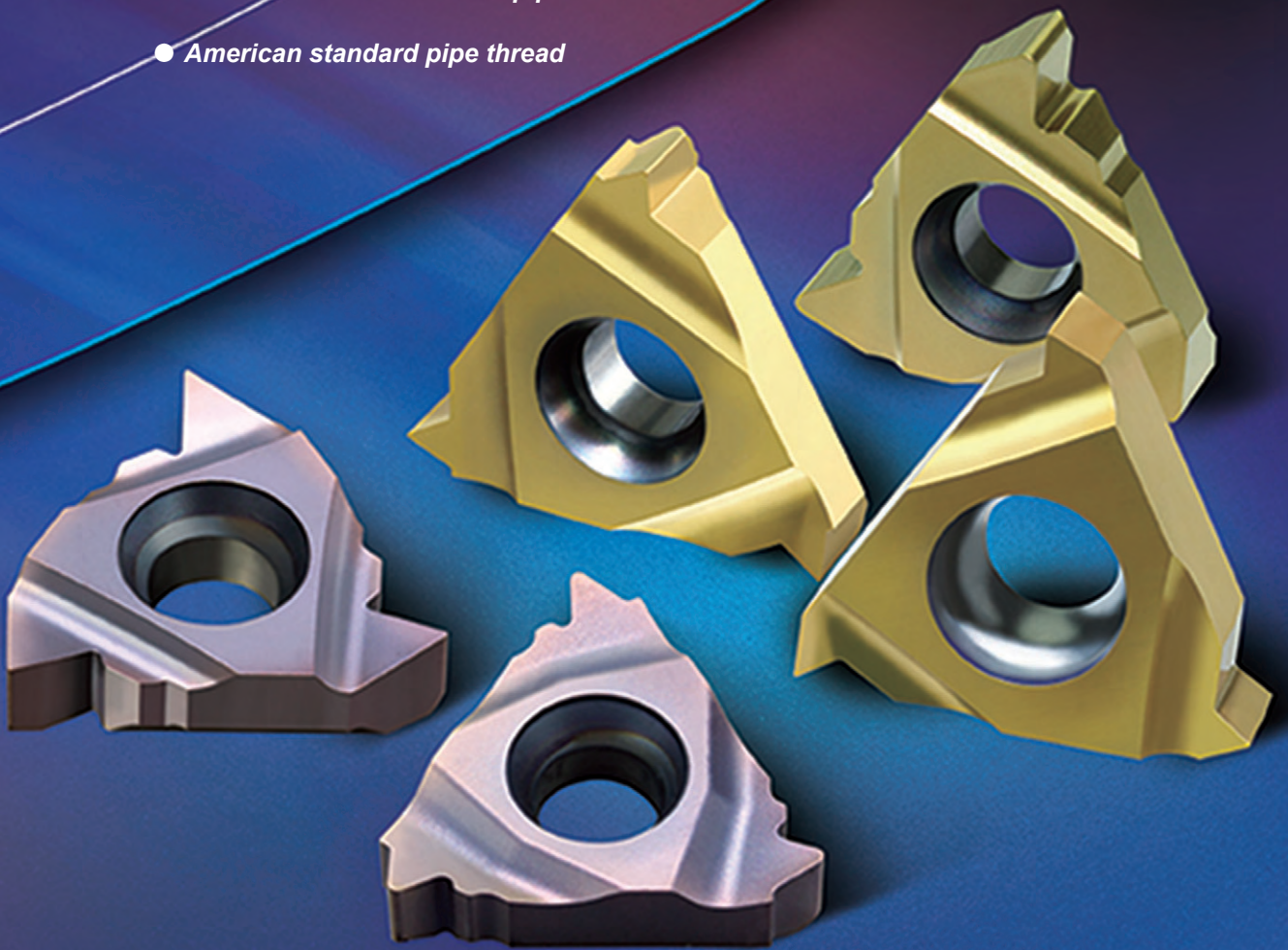# 6series

- ISO metric thread
- General pitch thread
- Whitworth thread
- Unified thread
- British standard pipe thread
- American standard pipe thread

Threading insert

Fully ground high precision inserts for high quality, high precision threading in a variety of materials e.g. steel, stainless steel, hard-to-machine materials.

TURNING

How to select threading tools

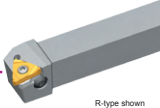### How to select threading tools

■ **Structure of threading tools selected table**

● Categorized as external threading and internal threading according to machining type.

● Separately listed out according to series.

Dimensions of product

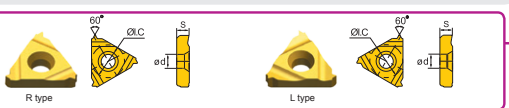Indicating external threading or internal threading

Threading insert type
Including type, standard, tolerance class

Diagram of thread pitch

External threading tools

R-type shown

Type		Stock	Basic dimensions(mm)					Applicable inserts	Inserts screw	Shim	Shim screw	Wrench
			a	h	b	L	s					
ZSER	1616H16	▲	16	16	16	100	20	Z16ER□□□□	I60 M3.5X12TT	MT16-□□MN	SM4X8C	WT15IP
	2020K16	▲	20	20	20	125	25					
	2525M16	▲	25	25	25	150	32					
	3225P16	▲	32	32	25	170	32					
	3232P16	▲	32	32	32	170	40					
	2525M22	▲	25	25	25	150	32	Z22ER□□□□	I60 M5X17	MT22-□□MN	SM5X8.5	WT20IP
	3225P22	▲	32	32	25	170	32					
	3232P22	▲	32	32	32	170	40					
	4040S22	△	40	40	40	250	50					
ZSEL	1616H16	▲	16	16	16	100	20	Z16EL□□□□	I60 M3.5X12TT	MT16-□□MN	SM4X8C	WT15IP
	2020K16	▲	20	20	20	125	25					
	2525M16	▲	25	25	25	150	32					
	3225P16	▲	32	32	25	170	32					
	3232P16	▲	32	32	32	170	40					
	2525M22	▲	25	25	25	150	32	Z22EL□□□□	I60 M5X17	MT22-□□MN	SM5X8.5	WT20IP
	3225P22	▲	32	32	25	170	32					
	3232P22	▲	32	32	32	170	40					
	4040S22	△	40	40	40	250	50					

▲Stock available △Make-to-order

ISO metric thread (with end)

ISO 965-1980   DIN 13
GB/T 197-2003   Tolerance class：6g/6H

R type   L type

	Type		Basic dimensions(mm)				Recommended coating grade	
	The right hand tools	The left hand tools	Pitch	S	ØI.C	ød	YBG203	YBG205
External thread	Z16ER0.5ISO	Z16EL0.5ISO	0.50	3.52	9.525	4.0	★	○
	Z16ER0.75ISO	Z16EL0.75ISO	0.75	3.52	9.525	4.0	★	○
	Z16ER1.0ISO	Z16EL1.0ISO	1.00	3.52	9.525	4.0	★	○
	Z16ER1.25ISO	Z16EL1.25ISO	1.25	3.52	9.525	4.0	★	○
	Z16ER1.5ISO	Z16EL1.5ISO	1.50	3.52	9.525	4.0	★	○
	Z16ER1.75ISO	Z16EL1.75ISO	1.75	3.52	9.525	4.0	★	○
	Z16ER2.0ISO	Z16EL2.0ISO	2.00	3.52	9.525	4.0	★	○
	Z16ER2.5ISO	Z16EL2.5ISO	2.50	3.52	9.525	4.0	★	○
	Z16ER3.0ISO	Z16EL3.0ISO	3.00	3.52	9.525	4.0	★	○
	Z22ER3.5ISO	Z22EL3.5ISO	3.50	4.65	12.7	5.0	★	○
	Z22ER4.0ISO	Z22EL4.0ISO	4.00	4.65	12.7	5.0	★	○
	Z22ER4.5ISO	Z22EL4.5ISO	4.50	4.65	12.7	5.0	★	○
	Z22ER5.0ISO	Z22EL5.0ISO	5.00	4.65	12.7	5.0	★	○
	Z22ER5.5ISO	Z22EL5.5ISO	5.50	4.65	12.7	5.0	★	○
	Z22ER6.0ISO	Z22EL6.0ISO	6.00	4.65	12.7	5.0	★	○

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

Product specification
Including type (right hand and left hand), basic dimensions, applicable inserts, spare parts

Product specification
Including type (right hand and left hand), basic dimensions, stock
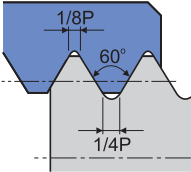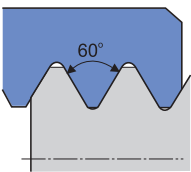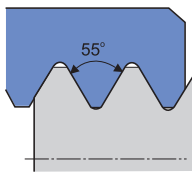
Dimension diagram of insert

Threading Tools

Threading tools overview

Applications		For general use		
Legend		1/8P 60° 1/4P	60°	55°
Thread name		ISO metric thread With end	General pitch thread Without end	General pitch thread Without end
Profil		**GM**	**60**	**55**
Shape of insert (length: 11, 16, 22mm)		R style shown A280-281	R style shown A282	R style shown A282
Tool holder / Pitch	Dimensions (mm) (H×W×L) (Dia×L×Min. dia)	Pitch/mm	Pitch/mm (pitch/Inch)	Pitch/mm (pitch/Inch)
External thread R-type shown A288	16×16×100 20×20×125 25×25×150 32×25×170 32×32×170 40×40×250	0.5~6.0	0.5~5.0 (5~48)	0.5~5.0 (5~48)
Internal thread R-type shown A289	16×125×12 16×150×16 16×150×20 20×150×25 20×180×25 25×150×32 32×200×40 32×250×40 40×300×50 50×350×63	0.5~6.0	0.5~5.0 (5~48)	0.5~5.0 (5~48)

General turning

Parting and grooving

Threading

Threading tools overview

For general use	For aerospace industry	Heater, gas and water pipe thread	For gas and water faucet and pipe connection
Whitworth thread	Unified thread (American standard threads)	British standard taper piper threads	American standard taper pipe threads
W	**UN**	**BSPT**	**NPT**
R style shown A283	R style shown A284	R style shown A285	R style shown A286
Pitch/mm (pitch/Inch)	Pitch/mm (pitch/Inch)	Pitch/mm (pitch/Inch)	Pitch/mm (pitch/Inch)
8~19	8~24	11~28	8~27
8~19	8~24	11~28	8~27

suitable for threading in a variety of materials

New nano coating grade

- **Specially treated edge for superior surface quality**

- **Sharp nose with small cutting resistance and superior performance**

- **Full ground inserts with high dimensional precision for high quality threading**

New fully ground series

Theoretical thread profile

Compared with products of other companies
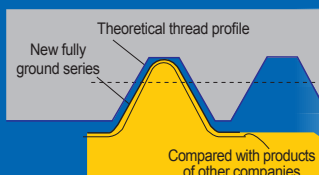
Thread type	Grade of tolerance
ISO metric thread	6g/6H
Whitworth thread W	Medium Class A
British standard pipe thread	Standard BSPT
Unified thread	2A/2B
American standard pipe thread	Standard NPT

- **New nano coating grade specially designed for threading with longer insert life**

Advanced surface treatment techniques effectively reduce friction and allows for better wear observation.

Advanced TiAlN substrate nano coating, in combination with proper coating ingredients, improves the mechanical and thermal properties of coating.

Further optimizing coating structre, improving coating stress, enhancing bond strength of coating and substrate.
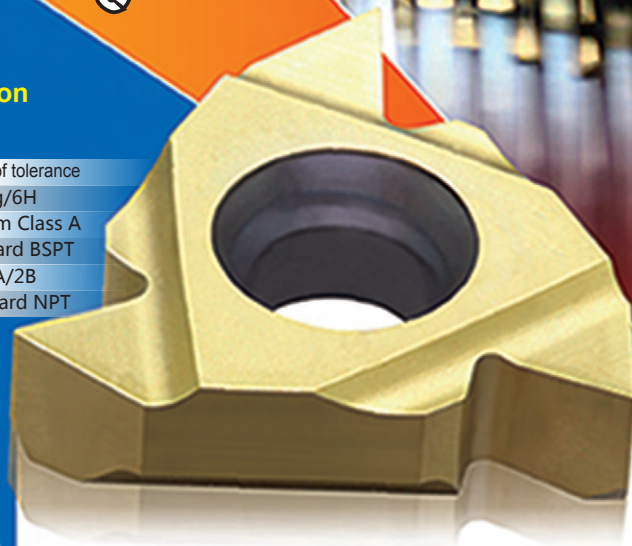
Case:

workpiece material: 42CrMo(HB260)

insert: Z16ER2.0ISO/YBG203

thread pitch: p=2.0mm

cutting data: Vc=120 m/min

tool life(pieces/ edge)

1600
1200
900
600
300
0

ZCC · CT
(YBG203)
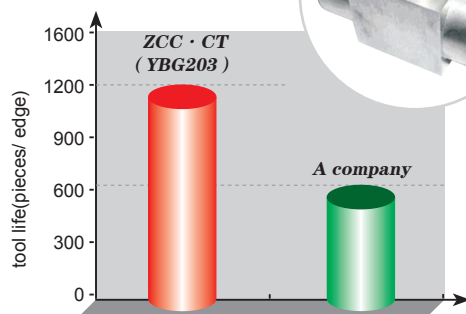
A company

84% tool life improvement of ZCC•CT product than that of company A under the same cutting condition.

Threading Tools **TURNING**

A

Threading insert

General turning

Parting and grooving

Threading

Threading insert

Threading inserts code key

Insert size

Code	Diameter of IC(mm)
Z11	ø6.35
Z16	ø9.525
Z22	ø12.7

Cutting style

E -External threading inserts

I -Internal threading inserts

Cutting direction

R-Righ

L-Left

Z16   E   R   2.0   ISO   (P)

Screw pitch

Full profile (Range of screw pitch is indicated by numbers).

mm	TPI
0.5-6.0	48-5

V profile (Range of screw pitch is indicated by letters).

	mm	TPI
A	0.5-1.5	48-16
AG	0.5-3.0	48-8
G	1.75-3.0	14-8
N	3.5-5.0	7-5

Thread specification	Range of thread pitch
ISO metric thread	0.5-6.0
General pitch thread	0.5-5.0
Whitworth thread W	8-19
British standard pipe thread	11-28
Unified thread	8-24
American standard pipe thread	8-27

Profile

ISO—ISO metric 60° thread

60—60° general pitch thread

55—55° general pitch thread

W—Whitworth thread

UN—Unified thread(American standard threads)

BSPT—British standard taper piper thread

NPT—American standard taper piper thread

chip breaker

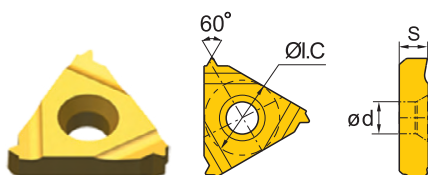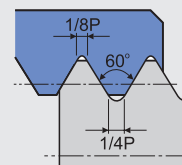□-fully ground edge insert

P –3-Dimensional chip-breaking insert

ISO metric thread (with end)

ISO 965-1980   DIN 13
GB/T 197-2003   Tolerance class：6g/6H

1/8P
60°
1/4P

60°
ØI.C
S
ød
R type

60°
ØI.C
S
ød
L type

Type		Basic dimensions(mm)				Recommended coating grade	
The right hand tools	The left hand tools	Pitch	S	ØI.C	ød	YBG203	YBG205
Z16ER0.5ISO	Z16EL0.5ISO	0.50	3.52	9.525	4.0	★	○
Z16ER0.75ISO	Z16EL0.75ISO	0.75	3.52	9.525	4.0	★	○
Z16ER1.0ISO	Z16EL1.0ISO	1.00	3.52	9.525	4.0	★	○
Z16ER1.25ISO	Z16EL1.25ISO	1.25	3.52	9.525	4.0	★	○
Z16ER1.5ISO	Z16EL1.5ISO	1.50	3.52	9.525	4.0	★	○
Z16ER1.75ISO	Z16EL1.75ISO	1.75	3.52	9.525	4.0	★	○
Z16ER2.0ISO	Z16EL2.0ISO	2.00	3.52	9.525	4.0	★	○
Z16ER2.5ISO	Z16EL2.5ISO	2.50	3.52	9.525	4.0	★	○
Z16ER3.0ISO	Z16EL3.0ISO	3.00	3.52	9.525	4.0	★	○
Z22ER3.5ISO	Z22EL3.5ISO	3.50	4.65	12.7	5.0	★	○
Z22ER4.0ISO	Z22EL4.0ISO	4.00	4.65	12.7	5.0	★	○
Z22ER4.5ISO	Z22EL4.5ISO	4.50	4.65	12.7	5.0	★	○
Z22ER5.0ISO	Z22EL5.0ISO	5.00	4.65	12.7	5.0	★	○
Z22ER5.5ISO	Z22EL5.5ISO	5.50	4.65	12.7	5.0	★	○
Z22ER6.0ISO	Z22EL6.0ISO	6.00	4.65	12.7	5.0	★	○

External thread

★Recommended grade (always stock available)　●Available grade (always stock available)　○Make-to-order
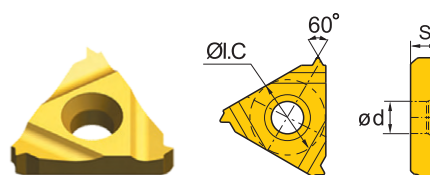
ISO metric thread (with end)

ISO 965-1980   DIN 13
GB/T 197-2003   Tolerance class：6g/6H

R type

L type

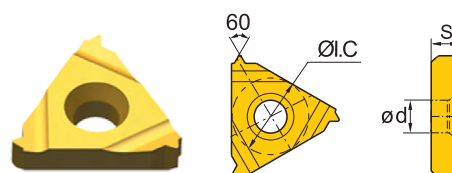| Type		Basic dimensions(mm)				Recommended coating grade	
The right hand tools	The left hand tools	Pitch	S	ØI.C	Ød	YBG203	YBG205
Z11IR0.5ISO	Z11IL0.5ISO	0.50	3.05	6.35	3.2	★	○
Z11IR0.75ISO	Z11IL0.75ISO	0.75	3.05	6.35	3.2	★	○
Z11IR1.0ISO	Z11IL1.0ISO	1.00	3.05	6.35	3.2	★	○
Z11IR1.25ISO	Z11IL1.25ISO	1.25	3.05	6.35	3.2	★	○
Z11IR1.5ISO	Z11IL1.5ISO	1.50	3.05	6.35	3.2	★	○
Z11IR1.75ISO	Z11IL1.75ISO	1.75	3.05	6.35	3.2	★	○
Z11IR2.0ISO	Z11IL2.0ISO	2.00	3.05	6.35	3.2	★	○
Z16IR0.5ISO	Z16IL0.5ISO	0.50	3.52	9.525	4.0	★	○
Z16IR0.75ISO	Z16IL0.75ISO	0.75	3.52	9.525	4.0	★	○
Z16IR1.0ISO	Z16IL1.0ISO	1.00	3.52	9.525	4.0	★	○
Z16IR1.25ISO	Z16IL1.25ISO	1.25	3.52	9.525	4.0	★	○
Z16IR1.5ISO	Z16IL1.5ISO	1.50	3.52	9.525	4.0	★	○
Z16IR1.75ISO	Z16IL1.75ISO	1.75	3.52	9.525	4.0	★	○
Z16IR2.0ISO	Z16IL2.0ISO	2.00	3.52	9.525	4.0	★	○
Z16IR2.5ISO	Z16IL2.5ISO	2.50	3.52	9.525	4.0	★	○
Z16IR3.0ISO	Z16IL3.0ISO	3.00	3.52	9.525	4.0	★	○
Z22IR3.5ISO	Z22IL3.5ISO	3.50	4.65	12.7	5.0	★	○
Z22IR4.0ISO	Z22IL4.0ISO	4.00	4.65	12.7	5.0	★	○
Z22IR4.5ISO	Z22IL4.5ISO	4.50	4.65	12.7	5.0	★	○
Z22IR5.0ISO	Z22IL5.0ISO	5.00	4.65	12.7	5.0	★	○
Z22IR5.5ISO	Z22IL5.5ISO	5.50	4.65	12.7	5.0	★	○
Z22IR6.0ISO	Z22IL6.0ISO	6.00	4.65	12.7	5.0	★	○

Internal thread

★Recommended grade (always stock available)   ●Available grade (always stock available)   ○Make-to-order

General turning

Parting and grooving

Threading

Threading insert

General pitch thread (without end)
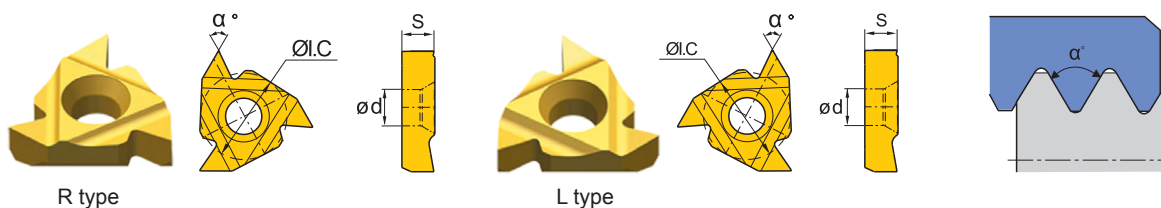
R type

L type

Type			Basic dimensions(mm)					Recommended coating grade	
The right hand tools	The left hand tools		Pitch/mm (pitch/Inch)	S	ØI.C	ød	α°	YBG203	YBG205
55°									
Z16ERA55	Z16ELA55		0.5-1.5(48-16)	3.52	9.525	4.0	55°	★	○
Z16ERG55	Z16ELG55		1.75-3.0(14-8)	3.52	9.525	4.0	55°	★	○
Z16ERAG55	Z16ELAG55		0.5-3.0(48-8)	3.52	9.525	4.0	55°	★	○
Z22ERN55	Z22ELN55		3.5-5.0(7-5)	4.65	12.7	5.0	55°	★	○
60°									
Z16ERA60	Z16ELA60		0.5-1.5(48-16)	3.52	9.525	4.0	60°	★	○
Z16ERG60	Z16ELG60		1.75-3.0(14-8)	3.52	9.525	4.0	60°	★	○
Z16ERAG60	Z16ELAG60		0.5-3.0(48-8)	3.52	9.525	4.0	60°	★	○
Z22ERN60	Z22ELN60		3.5-5.0(7-5)	4.65	12.7	5.0	60°	★	○

External thread

★Recommended grade (always stock available)　●Available grade (always stock available)　○Make-to-order

R type

L type

Type			Basic dimensions(mm)					Recommended coating grade	
The right hand tools	The left hand tools		Pitch/mm (pitch/Inch)	S	ØI.C	ød	α°	YBG203	YBG205
55°									
Z11IRA55	Z11ILA55		0.5-1.5(48-16)	3.05	6.35	3.2	55°	★	○
Z16IRA55	Z16ILA55		0.5-1.5(48-16)	3.52	9.525	4.0	55°	★	○
Z16IRG55	Z16ILG55		1.75-3.0(14-8)	3.52	9.525	4.0	55°	★	○
Z16IRAG55	Z16ILAG55		0.5-3.0(48-8)	3.52	9.525	4.0	55°	★	○
Z22IRN55	Z22ILN55		3.5-5.0(7-5)	4.65	12.7	5.0	55°	★	○
60°									
Z11IRA60	Z11ILA60		0.5-1.5(48-16)	3.05	6.35	3.2	60°	★	○
Z16IRA60	Z16ILA60		0.5-1.5(48-16)	3.52	9.525	4.0	60°	★	○
Z16IRG60	Z16ILG60		1.75-3.0(14-8)	3.52	9.525	4.0	60°	★	○
Z16IRAG60	Z16ILAG60		0.5-3.0(48-8)	3.52	9.525	4.0	60°	★	○
Z22IRN60	Z22ILN60		3.5-5.0(7-5)	4.65	12.7	5.0	60°	★	○

Internal thread

★Recommended grade (always stock available)　●Available grade (always stock available)　○Make-to-order
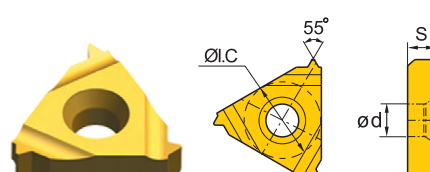
Whitworth thread (with end)

ISO 228/1:1982,
DIN 259, B.S.84:1956
Tolerance class：Medium class A
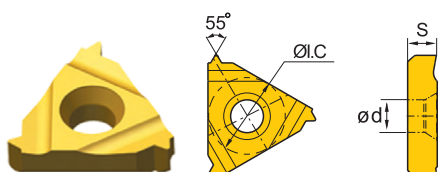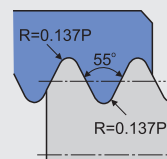
R=0.137P
55°
R=0.137P

55°   Øl.C   S   ød

R type

55°   Øl.C   S   ød

L type

Type		Basic dimensions(mm)				Recommended coating grade	
The right hand tools	The left hand tools	Pitch/mm (pitch/Inch)	S	Øl.C	ød	YBG203	YBG205
Z16ER8W	Z16EL8W	8	3.52	9.525	4.0	★	○
Z16ER9W	Z16EL9W	9	3.52	9.525	4.0	★	○
Z16ER10W	Z16EL10W	10	3.52	9.525	4.0	★	○
Z16ER11W	Z16EL11W	11	3.52	9.525	4.0	★	○
Z16ER12W	Z16EL12W	12	3.52	9.525	4.0	★	○
Z16ER14W	Z16EL14W	14	3.52	9.525	4.0	★	○
Z16ER16W	Z16EL16W	16	3.52	9.525	4.0	★	○
Z16ER18W	Z16EL18W	18	3.52	9.525	4.0	★	○
Z16ER19W	Z16EL19W	19	3.52	9.525	4.0	★	○

(External thread)

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

55°   Øl.C   S   ød

R type

55°   Øl.C   S   ød
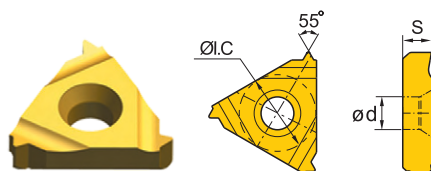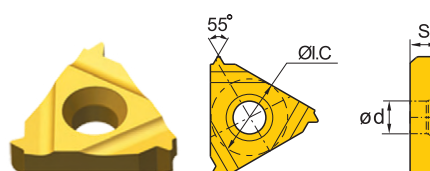
L type

Type		Basic dimensions(mm)				Recommended coating grade	
The right hand tools	The left hand tools	Pitch/mm (pitch/Inch)	S	Øl.C	ød	YBG203	YBG205
Z16IR8W	Z16IL8W	8	3.52	9.525	4.0	★	○
Z16IR9W	Z16IL9W	9	3.52	9.525	4.0	★	○
Z16IR10W	Z16IL10W	10	3.52	9.525	4.0	★	○
Z16IR11W	Z16IL11W	11	3.52	9.525	4.0	★	○
Z16IR12W	Z16IL12W	12	3.52	9.525	4.0	★	○
Z16IR14W	Z16IL14W	14	3.52	9.525	4.0	★	○
Z16IR16W	Z16IL16W	16	3.52	9.525	4.0	★	○
Z16IR18W	Z16IL18W	18	3.52	9.525	4.0	★	○
Z16IR19W	Z16IL19W	19	3.52	9.525	4.0	★	○

(Internal thread)

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

Threading insert

Unified thread (with end)

ASME B1.1-1989
Tolerance class：2A/2B
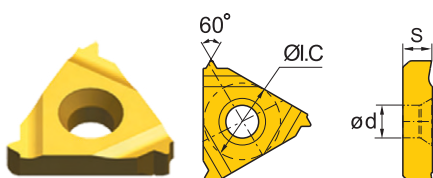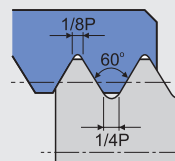
R type

L type

Type		Basic dimensions(mm)				Recommended coating grade	
The right hand tools	The left hand tools	Pitch/mm (pitch/Inch)	S	ØI.C	ød	YBG203	YBG205
Z16ER8UN	**Z16EL8UN**	8	3.52	9.525	4.0	★	○
Z16ER10UN	**Z16EL10UN**	10	3.52	9.525	4.0	★	○
Z16ER12UN	**Z16EL12UN**	12	3.52	9.525	4.0	★	○
Z16ER14UN	**Z16EL14UN**	14	3.52	9.525	4.0	★	○
Z16ER16UN	**Z16EL16UN**	16	3.52	9.525	4.0	★	○
Z16ER18UN	**Z16EL18UN**	18	3.52	9.525	4.0	★	○
Z16ER20UN	**Z16EL20UN**	20	3.52	9.525	4.0	★	○
Z16ER24UN	**Z16EL24UN**	24	3.52	9.525	4.0	★	○

External thread

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order
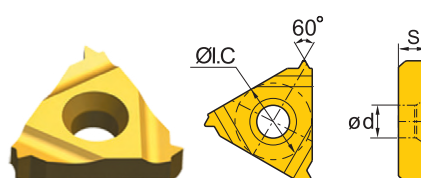

R type

L type

Type		Basic dimensions(mm)				Recommended coating grade	
The right hand tools	The left hand tools	Pitch/mm (pitch/Inch)	S	ØI.C	ød	YBG203	YBG205
Z16IR8UN	**Z16IL8UN**	8	3.52	9.525	4.0	★	○
Z16IR10UN	**Z16IL10UN**	10	3.52	9.525	4.0	★	○
Z16IR12UN	**Z16IL12UN**	12	3.52	9.525	4.0	★	○
Z16IR14UN	**Z16IL14UN**	14	3.52	9.525	4.0	★	○
Z16IR16UN	**Z16IL16UN**	16	3.52	9.525	4.0	★	○
Z16IR18UN	**Z16IL18UN**	18	3.52	9.525	4.0	★	○
Z16IR20UN	**Z16IL20UN**	20	3.52	9.525	4.0	★	○
Z16IR24UN	**Z16IL24UN**	24	3.52	9.525	4.0	★	○

Internal thread

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

British standard taper piper thread (with end)

ISO 7/1:1994
B.S.21:1985
Standard BSPT

R=0.137P
27.5° 27.5°
90° 1°47'

55°
ØI.C
S
ød
R type

55°
ØI.C
S
ød
L type

	Type		Basic dimensions(mm)				Recommended coating grade	
	The right hand tools	The left hand tools	Pitch/mm (pitch/Inch)	S	ØI.C	ød	YBG203	YBG205
External thread	Z16ER11BSPT	Z16EL11BSPT	11	3.52	9.525	4.0	★	○
	Z16ER14BSPT	Z16EL14BSPT	14	3.52	9.525	4.0	★	○
	Z16ER19BSPT	Z16EL19BSPT	19	3.52	9.525	4.0	★	○
	Z16ER28BSPT	Z16EL28BSPT	28	3.52	9.525	4.0	★	○

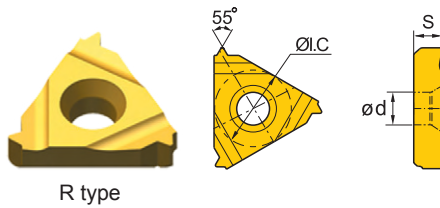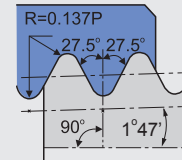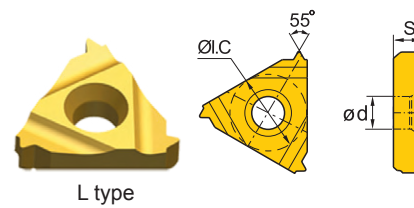★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

55°
ØI.C
S
ød
R type

55°
ØI.C
S
ød
L type
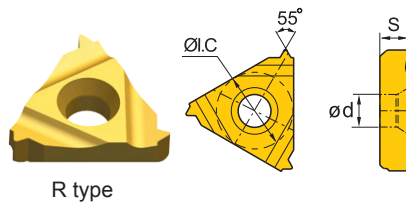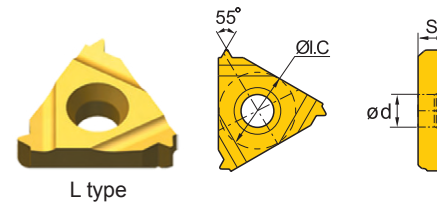
	Type		Basic dimensions(mm)				Recommended coating grade	
	The right hand tools	The left hand tools	Pitch/mm (pitch/Inch)	S	ØI.C	ød	YBG203	YBG205
Internal thread	Z16IR11BSPT	Z16IL11BSPT	11	3.52	9.525	4.0	★	○
	Z16IR14BSPT	Z16IL14BSPT	14	3.52	9.525	4.0	★	○
	Z16IR19BSPT	Z16IL19BSPT	19	3.52	9.525	4.0	★	○
	Z16IR28BSPT	Z16IL28BSPT	28	3.52	9.525	4.0	★	○

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

## American standard taper piper thread (with end)

ASME B1.20.1-1983
Standard NPT
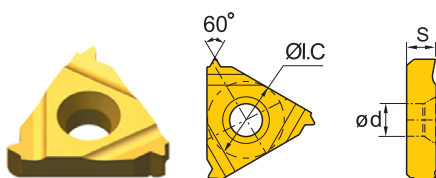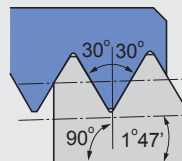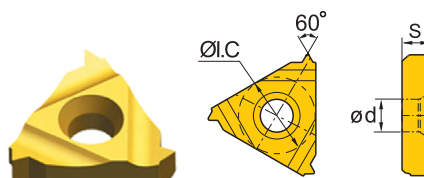
30° 30°

90° 1°47'

R type

L type

Type		Basic dimensions(mm)				Recommended coating grade	
The right hand tools	The left hand tools	Pitch/mm (pitch/Inch)	S	ØI.C	ød	YBG203	YBG205
Z16ER8NPT	Z16EL8NPT	8	3.52	9.525	4.0	★	○
Z16ER11.5NPT	Z16EL11.5NPT	11.5	3.52	9.525	4.0	★	○
Z16ER14NPT	Z16EL14NPT	14	3.52	9.525	4.0	★	○
Z16ER18NPT	Z16EL18NPT	18	3.52	9.525	4.0	★	○
Z16ER27NPT	Z16EL27NPT	27	3.52	9.525	4.0	★	○

(External thread)

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

R type

L type

Type		Basic dimensions(mm)				Recommended coating grade	
The right hand tools	The left hand tools	Pitch/mm (pitch/Inch)	S	ØI.C	ød	YBG203	YBG205
Z16IR8NPT	Z16IL8NPT	8	3.52	9.525	4.0	★	○
Z16IR11.5NPT	Z16IL11.5NPT	11.5	3.52	9.525	4.0	★	○
Z16IR14NPT	Z16IL14NPT	14	3.52	9.525	4.0	★	○
Z16IR18NPT	Z16IL18NPT	18	3.52	9.525	4.0	★	○
Z16IR27NPT	Z16IL27NPT	27	3.52	9.525	4.0	★	○

(Internal thread)

★Recommended grade (always stock available) ●Available grade (always stock available) ○Make-to-order

Threading tools code key

Clamping system

Top clamping	Screw clamping
ZC	ZS

Thread type

I ➤ Internal thread

E ➤ External thread

Cutting direction

Right hand	Left hand
R	L
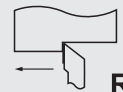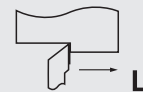
ZS E R 20 20 K 16

Nose height

h

Note: 00 for round tool holder.
Only to integer, for example:
h=8mm is labeled as 08.

Shank width

b

Note: Diameter for round tool holder
for example: b=8mm is labeled as 08.

Tool length

Code	H	K	M	P	Q	R	S	T	U
Length	100	125	150	170	180	200	250	300	350

Insert size

Code	11	16	22
Triangle side length	11	16	22
Inscribed circle	6.35	9.525	12.70

External threading tools

R-type shown

Type		Stock	Basic dimensions(mm)					Applicable inserts	Inserts screw	Shim	Shim screw	Wrench
			a	h	b	L	s					
ZSER	1616H16	▲	16	16	16	100	20	Z16ER□□□□	I60 M3.5X12TT	MT16-□□MN	SM4X8C	WT15IP
	2020K16	▲	20	20	20	125	25					
	2525M16	▲	25	25	25	150	32					
	3225P16	▲	32	32	25	170	32					
	3232P16	▲	32	32	32	170	40					
	2525M22	▲	25	25	25	150	32	Z22ER□□□□	I60 M5X17	MT22-□□MN	SM5X8.5	WT20IP
	3225P22	▲	32	32	25	170	32					
	3232P22	▲	32	32	32	170	40					
	4040S22	△	40	40	40	250	50					
ZSEL	1616H16	▲	16	16	16	100	20	Z16EL□□□□	I60 M3.5X12TT	MT16-□□MN	SM4X8C	WT15IP
	2020K16	▲	20	20	20	125	25					
	2525M16	▲	25	25	25	150	32					
	3225P16	▲	32	32	25	170	32					
	3232P16	▲	32	32	32	170	40					
	2525M22	▲	25	25	25	150	32	Z22EL□□□□	I60 M5X17	MT22-□□MN	SM5X8.5	WT20IP
	3225P22	▲	32	32	25	170	32					
	3232P22	▲	32	32	32	170	40					
	4040S22	△	40	40	40	250	50					

▲Stock available   △Make-to-order

Internal threading tools

R-type shown

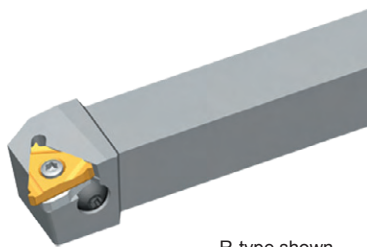| Type		Stock	Basic dimensions(mm)							Applicable inserts	Inserts screw	Shim	Shim screw	Wrench
			d	L	b	D_{min}	s	h	L_1					
ZSIR	0016K11	▲	16	125	16	12	10	15	20.9	Z11IR□□□□	I60 M2.5X6.5T	---	---	WT08IP
	0016M11	▲	16	150	15.5	16	10.5	15	25.9					
	0016M16	▲	16	150	15.5	20	12	15	27	Z16IR□□□□	I60 M3.5X08TT	---	---	WT15IP
	0020M16	▲	20	150	19	25	14	18	28.7					
	0020Q16	▲	20	180	19	25	14	18	34					
	0025M16	▲	25	150	24	32	17	23	28.8		I60 M3.5X12TT	MT16-□□MN	SM4X8C	
	0032R16	▲	32	200	31	40	22	30	30.9					
	0032S16	▲	32	250	31	40	22	30	30.9					
	0040T16	▲	40	300	38.5	50	27	37	31.5					
	0050U16	▲	50	350	49.5	63	35	49	40.2					
	0020Q22	▲	20	180	21.5	25	15	18	35	Z22IR□□□□	I60 M5X13.2	---	---	WT20IP
	0025R22	▲	25	200	24	32	19	23	39					
	0032S22	▲	32	250	31	40	22	30	36.4		I60 M5X17	MT22-□□MN	SM5X8.5	
	0040T22	▲	40	300	38.5	50	27	37	37.2					
	0050U22	▲	50	350	48.5	63	35	47	42.6					
ZSIL	0016K11	▲	16	125	16	12	10	15	20.9	Z11IL□□□□	I60 M2.5X6.5	---	---	WT07IP
	0016M11	▲	16	150	15.5	16	10.5	15	25.9					
	0016M16	▲	16	150	15.5	20	12	15	27	Z16IL□□□□	I60 M3.5X08TT	---	---	WT15IP
	0020M16	▲	20	150	19	25	14	18	28.7					
	0020Q16	▲	20	180	19	25	14	18	34					
	0025M16	▲	25	150	24	32	17	23	28.8		I60 M3.5X12	MT16-□□MN	SM4X8C	
	0032R16	▲	32	200	31	40	22	30	30.9					
	0032S16	▲	32	250	31	40	22	30	30.9					
	0040T16	▲	40	300	38.5	50	27	37	31.5					
	0050U16	▲	50	350	49.5	63	35	49	40.2					
	0020Q22	▲	20	180	21.5	25	15	18	35	Z22IL□□□□	I60 M5X13.2	---	---	WT20IP
	0025R22	▲	25	200	24	32	19	23	39					
	0032S22	▲	32	250	31	40	22	30	36.4		I60 M5X17	MT22-□□MN	SM5X8.5	
	0040T22	▲	40	300	38.5	50	27	37	37.2					
	0050U22	▲	50	350	48.5	63	35	47	42.6					

▲Stock available   △Make-to-order

General turning

Parting and grooving

Threading

Threading tools

Please follow the following steps to get the best threading result:

1 Select proper thread machining method.

2 Define helical angle and select shim.

3 Select proper insert and tool holder size.

4 By checking reference table of standard threading programs, select feasible cutting parameters.

5 Select feed way.

Machining method of threading tools

External threading machining (Right thread)
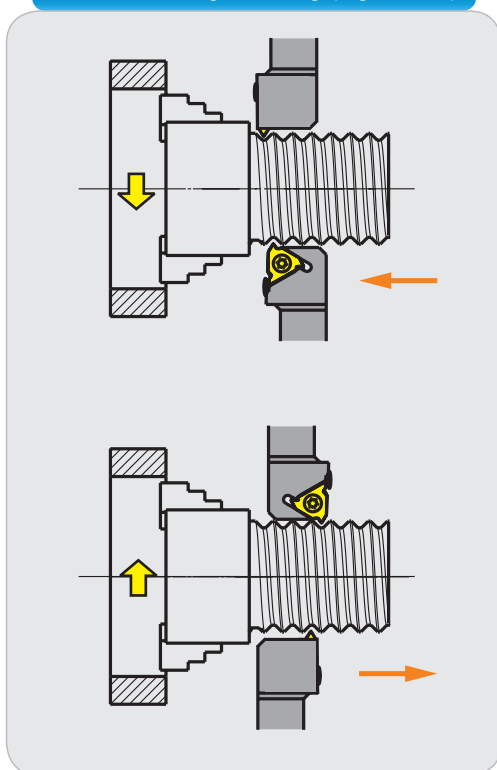
External threading machining (Left thread)
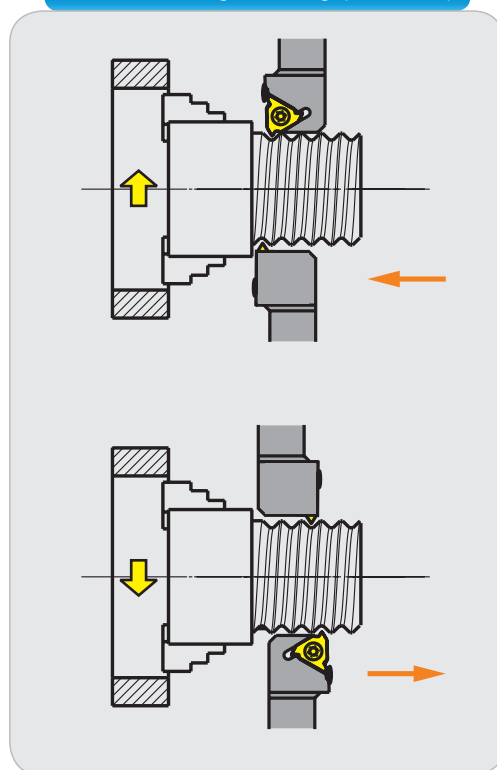
Internal threading machining (Right thread)
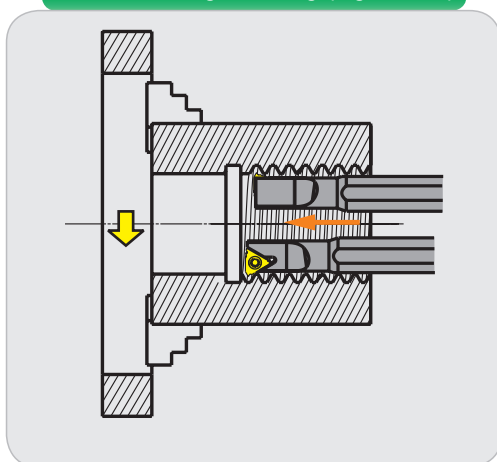
Internal threading machining (Left thread)
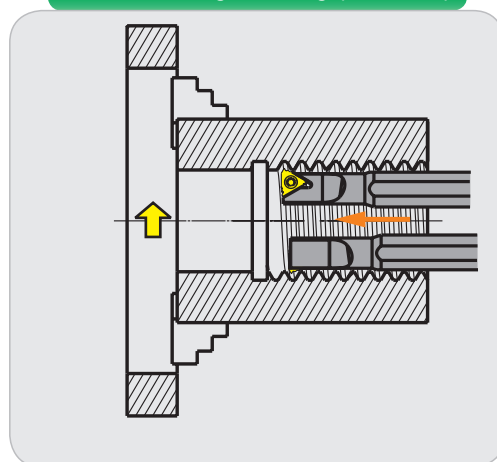
Decide helical angle and select shim

The clearance angle of threading inserts is actually along the edge (flank). This has significant effect on heat diffusion, spread of abrasion as well as tool life, security and pitch quality. The clearance angle of threading pitch on clearance face is determined by thread helical angle. These two angles are similar to each other to some extent. If inclined angle of insert is different from the helical angle, then the clearance angle won't be the same either.

The helical angle of pitch has to be the same with the inclined angle of insert to prevent over wearing on the clearance face which could affect tool life. the helical angle is calculated as below:

$$e = \arctan \frac{p}{d_2 \times \pi}$$

P= Pitch

d_2= pitch diameter

The most common inclined angle is 1°. MT standard shim and its inclined angle is also 1°.

Calculation of clearance angle:

Clearance angle is calculated as below:

$$\beta = \arctan(\tan\theta \times \tan\alpha)$$

2θ=Thread profile angle

α=The rake angle of external standard threading tools is 10°; the rake angle of internal standard threading tools is 15°.

The shim has to be changed when helical angle of thread is ≤ clearance angle of tool, which could cause intervene on insert flank.

Please change the shim to adjust the difference between helical angle of thread and inclined angle of shim to be within 2°~0°.

e = Helical angle

λ = Inclined angle
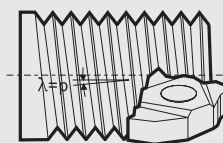
Please refer to the table below for actual value:

Thread profile angle 2θ	β	
	External thread	Internal thread
60°	5.8°	8.79°
55°	5.24°	7.94°
30°	2.7°	4.1°
29°	2.6°	3.96°

For example: when P=1.5, d2=24mm,
helical angle1.14°-(2°~0°)=inclined angle (-0.86°~1.14°)
it is feasible to use standard shim 1°.

Select shim:

lead of thread (mm)　　　　　　Threading number/inch

Shim specification table is as follows:

Screw pitch range	Insert dimensions	Inclined angle	Shim
0.5-3.0	16	0	MT16-00MN
		1	MT16-01MN
		2	MT16-02MN
		3	MT16-03MN
3.5-6.0	22	0	MT22-00MN
		1	MT22-01MN
		2	MT22-02MN
		3	MT22-03MN

Note: the standard angle of shim for our threading tools is 1°.
((MT16-01MN or MT22-01MN)

Select proper inserts and size of tool holder (Please refer to detailed table of threading tools and inserts)

Parameter table for threading program under different standards

■ Table of recommended in-feed for metric ISO external threading with wiper edge

Screw pitch	1.0	1.25	1.5	1.75	2.0	2.5	3.0	4.0	5.0
Total in-feed	0.72	0.86	1.02	1.17	1.33	1.63	1.94	2.58	3.21
Number of passes	5	6	7	8	9	11	13	15	17
Order to follow in threading operation	Value of radial in-feed (X) and flank in-feed (Z)								
	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z
1	0.20/-	0.20/-	0.21/-	0.22/-	0.24/-	0.25/-	0.26/-	0.35/-	0.40/-
2	0.18/0.10	0.18/0.10	0.18/0.10	0.20/0.12	0.22/0.13	0.24/0.14	0.24/0.14	0.30/0.17	0.35/0.20
3	0.16/0.09	0.14/0.09	0.18/0.10	0.18/0.10	0.20/0.12	0.21/0.12	0.20/0.12	0.25/0.14	0.30/0.17
4	0.10/0.06	0.10/0.08	0.15/0.09	0.15/0.09	0.15/0.09	0.18/0.10	0.20/0.12	0.20/0.12	0.28/0.16
5	0.08/-	0.08/0.06	0.12/0.07	0.13/0.08	0.12/0.07	0.15/0.09	0.18/0.10	0.18/0.10	0.25/0.14
6			0.10/0.06	0.11/0.06	0.12/0.07	0.12/0.07	0.15/0.09	0.18//0.10	0.20/0.12
7			0.08/-	0.10/0.06	0.10/0.06	0.12/0.07	0.13/0.08	0.16/0.09	0.18/0.10
8				0.08/-	0.10/0.06	0.10/0.06	0.12/0.07	0.15/0.09	0.16/0.09
9					0.08/-	0.10/0.06	0.10/0.06	0.15/0.09	0.15/0.09
10						0.08/0.05	0.10/0.06	0.13/0.08	0.15/0.09
11						0.08/-	0.08/0.06	0.12/0.07	0.13/0.08
12							0.08/0.05	0.12/0.07	0.13/0.08
13								0.11/0.06	0.12/0.07
14								0.10/0.06	0.12/0.07
15								0.08/-	0.11/0.06
16									0.10/0.06
17									0.08/-

■ **Table of recommended in-feed for metric ISO internal threading with wiper edge**

Screw pitch	1.00	1.25	1.5	1.75	2.0	2.5	3.0	4.0	5.0
Total in-feed	0.62	0.77	0.92	1.06	1.21	0.15	1.79	2.36	2.95
Number of passes	5	6	7	8	9	11	13	15	17
Order to follow in threading operation	Value of radial in-feed (X) and flank in-feed (Z)								
	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z	X/Z
1	0.18/-	0.20/-	0.22/-	0.23/-	0.24/-	0.25/-	0.26/-	0.30/-	0.32/-
2	0.14/0.08	0.15/0.09	0.16/0.09	0.16/0.09	0.18/0.10	0.20/0.12	0.20/0.12	0.25/0.14	0.28/0.16
3	0.12/0.07	0.12/0.07	0.14/0.08	0.14/0.08	0.15/0.09	0.15/0.09	0.20/0.12	0.22/0.13	0.25/0.14
4	0.10/0.06	0.12/0.07	0.12/0.07	0.13/0.08	0.14/0.08	0.15/0.09	0.18/0.10	0.20/0.12	0.22/0.13
5	0.08/-	0.10/0.06	0.11/0.06	0.12/0.07	0.12/0.07	0.13/0.08	0.15/0.09	0.18/0.10	0.21/0.12
6			0.09/0.05	0.10/0.06	0.11/0.06	0.12/0.07	0.12/0.07	0.15/0.09	0.20/0.12
7			0.08/-	0.10/0.06	0.10/0.06	0.12/0.07	0.12/0.07	0.15/0.09	0.18/0.10
8				0.08/-	0.09/0.05	0.10/0.06	0.10/0.06	0.15/0.09	0.18/0.10
9					0.08/-	0.10/0.06	0.10/0.06	0.12/0.07	0.15/0.09
10						0.09/0.05	0.10/0.06	0.12/0.07	0.15/0.09
11						0.08/-	0.10/0.06	0.12/0.07	0.15/0.09
12							0.08/0.05	0.11/0.06	0.15/0.09
13								0.11/0.06	0.12/0.07
14								0.10/0.06	0.11/0.06
15								0.08/-	0.10/0.06
16									0.10/0.06
17									0.08/-

Table of recommended in-feed for American unified standard external threading with wiper edge

Screw pitch	24	20	18	16	14	12	11	10	9	8	7	6	5
Total in-feed	0.649	0.779	0.866	0.974	1.113	1.299	1.416	1.558	1.731	1.948	2.226	2.597	3.116
Number of passes	5	6	6	7	9	9	10	11	12	13	14	15	16
Order to follow in threading operation	Value of radial in-feed (X) and flank in-feed (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	X/Z
1	0.206 / —	0.210 / —	0.233 / —	0.226 / —	0.196 / —	0.229 / —	0.220 / —	0.214 / —	0.210 / —	0.211 / —	0.213 / —	0.218 / —	0.229 / —
2	0.148 / 0.086	0.163 / 0.094	0.181 / 0.104	0.188 / 0.109	0.189 / 0.110	0.222 / 0.128	0.228 / 0.132	0.240 / 0.139	0.256 / 0.148	0.276 / 0.160	0.304 / 0.176	0.343 / 0.198	0.399 / 0.230
3	0.114 / 0.066	0.125 / 0.072	0.139 / 0.080	0.145 / 0.083	0.146 / 0.084	0.170 / 0.098	0.176 / 0.102	0.184 / 0.106	0.196 / 0.113	0.212 / 0.122	0.234 / 0.135	0.263 / 0.152	0.306 / 0.177
4	0.096 / 0.055	0.105 / 0.061	0.117 / 0.068	0.122 / 0.070	0.123 / 0.071	0.143 / 0.083	0.148 / 0.086	0.155 / 0.090	0.165 / 0.095	0.179 / 0.103	0.197 / 0.114	0.222 / 0.128	0.258 / 0.149
5	0.085 / 0.049	0.093 / 0.054	0.103 / 0.059	0.107 / 0.062	0.108 / 0.062	0.126 / 0.073	0.131 / 0.075	0.137 / 0.079	0.146 / 0.084	0.158 / 0.091	0.173 / 0.100	0.195 / 0.113	0.227 / 0.131
6		0.084 / 0.048	0.093 / 0.054	0.097 / 0.056	0.098 / 0.056	0.114 / 0.066	0.118 / 0.068	0.124 / 0.072	0.132 / 0.076	0.142 / 0.082	0.157 / 0.091	0.177 / 0.102	0.205 / 0.119
7				0.089 / 0.052	0.090 / 0.052	0.105 / 0.061	0.109 / 0.063	0.114 / 0.066	0.121 / 0.070	0.131 / 0.076	0.144 / 0.083	0.163 / 0.094	0.189 / 0.109
8					0.084 / 0.048	0.098 / 0.056	0.101 / 0.058	0.106 / 0.061	0.113 / 0.065	0.122 / 0.070	0.134 / 0.078	0.151 / 0.087	0.176 / 0.101
9					0.079 / 0.045	0.092 / 0.053	0.095 / 0.055	0.100 / 0.057	0.106 / 0.061	0.114 / 0.066	0.126 / 0.073	0.142 / 0.082	0.165 / 0.095
10							0.090 / 0.052	0.094 / 0.054	0.100 / 0.058	0.108 / 0.063	0.119 / 0.069	0.134 / 0.078	0.156 / 0.090
11								0.090 / 0.052	0.095 / 0.055	0.103 / 0.059	0.113 / 0.065	0.128 / 0.074	0.149 / 0.086
12									0.091 / 0.053	0.098 / 0.057	0.108 / 0.063	0.122 / 0.071	0.142 / 0.082
13										0.094 / 0.054	0.104 / 0.060	0.117 / 0.068	0.136 / 0.079
14											0.100 / 0.058	0.113 / 0.065	0.131 / 0.076
15												0.109 / 0.063	0.126 / 0.073
16													0.122 / 0.071

General turning

Parting and grooving

Threading

Application information of threading

▣ Table of recommended in-feed for American unified standard internal threading with wiper edge

Screw pitch	24	20	18	16	14	12	11	10	9	8	7	6	5
Total in-feed	0.573	0.687	0.764	0.860	0.982	1.146	1.250	1.375	1.528	1.719	1.964	2.291	2.750
Number of passes	5	6	6	7	8	9	9	10	11	12	13	14	15
Order to follow in threading operation	Value of radial in-feed (X) and flank in-feed (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	X/Z
1	0.193/—	0.200/—	0.222/—	0.219/—	0.220/—	0.228/—	0.250/—	0.247/—	0.246/—	0.252/—	0.262/—	0.278/—	0.302/—
2	0.127/0.073	0.239/0.081	0.155/0.089	0.161/0.093	0.173/0.100	0.190/0.110	0.207/0.120	0.216/0.125	0.229/0.132	0.247/0.142	0.271/0.156	0.304/0.176	0.353/0.204
3	0.098/0.056	0.107/0.062	0.119/0.069	0.124/0.072	0.132/0.076	0.146/0.084	0.159/0.092	0.166/0.096	0.176/0.101	0.189/0.109	0.208/0.120	0.234/0.135	0.271/0.156
4	0.082/0.048	0.090/0.052	0.100/0.058	0.104/0.060	0.112/0.064	0.123/0.071	0.134/0.077	0.140/0.081	0.148/0.086	0.160/0.092	0.175/0.101	0.197/0.114	0.228/0.132
5	0.073/0.042	0.079/0.046	0.088/0.051	0.092/0.053	0.098/0.057	0.108/0.062	0.118/0.068	0.123/0.071	0.130/0.075	0.141/0.081	0.1543/0.089	0.173/0.100	0.201/0.116
6		0.072/0.041	0.080/0.046	0.083/0.048	0.089/0.051	0.098/0.056	0.107/0.062	0.111/0.064	0.118/0.068	0.127/0.073	0.140/0.081	0.157/0.091	0.182/0.105
7				0.077/0.044	0.082/0.047	0.090/0.052	0.098/0.057	0.102/0.059	0.108/0.063	0.117/0.067	0.128/0.074	0.144/0.083	0.167/0.097
8					0.076/0.044	0.084/0.048	0.091/0.053	0.095/0.055	0.101/0.058	0.109/0.063	0.119/0.069	0.134/0.078	0.156/0.090
9						0.079/0.045	0.086/0.050	0.090/0.052	0.095/0.055	0.102/0.059	0.112/0.065	0.126/0.073	0.146/0.084
10								0.085/0.049	0.090/0.052	0.097/0.056	0.106/0.061	0.119/0.069	0.138/0.080
11									0.085/0.049	0.092/0.053	0.101/0.058	0.113/0.065	0.131/0.076
12										0.088/0.051	0.096/0.056	0.108/0.063	0.126/0.073
13											0.092/0.053	0.101/0.060	0.121/0.070
14												0.100/0.058	0.116/0.067
15													0.112/0.065

Application information of threading

■ **Table of recommended in-feed for British standard internal and external threading with wiper edge**

Screw pitch	28	20	19	16	14	12	11	10	9	8	7	6	5
Total in-feed	0.581	0.813	0.856	1.017	1.162	1.355	1.479	1.626	1.807	2.033	2.324	2.711	3.253
Number of passes	5	6	6	8	8	9	9	10	11	12	14	15	16
Order to follow in threading operation	Value of radial in-feed (X) and flank in-feed (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	X/Z
1	0.179 / —	0.211 / —	0.223 / —	0.196 / —	0.223 / —	0.226 / —	0.246 / —	0.236 / —	0.230 / —	0.255 / —	0.195 / —	0.197 / —	0.204 / —
2	0.134 / 0.070	0.172 / 0.089	0.181 / 0.094	0.186 / 0.097	0.213 / 0.111	0.234 / 0.122	0.255 / 0.133	0.226 / 0.139	0.282 / 0.147	0.304 / 0.158	0.322 / 0.167	0.361 / 0.189	0.421 / 0.219
3	0.104 / 0.054	0.132 / 0.069	0.139 / 0.072	0.143 / 0.074	0.163 / 0.085	0.180 / 0.093	0.197 / 0.102	0.206 / 0.106	0.216 / 0.113	0.233 / 0.121	0.247 / 0.128	0.278 / 0.145	0.323 / 0.168
4	0.087 / 0.045	0.111 / 0.058	0.117 / 0.061	0.120 / 0.063	0.138 / 0.072	0.151 / 0.079	0.165 / 0.086	0.172 / 0.090	0.182 / 0.095	0.197 / 0.102	0.208 / 0.108	0.234 / 0.122	0.272 / 0.142
5	0.077 / 0.040	0.098 / 0.051	0.103 / 0.054	0.106 / 0.055	0.121 / 0.063	0.133 / 0.069	0.145 / 0.076	0.152 / 0.079	0.161 / 0.084	0.1738 / 0.090	0.183 / 0.095	0.207 / 0.108	0.240 / 0.125
6		0.089 / 0.046	0.093 / 0.049	0.096 / 0.050	0.110 / 0.057	0.121 / 0.063	0.131 / 0.068	0.137 / 0.071	0.145 / 0.076	0.157 / 0.082	0.166 / 0.086	0.187 / 0.097	0.217 / 0.113
7				0.088 / 0.046	0.101 / 0.052	0.111 / 0.058	0.121 / 0.063	0.126 / 0.066	0.134 / 0.070	0.144 / 0.075	0.152 / 0.079	0.172 / 0.089	0.200 / 0.104
8				0.082 / 0.043	0.093 / 0.049	0.103 / 0.054	0.113 / 0.059	0.117 / 0.061	0.124 / 0.065	0.134 / 0.070	0.142 / 0.074	0.160 / 0.083	0.186 / 0.097
9						0.097 / 0.050	0.106 / 0.055	0.110 / 0.057	0.117 / 0.061	0.126 / 0.066	0.133 / 0.069	0.150 / 0.078	0.174 / 0.091
10								0.104 / 0.054	0.111 / 0.058	0.119 / 0.062	0.126 / 0.066	0.142 / 0.074	0.165 / 0.086
11									0.105 / 0.055	0.113 / 0.059	0.120 / 0.062	0.135 / 0.070	0.157 / 0.082
12										0.108 / 0.056	0.114 / 0.060	0.129 / 0.067	0.150 / 0.078
13											0.110 / 0.055	0.124 / 0.064	0.144 / 0.075
14												0.119 / 0.062	0.138 / 0.072
15												0.115 / 0.060	0.133 / 0.069
16													0.129 / 0.067

Table of recommended in-feed for NPT internal and external threading with wiper edge

Screw pitch	27	18	14	11.5	8
Total in-feed	0.75	1.129	1.451	1.767	2.54
Number of passes	6	8	10	12	14
Order to follow in threading operation	Value of radial in-feed (X) and flank in-feed (Z)				
	X/Z	X/Z	X/Z	X/Z	X/Z
1	0.19/-	0.22/-	0.240/-	0.24/-	0.255/-
2	0.15/0.087	0.181/0.104	0.200/0.115	0.208/0.120	0.250/0.144
3	0.13/0.075	0.152/0.088	0.170/0.098	0.182/0.105	0.245/0.141
4	0.11/0.063	0.141/0.081	0.150/0.086	0.168/0.097	0.230/0.133
5	0.09/0.052	0.131/0.075	0.140/0.081	0.155/0.089	0.210/0.121
6	0.08/0.46	0.121/0.070	0.130/0.075	0.145/0.084	0.195/0.112
7		0.101/0.058	0.120/0.069	0.138/0.079	0.180/0.104
8		0.082/0.047	0.110/0.063	0.124/0.072	0.175/0.101
9			0.100/0.058	0.117/0.067	0.170/0.098
10			0.091/0.052	0.105/0.060	0.155/0.089
11				0.095/0.055	0.140/0.080
12				0.090/0.052	0.125/0.072
13					0.110/0.063
14					0.100/0.058

Table of recommended in-feed for BSPT internal and external threading with wiper edge

Screw pitch	28	19	14	11
Total in-feed	0.581	0.856	1.162	1.479
Number of passes	5	6	8	10
Order to follow in threading operation	Value of radial in-feed (X) and flank in-feed (Z)			
	X/Z	X/Z	X/Z	X/Z
1	0.179/-	0.223/-	0.222/-	0.214/-
2	0.134/0.070	0.181/0.094	0.213/0.111	0.242/0.126
3	0.103/0.054	0.139/0.072	0.163/0.085	0.186/0.097
4	0.087/0.045	0.117/0.061	0.138/0.072	0.157/0.082
5	0.078/0.040	0.103/0.054	0.121/0.063	0.138/0.072
6		0.093/0.049	0.110/0.057	0.125//0.065
7			0.101/0.052	0.115/0.060
8			0.094/0.049	0.107/0.056
9				0.100/0.052
10				0.095//0.049

Table of recommended cutting parameters

ISO	Material		Unit cutting force Kc0.4 N/mm^2	Hardness HB	Grade YBG202 YBG203 YBG205 Cutting speed(m/min)
P	Carbon steel	C=0.15%	1900	125	150−175
		C=0.35%	2100	150	140−155
		C=0.60%	2250	200	130−145
	Alloy steel	Anneal	2100	180	110−130
		Hardened	2600	275	80−100
		Hardened	2700	300	70−90
		Hardened	2850	350	60−80
	High alloy steel	Anneal	2600	200	90−115
		Hardened	3900	325	70−90
	Cast steel	Non-alloy	2000	180	180−210
		low alloy	2500	200	90−115
		high alloy	2700	225	90−115
		Martensite steel 12%Mn	3600	250	40−50
M	Stainless steel	Austenite	2450	180	110−130
		Martensite/Ferrite	2300	200	130−170
K	Malleable cast iron	Ferrite	1100	130	110−140
		Pearlite	1100	230	85−105
	Gray cast iron	Low tensile-strength	1100	180	110−140
		High tensile-strength	1500	260	90−115
	Nodular cast iron	Ferrite	1100	160	110−130
		Pearlite	1800	250	80−100
N	Al alloy	Non-aging treatment	500	60	1300−1450
		Aging treatment	800	100	450−500
	Cast aluminum alloy	Non-aging treatment	750	75	430−470
		Aging treatment	900	90	250−290
S	Heat resistant alloy	Iron base — Anneal	3000	200	35−50
		Iron base — Aging	3050	280	25−35
		Ni- or Co-base — Anneal	3500	250	15−25
		Ni- or Co-base — Aging	4150	350	10−20
		Ni- or Co-base — Casting	4150	320	10−15
H	Hardened steel	Hardened steel	4500	HRC55	40−50

Note: • The values in the above table are range values. High values in the range could be considered in actual cutting. When trying new cutting speed, please check the cutting edge condition before operation.
• In stainless steel threading, high cutting speed should be used to prevent built-up edge.
• The cutting parameters should be reduced when cutting small pitch thread and when using tools with small nose radius.
• When cutting thread by tools with small nose radius, such as NPT standard thread, it is advisable to use tools with big nose radius first to rough, so as to improve the life of tools with small nose radius.

In-feed way of threading tools

Radial in-feed
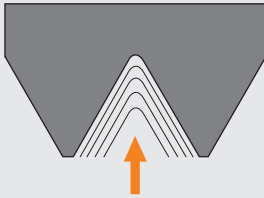
- Easy operating, high general.
- V-shape chip caused by long chip steel workpiece will produce big bend stress on cutting edge.
- It requires low cutting depth, sharp cutting edge and good tough material.
- Big quantity of heat when cutting ,V-shape chip is hard to control.
- Because the interface of cutting chips on the right and left side is long, so it is easy to cause vibration and make the cutting edge suffer more overloading.

Flank in-feed

- Cutting edge suffer small bend stress, stable estate, it is easy for chips formation in deep cutting depth.
- There are enough space to leave chips flow when flank in-feed.
- Big abrasion on right flank.

Modified flank in-feed

3–5°
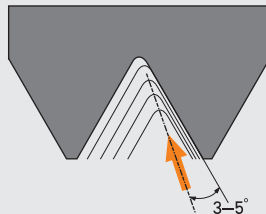
- Right Cutting Edge also engage on cutting depth to a certain extent, it can reduce the abrasion on right side of clearance face.
- Cutting edge suffer small bend stress, stable estate, it is easy for chips formation in deep cutting depth.
- Good Cutting Performance.

Alternate flank in-feed

- Cutting edge trade off when machining, equality abrasion on left and right side of clearance face on cutting edge, it can improve the life of tools.
- Chips are flowing from both of right and left side, good chips flowing.
- Recommend using in big screw-pitch thread cutting.

! Recommend adopting flank in-feed or alternate flank in-feed under allowable range of machining equipment or programmer, it can eliminate the machining vibration effectively, and it has enough space discharge the chips between pitch. Cutting edge suffer a small stress, machining stable, it likes the general turning process when machining thread, good chip control without extra chips.

General turning

Parting and grooving

Threading

Application information of threading

Common problems in threading and solutions

Problem	Cause	Solutions
Wear on clearance face	Cutting speed too high.	Reduce cutting speed.
	Low cutting depth, abrasion.	Reduce frequency of feed and friction of cutting edge.
	Inserts are over the center line.	Adopt correct center height.
Asymmetric wear on right and left cutting edge	The inclined angle of insert is different from the helical angle of thread.	Change to proper shim to get correct inclined angle.
	Flank in-feed is not correct.	Change the way of flank in-feed.
Breakage	Cutting speed too low.	Increase cutting speed.
	Cutting force too high.	Increase frequency of feed and reduce Max in-feed.
	Unstable clamping.	Check if workpiece vibrates. Reduce overhang of tool. Verify clamping of workpiece and tool.
	Chip twisting.	Increase the pressure of cooling liquid to blow away chips.
Plastic deformation	High cutting speed, high temperature on cutting area.	Reduce cutting speed. Increase feed frequency and reduce Max cutting depth.
	Insufficient cooling fluid.	Increase cooling fluid supply.
Low thread surface quality	Cutting speed too low. The insert is over the center line. Chips are not under control.	Increase cutting speed. Adjust centre height. Change the operation way of tools to well control chips.
Incorrect profile	Incorrect center height.	Adjust centre height.
	Pitch on machine is not correct.	Adjust machine.
Shallow profile	Cutting speed set wrong.	Adjust cutting depth.
Surface damage	Chips involved or contacted.	Change to flank in-feed to control chip flow direction.
Built-up edge	Temperature of cutting edge is too low. Usually occur when machining stainless steel and low carbon steel.	Increase cutting speed as well as pressure and concentration of cooling fluid. Choose inserts with good toughness.
Crack on surface	Cutting force too high	Reduce the cutting depth of each feed.
Vibration	Incorrect clamping of workpiece or tool	Verify clamping of workpiece and tool. Minimize overhang of tool.
	Incorrect cutting parameters	Increase cutting speed or reduce it substantially.
	Incorrect tool clamping	Adjust center height.