User Guide

Threading Inserts - Types and Profiles

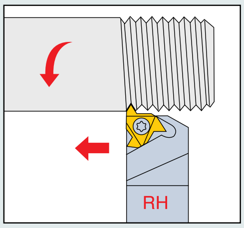
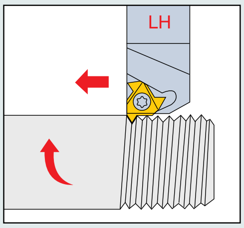
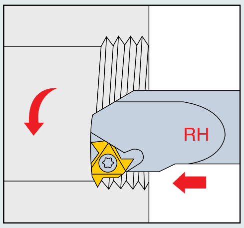
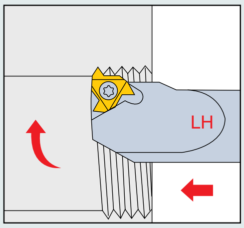
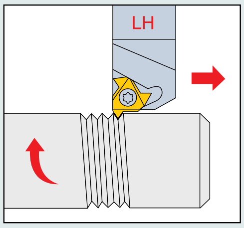
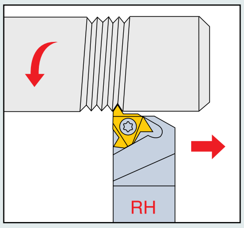
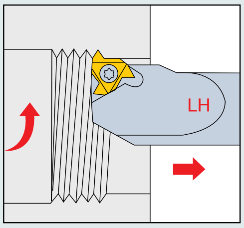
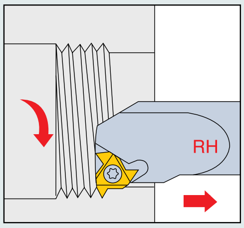
Partial Profile

- Suitable for a wide range of pitches with a common angle (60°or 55°)
- Inserts with small root-corner radius suitable for the smallest pitch range.
- Additional operations to complete the outer/internal diameter is necessary.
- Not recommended for mass production.
- Eliminates the need for different inserts.

Full Profile

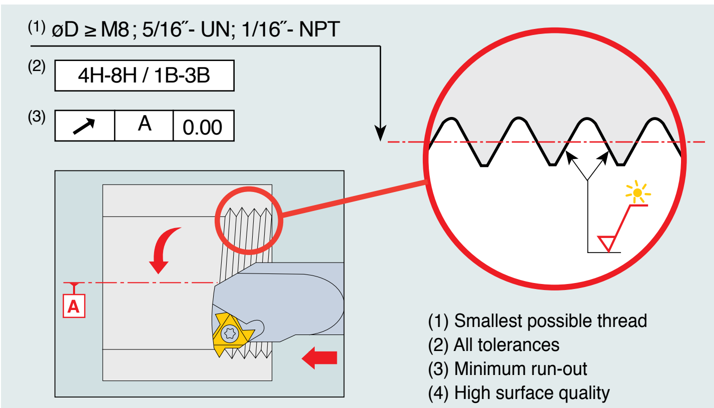
- Performs complete thread profile.
- Root corner radius is suitable only for the relevant pitch.
- Recommended for mass production.
- Suitable for one profile only.

Thread Turning Methods

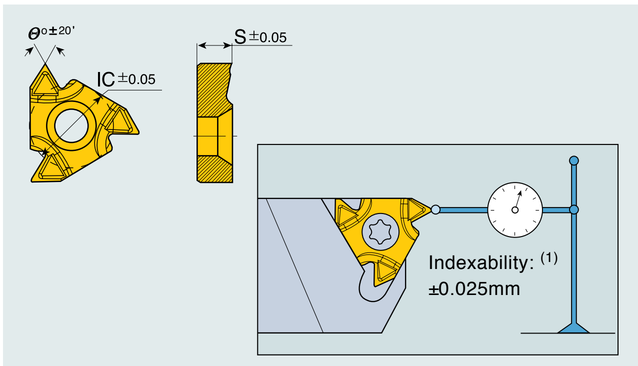
External Thread		Internal Thread	
Right-Hand Thread	Left-Hand Thread	Right-Hand Thread	Left-Hand Thread
			
			
Change anvil to negative(1)	Change anvil to negative(1)	Change anvil to negative(1)	Change anvil to negative(1)

- (1)See page B24

Mini - Tool Features



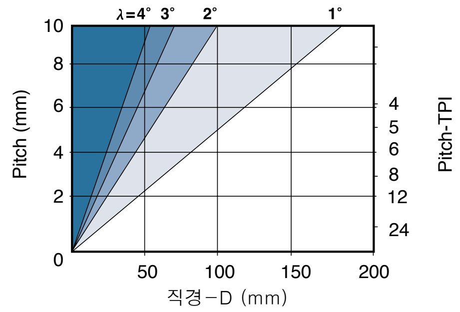
M-Type Threading Insert - Accuracy



(1) Insert indexability accuracy: ±0.015mm

Thread Helix Angle and Anvil Selection

Helix Angle λ Evaluation

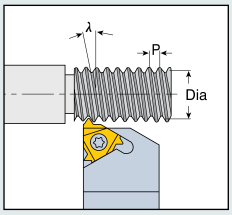


(1)β -Effective inclination angle.

β(1)=4.5°
β(1)=3.5°
β(1)=2.5°
β(1)=1.5°
β(1)=0.5°

$$tg\ \lambda = \frac{1 \times P}{3.14 \cdot D}$$

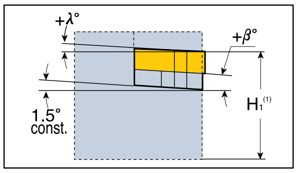
$$\lambda° = \frac{20 \times P}{D}$$



P - Pitch (mm)
D - Effective diameter of thread (mm)
λ - Angle of inclination

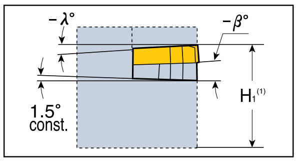
Anvil Selection According to Thread Helix Angle λ

		Standard						
Thread Helix Angle λ		> 4°	3°- 4°	2°- 3°	1°- 2°	0°- 1°	Negative Anvils	
	Inclination Angle β	4.5°	3.5°	2.5°	1.5°	0.5°	-0.5°	-1.5°
I(IC)	Toolholder	Anvil Designation						
16	EX RH OR IN LH	AE 16 +4.5	AE 16 +3.5	AE 16 +2.5	AE 16	AE 16 +0.5	AE 16 -0.5	AE 16 -1.5
(3/8)	EX LH OR IN RH	AI 16 +4.5	AI 16 +3.5	AI 16 +2.5	AI 16	AI 16 +0.5	AI 16 -0.5	AI 16 -1.5
22	EX RH OR IN LH	AE 22 +4.5	AE 22 +3.5	AE 22 +2.5	AE 22	AE 22 +0.5	AE 22 -0.5	AE 22 -1.5
(1/2)	EX LH OR IN RH	AI 22 +4.5	AI 22 +3.5	AI 22 +2.5	AI 22	AI 22 +0.5	AI 22 -0.5	AI 22 -1.5
27	EX RH OR IN LH	AE 27 +4.5	AE 27 +3.5	AE 27 +2.5	AE 27	AE 27 +0.5	AE 27 -0.5	AE 27 -1.5
(5/8)	EX LH OR IN RH	AI 27 +4.5	AI 27 +3.5	AI 27 +2.5	AI 27	AI 27 +0.5	AI 27 -0.5	AI 27 -1.5
22U	EX RH OR IN LH	AE 22U +4.5	AE 22U +3.5	AE 22U +2.5	AE 22U	AE 22U +0.5	AE 22U -0.5	AE 22U -1.5
(1/2U)	EX LH OR IN RH	AI 22U +4.5	AI 22U +3.5	AI 22U +2.5	AI 22U	AI 22U +0.5	AI 22U -0.5	AI 22U -1.5
27U	EX RH OR IN LH	AE 27U +4.5	AE 27U +3.5	AE 27U +2.5	AE 27U	AE 27U +0.5	AE 27U -0.5	AE 27U -1.5
(5/8U)	EX LH OR IN RH	AI 27U +4.5	AI 27U +3.5	AI 27U +2.5	AI 27U	AI 27U +0.5	AI 27U -0.5	AI 27U -1.5



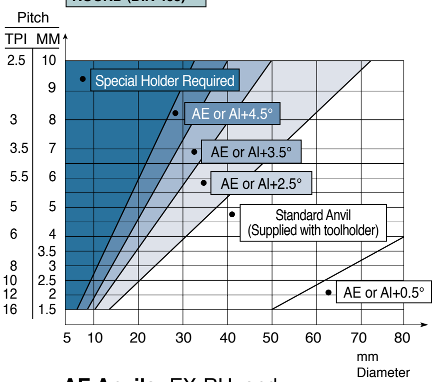
Anvils for negative inclination β used when turning **RH** thread with **LH** holder or **LH** thread with **RH** holder.

(1) H_1 remains constant for every anvil combination.



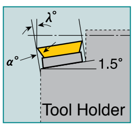
Anvils for positive inclination angle β applicable when turning **RH** thread with **RH** holder or **LH** thread with **LH** holders.

ACME
STUB ACME
TRAPEZE (DIN 103)
ROUND (DIN 405)

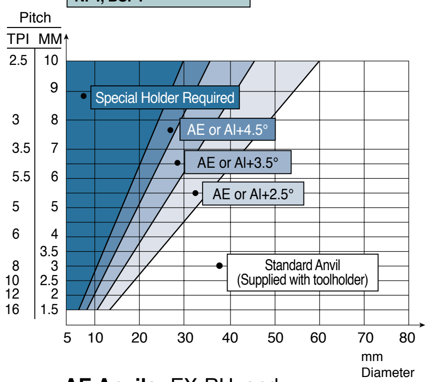


AE Anvils: EX-RH and IN-LH Toolholders

AI Anvils: IN-RH and EX-LH Toolholders.



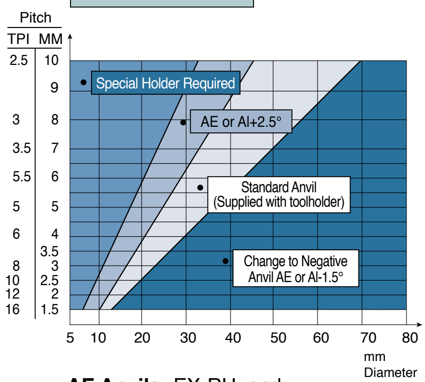
PARTIAL PROFILES 60°
PARTIAL PROFILES 55°
ISO, UN,WHITWORTH,
NPT, BSPT



AE Anvils: EX-RH and IN-LH Toolholders

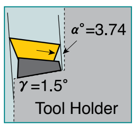
AI Anvils: IN-RH and EX-LH Toolholders.

AMERICAN BUTTRESS
SAGENGEWINDE
(DIN-513)



AE Anvils: EX-RH and IN-LH Toolholders

AI Anvils: IN-RH and EX-LH Toolholders.

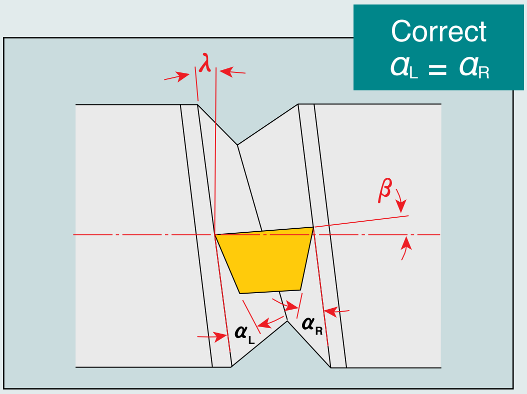


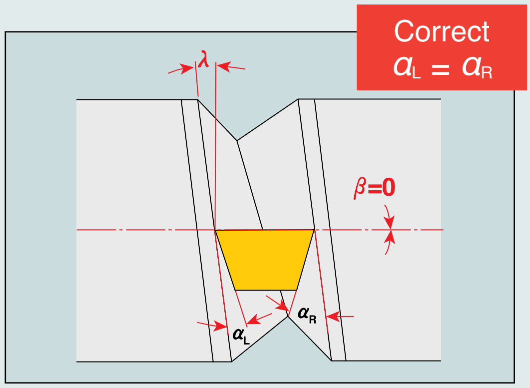
Replacing the standard anvil with a negative angle anvil will eliminate side rubbing

User Guide

Flank Clearance and Effective Inclination Angle

Inclination angle β of the cutting edges correspond to a specific thread helix angle λ and insures equal clearance angle on both sides of insert.

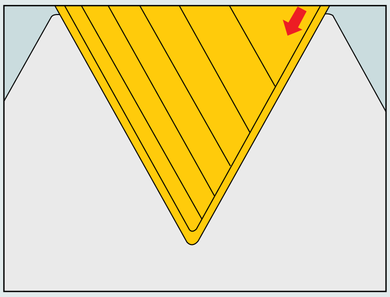




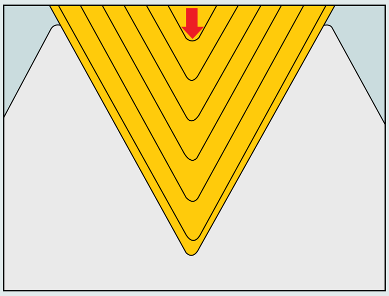
α - Flank clearance angle
λ - Helix angle
β - Effective inclination angle is achieved by selecting the suitable anvil

Infeed Methods for Threading Operations

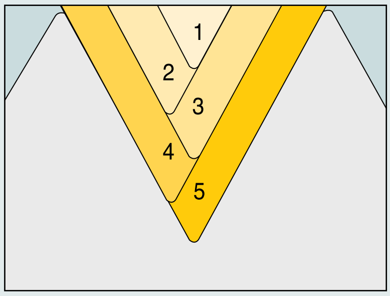
Flank Infeed



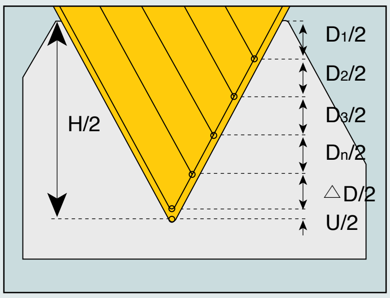
Radial Infeed



Alternating Flank Infeed

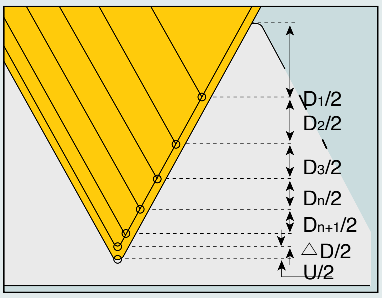


Flank Equal
Equal depth of cut for each pass



$$\frac{D_1}{2} = \frac{D_2}{2} = \frac{D_3}{2} = \frac{D_n}{2}$$

Flank Diminishing
Diminished depth of cut for each pass



$$\frac{D_1}{2} > \frac{D_2}{2} > \frac{D_3}{2} > \frac{D_n}{2} > \frac{D_{n+1}}{2}$$

H - Depth of thread profile (on Ø)
D - Depth of pass (on Ø)
U - Depth of finishing pass (on Ø)

Cutting Data

Maximum depth of first cut for CNC control / External Threading - M-Type Inserts

Full Profile	Pitch mm	Pitch TPI	Insert Designation	No. of passes Min.	No. of passes Max.	Low Carbon Steel Eq.	Low Carbon Steel Dim.	High Carbon Steel Eq.	High Carbon Steel Dim.	Alloy Steel Eq.	Alloy Steel Dim.	Stainless Steel Eq.	Stainless Steel Dim.	Nonferrous Aluminum Eq.	Nonferrous Aluminum Dim.
ISO Metric	1.00		16 ERM 1.00 ISO	5	9	0.34	0.51	0.31	0.46	0.27	0.41	0.22	0.33	0.48	0.71
	1.25		16 ERM 1.25 ISO	6	11	0.42	0.63	0.38	0.57	0.34	0.50	0.27	0.41	0.59	0.88
	1.50		16 ERM 1.50 ISO	6	12	0.46	0.69	0.41	0.62	0.37	0.55	0.30	0.45	0.64	0.97
	1.75		16 ERM 1.75 ISO	8	13	0.48	0.72	0.43	0.65	0.38	0.58	0.31	0.47	0.67	1.01
	2.00		16 ERM 2.00 ISO	8	14	0.50	0.75	0.45	0.68	0.40	0.60	0.33	0.49	0.70	1.05
	2.50		16 ERM 2.50 ISO	10	15	0.53	0.80	0.48	0.72	0.42	0.64	0.34	0.52	0.74	1.12
	3.00		16 ERM 3.00 ISO	12	17	0.56	0.84	0.50	0.76	0.45	0.67	0.36	0.55	0.78	1.18
American UN		24	16 ERM 24 UN	5	9	0.34	0.51	0.31	0.46	0.27	0.41	0.22	0.33	0.48	0.71
		20	16 ERM 20 UN	6	10	0.42	0.63	0.38	0.57	0.34	0.50	0.27	0.41	0.59	0.88
		18	16 ERM 18 UN	6	11	0.46	0.69	0.41	0.62	0.37	0.55	0.30	0.45	0.64	0.97
		16	16 ERM 16 UN	7	12	0.47	0.71	0.42	0.64	0.38	0.57	0.31	0.46	0.66	0.99
			16 ERM 16 UN	6	13	0.46	0.69	0.41	0.62	0.37	0.55	0.28	0.41	0.64	0.97
		12	16 ERM 12 UN	8	14	0.50	0.75	0.45	0.68	0.40	0.60	0.33	0.49	0.70	1.05
		8	16 ERM 8 UN	12	17	0.56	0.84	0.50	0.76	0.45	0.67	0.36	0.55	0.78	1.18
British BSW		19	16 ERM 19 W	6	11	0.35	0.52	0.32	0.47	0.28	0.42	0.21	0.31	0.49	0.73
		16	16 ERM 16 W	7	12	0.47	0.71	0.42	0.64	0.38	0.57	0.31	0.46	0.66	0.99
		14	16 ERM 14 W	8	13	0.50	0.75	0.45	0.68	0.40	0.60	0.33	0.49	0.70	1.05
		11	16 ERM 11 W	9	14	0.44	0.66	0.40	0.59	0.35	0.53	0.29	0.43	0.62	0.92
NPT		18	16 ERM 18 NPT	10	20	0.24	0.36	0.22	0.32	0.19	0.29	0.16	0.23	0.34	0.50
		14	16 ERM 14 NPT	13	26	0.24	0.36	0.22	0.32	0.19	0.29	0.14	0.22	0.34	0.50
		11.5	16 ERM 11.5 NPT	15	24	0.27	0.40	0.24	0.36	0.22	0.32	0.18	0.26	0.38	0.56
		8	16 ERM 8 NPT	17	30	0.31	0.46	0.28	0.41	0.25	0.37	0.20	0.30	0.43	0.64
Round		6	16 ERM 6 RND	9	20	0.42	0.63	0.38	0.57	0.34	0.50	0.27	0.41	0.59	0.88
Partial Profile 60°	0.50-1.50	48-16	16 ERM A 60	(1)	0.22	0.33	0.20	0.30	0.18	0.26	0.14	0.21	0.31	0.46	
	1.75-3.00	14-8	16 ERM G 60			0.50	0.75	0.45	0.68	0.40	0.60	0.33	0.49	0.70	1.05
	0.50-3.00	48-8	16 ERM AG 60			0.24	0.36	0.22	0.32	0.19	0.29	0.16	0.23	0.34	0.50
	3.50-5.00	7-5	22 ERM N 60			0.41	0.62	0.37	0.56	0.33	0.50	0.27	0.40	0.57	0.87
Partial Profile 55°	1.75-3.00	14-8	16 ERM G 55			0.50	0.75	0.45	0.68	0.40	0.60	0.33	0.49	0.70	1.05
	0.50-3.00	48-8	16 ERM AG 55			0.22	0.33	0.20	0.30	0.18	0.26	0.14	0.21	0.31	0.46

Max. Depth for First Pass (D1) mm

Maximum depth of first cut for CNC control / Internal Threading - M-Type Inserts

Full Profile	Pitch mm	Pitch TPI	Insert Designation	No. of passes Min.	No. of passes Max.	Low Carbon Steel Eq.	Low Carbon Steel Dim.	High Carbon Steel Eq.	High Carbon Steel Dim.	Alloy Steel Eq.	Alloy Steel Dim.	Stainless Steel Eq.	Stainless Steel Dim.	Nonferrous Aluminum Eq.	Nonferrous Aluminum Dim.
ISO Metric	1.50		11 IRM 1.50 ISO	10	20	0.20	0.30	0.18	0.27	0.16	0.24	0.12	0.18	0.28	0.42
	1.00		16 IRM 1.00 ISO	9	16	0.14	0.20	0.13	0.18	0.11	0.16	0.09	0.13	0.20	0.28
	1.25		16 IRM 1.25 ISO	9	16	0.19	0.28	0.17	0.25	0.15	0.22	0.12	0.18	0.27	0.39
	1.50		16 IRM 1.50 ISO	10	20	0.20	0.30	0.18	0.27	0.16	0.24	0.12	0.18	0.28	0.42
	1.75		16 IRM 1.75 ISO	11	18	0.21	0.32	0.19	0.29	0.17	0.26	0.14	0.21	0.29	0.45
	2.00		16 IRM 2.00 ISO	12	21	0.22	0.33	0.20	0.30	0.18	0.26	0.14	0.21	0.31	0.46
	2.50		16 IRM 2.50 ISO	14	21	0.23	0.34	0.21	0.31	0.18	0.27	0.15	0.22	0.32	0.48
	3.00		16 IRM 3.00 ISO	16	22	0.24	0.35	0.22	0.32	0.19	0.29	0.16	0.23	0.34	0.50
American UN		20	16 IRM 20 UN	7	13	0.20	0.30	0.18	0.27	0.16	0.24	0.12	0.18	0.28	0.42
		18	16 IRM 18 UN	8	15	0.20	0.30	0.18	0.27	0.16	0.24	0.12	0.18	0.28	0.42
		16	16 IRM 16 UN	11	19	0.20	0.30	0.18	0.27	0.16	0.24	0.13	0.20	0.28	0.42
		14	16 IRM 14 UN	11	20	0.21	0.31	0.19	0.28	0.17	0.25	0.13	0.19	0.29	0.43
		12	16 IRM 12 UN	12	21	0.23	0.34	0.21	0.31	0.18	0.27	0.15	0.22	0.32	0.48
		8	16 IRM 8 UN	14	20	0.24	0.36	0.22	0.32	0.19	0.29	0.16	0.23	0.34	0.50
British BSW		19	16 IRM 19 W	7	12	0.28	0.42	0.25	0.38	0.22	0.34	0.17	0.25	0.39	0.59
		16	16 IRM 16 W	9	14	0.26	0.39	0.23	0.35	0.21	0.31	0.17	0.25	0.36	0.55
		14	16 IRM 14 W	10	16	0.27	0.41	0.24	0.37	0.22	0.33	0.18	0.27	0.38	0.57
		11	16 IRM 11 W	12	19	0.31	0.46	0.28	0.41	0.25	0.37	0.20	0.30	0.43	0.64
NPT		14	16 IRM 14 NPT	21	35	0.13	0.20	0.12	0.18	0.10	0.16	0.08	0.12	0.18	0.28
		11.5	16 IRM 11.5 NPT	21	33	0.17	0.25	0.15	0.23	0.14	0.20	0.11	0.16	0.24	0.35
		8	16 IRM 8 NPT	20	34	0.23	0.34	0.21	0.31	0.18	0.27	0.14	0.20	0.32	0.48
Round		6	16 IRM 6 RND	12	24	0.30	0.46	0.27	0.41	0.24	0.37	0.20	0.30	0.42	0.64
Partial Profile 60°	0.50-1.25	48-16	06 IRM A 60			0.22	0.33	0.20	0.30	0.18	0.26	0.14	0.21	0.31	0.46
	0.50-1.50	48-16	08 IRM A 60		(1)	0.13	0.20	0.12	0.18	0.10	0.16	0.08	0.13	0.18	0.28
	0.50-1.50	48-16	11 IRM A 60			0.13	0.20	0.12	0.18	0.10	0.16	0.08	0.13	0.18	0.28
	0.50-1.50	48-16	16 IRM A 60			0.13	0.20	0.12	0.18	0.10	0.16	0.08	0.13	0.18	0.28
	1.75-3.00	14-8	16 IRM G 60			0.22	0.33	0.20	0.30	0.18	0.26	0.14	0.21	0.31	0.46
	0.50-3.00	48-8	16 IRM AG 60			0.14	0.21	0.13	0.19	0.11	0.17	0.09	0.14	0.20	0.29
	3.50-5.00	7-5	22 IRM N 60			0.23	0.34	0.21	0.31	0.18	0.27	0.15	0.22	0.32	0.48
Partial Profile 55°	1.75-3.00	14-8	16 IRM G 55			0.34	0.50	0.31	0.45	0.27	0.40	0.22	0.33	0.48	0.70
	0.50-3.00	48-8	16 IRM AG 55			0.14	0.20	0.13	0.18	0.11	0.16	0.09	0.13	0.20	0.28

Max. Depth for First Pass (D1) mm

- (1) As per the number of passes for the relevant pitch

Number of Cutting Passes for Regular Type Inserts

Pitch mm	0.5	1.0	1.5	2.0	2.5	3.0	4.0	6.0
Pitch TPI	48	24	16	12	10	8	6	4
Number of Passes	4-6	5-9	5-12	6-14	7-15	8-17	10-20	11-22

- For mini-tools (06IR or 08IR) add 1÷3 passes. Increase for hard materials

Recommended Cutting Conditions

According to DIN/ISO513 and VDI 3323

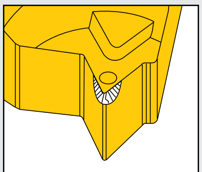
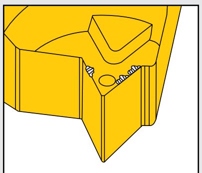
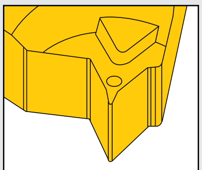
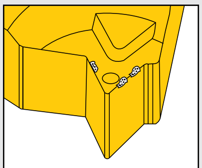
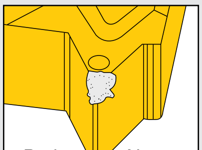
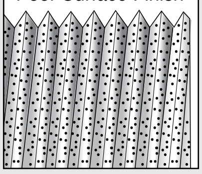
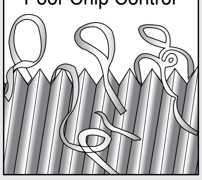
ISO	Material			Tensile Strength (N/mm^2)	Brinell HB	Material Group No.	Coated TT7010	Coated TT9030	Coated TT8010	Uncoated P30
							Cutting Speed (m/min)			
P	Non-alloy steel, cast steel, free cutting steel	< 0.25 %C	Annealed	420	125	1	160	180	105	100
		>= 0.25 %C	Annealed	650	190	2	160	180	105	100
		< 0.55 %C	Quenched and tempered	850	250	3	150	160	100	90
		>= 0.55 %C	Annealed	750	220	4	150	160	100	90
			Quenched and tempered	1000	300	5	130	140	85	85
	Low alloy steel and cast steel (less than 5% alloying elements)		Annealed	600	200	6	80	80	60	60
			Quenched and tempered	930	275	7	130	130	85	85
				1000	300	8	120	120	80	80
				1200	350	9	95	100	60	60
	High alloy steel, cast steel and tool steel.		Annealed	680	200	10	80	80	50	5
			Quenched and tempered	1100	325	11	60	60	40	40
M	Stainless steel and cast steel		Ferritic/martensitic	680	200	12	105	110	50	50
			Martensitic	820	240	13	150	160	100	100
			Austenitic	600	180	14	70	80	45	45
K	Gray cast iron (GG)		Ferritic		160	15		120	100	
			Pearlitic		250	16		130	100	
	Cast iron nodular (GGG)		Ferritic		180	17		130	100	
			Pearlitic		260	18		100	80	
	Malleable cast iron		Ferritic		130	19		130	70	
			Pearlitic		230	20		100	50	
N	Aluminum-wrought alloy		Not cureable		60	21		1400	800	
			Cured		100	22		500	380	
	Aluminum-cast, alloyed	<=12% Si	Not cureable		75	23		700	400	
			Cured		90	24		420	330	
		>12% Si	High temp.		130	25		240	180	
	Copper alloys	>1% Pb	Free cutting		110	26		300	200	
			Brass		90	27		400	280	
			Electrolitic copper		100	28		120	100	
	Non metallic		Duroplastics, fiber plastics			29		300	180	
			Hard rubber			30		300	180	
S	High temp. alloys	Fe based	Annealed		200	31		60	30	
			Cured		280	32		50	30	
		Ni or Co based	Annealed		250	33		30	20	
			Cured		350	34		20	10	
			Cast		320	35		20	10	
	Titanium, Ti alloys			Rm 400		36		140	100	
			Alpha+beta alloys cured	Rm 1050		37		50	30	
H	Hardened steel		Hardened		55 HRc	38		40	25	
			Hardened		60 HRc	39		30	20	
	Chilled cast iron		Cast		400	40		30	20	
	Cast iron nodular		Hardened		55 HRc	41		20	15	

* For more information of material groups, see the TaeguTec concise catalogue "Material conversion Table" section.

Steel **Stainless Steel** **Cast Iron** **Nonferrous** **High Temp. Alloys** **Hardened Steel**

User Guide

Trouble Shooting

Problem	Caused by	Solution
 Premature Wear	• Cutting speed too high	Reduce RPM
	• Infeed depth too small	Increase depth of cut
		Modify flank infeed
	• Highly abrasive material	Use coated grade
	• Inadequate coolant supply	Apply coolant
	• Wrong inclination anvil	Reselect anvil
	• Wrong turned dia. prior to threading	Check turned dia.
	• Insert is above center line	Check center height
 Chipped Edge	• Cutting speed too high	Reduce RPM
	• Depth of cut too large	Reduce depth of cut
	• Wrong grade	Use coated grade
		Use tougher grade
	• Poor chip control	Modify flank infeed
	• Inadequate coolant supply	Apply coolant
	• Center height incorrect	Adjust center height
 Plastic Deformation	• Excessive heat in cutting zone	Reduce RPM
		Reduce depth of cut
		Check turned dia.
	• Wrong grade	Use coated grade
		Use harder grade
	• Inadequate coolant supply	Apply more coolant
 Built-Up Edge	• Cutting edge too cold	Increase RPM
		Increase depth of cut
	• Wrong grade	Use coated grade
	• Inadequate coolant supply	Apply coolant
 Broken Nose during 1st Pass	• Cutting edge too cold	Increase RPM
	• Depth of cut too large	Reduce depth of cut
		Increase number of infeed passes
	• Wrong grade	Use tougher grade
	• Wrong turned dia. prior to threading	Check turned dia.
	• Corner height incorrect	Adjust center height
	• Infeed depth too shallow	Modify flank infeed
	• Wrong inclination anvil	Reselect anvil
	• Tool overhang too long	Reduce tool overhang
Poor Surface Finish 	• Wrong cutting speed	Increase RPM
		Reduce RPM
	• Excessive heat in cutting zone	Reduce depth of cut
	• Poor chip control	Modify flank infeed
	• Inadequate coolant supply	Apply coolant
	• Wrong inclination anvil	Reselect anvil
	• Tool overhang too long	Reduce tool overhang
	• Center height incorrect	Check center height
Poor Chip Control 	• Excessive heat in cutting zone	Reduce RPM
		Change depth of cut
		Check turned dia.
	• Wrong grade	Use coated grade
		Check turned dia.
		Use M-type insert
	• Inadequate coolant supply	Apply coolant
	• Wrong turned dia. prior to threading	Check turned dia.