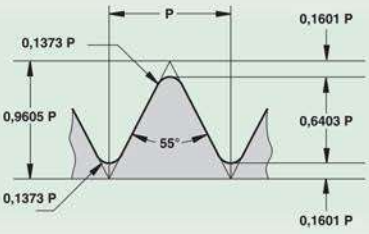
Use: All branches of mechanical industry.

UNJ (controlled root radius)



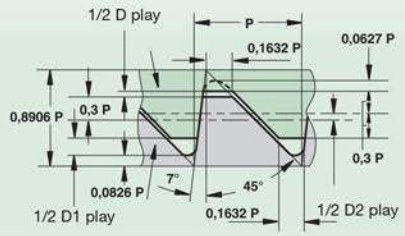
Use: Aircraft and space industry.

Whitworth (BSW)



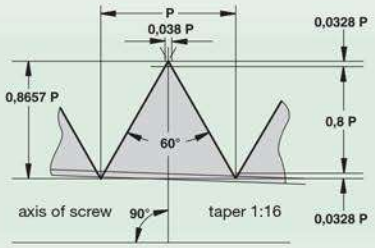
Use: Fittings and pipe couplings for gas, water, and sewer lines (replaced by ISO).

American Buttress



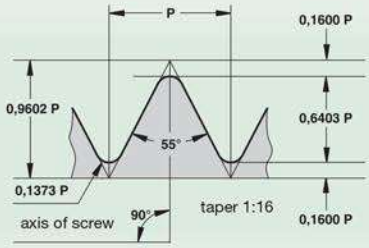
Use: Fittings and pipe couplings.

NPT (American National Pipe Thread)



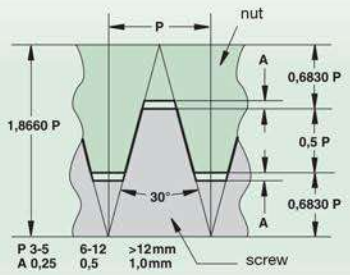
Use: Fittings and pipe couplings.

BSPT (British Standard Pipe Thread)



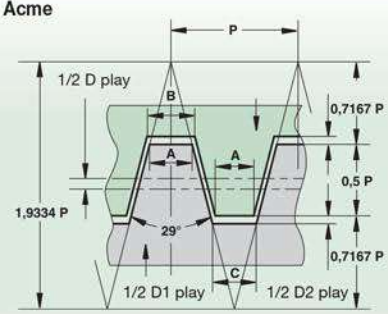
Use: Pipe thread for steam, gas, and water lines.

TR DIN 103



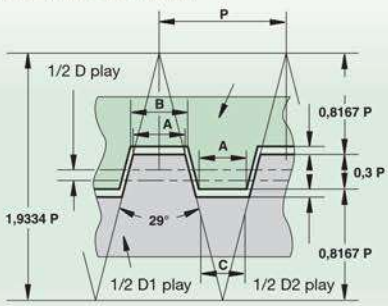
Use: Mechanical industry for motion transmission screws.

Acme



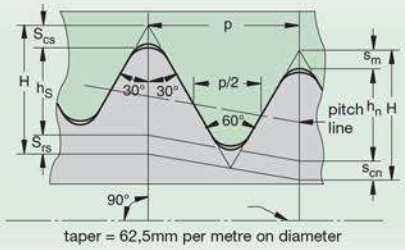
A = 0,0307 P
B = 0,3707 P—x D play
C = 0,3707 P—(D1 play—D2 play)
Use: Acme-General is used in mechanical industry for motion transmission screws.

Acme, truncated (Stub)



A = 0,4224 P
B = 0,4224 P—x D play
C = 0,4224 P—(D1 play—D2 play)
Use: Where normal Acme is too deep.

API Casing and Tubing Round Thread Form



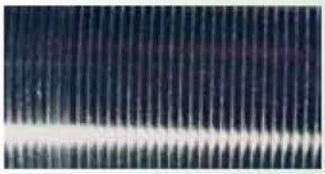
NOTE: Taper shown exaggerated.

Suggested Grades and Speeds for Threading Various Workpiece Materials

workpiece group	workpiece material	recommended surface speed – SFM		
		uncoated	PVD coated	
		THM	TN6010	TN6025
free-machining carbon steel	10L18, 10L45, 1213, 12L13, 12L14, 1140, 1141, 11L44, 1151, 10L50	–	91–98	45–198
plain carbon steel	10063, 1008, 1010, 1015, 1018, 1020, 1025, 1026, 1108, 1117	–	76–198	45–175
alloy steels/tool steels 150–325 HB (up to 35 HRC)	1042, 1045, 1070, 1080, 1085, 1090, 1095, 1541, 1561, 1572, 5140, 8620, W1, O1, S1, P20, H13, D2, A6, H13, L6	–	76–198	38–167
alloy steels/tool steels 330–450 HB (36–47 HRC)		–	61–160	–
martensitic/ferritic stainless/precipitation hardening	416, 420F, 440F, 405, 409, 429, 430, 434, 436, 442, PH	–	45–160	30–120
austenitic stainless steel	201, 202, 301, 302, 303, 304, 304, 305, 321, 347, 348, 310, 314, 316, 316L, 330	61–106	61–198	46–137
grey cast iron 135–270 HB	class 20, 30, 35, 45	61–91	61–237	46–122
grey cast iron 275–450 HB	class 50, 55, 60	45–76	45–175	15–76
alloy/ductile iron	A536, J434C, 60-40-18, 80-55-06, 100-70-03	45–76	45–650	100–525
free-machining aluminium alloys	2024-T4, 2014-T6, 6061-T6 2011-T3, 3003-H18, A2, Alcan, Alcoa 510, Duralumin	122—244	122—265	–
high-silicon aluminium alloys	A380, A390, A380-1, A390-1, A380-2	–	–	–
copper/zinc/brass		76–183	76–304	46–236
non-metallics	Graphite, Nylon, Plastics, Rubbers, Phenolics, Carbon	122–457	122–396	46–305
high-temperature alloys 125–269 HB (up to 27 HRC)	Nickel 200, Monel, R405, Monel K500, INCONEL 600, INCONEL® 625/901x750/718, Waspaloy, Hastelloy C	24–37	24–122	13–76
high-temperature alloys 260–450 HB (26–47 HRC)	Rene 95, Waspaloy A286, Incoloy 800, Haynes 188, Stellite F, Haynes 25	24–30	30–76	6—61
titanium alloys	Ti-6Al-4V, TI-5Al-2.5Sn	34–55	34–99	–

NOTE: When workpiece hardness levels are at the top of a range, starting m/min should be at the lower end. Regularly inspect insert clamps for worn flats.

Edge preparation:
Uncoated — sharp
PVD coated — light hone except positive top rake, top rake-sharp

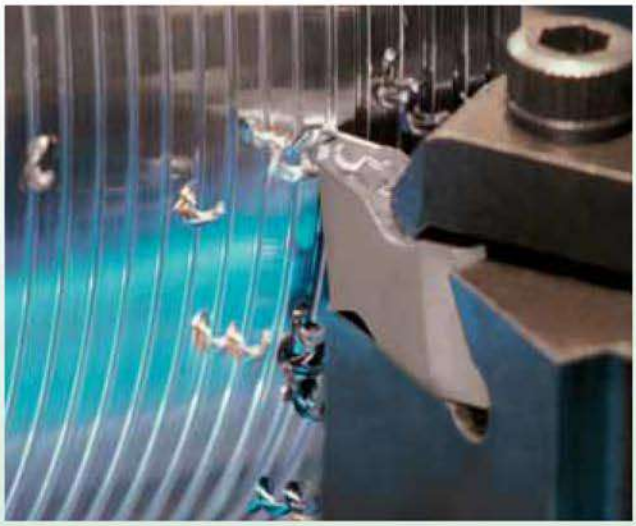
problem	cause	possible solution
thread with torn finish 	• Burs. • Torn finish. • Steps. • Improper shim. • Improper infeed.	• Use modified flank infeed. • Use full profile insert. • Increase coolant concentration. • Increases m/min. • Check machine "Z" travel axis. • Check insert form. • Check for correct shim in LT system. • Calculate flank clearance.
chatter 	• Poor rigidity. • Insert movement. • Improper infeed. • Off centreline.	• Use modified flank infeed. • Minimise tool overhang. • Check for workpiece deflection. • Check insert and clamp. • Verify that tool cutting position is at workpiece centreline. • Adjust number of passes. Fewer passes reduce chatter.
built-up edge 	• Speed too low. • Insufficient coolant. • Chip load.	• Increase m/min. • Increase coolant concentration and/or flow. • Adjust infeed angle. • Increase depth of cut per pass.
deformation 	• Wrong grade. • Speed too high. • Improper infeed angle. • Insufficient coolant.	• Use modified flank infeed. • Use a more wear-resistant grade (e.g., TN6010™). • Reduce m/min. • Increase coolant flow.
chipping 	• Improper infeed. • Chip load. • Wrong grade. • Incorrect speed. • Poor rigidity.	• Use modified flank infeed. • Increase or decrease number of passes. • Eliminate spring passes. • Use tougher grade (e.g., TN6025™). • Increase m/min if chipping on trailing edge. • Decrease m/min if chipping on leading edge. • Minimise tool overhang. • Check for insert movement/check clamp. Torque screw or clamp to correct value. • Check for possible part deflection. • Calculate flank clearance. • Ensure correct shim.
broken nose 	• Heavy chip load. • Small nose radius. • Wrong grade. • Improper infeed.	• Use modified flank infeed. • Decrease chip load. • Use large nose radius if possible. • Use tougher grade (e.g., TN6025).
flank wear 	• Improper shim. • Wrong grade. • Insufficient coolant. • Off centreline. • Insufficient flank clearance. • Improper infeed angle.	• Ensure correct shim. • Use a more wear-resistant grade (e.g., TN6025). • Increase coolant flow. • Check the centreline height of the tool. (The smaller the diameter, the more critical the need for centreline accuracy.) • Calculate flank clearance and change shim to increase clearance on worn flank. • If wear is on trailing flank, increase infeed angle clearance.

problem	possible solution																
	increase m/min	reduce m/min	increase chip load	decrease chip load where failure occurs	use tougher carbide grade	use harder carbide grade	apply coolant	use coated carbide	use topping insert	change infeed angle	check for insert movement and reseat	reduce tool overhang	reselect shim	apply chipbreaker style	reduce DOC	adjust centre height	begin cutting threads 12mm before workpiece	change infeed method
chatter	•			•							•	•				•		•
bur on crest	•								•									•
short tool life		•	•	•		•		•										•
chipped leading edge			•	•	•													
chipped trailing edge					•					•								
broken nose (first pass)	•														•	•		
broken nose (after first pass)				•	•					•			•					•
built-up on cutting edge	•		•				•	•										•
premature topping													•					
splitting threads																	•	
poor chip evacuation														•				•

WIDIA™ insert technology brings chip control to your threading operations with the TopThread™ platform. The proprietary WIDIA recessed chip groove, when used according to our recommendations, controls the chip in most applications. Our positive rake design lowers cutting pressures, which in turn lowers damaging heat generation thus providing better tool life. Long, stringy chips no longer mar the workpiece surface finish. The danger to operators when removing long chips from the workpiece and chuck is eliminated. All of these benefits combine to improve the productivity of your threading operations.

The Last Pass

Some CNC controls require the last pass to be at a 0° infeed angle because the chip will not break on the last pass. On most carbon and alloy steels, the last pass can remain at 0,127mm depth of cut and produce an acceptable finish. For some materials, a 0,025mm to 0,076mm (spring) pass may be used to improve surface finish, however, chipbreaking action may be compromised.

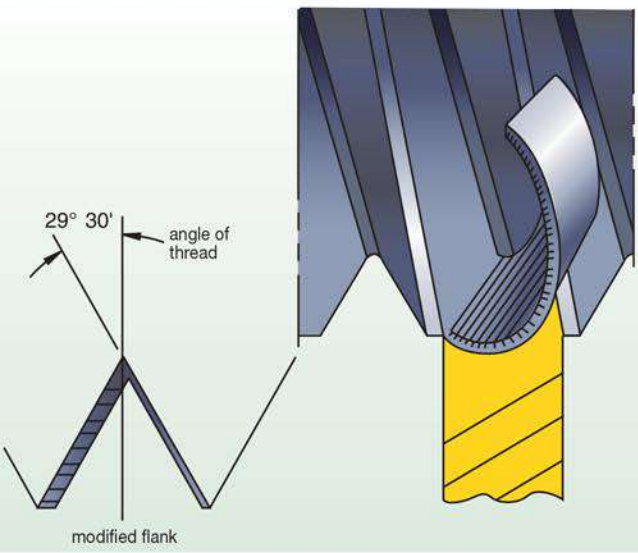


Machine Programming

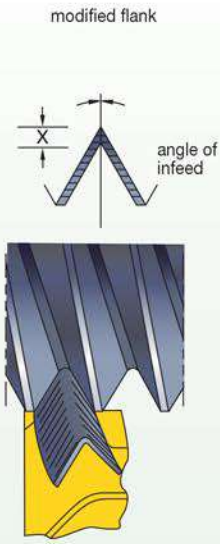
Modern CNC controls allow the programmer to easily adjust infeed angle, the number of passes, and depth of cut for each pass. The chip control threading insert performs best at an infeed angle of 29° 30', although 15° to 30° is acceptable. Also, it is important to maintain a minimum of 0,127mm depth of cut on every pass. In most applications, use of CNC canned cycles produce only marginally successful results. Custom written programmes are better and are recommended.

Infeed Angle

In order to effectively and consistently break the chip, it is important to use an infeed angle between 28° and 29° 30'. Do not apply chip control inserts at infeed angles less than 15°.



Radial



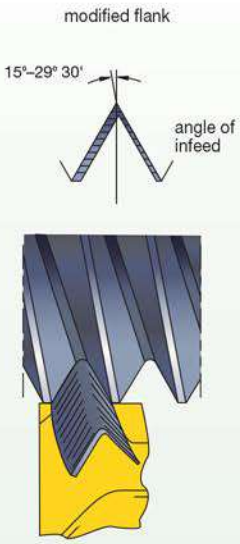
Advantage –

- Cutting on both sides of the thread form places all of the cutting edge in the cut and protects edge from chipping.
- Even wear on the insert.

Disadvantage –

- Tool develops a channel chip that may be difficult to handle.
- Tip chipping occurs when cutting high-tensile materials.
- Bur condition is increased.
- Entire cutting edge is engaged at finish of thread, causing increased tendency to chatter.

Modified flank



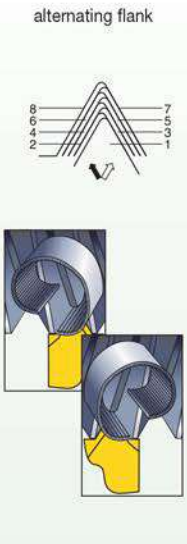
Advantage –

- Tool cuts both sides of thread form, so it is protected from chipping similar to 0° infeed. Channel-type chip develops, but uneven chip thickness helps remove the chip similar to flank infeed.
- This is the preferred method, especially when used with a chip control insert.
- Combined radial and/or alternating flank infeed.
- Results in good tool life, with wear evenly distributed over both flanks.

Disadvantage –

- Similar disadvantages as with 0° infeed, although reduced somewhat in magnitude as cutting forces are better equalised and chip flow is much less of a problem.

Alternating flank



Advantage –

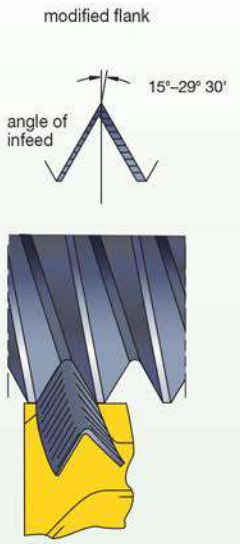
- Increased tool life because both edges are used equally.

NOTE: Some machine tools may require special programming techniques to achieve this method of infeed.

Disadvantage –

- Difficult to cut on conventional machinery.

Reversed modified flank



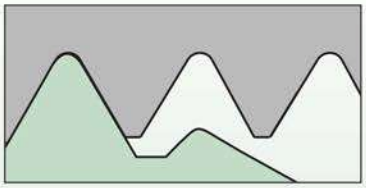
Advantage –

- Tool cuts both sides of thread form, so it is protected from chipping similar to 0° infeed. Channel-type chip develops, but uneven chip thickness helps remove the chip similar to flank infeed.
- This is the preferred method, especially when used with a chip control insert.
- Combined radial and/or alternating flank infeed.
- Results in good tool life, with wear evenly distributed over both flanks.
- As chip flow is the reversed feed direction, it is an excellent choice for internal threading.

Disadvantage –

- Programming needs to be done line by line.

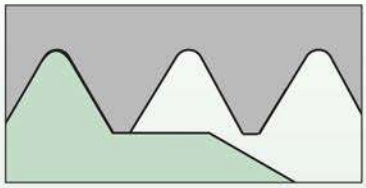
Partial Profile



Tooth profile with universal profile shape:

- 55° or 60° without cutting edges for the tooth tapers.
- Reduced inventory.
- For various pitches in a limited range.
- Preferably one time production.
- Major/minor diameters must be accurately pre-turned.

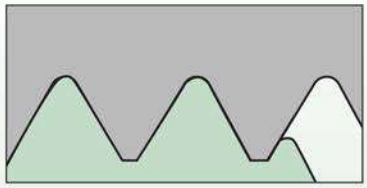
Full Profile



Tooth profile with full profile shape including tooth height:

- For bur-free, precise threads in the specified pitch.
- General application.
- Machining allowance for outside/core diameter around 0,1–0,15mm.

Multi-Tooth Profile



Multi-tooth full profile generally with 2–3 teeth:

- Highly productive threading with fewer passes and longer tool life.
- Requires a rigid setup and long thread pass through.
- Minimum clearance width approximately 1.25 x E as per indexable insert dimensions table.

Formulas

Metric Formula		
to find	**given**	**formula**
m/min	D (mm) RPM	$m/min = \frac{\pi \times D}{1000} \times RPM$
RPM	D (mm) m/min	$RPM = \frac{m/min \times 1000}{D \times \pi}$

Legend

m/min	=	metres per minute
RPM	=	revolutions per minute
D	=	part diameter
π	=	3.1416

Maximum Cutting Speeds

On older machines, cutting speed is often limited by the maximum travel speed mm/min of the tool allowed by the machine.

Check your maximum speed with the following formulas:

metric formula: maximum cutting speed (m/min) = part diameter (mm) x 3.14 x (1/pitch) x $\frac{\text{max mm/min}}{1000\text{mm}}$

Flank clearance

γ = arctan (sin (β/2) * tan(α))
γ = side (flank) clearance
β = included angle of thread form
α = radial inclination angle

Thread	Angle	External	Internal
UN & ISO	60	5.3	8
BSW	55	4.8	7.3
TR	30	2.6	4
ACME	29	2.6	3.9
AMBUT	7	.6	.9
AMBUT	45	4	6

Recommendation for Threading Infeed Passes

TPI	48–32	28–24	20–16	14–12	11.5–9	8–6	5–4	3–2
metric pitch (mm)	0,50–0,75	0,80–1	1,25–1,5	1,75–2	2,5–3	3,5–4	4,5–6	8
Thread Type	**recommended number of passes**							
Common V-thread forms ISO, UN, UNJ, NPT, Whitworth, BSPT, API Rotary Shoulder	4–5	5–6	6–8	8–10	9–12	12–15	14–16	15–25
Acme, Trapez, Round, API Round	–	–	5–6	7–8	10–11	12–13	13–15	18–20
Stub Acme, API Buttress	–	–	5	5–6	7–8	8–10	10–12	14–16
American Buttress	–	–	7–8	9–10	11–12	13–15	17–19	22–24

Maintain minimum 0,05mm infeed on last passes to avoid work hardening and excessive abrasion of the threading tool.

Constant Volume Infeed Values for Threading Operations

In most applications, use of CNC canned cycles produces only marginally successful results. For example, an 8-pitch external thread has a depth of 2mm (.0789").

$$\Delta ap_x = \frac{ap}{\sqrt{nap-1}} * \sqrt{\phi}$$

Formula for constant chip load infeed

Δap	=	radial infeed
x	=	actual pass (from 1 to the nap)
nap	=	number of passes
ϕ	=	1st pass, 0.3
		2nd pass, 1
		3rd pass and up, x-1

Using Radial Infeed

Bending stress on the cutting edge caused by V-shaped chips from long-chipping steel workpiece materials.

High cutting forces with small cutting thicknesses require sharp edges with high strength.

Using Flank Infeed

Lower bending stress and stabilised cutting edges produce more favourable chip shapes and larger cutting thicknesses.

Carbides with high hardness, good wear resistance, and temperature stability are advantageous.

Guidelines for Infeeds – How to Determine the Number and the Size of Passes

The number of passes "s" per thread is decisive for successful threading and crest turning. The following tables give standard values for the application condition when machining steel. The proper number of passes must be determined empirically.

If insert breakage occurs, the number of passes must be increased. With increased wear, we recommend decreasing the number of passes. The chip thickness should not be less than 0,05mm. The allowance at the diameter should not exceed 0,2mm.

Metric ISO, External Thread Cutting

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
T Ap (mm)	0,305	0,457	0,610	0,762	0,914	1,067	1,219	1,524	1,829	2,159	2,464	2,769	3,073
N Ap	4	4	5	6	6	8	8	10	12	14	15	15	16
	values for flank infeed (X/Z)												
order of passes	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z
1	0,096	0,145	0,167	0,187	0,224	0,221	0,252	0,278	0,302	0,328	0,361	0,405	0,435
2	0,080	0,119	0,138	0,154	0,185	0,182	0,208	0,230	0,249	0,271	0,298	0,335	0,359
3	0,073	0,109	0,126	0,141	0,169	0,167	0,191	0,210	0,228	0,248	0,273	0,306	0,329
4	0,056	0,084	0,097	0,108	0,130	0,128	0,146	0,161	0,175	0,190	0,209	0,235	0,252
5			0,082	0,091	0,110	0,108	0,123	0,136	0,148	0,160	0,176	0,198	0,213
6				0,080	0,097	0,095	0,109	0,120	0,130	0,141	0,155	0,175	0,187
7						0,086	0,098	0,108	0,118	0,128	0,141	0,158	0,169
8						0,079	0,090	0,100	0,108	0,118	0,129	0,145	0,156
9								0,093	0,101	0,109	0,120	0,135	0,145
10								0,087	0,095	0,103	0,113	0,127	0,136
11									0,089	0,097	0,107	0,120	0,129
12									0,085	0,092	0,102	0,114	0,122
13										0,088	0,097	0,109	0,117
14										0,085	0,093	0,105	0,112
15											0,090	0,101	0,108
16													0,104
T Ap (mm)	0,305	0,457	0,610	0,762	0,914	1,067	1,219	1,524	1,829	2,159	2,464	2,769	3,073

NOTE: Always allow 0,08–0,13mm extra stock for full profile inserts.

Metric ISO, Internal Thread Cutting

thread pitch P (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
T Ap (mm)	0,279	0,406	0,533	0,686	0,813	0,940	1,092	1,346	1,626	1,905	2,159	2,438	2,718
N Ap	4	4	5	6	6	8	8	10	11	12	14	15	16
	values for flank infeed (X/Z)												
order of passes	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z
1	0,088	0,129	0,146	0,168	0,199	0,195	0,226	0,246	0,282	0,315	0,328	0,357	0,384
2	0,073	0,106	0,121	0,139	0,164	0,161	0,187	0,203	0,232	0,260	0,271	0,295	0,317
3	0,067	0,097	0,110	0,127	0,151	0,147	0,171	0,186	0,213	0,238	0,248	0,270	0,291
4	0,051	0,075	0,085	0,097	0,116	0,113	0,131	0,143	0,163	0,183	0,190	0,207	0,223
5			0,071	0,082	0,097	0,095	0,111	0,120	0,138	0,154	0,160	0,175	0,188
6				0,072	0,086	0,084	0,097	0,106	0,121	0,136	0,141	0,154	0,166
7						0,076	0,088	0,096	0,110	0,123	0,128	0,139	0,150
8						0,070	0,081	0,088	0,101	0,113	0,118	0,128	0,138
9								0,082	0,094	0,105	0,109	0,119	0,128
10								0,077	0,088	0,099	0,103	0,112	0,120
11									0,083	0,093	0,097	0,106	0,114
12									0,000	0,089	0,092	0,101	0,108
13										0,000	0,088	0,096	0,103
14										0,000	0,085	0,092	0,099
15											0,000	0,089	0,096
16													0,092
T Ap (mm)	0,279	0,406	0,533	0,686	0,813	0,940	1,092	1,346	1,626	1,905	2,159	2,438	2,718

NOTE: Always allow 0,08–0,13mm extra stock for full profile inserts.

UN Thread, External Thread Cutting

TPI	24	20	18	16	14	12	11	10	9	8	7	6	5
T Ap (mm)	0,660	0,787	0,864	0,965	0,914	1,067	1,219	1,524	1,829	2,159	2,464	2,769	3,073
N Ap	5	6	6	7	9	9	10	11	12	13	14	15	16
	values for flank infeed (X/Z)												
order of passes	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z
1	0,181	0,193	0,212	0,216	0,177	0,207	0,223	0,264	0,302	0,341	0,374	0,405	0,435
2	0,149	0,159	0,175	0,178	0,146	0,171	0,184	0,218	0,249	0,282	0,309	0,335	0,359
3	0,137	0,146	0,160	0,163	0,134	0,156	0,168	0,200	0,228	0,258	0,283	0,306	0,329
4	0,105	0,112	0,123	0,125	0,103	0,120	0,129	0,153	0,175	0,198	0,217	0,235	0,252
5	0,088	0,094	0,103	0,106	0,087	0,101	0,109	0,129	0,148	0,167	0,183	0,198	0,213
6		0,083	0,091	0,093	0,076	0,089	0,096	0,114	0,130	0,147	0,161	0,175	0,187
7				0,084	0,069	0,080	0,087	0,103	0,118	0,133	0,146	0,158	0,169
8					0,063	0,074	0,080	0,095	0,108	0,122	0,134	0,145	0,156
9					0,059	0,069	0,074	0,088	0,101	0,114	0,125	0,135	0,145
10							0,070	0,083	0,095	0,107	0,117	0,127	0,136
11								0,078	0,089	0,101	0,111	0,120	0,129
12									0,085	0,096	0,105	0,114	0,122
13										0,092	0,101	0,109	0,117
14											0,097	0,105	0,112
15												0,101	0,108
16													0,104
T Ap (mm)	0,660	0,787	0,864	0,965	0,914	1,067	1,219	1,524	1,829	2,159	2,464	2,769	3,073

NOTE: Always allow 0,08–0,13mm extra stock for full profile inserts.

UN Thread, Internal Thread Cutting

TPI	24	20	18	16	14	12	11	10	9	8	7	6	5
T Ap (mm)	0,584	0,686	0,762	0,864	0,991	1,143	1,245	1,372	1,524	1,727	1,956	2,286	2,743
N Ap	5	6	6	7	8	9	9	10	11	12	13	14	15
	values for flank infeed (X/Z)												
order of passes	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z
1	0,160	0,168	0,187	0,193	0,205	0,221	0,241	0,250	0,264	0,285	0,309	0,347	0,402
2	0,132	0,139	0,154	0,159	0,169	0,183	0,199	0,207	0,218	0,236	0,255	0,287	0,332
3	0,121	0,127	0,141	0,146	0,155	0,167	0,182	0,189	0,200	0,216	0,234	0,263	0,304
4	0,093	0,097	0,108	0,112	0,119	0,128	0,140	0,145	0,153	0,166	0,179	0,202	0,233
5	0,078	0,082	0,091	0,094	0,100	0,108	0,118	0,123	0,129	0,140	0,151	0,170	0,196
6		0,072	0,080	0,083	0,088	0,095	0,104	0,108	0,114	0,123	0,133	0,150	0,173
7				0,075	0,080	0,086	0,094	0,098	0,103	0,111	0,120	0,135	0,156
8					0,073	0,079	0,086	0,090	0,095	0,102	0,111	0,124	0,144
9						0,074	0,080	0,084	0,088	0,095	0,103	0,116	0,134
10								0,078	0,083	0,089	0,097	0,109	0,126
11									0,078	0,085	0,092	0,103	0,119
12										0,080	0,087	0,098	0,113
13											0,083	0,094	0,108
14											0,080	0,090	0,104
15													0,100
16													
T Ap (mm)	0,584	0,686	0,762	0,864	0,991	1,143	1,245	1,372	1,524	1,727	2,036	2,286	2,743

NOTE: Always allow 0,08–0,13mm extra stock for full profile inserts.

NPT Thread, External, and Internal Machining

TPI	27	18	14	11,5	8
T Ap (mm)	0,762	1,118	1,422	1,727	2,489
N Ap	6	8	10	12	14
	values for flank infeed (X/Z)				
order of passes	X/Z	X/Z	X/Z	X/Z	X/Z
1	0,187	0,231	0,260	0,285	0,378
2	0,154	0,191	0,214	0,236	0,312
3	0,141	0,175	0,196	0,216	0,286
4	0,108	0,134	0,151	0,166	0,219
5	0,091	0,113	0,127	0,140	0,185
6	0,080	0,100	0,112	0,123	0,163
7		0,090	0,101	0,111	0,147
8		0,083	0,093	0,102	0,135
9			0,087	0,095	0,126
10			0,081	0,089	0,118
11				0,085	0,112
12				0,080	0,107
13					0,102
14					0,098
15					
16					
T Ap (mm)	0,762	1,118	1,422	1,727	2,489

NOTE: Always allow 0,08–0,13mm extra stock for full profile inserts.

BSPT Thread, External, and Internal Machining

TPI	28	19	14	11
T Ap (mm)	0,584	0,864	1,168	1,448
N Ap	5	8	10	12
	values for flank infeed (X/Z)			
order of passes	X/Z	X/Z	X/Z	X/Z
1	0,160	0,179	0,213	0,239
2	0,132	0,148	0,176	0,197
3	0,121	0,135	0,161	0,181
4	0,093	0,104	0,124	0,139
5	0,078	0,087	0,104	0,117
6		0,077	0,092	0,103
7		0,070	0,083	0,093
8		0,064	0,076	0,086
9			0,071	0,080
10			0,067	0,075
11				0,071
12				0,067
13				
14				
15				
16				
T Ap (mm)	0,584	0,864	1,168	1,448

Trapezoid Thread to DIN 103, External, and Internal Machining

pitch	1,5	2	3	4	5
T Ap (mm)	1,016	1,245	1,753	2,261	2,743
N Ap	6	8	10	12	14
	values for flank infeed (X/Z)				
order of passes	X/Z	X/Z	X/Z	X/Z	X/Z
1	0,249	0,258	0,320	0,373	0,417
2	0,206	0,213	0,264	0,308	0,344
3	0,188	0,195	0,242	0,282	0,315
4	0,144	0,150	0,186	0,217	0,242
5	0,122	0,126	0,157	0,183	0,204
6	0,107	0,111	0,138	0,161	0,180
7		0,100	0,125	0,145	0,162
8		0,092	0,115	0,134	0,149
9			0,107	0,125	0,139
10			0,100	0,117	0,131
11				0,111	0,123
12				0,105	0,117
13					0,112
14					0,108
15					
16					
T Ap (mm)	1,016	1,245	1,753	2,261	2,743

NOTE: Always allow 0,08–0,13mm extra stock for full profile inserts.

Round Thread to DIN 405, External, and Internal Machining

pitch	10	8	6
T Ap (mm)	1,321	1,626	2,159
N Ap	8	10	12
	values for flank infeed (X/Z)		
order of passes	X/Z	X/Z	X/Z
1	0,273	0,297	0,357
2	0,226	0,245	0,294
3	0,207	0,224	0,270
4	0,159	0,172	0,207
5	0,134	0,145	0,174
6	0,118	0,128	0,154
7	0,107	0,116	0,139
8	0,098	0,106	0,128
9		0,099	0,119
10		0,093	0,112
11			0,106
12			0,100
13			
14			
15			
16			
T Ap (mm)	1,321	1,626	2,159

NOTE: Always allow 0,08–0,13mm extra stock for full profile inserts.

Whitworth, External, and Internal Thread Cutting

TPI	28	20	19	16	14	12	11	10	9	8	7	6	5
T Ap (mm)	0,584	0,813	0,813	0,864	1,016	1,346	1,473	1,626	1,803	2,032	2,311	2,718	3,251
N Ap	5	6	6	8	8	9	9	10	11	12	14	15	16
	values for flank infeed (X/Z)												
order of passes	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z
1	0,160	0,199	0,199	0,179	0,210	0,261	0,285	0,297	0,312	0,336	0,351	0,398	0,460
2	0,132	0,164	0,164	0,148	0,174	0,215	0,236	0,245	0,258	0,277	0,290	0,329	0,380
3	0,121	0,151	0,151	0,135	0,159	0,197	0,216	0,224	0,236	0,254	0,266	0,301	0,348
4	0,093	0,116	0,116	0,104	0,122	0,151	0,166	0,172	0,181	0,195	0,204	0,231	0,267
5	0,078	0,097	0,097	0,087	0,103	0,128	0,140	0,145	0,153	0,164	0,172	0,195	0,225
6		0,086	0,086	0,077	0,091	0,112	0,123	0,128	0,135	0,145	0,151	0,171	0,198
7				0,070	0,082	0,102	0,111	0,116	0,122	0,131	0,137	0,155	0,179
8				0,064	0,075	0,093	0,102	0,106	0,112	0,120	0,126	0,143	0,165
9						0,087	0,095	0,099	0,104	0,112	0,117	0,133	0,153
10								0,093	0,098	0,105	0,110	0,125	0,144
11									0,093	0,099	0,104	0,118	0,136
12										0,095	0,099	0,112	0,130
13											0,095	0,107	0,124
14											0,091	0,103	0,119
15												0,099	0,114
16													0,110
T Ap (mm)	0,584	0,813	0,813	0,864	1,016	1,346	1,473	1,626	1,803	2,032	2,311	2,718	3,251

NOTE: Always allow 0,08–0,13mm extra stock for full profile inserts.

Multi-Tooth Threads, Internal

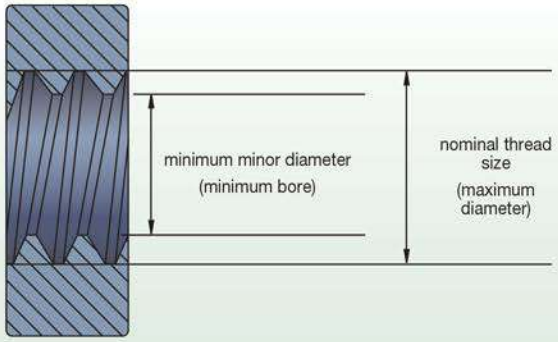
	ISO metric						ISO UN					Whitworth	NPT		
type	3M	2M	3M	2M	3M	2M	2M	3M	2M	3M	2M	2M	2M	3M	2M
pitch (mm)	1,0	1,5	1,5	2,0	2,0	3,0	–	–	–	–	–	–	–	–	–
TPI	–	–	–	–	–	–	16	16	12	12	8	11	11.5	11.5	8
total depth (mm)	0,609	0,838	0,838	1,168	1,168	1,778	0,939	0,939	1,245	1,245	1,880	1,575	1,753	1,753	2,540
pass 10mm	0,330	0,381	0,508	0,508	0,711	0,558	0,431	0,558	0,558	0,762	0,584	0,736	0,584	0,812	0,889
2	0,279	0,254	0,330	0,381	0,457	0,482	0,304	0,381	0,406	0,482	0,508	0,482	0,508	0,558	0,635
3	–	0,203	–	0,279	–	0,431	0,203	–	0,279	–	0,431	0,355	0,355	0,381	0,558
4	–	–	–	–	–	0,304	–	–	–	–	0,355	–	0,304	–	0,457

Recommendations for Steel Workpieces (<300 BHN)

			total depth – on radius		
catalogue number	insert size	TPI profile	1st pass	2nd pass	3rd pass
NTC-8R/L8EM	8	8 UN	1,21	1,63	2,00
NTC-8R/L8IM	8	8 UN	1,19	1,55	1,88
NTC-8R/L10EM	8	10 UN	0,92	1,27	1,60
NTC-8R/L10IM	8	10 UN	0,90	1,22	1,52
NTC-8R/L12EM	8	12 UN	0,76	1,04	1,32
NTC-8R/L12IM	8	12 UN	0,76	0,93	1,20
NTC-8R/L14EM	8	14 UN	0,68	0,95	1,12
NTC-8R/L14IM	8	14 UN	0,60	0,78	1,04
NTC-8R/L16EM 8	8	16 UN	0,58	0,81	0,96
NTC-8R/L16IM	8	16 UN	0,50	0,68	0,93
NTC-8R/L18EM	8	18 UN	0,48	0,66	0,86
NTC-8R/L18IM	8	18 UN	0,48	0,60	0,83
NDC-68RDR/L-75M	8	8 round	1,47	1,65	1,85
NDC-61RDR/L-75M	8	10 round	1,11	1,29	1,45
NDC-88RDRD/L-75M	8	8 round	1,29	1,75	1,85
NDC-88VR/L-75M	8	8 NPT	1,01	1,72	2,45
NDC-8115VR/L-75M	8	11.5 NPT	0,96	1,37	1,70
NDN-814VR/L-75M	8	14 NPT	0,96	1,22	1,36

NOTE: Always allow 0,08–0,13mm extra stock for full profile inserts.

The following charts list the largest thread pitch that can be applied on internal applications using TopThread threading inserts for 60° V-threading and Acme threading.



Metric-sized 60° V-Threading Limits

internal threading limitations
NT-1, NT-2 60° V-threading inserts

TPI	nominal thread size		minimum thread diameter (mm)	
	NT-1	NT-2	NT-1	NT-2
4,00	M48 x 4.00	–	43,67	–
3,00	M42 x 3.00	–	38,75	–
2,50	M39 x 2.50	M24 x 2,50	36,29	21,29
2,00	M33 x 2.00	M15 x 2,00	30,84	12,84
1,75	M32 x 1.75	M15 x 1,75	30,11	13,11
1,50	M32 x 1.50	M15 x 1,50	30,38	13,38
1,25	M29 x 1.29	M14 x 1,25	27,65	12,65
1,00*	M27 x 1.00	M14 x 1,00	25,92	12,92
0,75	M22 x 0.75	M12 x 0,75	21,19	11,19

**Thread pitch of 1mm and less can be cut with an NT-2 insert provided the core thread diameter is 25mm or larger (11mm or larger with NT-1).*

internal threading limitations
NT-3 and NT-4 60° V-threading inserts

TPI	nominal thread size	minimum thread diameter (mm)
6,00**	M76 x 6.00	69,50
5,50**	M73 x 5.50	67,05
5,00	M70 x 5.00	64,59
4,00	M64 x 4.00	59,67
3,00	M52 x 3.00	48,75
2,50	M48 x 2.50	45,29
2,00	M42 x 2.00	39,84
1,75	M40 x 1.75	38,11
1,50*	M38 x 1.50	36,38

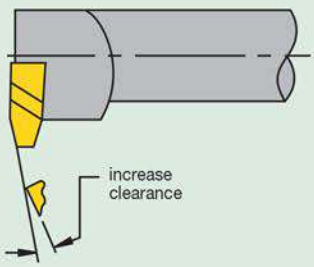
**Thread pitch of 1,5mm and less can be cut provided core thread diameter is 35mm or larger.*
***NT-4-insert only.*

Acme Threading Limits

internal threading limitations
NA and NAS-2, -3, -4, and -6 Acme threading inserts

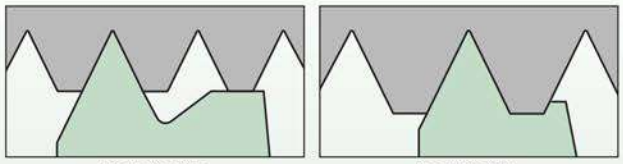
TPI	nominal thread size	minimum thread diameter (mm)	
	NT-1	NT-1	NT-2
2**	5	4.500	114.3
2-1/2**	4-1/2	4.100	104.1
3**	4	3.665	93.1
4	3-1/2	3.250	82.6
5	3	2.800	71.1
6	2-1/2	2.333	59.3
8	2-1/4	2.125	54.0
10	2	1.900	48.3
12	1-3/4	1.667	42.4
14	1-5/8	1.554	39.5
16*	1-1/2	1.438	36.5

**Sixteen threads per inch and finer can be cut provided minor diameter is 36,5mm or larger.*
***NA-6 insert only.*



Additional secondary clearance can be ground on leading edge of insert to provide sufficient helical clearance for machining coarser threads and multiple start threads. Modified standard inserts may be furnished for machining threads outside of the limits shown.

60° V-Thread Crest Turning Application Data



NTC crest turning insert for (P ≤ 2mm) and finer.

NTC crest turning insert for (P ≥ 3mm) and coarser.

NOTE: NTC inserts automatically control root to crest dimensions. Therefore, in setting up threading operations with NTC inserts, check the O.D. or I.D. at the thread crest for correct dimensions.

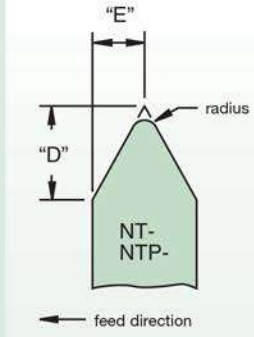
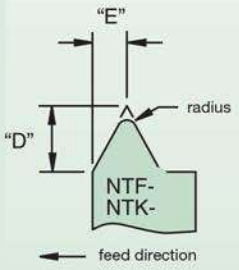
60° V-Thread Crest Turning Application Data

insert catalogue number	nose radius on insert (mm)	thread radius per MIL-S-8879A (mm)
NJ-3014R/L12	0,317/0,342	0,317/0,381
NJK-3008R/L20	0,190/0,215	0,190/0,0228

"J" thread note for catalogue

The controlled root radius thread form (SAE8879C) is defined for the external thread only. To machine the corresponding internal thread, choose any insert that will cut a unified class 2B thread, then bore the minor diameter to size. Refer to SAE8879C and MIL-S-8879C and SAEAS8879D for the correct "J" thread minor diameter values.

60° V-Thread Application Data

insert description	insert	D (mm)	E (mm)	recommended TPI*		recommended TP*	
				external	internal	external	internal
	NT-1	1,90	1,11	–	24–12	–	1,00–2,00
	NT-2	28,70	1,90	36–8	20–7	0,70–3,00	1,25–3,50
	NT-2-K	28,70	1,90	36–8	20–7	0,70–3,00	1,25–3,50
	NTF-2	15,75	1,01	44–14	24–12	0,60–1,75	1,00–2,00
	NTK-2	15,75	1,01	44–14	24–12	0,60–1,75	1,00–2,00
	NTP-2	28,70	1,90	36–8	20–7	0,70–3,0	1,25–3,50
	NT-3	37,59	2,46	20–6	12–5	1,25–4,00	2,00–5,00
	NT-3-K	37,59	2,46	20–6	12–5	1,25–4,00	2,00–5,00
	NT-3-C	37,59	2,46	11–6	6 (only)	2,50–4,00	4,00 (only)
	NT-3-CK	37,59	2,46	11–6	6 (only)	2,50–4,00	4,00 (only)
	NTF-3	21,08	1,37	44–10	24–9	0,60–2,50	1,00–2,50
	NTK-3	21,08	1,37	44–10	24–9	0,60–2,50	1,00–2,50
	NTP-3	37,59	2,46	20–6	12–5	1,25–4,00	2,00–5,00
	NT-4	49,78	3,22	20–4	12–4	1,25–6,25	2,00–6,25
	NT-4-K	49,78	3,22	20–4	12–4	1,25–6,25	2,00–6,25
	NT-4-C	49,78	3,22	11–4 1/2	6–4 1/2	2,50–5,50	4,00–5,50
	NT-4-CK	49,78	3,22	11–4 1/2	6–4 1/2	2,50–5,50	4,00–5,50
	NTF-4	21,08	1,37	44–10	24–9	0,60–2,50	1,00–2,50
	NTK-4	21,08	1,37	44–10	24–9	0,60–2,50	1,00–2,50
	NTP-4	49,78	3,22	20–4	12–4	1,25–6,25	2,00–6,25

**Based on maximum insert radius size and class 2A and 2B thread specifications.*

API Thread Forms • Insert Applications Chart for API Rotary Shouldered Connections

thread form	WIDIA™ insert		tool joint application	minimum box size*
	cresting	non-cresting		
V-.038R 2" TPF 4 TPI	NDC-4038R/L2 4-E/IR4API382	ND-3038R/L	2-3/8 API internal flush 2-7/8 API internal flush 3-1/2 API internal flush 4 API internal flush 4-1/2 API internal flush 5-1/2 API internal flush 6-5/8 API internal flush 4 API full hole API #23, API #26, API #31, API #35, API #38, API #40, API #44, API #46, API #50	API #31 2-7/8 IF
V-.038R 3" TPF 4 TPI	NDC-4038R/L3 4-E/IR4API383	ND-3038R/L	API #56 API #61 API #70 API #77	API #56
V-.050 2" TPF 4 TPI	NDC-4050R/L2 4-E/IRAPI502	ND-4050R/L	5-1/2 API full hole 6-5/8 API regular 6-5/8 API full hole	5-1/2 API full hole
V-.050 3" TPF 4 TPI	NDC-4050R/L3 4-E/IR4API503	ND-4050R/L	5-1/2 API regular 7-5/8 API regular 8-5/8 API regular	5-1/2 API regular
V-.040 3" TPF 5 TPI	NDC-3040R/L3 NDC-4040R/L3 4-E/IR5API403	ND-3040R/L ND-4040R/L	2-3/8 API regular 2-7/8 API regular 3-1/2 API regular 4-1/2 API regular	3-1/2 API regular

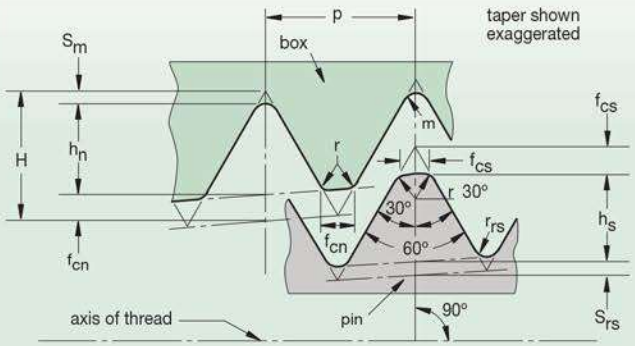
**Minimum box size that can be threaded with a standard TopThread insert due to minimum bore equipment.*

API Thread Forms
Product Thread Dimensions • Rotary Shouldered Connections (Inch)

threadform	taper inch per ft.	thread height, not truncated H	thread height, truncated $h_n=h_s$	root truncation $S_m=S_{rs}$ $f_m=f_{rs}$	crest truncation $f_{cn}=f_{cs}$	width of flat		root radius $r_m=r_{rs}$	radius at thread corners r	pitch p
						crest $f_{cn}=f_{cs}$	crest $f_m=f_{rs}$			
V-.038R	2	.216005	.121844	.038000	.056161	.065	—	.038	.015	.250
V-.038R	3	.215379	.121381	.038000	.055998	.065	—	.038	.015	
V-.040	3	.172303	.117842	.020000	.034461	.040	—	.020	.015	.250
V-.050	3	.215379	.147303	.025000	.043076	.050	—	.025	.015	
V-.050	2	.216005	.147804	.025000	.043201	.050	—	.025	.015	.250

NOTE: All dimensions in inches.

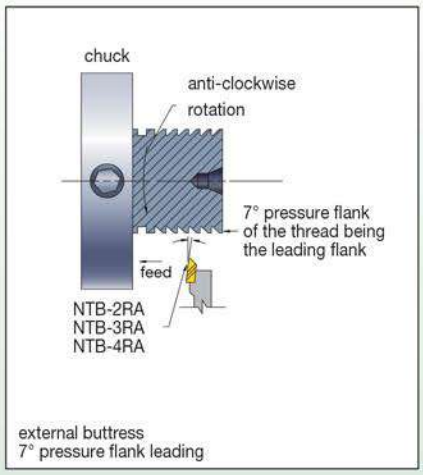
V-.040 and V-.050 Product Thread Form

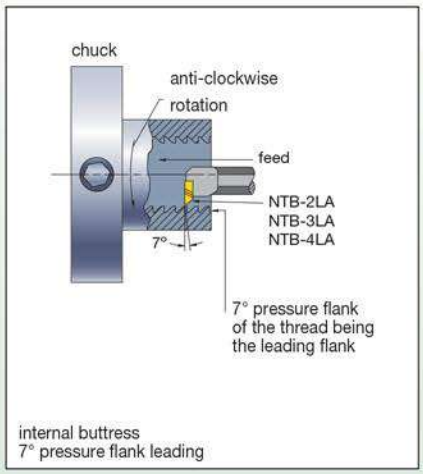


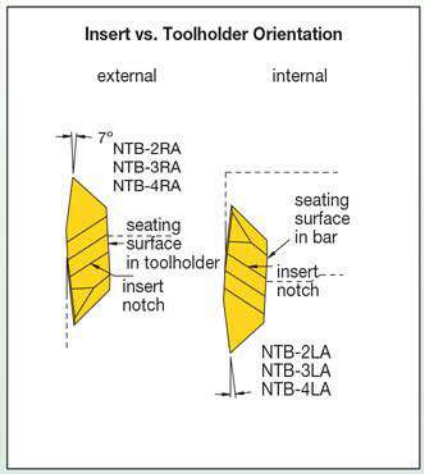
Casing and Tubing Round Thread (Height Dimensions)

thread element		10 TPI p= .1000	8 TPI p= .1250
H	= .866p	.08660	.10825
$H_s = h_n$	= .626p - .007	.05560	.07125
$S_{rs} = S_m$	= .120p + .002	.01400	.01700
$S_{cs} = S_{cn}$	= .120p + .005	.01700	.02000

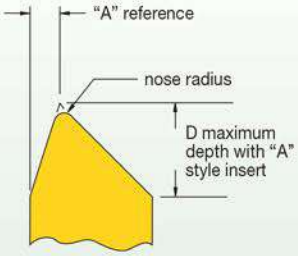
American Buttress (7° Pressure Flank Leading) NTB-A Inserts • Push Type



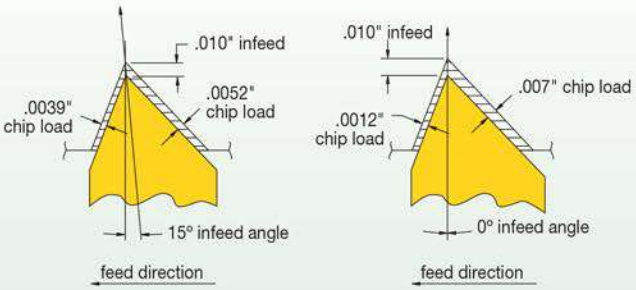




Reference Dimensions



Infeed Angle vs. Chip Load: 7° Pressure Flank Leading



NTB-A insert

insert	D (inch)	"A" ref. (inch)	nose radius (inch)	pitch based on maximum radius
NTB-2A	.133	.024	.002–.004	16–20 TPI
NTB-3A	.171	.031	.005–.008	8–16 TPI
NTB-4A	.218	.049	.008–.012	4–6 TPI

NOTE: For balanced chip load, 15° infeed angle is suggested.

Internal Threading Limitations

internal threading limitations
NTB-2A Buttress threading inserts

TPI	nominal thread size	minimum minor diameter (inch)
8	1-3/4	1.600
10	1-5/8	1.505
12	1-1/2	1.400
16	1-1/4	1.175
20	1-1/16	1.002

internal threading limitations
NTB-3 and NTB-4A Buttress threading inserts

TPI	nominal thread size	minimum minor diameter (inch)
4*	2-1/2	2.200
5	2-1/4	2.010
6	2	1.800
8	1-3/4	1.600
10	1-5/8	1.505
12**	1-1/2	1.400

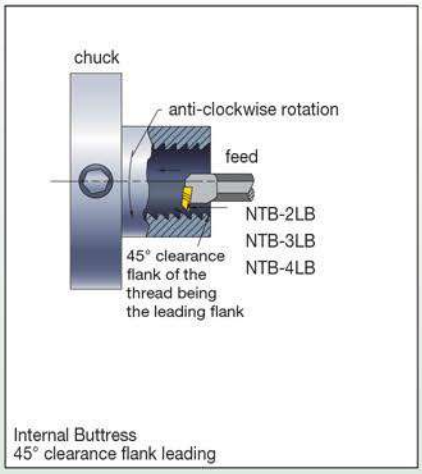
**NTB-4A insert only.*
***Can cut 16 or 20 threads per inch provided minor diameter is 1.375" or larger.*

Threads per Inch vs. Maximum Root Radius Chart (Inch)

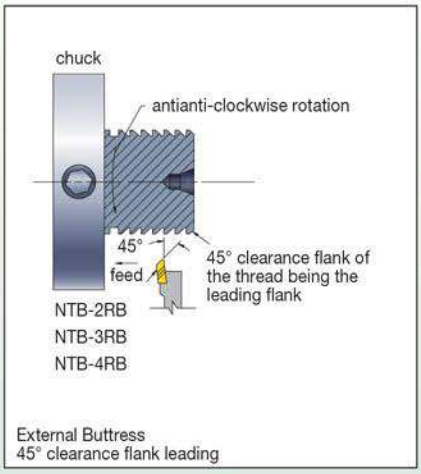
TPI	20	16	12	10	8	6	5	4	3	2-1/2	2	1-1/2	1-1/4	1
maximum root radius	.0036	.0045	.0059	.0071	.0089	.0119	.0143	.0179	.0238	.0268	.0375	.0476	.0572	.0714

NOTE: Special Buttress forms are available upon request.

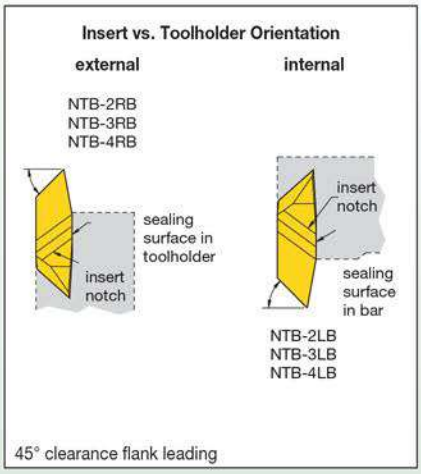
American Buttress (45° Clearance Flank Leading): NTB-B Inserts • PULL-type



Internal Buttress
45° clearance flank leading

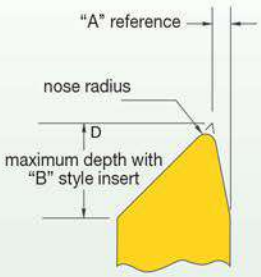


External Buttress
45° clearance flank leading

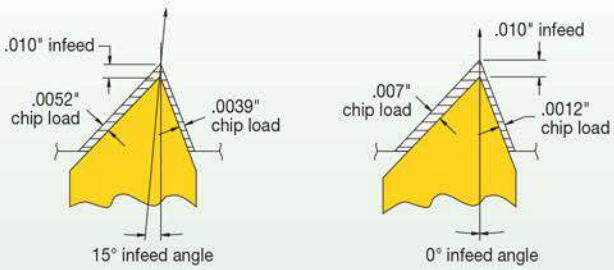


45° clearance flank leading

Reference Dimensions



Infeed Angle vs. Chip Load: 45° Clearance Flank Leading



NTB-B insert

insert	D (inch)	"A" reference (inch)	nose radius (inch)	pitch based on maximum radius
NTB-3B	.171	.031	.005–.004	8–16 TPI

NOTE: For balanced chip load, a reverse 15° infeed angle is suggested.

Internal Threading Limitations

internal threading limitations NTB-2B Buttress threading inserts		
TPI	**nominal thread size**	**minimum minor diameter (inch)**
8	1-3/4	1.600
10	1-5/8	1.505
12	1-1/2	1.400
16	1-1/4	1.175
20	1-1/16	1.002

internal threading limitations NTB-3 and NTB-4B Buttress threading inserts		
TPI	**nominal thread size**	**minimum minor diameter (inch)**
4*	2-7/8	2.575
5	2-3/4	2.510
6	2-3/8	2.175
8	2-1/8	1.975
10	1-7/8	1.755
12	1-5/8	1.525
16	1-1/2	1.407
20	1-7/16	1.378

**NTB-4B insert only.*

Laydown Threading System

EXTREME **CHALLENGES.**
EXTREME **RESULTS.**

The specially engineered WIDIA™ Laydown Threading System ensures the highest accuracy and quality available to meet all modern production standards. With an extensive range of inserts and toolholders available, the Laydown Threading platform is ideal for all of your internal and external threading applications.

- Low-profile design enables unrestricted chip flow.
- Precision-ground thread forms for industry-leading thread quality.
- Ideal choice for high-helix/multi-start threads and single-point threading in small-diameter bores.

To learn more, contact your local Authorised Distributor or visit **widia.com.**

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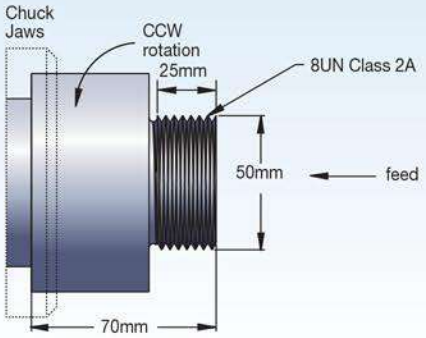
Required Information

From Part Drawing:

material: 316SS, 200 HB
thread form: 8UN
tolerance: class 2A
operation: external threading
pitch diameter: 50mm x 25mm deep

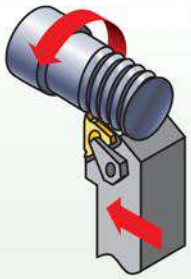
From Machine Setup Data:

tooling: 20mm x 20mm
spindle rotation: anti-clockwise
feed: toward chuck



Steps for a Successful Threading Operation

Step 1 • Determine Threading Method



Need to Know:

- Operation (external).
- Spindle rotation (CCW).
  Anti-clockwise rotation.
- Feed direction (toward chuck).
- Right-hand toolholder.
- Right-hand insert (ER).
- Standard helix method.

Step 2 • Select Insert

Need to Know:

- Thread form (ISO R262 1mm pitch).
- Hand of insert (right hand — ER).

Choose the High-Performance Solution

catalogue number	insert size	TN6025
3ER10ISO	3	•

High-Performance Selection

NOTE: Use insert with largest insert size available.

insert: 3ER10ISO
grade: TN6025
speed: 150 m/min

Step 3 • Select the Grade and Speed

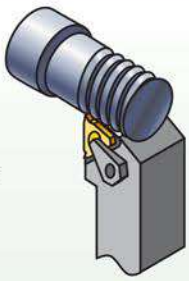
Need to Know:

- Workpiece material (316SS-200HB).
- Operation (external).

Options: Grade and Speed Selection Guidelines

threading operation	stainless steel
external	general purpose and high performance
	TN6025
	50–360 m/min

Step 4 • Select Toolholder



Need to Know:

- External or internal operation (external).
- Pitch diameter to determine minimum bore diameter (N/A).
- Type of tooling — toolholder, boring bar (toolholder).
- Hand of tool (right hand).
- Insert size (16).

Options:

catalogue number	insert size	shim
AL203R	3	SM-YE3

Step 5 • Select Shim

Need to Know:

- Thread form — TPI or pitch (8 TPI).
- Pitch diameter (50mm).
- Helix method (standard).
  See Laydown Threading (LT) shim selection chart.

Select SM-YE3 shim

NOTE: For this application, the standard shim supplied should be replaced with the recommended shim, SM-YE3.

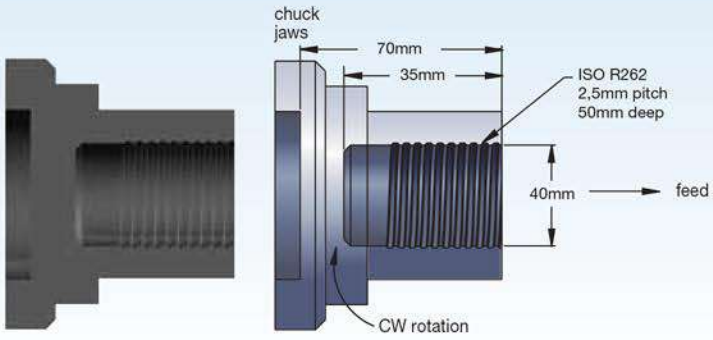
Required Information

From Part Drawing:

material: 4140 steel
thread form: ISO R262 2,5mm pitch
tolerance: ISO Metric Class 6G/6H
operation: internal threading
pitch diameter: 40mm x 35mm deep

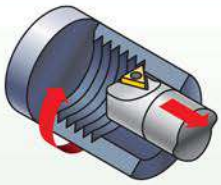
From Machine Setup Data:

tooling: 20mm boring bar
spindle rotation: clockwise
feed: away from chuck



Steps for a Successful Threading Operation

Step 1 • Determine Threading Method



Need to Know:

- Operation (internal).
- Spindle rotation (CW). *Clockwise rotation.*
- Feed direction (away from chuck).
- Left-hand toolholder.
- Left-hand insert (NL).
- Reverse helix method.

Step 2 • Select Insert

Need to Know:

- Thread form (ISO Metric Class 6G/6H).
- Hand of insert (left hand — NL).

Choose the High-Performance Solution

catalogue number	insert size	TN6025
3IL25ISO	3	•

High-Performance Selection

NOTE: Use insert with largest possible insert size to go into the bore.
insert: 3IL25ISO
grade: TN6025
speed: 130 m/min

Step 3 • Select the Grade and Speed

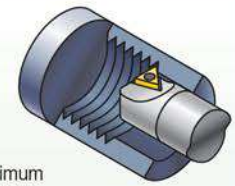
Need to Know:

- Workpiece material (4010 steel).
- Operation (internal).

Options: Grade and Speed Selection Guidelines

threading operation	steel
internal	general purpose and high performance
	TN6025
	40–200 m/min

Step 4 • Select Toolholder



Need to Know:

- External or internal operation (internal).
- Pitch diameter to determine minimum bore diameter for internal operations (40mm).
- Type of tooling — toolholder, boring bar (boring bar).
- Hand of tool (left hand).
- Insert size (16).

Options:

catalogue number	insert size	shim
AVR32D3R	3	SM-YE3

Step 5 • Select Shim

Need to Know:

- Thread form — TPI or pitch (2,5mm pitch).
- Pitch diameter (40mm).
- Helix method (reverse). See Laydown Threading (LT) shim selection chart.

Select SM-YE3

NOTE: For this application, the standard shim supplied should be replaced with the recommended shim, SM-YE3.

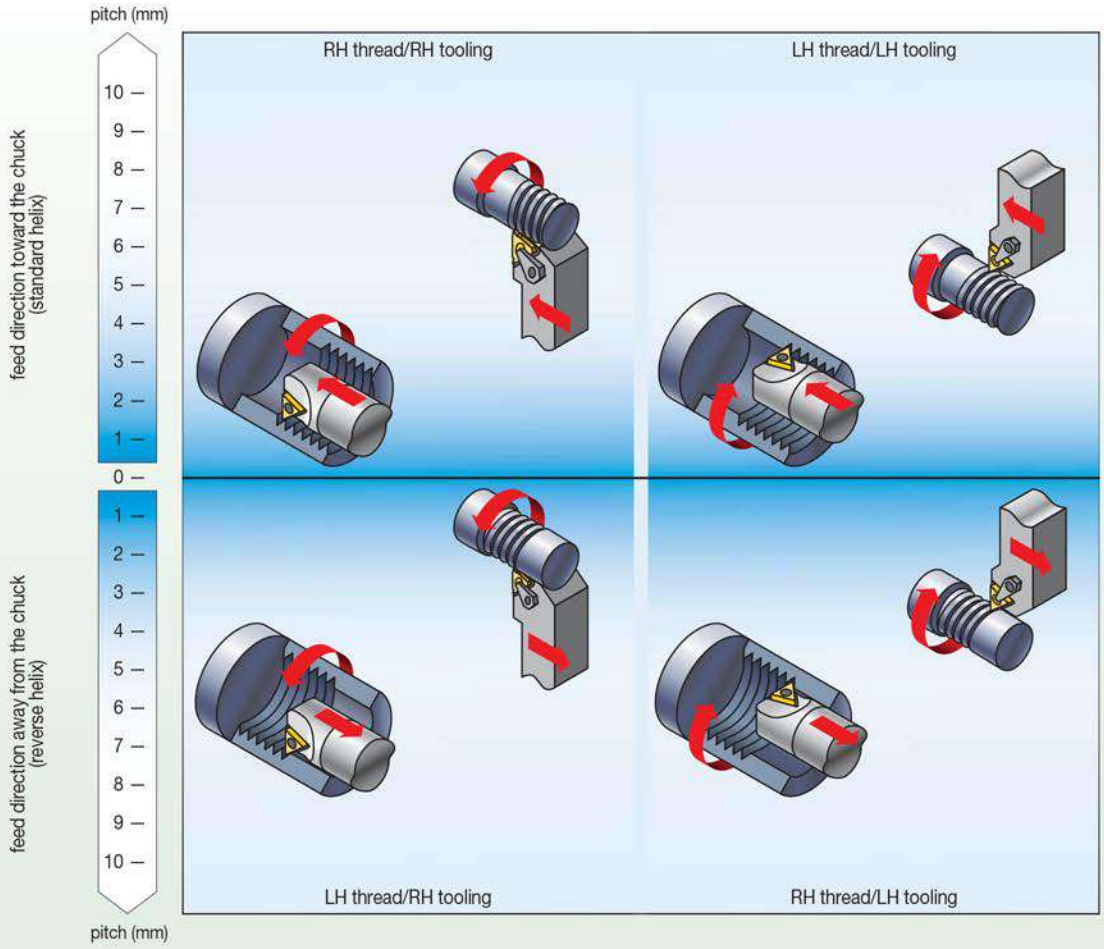
Laydown Threading Shim Selection Guidelines

It is essential to select the correct shim to ensure thread quality and maximum tool life. These parameters are needed:

- Pitch
- Pitch diameter
- Number of starts
- Feed direction

NOTE: When considering method of thread cutting, the part's shape and stability and the flow of chips are determining factors in your decision.

Laydown Selection Chart



NOTE: For multi-start threads, use the lead value instead of the pitch.

Diagram of Thread Lead Angles

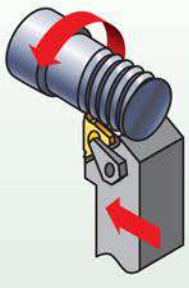
To calculate the lead angle of a given thread, use this formula:

$$\beta = \text{Arctan} \frac{P \bullet S}{\pi D_e}$$

ß = thread lead angle
De = effective pitch diameter of thread wear
P = 1/TPI
TPI = threads per inch
S = number of starts
single-start, lead = pitch
multiple-start, lead = pitch (x) number of starts

All toolholders are designed with an inclination angle = 1.5°. When turning standard threads with a lead angle of 1–2°, this guarantees adequate clearance at the flanks of the insert's thread tooth. The thread lead angle and the required inclination angle of the insert are given by ß.

Cutting edge height is constant at every shim and insert combination. All toolholders are supplied with 1-1/2° lead angle.

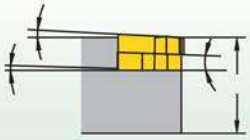


Laydown Threading Shim Selection Table • Metric

insert size	toolholder external	toolholder internal	shim ordering code (mm)							
						standard				
3 (9,52)	RH	LH	SM–YE3–3P	SM–YE3–2P	SM–YE3–1P	SM–YE3	SM–YE3–1N	SM–YE3–1.5N	SM–YE3–2N	SM–YE3–3N
3 (9,52)	LH	RH	SM–YI3–3P	SM–YI3–2P	SM–YI3–1P	SM–YI3	SM–YI3–1N	SM–YI3–1.5N	SM–YI3–2N	SM–YI3–3N
4 (12,7)	RH	LH	SM–YE4–3P	SM–YE4–2P	SM–YE4–1P	SM–YE4	SM–YE4–1N	SM–YE4–1.5N	SM–YE4–2N	SM–YE4–3N
4 (12,7)	LH	RH	SM–YI4–3P	SM–YI4–2P	SM–YI4–1P	SM–YI4	SM–YI4–1N	SM–YI4–1.5N	SM–YI4–2N	SM–YI4–3N
TPI		pitch (mm)	pitch diameter (mm)							
72		–	–	–	–	3,1–8	8–21,4	>21,4	21,4–8	8–3,1
–		0,35	–	–	–	3,0–8	8–21,3	>21,3	21,3–8	3–8
64		–	–	–	–	3,4–9	9–24,1	>24,1	24,1–9	9–3,4
–		0,40	–	–	–	3,5–9,1	9,1–24,3	>24,3	24,3–9,1	9,1–3,5
56		0,45	–	–	–	3,9–10,3	10,3–27,6	>27,6	27,6–10,3	10,3–3,9
–		0,50	–	–	2,8–4,3	4,3–11,4	11,4–30,4	>30,4	30,4–11,4	11,4–4,3
48		–	–	–	3–4,6	4,6–12,1	12,1–32,2	>32,2	32,2–12,1	12,1–4,6
44		–	–	–	3,3–5	5–13,2	13,2–35,1	>35,1	35,1–13,2	13,2–5
–		0,60	–	2,6–3,4	3,4–5,2	5,2–13,7	13,7–36,5	>36,5	36,5–13,7	13,7–5,2
40		–	–	2,8–3,6	3,6–5,5	5,5–14,5	14,5–38,6	>38,6	38,6–14,5	14,5–5,5
–		0,70	–	3,0–4	4–6,1	6,1–16	16–42,6	>42,6	42,6–16	16–6,1
36		–	–	3,1–4	4–6,1	6,1–16,1	16,1–42,9	>42,9	42,9–16,1	16,1–6,1
–		0,75	2,8–3,2	3,3–4,3	4,3–6,5	6,5–17,1	17,1–45,6	>45,6	45,6–17,1	17,1–6,5
32		–	3–3,4	3,4–4,5	4,5–6,9	6,9–18,1	18,1–48,3	>48,3	48,3–18,1	18,1–6,9
–		0,80	3–3,5	3,5–4,6	4,6–6,9	6,9–18,2	18,2–48,6	>48,6	48,6–18,2	18,2–6,9
28		–	3,4–3,9	3,9–5,2	5,2–7,9	7,9–20,7	20,7–55,1	>55,1	55,1–20,7	20,7–7,9
27		–	3,6–4,1	4,1–5,4	5,4–8,2	8,2–21,4	21,4–57,2	>57,2	57,2–21,4	21,4–8,2
–		1,00	3,8–4,3	4,3–5,7	5,7–8,7	8,7–22,8	22,8–60,8	>60,8	60,8–22,8	22,8–8,7
24		–	4–4,6	4,6–6	6–9,2	9,2–24,1	24,1–64,3	>64,3	64,3–24,1	24,1–9,2
–		1,25	4,7–5,4	5,4–7,1	7,1–10,8	10,9–28,5	28,5–76	>76,0	76–28,5	28,5–10,8
20		–	4,8–5,5	5,5–7,2	7,2–11	11–28,9	29–77,2	>77,2	77,2–28,9	29–11
18		–	5,3–6,1	6,1–8	8–12,2	12,2–32,2	32,2–85,8	>85,8	85,8–32,2	32,2–12,2
–		1,50	5,7–6,5	6,5–8,5	8,5–13	13–34,2	34,2–91,2	>91,2	91,2–34,2	34,2–13
16		–	6–6,9	6,9–9	9–13,8	13,8–36,2	36,2–96,5	>96,5	96,5–36,2	36,2–13,8
–		1,75	6,6–7,96	7,6–10	10–15,2	15,2–39,9	39,9–106,4	>106,4	106,4–39,9	39,9–15,2
14		–	6,9–7,9	7,9–10,3	10,3–15,7	15,7–41,4	41,4–110,3	>110,3	110,3–41,4	41,4–15,7
13		–	7,4–8,5	8,5–11,1	11,1–17	17–44,5	44,5–118,8	>118,8	118,8–44,5	44,5–17
–		2,00	7,6–8,7	8,7–11,4	11,4–17,4	17,4–45,6	45,6–121,6	>121,6	121,6–45,6	45,6–17,4
12		–	8–9,2	9,2–12	12,1–18,4	18,4–48,2	48,3–128,7	>128,7	128,7–48,2	48,2–18,4
11.5		–	8,4–9,6	9,6–12,6	12,6–19,2	19,2–50,3	50,3–134,3	>134,3	134,3–50,3	50,3–19,2
11		–	8,8–10	10–13,1	13,1–20	20–52,6	52,6–140,4	>140,4	140,4–52,6	52,6–20
–		2,50	9,5–10,8	10,8–14,2	14,2–21,7	21,7–57	57–152	>152,0	152–57	57–21,7
10		–	9,6–11	11–14,5	14,5–22	22–57,9	57,9–154,4	>154,4	154,4–57,9	57,9–22
9		–	10,7–12,2	12,2–16,1	16,1–24,5	24,5–64,3	64,3–171,6	>171,6	171,6–64,3	64,3–24,5
–		3,00	11,4–13	13–17,1	17,1–26	26–68,4	68,4–182,4	>182,4	182,4–68,4	68,4–26
8		–	12–13,8	13,8–18,1	18,1–27,6	27,6–72,4	72,4–193	>193,0	193–72,4	72,4–27,6
–		3,50	13,3–15,2	15,2–19,9	19,9–30,4	30,4–79,8	79,8–212,8	>212,8	212,8–79,8	79,8–30,4
7		–	13,8–15,7	15,7–20,7	20,7–31,5	31,5–82,7	82,7–220,6	>220,6	220,6–82,7	82,7–31,5
–		4,00	15,2–17,3	17,3–22,8	22,8–34,7	34,7–91,2	91,2–243,2	>243,2	243,2–91,2	91,2–34,7
6		–	16–18,3	18,3–24,1	24,1–36,7	36,7–96,5	96,5–257,4	>257,4	257,4–96,5	96,5–36,7
–		5,00	19–21,7	21,7–28,5	28,5–43,4	43,4–114	114–304	>304,0	304–114	114–43,4
5		–	19,3–22	22–28,9	28,9–44,1	44,1–115,8	115,8–308,8	>308,8	308,8–115,8	115,8–44,1
4,5		–	21,4–24,5	24,5–32,1	32,1–49	49–128,7	128,7–343,1	>343,1	343,1–128,7	128,7–49
–		6,00	22,7–26	26–34,2	34,2–52,1	52,1–136,8	136,8–364,8	>364,8	364,8–136,8	136,8–52,1
4		–	24,1–27,5	27,5–36,2	36,2–55,1	55,1–144,8	144,8–386	>386	386–144,8	144,8–55,1
inclination angle			4.5	3.5	2.5	1.5	0.5	0.0	-0.5	-1.5
			standard helix (feed toward the chuck)						reverse helix (feed away from the chuck)	

1. Select TPI or pitch from the left-hand columns.
2. Follow row to specified pitch diameter and the correct feed direction.
3. Follow the column to the top for the required shim based on the toolholder and insert size.

standard helix method:
Used when RH thread is cut with RH tool or LH thread with LH tool.



reverse helix method:
Used when RH thread is cut with LH tool or when LH thread is cut with RH tool.