THREAD TURNING

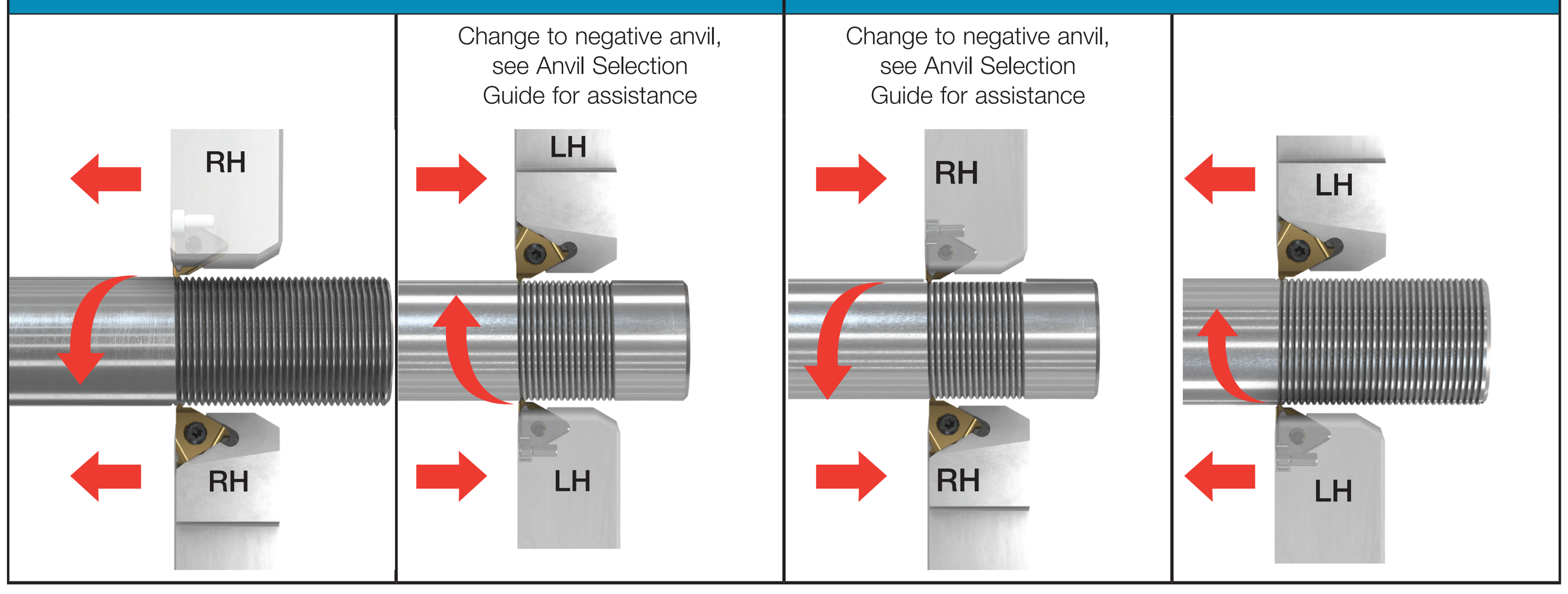
Thread Turning Operations with ISCAR

1. Thread Turning Directions

External Right-Hand (RH) Threading | External Left-Hand (LH) Threading

Change to negative anvil, see Anvil Selection Guide for assistance

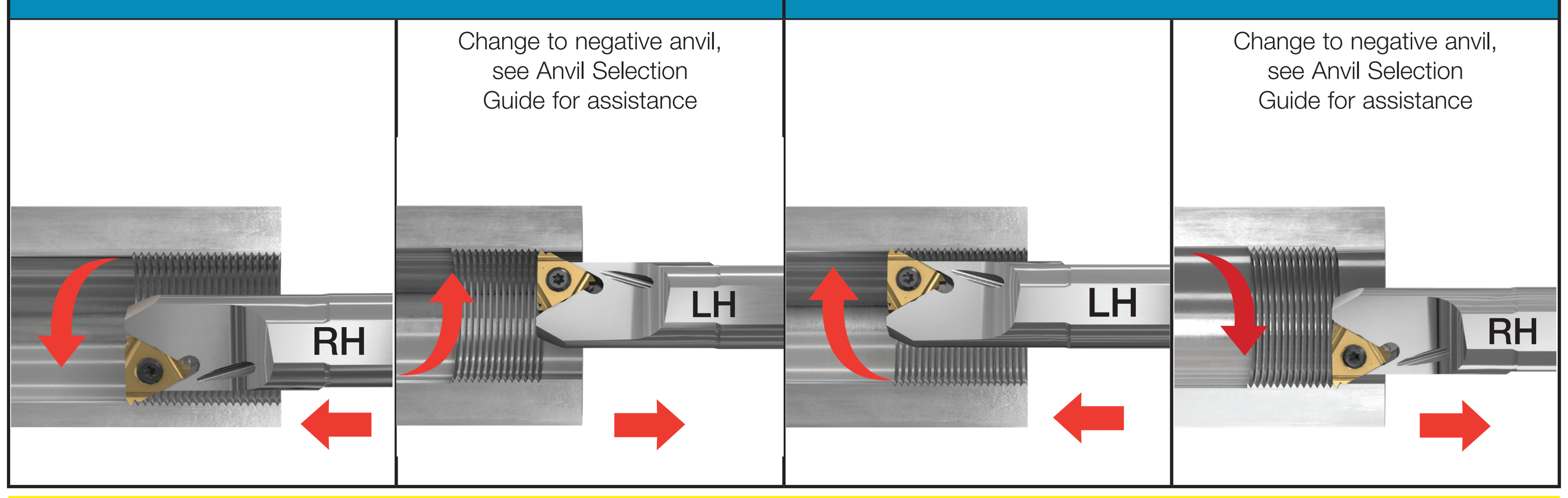
Change to negative anvil, see Anvil Selection Guide for assistance



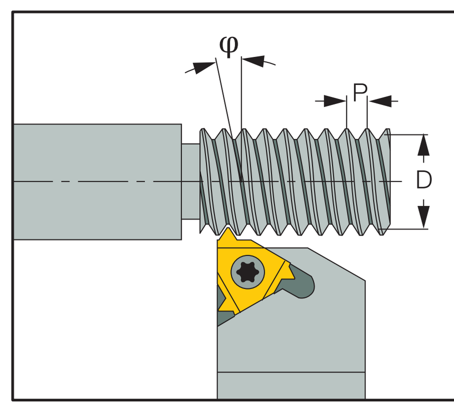
Internal Right-Hand (RH) Threading | Internal Left-Hand (LH) Threading

Change to negative anvil, see Anvil Selection Guide for assistance

Change to negative anvil, see Anvil Selection Guide for assistance

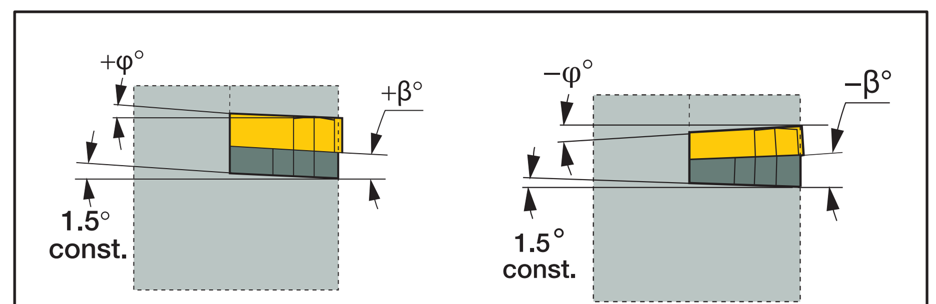


2. Laydown Anvil Selection Guide



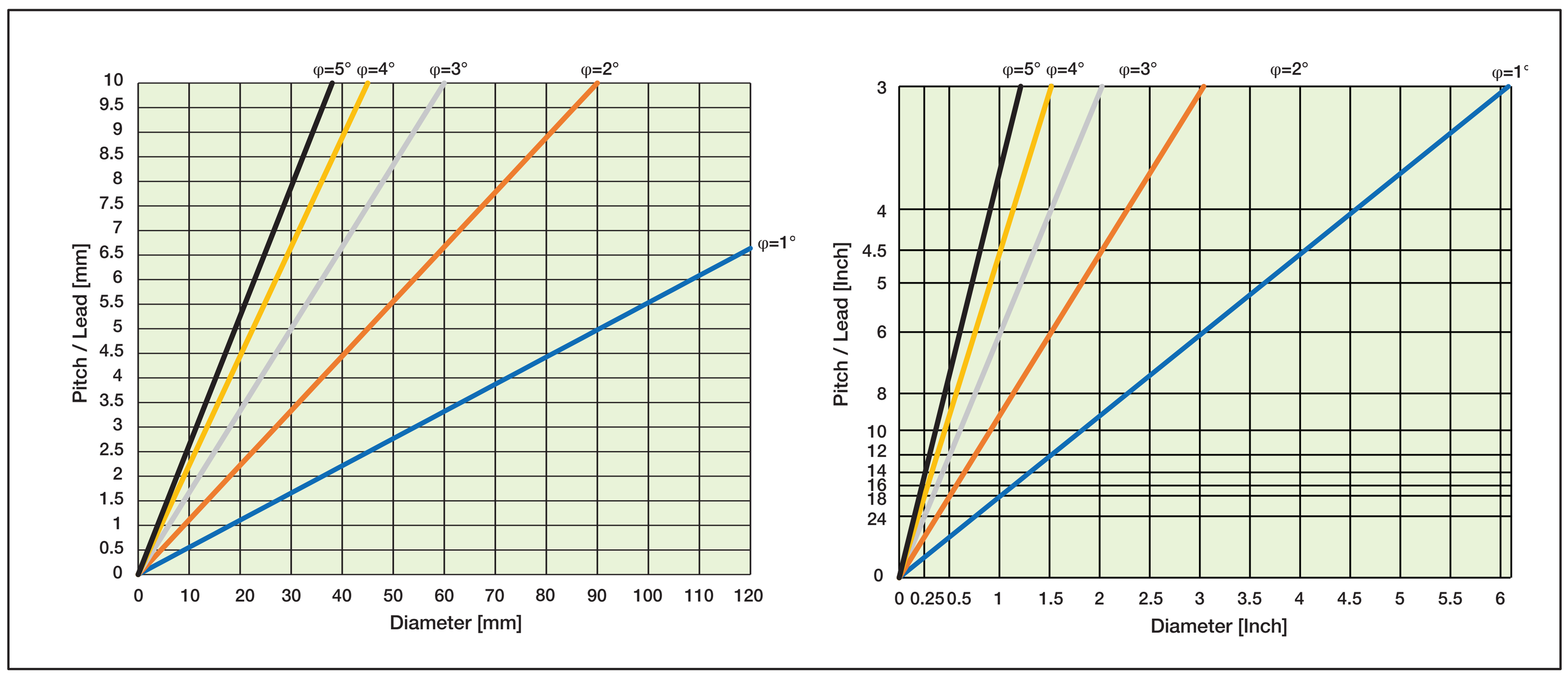
$$\arctan \varphi = \frac{P \cdot N}{3.14 \cdot D}$$

P - Pitch in mm / TPI
D - Effective diameter of thread in mm
φ - Lead angle
N - Number of starts
Lead - P•N



Anvils for positive inclination angle applicable when turning RH thread with RH holders or LH thread with LH toolholders.

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



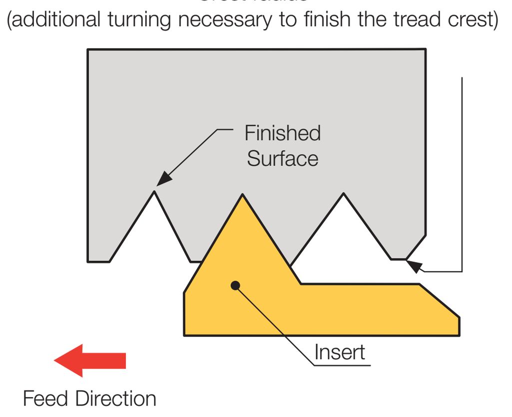
Anvil Selection Recommendation for Symmetric Profiles (ISO, UN, W, NPT, BSPT, TRAPEZOIDAL, ACME, RD)										
Thread Helix Angle φ		φ≥5°	4°≤φ<5°	3°<φ≤4°	2°<φ≤3°	1°<φ≤2°(2)	0°<φ<1°	0°<φ≤1°(1)	1°<φ≤2°(1)	φ≥2°
Inclination Angle β		Special solution(4)	4.5°	3.5°	2.5°	1.5°	0.5°	-0.5°	-1.5°	Special solution(4)
SAGE DIN 513(3)										
Thread helix angle range				φ<5.7°	5.1°<φ≤5.6°	3.1°<φ≤5°(2)	2.1°<φ≤3°	1.1°<φ≤2°	0°<φ≤1°	
Inclination Angle β				special solution(4)	2.5°	1.5°	'0.5°	-0.5°	-1.5°	
AMERICAN BUTTRESS(3)										
Thread helix angle range					φ<3.6°	3.1°<φ≤3.5°(2)	2.1°<φ≤3°	1.1°<φ≤2°	0°<φ≤1°	
Inclination Angle β					special solution(4)	1.5°	0.5°	-0.5°	-1.5°	
I (d)	Toolholder	Anvil Designation								
16	EX RH OR IN LH	Special solution(4)	AE16+4.5	AE16+3.5	AE16+2.5	AE16	AE16+0.5	AE16-0.5	AE16-1.5	Special solution(4)
(3/8)	EX LH OR IN RH		AI16+4.5	AI16+3.5	AI16+2.5	AI16	AI16+0.5	AI16-0.5	AI16-1.5	
22	EX RH OR IN LH		AE22+4.5	AE22+3.5	AE22+2.5	AE22	AE22+0.5	AE22-0.5	AE22-1.5	
(1/2)	EX LH OR IN RH		AI22+4.5	AI22+3.5	AI22+2.5	AI22	AI22+0.5	AI22-0.5	AI22-1.5	
27	EX RH OR IN LH		AE27+4.5	AE27+3.5	AE27+2.5	AE27	AE27+0.5	AE27-0.5	AE27-1.5	
(5/8)	EX LH OR IN RH		AI27+4.5	AI27+3.5	AI27+2.5	AI27	AI27+0.5	AI27-0.5	AI27-1.5	
22U	EX RH OR IN LH		AE22U+4.5	AE22U+3.5	AE22U+2.5	AE22U	AE22U+0.5	AE22U-0.5	AE22U-1.5	
(1/2U)	EX LH OR IN RH		AI22U+4.5	AI22U+3.5	AI22U+2.5	AI22U	AI22U+0.5	AI22U-0.5	AI22U-1.5	
27U	EX RH OR IN LH		AE27U+4.5	AE27U+3.5	AE27U+2.5	AE27U	AE27U+0.5	AE27U-0.5	AE27U-1.5	
(5/8U)	EX LH OR IN RH		AI27U+4.5	AI27U+3.5	AI27U+2.5	AI27U	AI27U+0.5	AI27U-0.5	AI27U-1.5	

(1) **Symmetrical profiles by pulling**
(2) **Supplied with tool holder**
(3) **SAGE DIN513 , AMERICAN BUTTRESS profiles by pulling**
(4) **Contact ISCAR representative**

3. Insert Types

Partial Profile

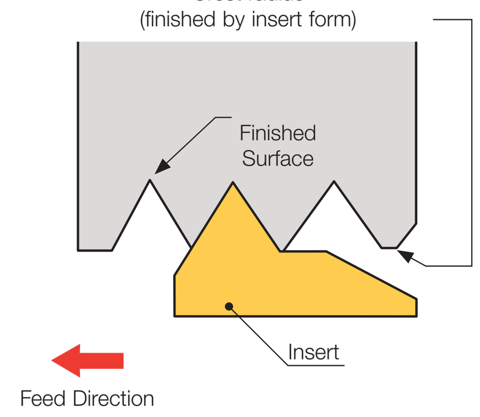
Crest radius (additional turning necessary to finish the tread crest)



- Suitable for a wide range of pitches.
- Will require an additional operation to complete the thread.
- Less recommended for mass production (small radii may cause shorter tool life)

Full Profile

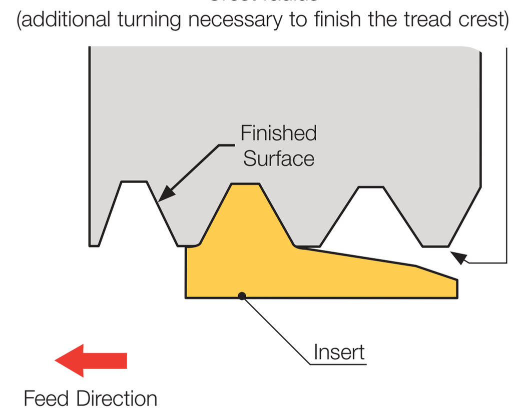
Crest radius (finished by insert form)



- Completes the thread in one operation.
- Profile is suitable for a specific standard and pitch.

Semi Topping

Crest radius (additional turning necessary to finish the tread crest)

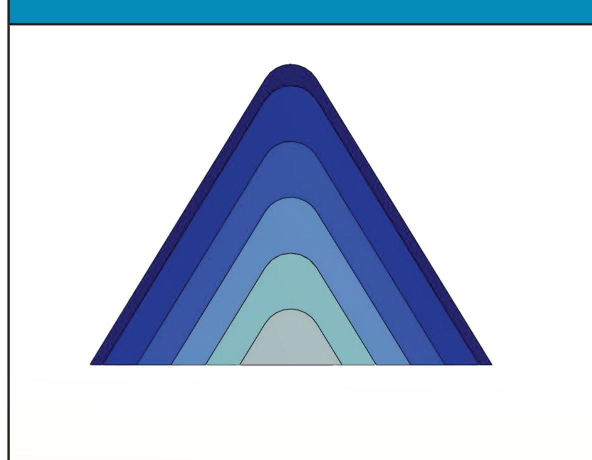


- Completes the thread in one operation.
- Profile is suitable for a specific standard and pitch.
- May require an additional operation.

4. Infeed Methods

There are four main Infeed Threading methods. Choosing the correct one is crucial for achieving best tool life surface finish and chip evacuation.

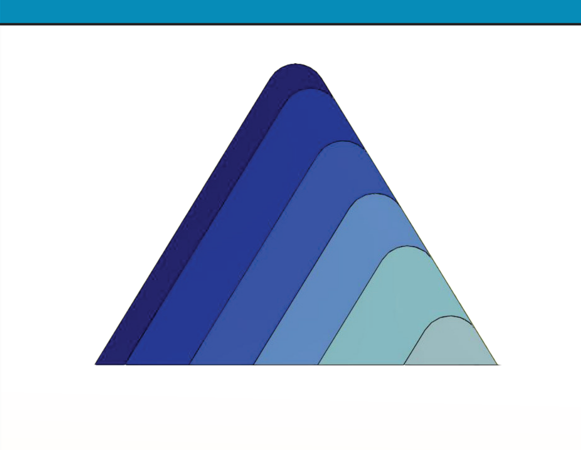
Radial Infeed



Advantages
- Can be used on conventional machines.
- Easy to use.
- Uniform wear.

Disadvantages
- Mediocre chip control.
- Not recommended for large pitches.
- Incerased load on the corner radii.

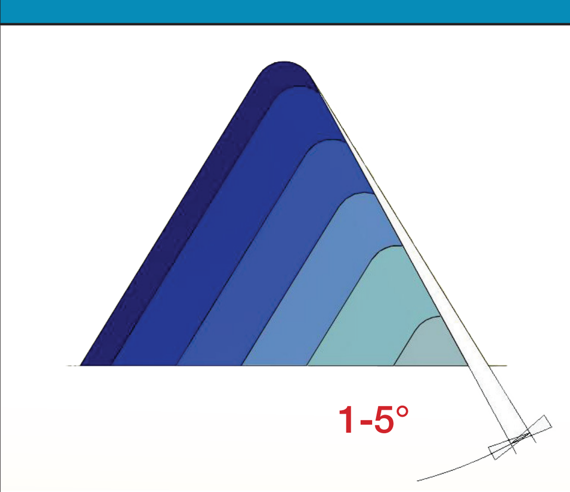
Flank Infeed



Advantages
- Most recommended method.
- Offers good chip evacuation.
- For pitches bigger than 1 mm.
- Recommended for Trapezoidal profiles.

Disadvantages
- Asymmetric wear, wear is constant on one flank.
- Cannot be applied on all machines.

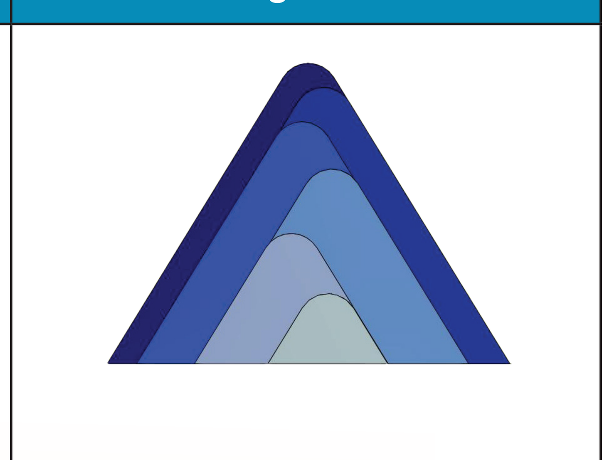
Modified Flank Infeed



Advantages
- Offers improved chip evacuation over flank infeed and radial infeed.
- Offers good chip evacuation.
- Reduced flank wear.
- Reduced cutting load.

Disadvantages
- Asymmetric wear, wear is constant on one flank.
- Cannot be applied on all machines.

Alternating Flank Infeed

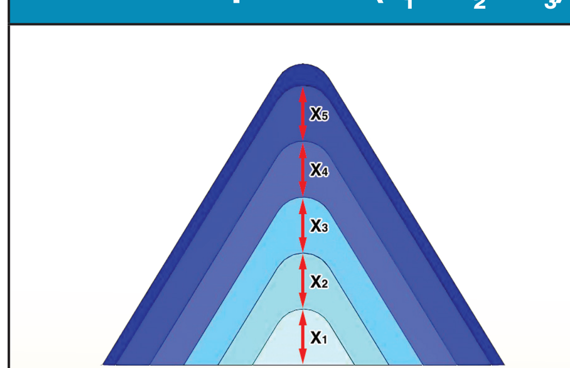


Advantages
- Uniform wear on both flanks on the insert.
- Can improve tool life.
- Reduces cutting load.

Disadvantages
- Complex programming.
- Cannot be applied on all machines.

5. Threading Depth, Constant Depth or Volume

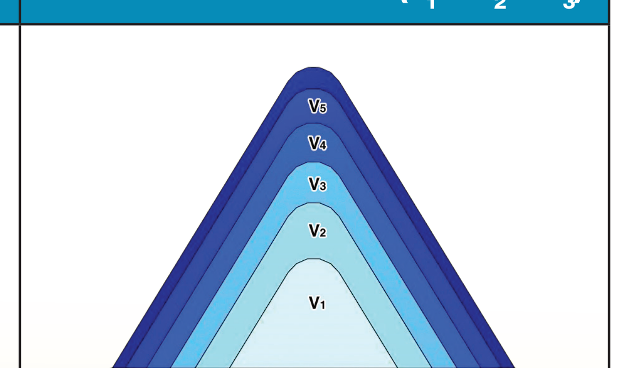
Constant Depth Pass ($X_1 = X_2 = X_3$)



Advantages
- Easy to calculate.
- Good chip control.
- Reduced load on radii.

Disadvantages
- Less productive method.
- Increased forces at later passes (prone to vibrations).

Constant Volume Pass ($V_1 = V_2 = V_3$)



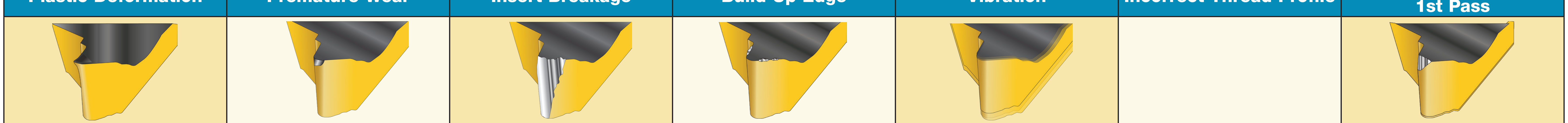
Disadvantages
- Longer chip in final pass.
- Additional calculations required when changing number of passes.

Number of Cutting Passes for Regular Type Inserts

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

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

6. Troubleshooting



Plastic Deformation	Premature Wear	Insert Breakage	Build Up Edge	Vibration	Incorrect Thread Profile	Broken Nose During 1st Pass
Cause • Excessive heat in cutting zone • Wrong carbide grade • Inadequate coolant supply • Depth of cut too large • Cutting speed too high • Nose radius too small	**Cause** • Cutting speed too high • Infeed depth too small • Highly abrasive material • Inadequate coolant supply • Wrong inclination anvil • Wrong turned dia. prior to threading • Insert is above center line	**Cause** • Wrong turned dia. prior to threading • Wrong grade • Poor chip control • Incorrect center height	**Cause** • Cutting edge too cold • Wrong grade • Inadequate coolant supply • Incorrect cutting speed	**Cause** • Incorrect workpiece clamping • Incorrect tool setup • Incorrect cutting speed • Incorrect center height	**Cause** • Unsuitable threading profile • Incorrect center height • Incorrect pitch in the program	**Cause** • Cutting edge too cold • Depth of cut too large • Wrong grade • Wrong turned dia. prior to threading • Incorrect center height • Infeed depth too shallow • Wrong inclination anvil • Tool overhang too long
Solution • Reduce RPM / Reduce depth of cut / Check turned dia. • Use coated grade / Use harder grade • Apply coolant • Reduce depth of cut / Increase no. of passes • Reduce cutting speed • If possible use insert with larger radius	**Solution** • Reduce RPM • Modify flank infeed / Increase depth of cut • Use coated grade • Apply coolant • Reselect anvil • Check turned dia. • Check center height	**Solution** • Check turned dia. • Use tougher grade • Change to M-Type / B-Type inserts and use modified flank infeed • Check center height	**Solution** • Increase RPM / Increase depth of cut • Use coated grade • Apply coolant • Increase cutting speed	**Solution** • Use soft jaws • Check tool overhang / Use anti-vibration bars • Increase cutting speed • Check center height	**Solution** • Adjust to correct tool, anvil, and insert • Adjust center height • Change the program	**Solution** • Reduce RPM • Reduce depth of cut/Increase number of infeed passes • Use tougher grade • Check turned dia. • Adjust center height • Change depth of cut • Reselect anvil • Reduce tool overhang / Use Anti-vibration bar