

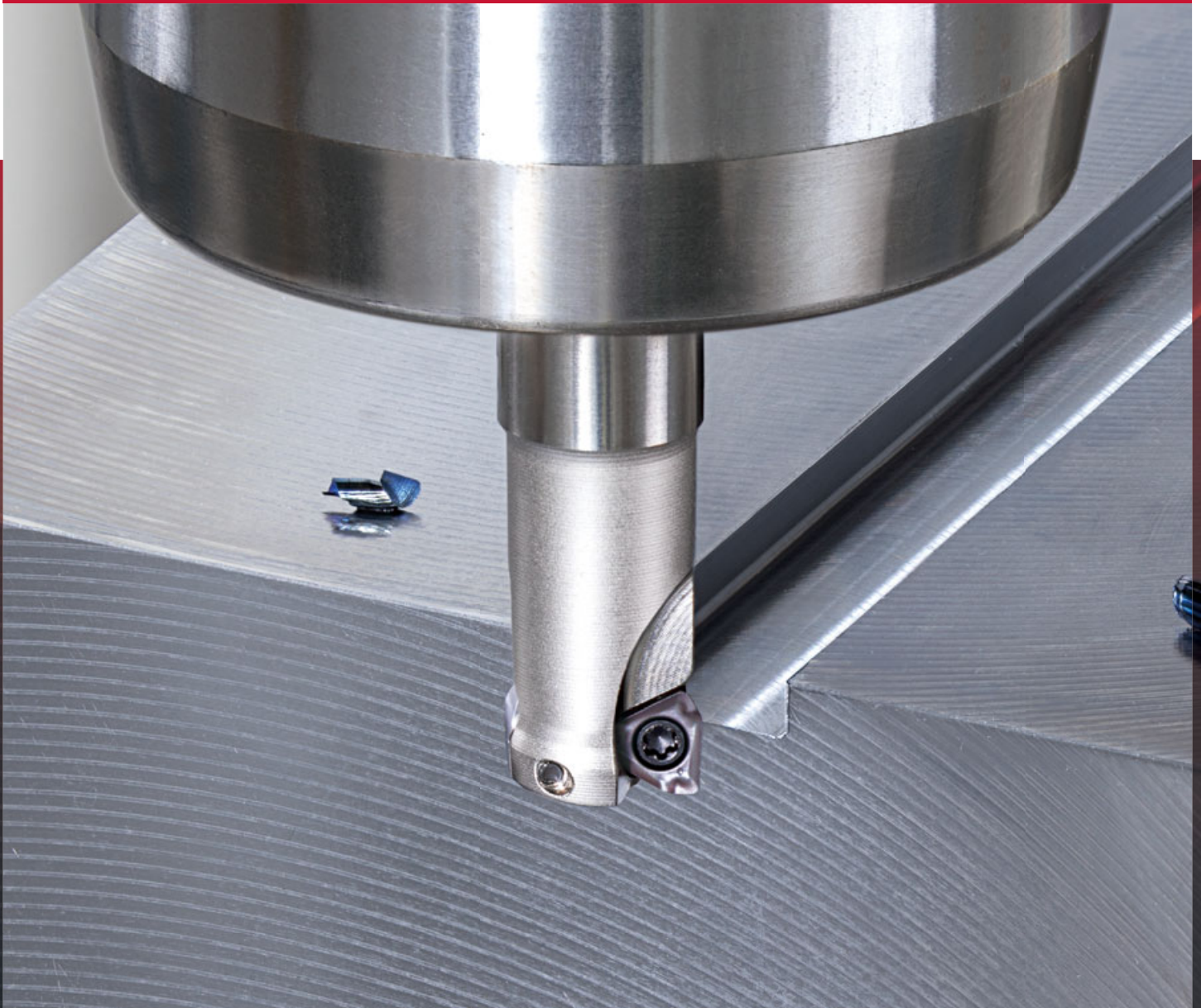


Shoulder milling cutter

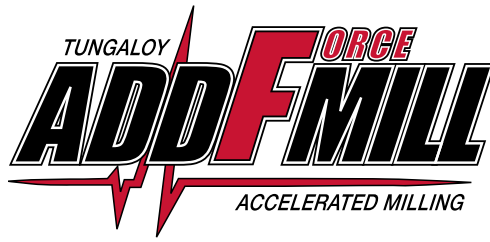
TUNG-TRI

Tungaloy Report No. 421-G

**Economical shoulder milling cutter with
3 cutting edged insert with wide range of
sizes, grades and diameters**







TUNG-TRI



Complete solution for shoulder milling with
outstanding performance and cost-effective inserts

Shoulder milling from ø8 up to ø160 mm

Four insert sizes

APMX = Max. depth of cut



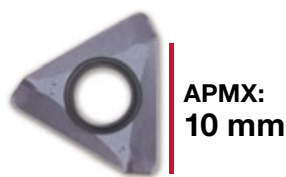
Insert size 04

ø8 - ø25 mm



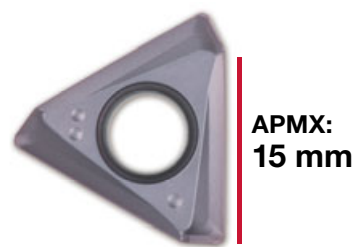
Insert size 06

ø12 - ø50 mm



Insert size 10

ø25 - ø100 mm



Insert size 15

ø40 - ø160 mm

Toolholder adaptation

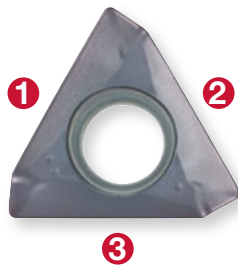


Tool diameters and number of teeth for each insert size

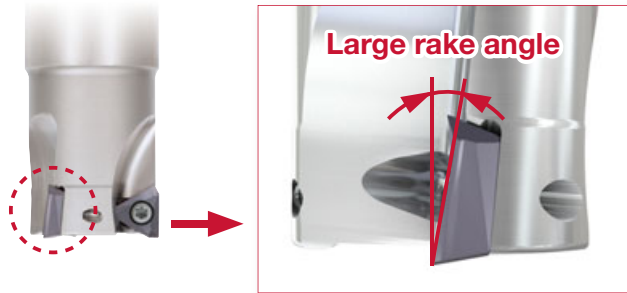
Insert size	Max. depth of cut (mm)	Corner radius (mm)	Workpiece material	Tool diameter (mm), Number of teeth																	
				ø8	ø10	ø12	ø16	ø18	ø20	ø22	ø25	ø28	ø32	ø35	ø40	ø50	ø63	ø80	ø100	ø125	ø160
04	3.5	0.4 0.8	P K H M S	1	2	3 2	4 3		5 4		6 5 4										
06	6	0.2 0.4 0.8	P K S M N H			1	2	2	3 2	3 2	4 3 2	4 3 2	5		6	8					
10	10	0.4 0.8 1.6	P K S M N H								2	2	3 2	3 2	4 3 2	4	6	7	8		
15	15	0.4 0.8 1.6 2	P K S M N H												3 2	4 2	5	6	7	8 10	

See page 9 for roughing type.

■ 3 cutting-edged insert provides economical solution with low cutting forces



Helical cutting edge provides low cutting forces in all applications



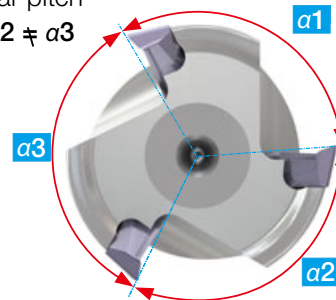
■ Applicable for a wide range of cutting conditions

A combination of inserts with multi-angled side clearance and irregular-pitched insert arrangements eliminates chatter generation during machining



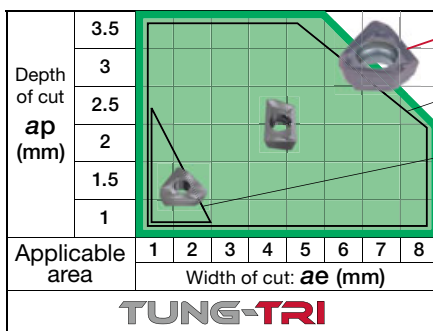
Uniquely designed flank face prevents chipping and chattering

Irregular pitch
 $\alpha 1 \neq \alpha 2 \neq \alpha 3$



■ Cutting performance

Insert size 04 $\phi 10$ mm



TUNG-TRI

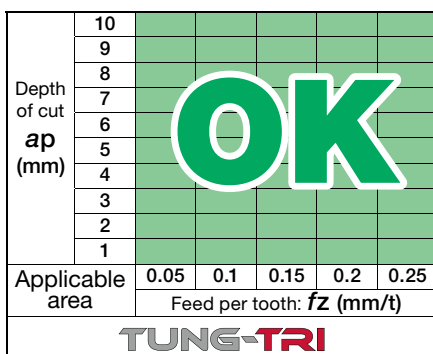
Competitor's insert (with 2 cutting edges)

Competitor's insert (with 3 cutting edges)

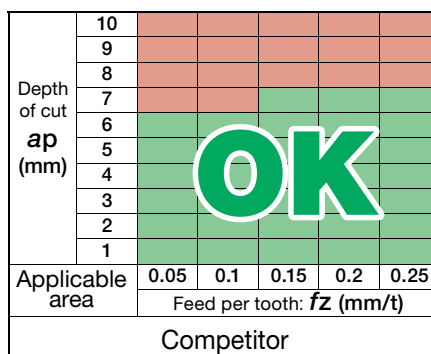
Cutter : EPA04R010M10.0-02
($\phi 10$ mm, $z = 2$)
Insert : TOMT040204PXER-MM
Grade : AH3225
Workpiece : S55C / C55
Cutting speed : $V_c = 200$ m/min

Feed per tooth : $f_z = 0.07$ mm/t
Coolant : Air blast
Overhang length : 20 mm
Machine : Vertical M/C, HSK63A
Criteria : Chattering

Insert size 10 $\phi 32$ mm



OK Chatter



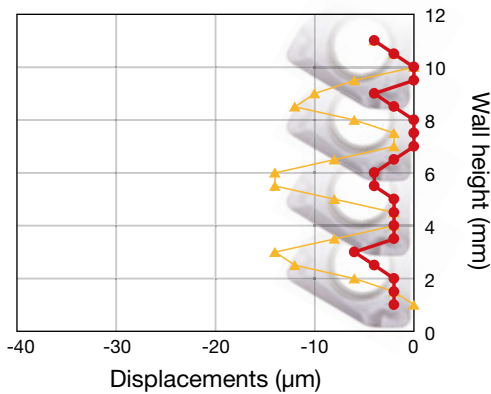
Cutter : EPA10R032M32.0-03N
($\phi 32$ mm, $z = 3$)
Insert : TOMT100404PDER-MJ
Grade : AH3135
Workpiece : S55C / C55 (200 HB)
Cutting speed : $V_c = 150$ m/min
Width of cut : $a_e = 32$ mm
Machine : Vertical M/C, BT50
Criteria : Chattering

■ Excellent wall accuracy

High wall accuracy due to helical cutting edge with low cutting force

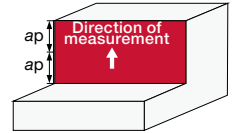
■ Wall accuracy

Insert size 04 $\phi 10$ mm

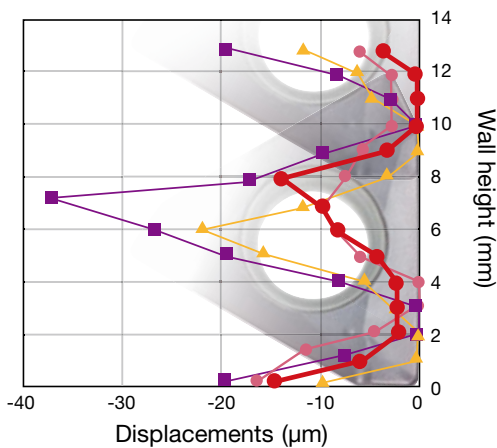


P	Cutter	: EPA04R010M10.0-02 ($\phi 10$ mm, $z = 2$)
	Insert	: TOMT040204PXER-MM
	Grade	: AH3225
	Workpiece	: S55C / C55
	Cutting speed	: $V_c = 200$ m/min
	Feed per tooth	: $f_z = 0.07$ mm/t
	Depth of cut	: $a_p = 3$ mm x 4 passes
	Width of cut	: $a_e = 0.5$ mm
	Coolant	: Air blast
	Overhang length	: 20 mm
	Machine	: Vertical M/C, HSK63A

—●— **TUNG-TRI**
—▲— Competitor's insert
(with 2 cutting edges)



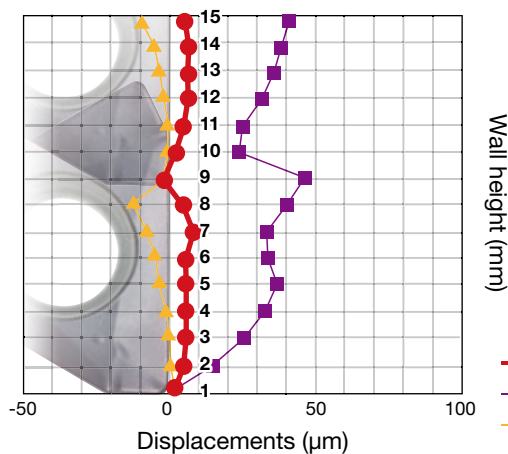
Insert size 10 $\phi 32$ mm



P	Cutter	: EPA10R032M32.0-03N ($\phi 32$ mm, $z = 3$)
	Insert	: TOMT100404PDER-MJ
	Grade	: AH3135
	Workpiece	: S55C / C55 (200HB)
	Cutting speed	: $V_c = 150$ m/min
	Feed per tooth	: $f_z = 0.1$ mm/t
	Depth of cut	: $a_p = 8$ mm x 2 passes
	Width of cut	: $a_e = 5$ mm
	Machine	: Vertical M/C, BT50

—●— **TUNG-TRI**
—●— Conventional
—■— Competitor A
—▲— Competitor B

Insert size 10 $\phi 32$ mm



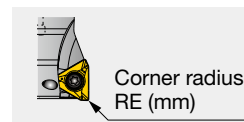
N	Cutter	: EPA10R032M32.0-03N ($\phi 32$ mm, $z = 3$)
	Insert	: TOGT100408PDRF-AJ
	Grade	: KS05F
	Workpiece	: A7075 (Alumigo Hard)
	Cutting speed	: $V_c = 900$ m/min
	Feed per tooth	: $f_z = 0.1$ mm/t
	Depth of cut	: $a_p = 8$ mm x 2 passes
	Width of cut	: $a_e = 5$ mm
	Coolant	: External air
	Machine	: Vertical M/C, HSK63A

—●— **TUNG-TRI**
—■— Competitor A
—▲— Competitor B

Various chipbreaker geometries

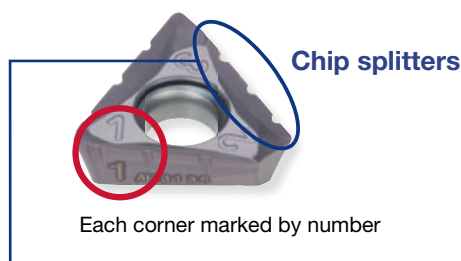
Insert size	First-choice chipbreakers		
	MM / MJ	NMJ	AJ
04	 RE: 0.4 - 0.8	-	-
06	 RE: 0.2 - 0.8	-	 RE: 0.4 - 0.8
10	 RE: 0.4 - 1.6	-	 RE: 0.4 - 0.8 (- 1.6*)
15	 RE: 0.4 - 2.0	 RE: 0.8	 RE: 0.4 - 0.8 (- 2.0*)

* Available upon request



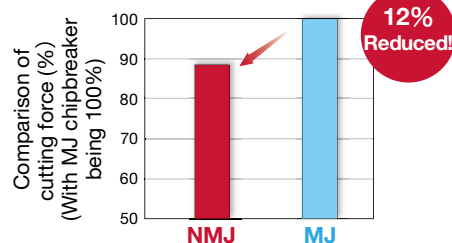
Chip splitter for breaking chips in small pieces

NMJ chipbreaker (insert size 15)



- 10% reduction in cutting force compared to MJ chipbreaker due to split chips
- Suitable for machining with large width of cut due to split chips

Insert size 15 ø80 mm



P Cutter : TPA15R080M25.4-06 (ø80 mm, z = 6)
 Insert : TOMT150608PDER-NMJ, TOMT150608PDER-MJ
 Grade : AH3135
 Workpiece : SCM440 / 42CrMo4 (200HB)
 Cutting speed : $V_c = 100$ m/min
 Feed per tooth : $f_z = 0.1$ mm/t
 Depth of cut : $a_p = 13$ mm
 Width of cut : $a_e = 29$ mm
 Coolant : Air blast
 Machine : Vertical M/C, BT50

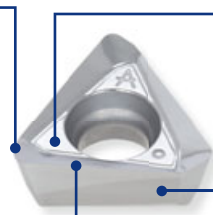
AJ chipbreaker (insert size 06, 10, 15) for non-ferrous applications

Wiper edge specifically designed for aluminium machining

Provides excellent surface finish by directing chips away from the machined surface

Cutting edge with large rake angle and high inclination

Low cutting force and smooth machining



Lapping treatment

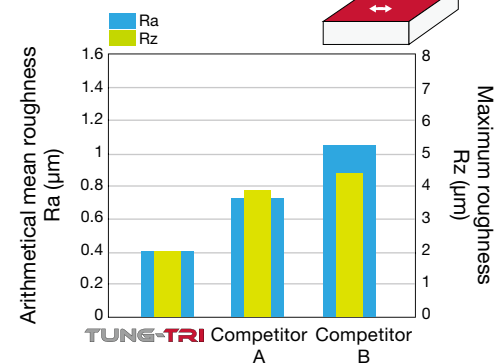
Prevents welding on the cutting edge

Unique side clearance design

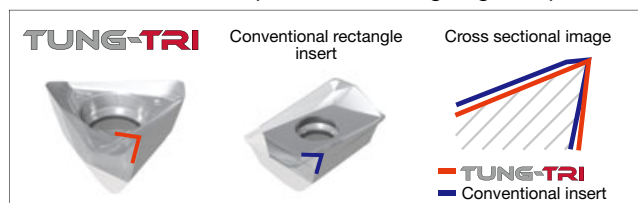
Optimized clearance geometry to enhance insert robustness and vibration damping for machining aluminium

Surface roughness

Insert size 10 ø32 mm



Cross sectional comparison of cutting edge shapes



N Cutter : EPA10R032M32.0-03N (ø32 mm, z = 3)
 Insert : TOGT100408PDFR-AJ
 Grade : KS05F
 Workpiece : A7075 (Alumigo Hard)
 Cutting speed : $V_c = 900$ m/min
 Feed per tooth : $f_z = 0.1$ mm/t
 Depth of cut : $a_p = 2$ mm
 Width of cut : $a_e = 21$ mm
 Coolant : External air
 Machine : Vertical M/C, HSK63A

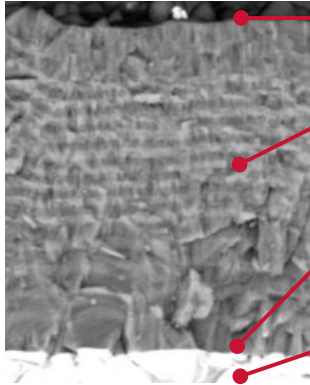
■ Addition of AH3225 grade for enhanced insert grade lineup!

Offering four PVD grades, two CVD grades, and one uncoated carbide grade

New

AH3225 P M S

- Nano multi-layer coating technology with three major properties for optimal cutting edge integrity
- Increased resistance to wear, fracture, oxidation, built-up edge, and delamination



Resistance to built-up edge

The coating surface prevents built-up edge

Resistance to wear, oxidation, and fracture

Multi-layered coating is designed to resist wear and oxidation, while preventing micro-cracks from propagating in the coating layer for improved resistance to edge chipping

Strong coating / substrate adhesion

Coating is optimized for strong adhesion property with substrate to maintain strong cutting edge integrity

Carbide substrate

High resistance to fracture

PREMIUMTEC

AH3135 P M

- PVD grade for high fracture resistance
- Most suitable for steel and stainless steel in general cutting parameters

AH120 P K

- PVD grade with well-balanced wear and fracture resistance
- Ideal for general machining of steel and cast iron

AH8015 H S

- Incorporates a hard coating layer and carbide substrate
- Strong resistance to wear, heat, and built-up edge, ideal for machining hard or difficult materials

T3225 P M

- CVD grade with high chipping and fracture resistance

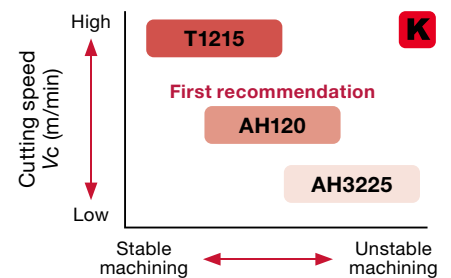
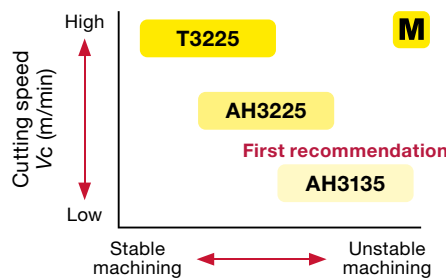
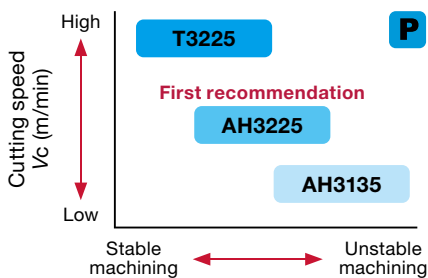
T1215 K

- CVD grade with outstanding wear and chipping resistance
- Best for cast iron at high-speed machining

KS05F N

- Fine-grained cemented carbide grade with high wear resistance
- Extremely sharp edge is suitable for non-ferrous materials

■ APPLICATION AREAS



Roughing type

Insert size 10

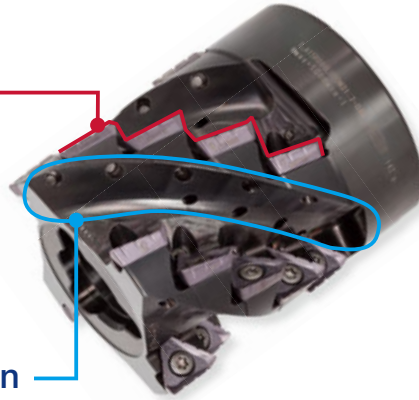
Insert size 15

Excellent chattering resistance

- Ideal insert positioning in high helix angle
- Irregular pitch

Smooth chip evacuation

- Big chip gullet for large width of cut



Tool diameter and max d.o.c.

Tool dia. (mm)	Max. depth of cut (mm)			
	For TLA10	For TLA15	For TLA15 + BT50 integrated	For TLA15 + PSC integrated
ø50	54 ZEFP = 4			
ø63	54 ZEFP = 4			55 ZEFP = 3
ø80		70 - 126* ZEFP = 4	83 - 139* ZEFP = 4	70 ZEFP = 4
ø100		83 - 139* ZEFP = 5	97 - 153* ZEFP = 5	

* Extended with two sub-units

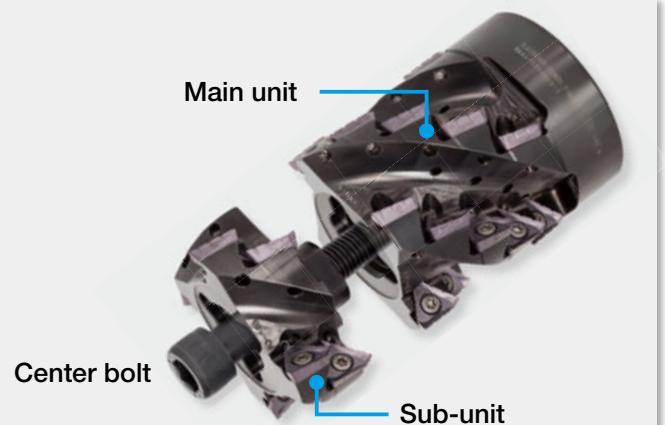
ZEFP = Number of effective cutting edges on periphery

Main and sub-unit system (TLA15 type)*

Insert size 15

- **Exchangeable sub-units**
(A main unit can be used without the sub-unit.)
- **Adjustable cutting length**
Maximum depth of cut can be increased
(Up to 2 sub-units can be added on a main unit to increase depth of cut.)

* Excluding C-TLA line (integrated with PSC connection)



Comparison of application areas

- Strong resistance to chattering and low cutting force cover a wide range of applications
- The application range is remarkably expanded with NMJ chipbreaker

Cutting performance

Insert size 15 ø80 mm

						OK	Chatter
30	38%	with NMJ chipbreaker					
20	25%	with MJ chipbreaker					
10	13%	OK					
ae (mm)	ae / øDc (mm)	0.05	0.1	0.15	0.2	ae (mm)	ae / øDc (mm)
Width of cut		Feed per tooth: fz (mm/t)				Width of cut	
TUNG-TRI						Competitor	

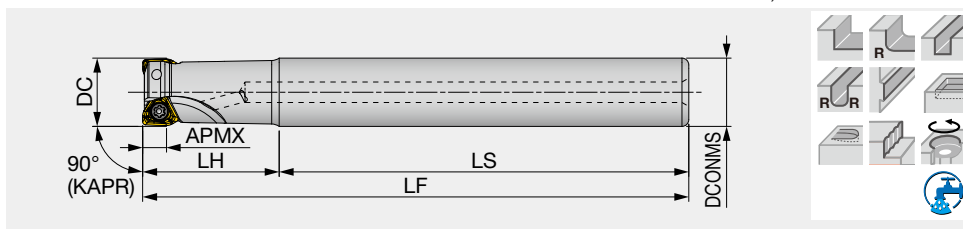
Cutter : TLA15R080L070M31.7-04M
(ø80 mm, ZEFP = 4)
Insert : TOMT150608PDER-NMJ,
TOMT150608PDER-MJ
Grade : AH3135
Workpiece : SCM440 / 42CrMo4 (270HB)

Cutting speed : Vc = 100 m/min
Depth of cut : ap = 55 mm
Coolant : Dry
Machine : Vertical M/C, BT50
Criteria : Chattering

EPA04

High precision square shoulder endmill, shank type, with screw clamp system, for triangular inserts

GAMP = +12.1° ~ +12.2°, GAMF = -14.2° ~ -18.3°



Designation	APMX	DC	CICT	DCONMS	LS	LH	LF	WT(kg)	Air hole	Insert
EPA04R008M08.0-01	3.5	8	1	8	48	12	60	0.02	with	TOMT04...
EPA04R010M10.0-02	3.5	10	2	10	60	20	80	0.04	with	TOMT04...
EPA04R010M10.0-02L	3.5	10	2	10	65	35	100	0.05	with	TOMT04...
EPA04R012M12.0-02	3.5	12	2	12	60	20	80	0.06	with	TOMT04...
EPA04R012M12.0-03	3.5	12	3	12	60	20	80	0.06	with	TOMT04...
EPA04R012M12.0-02L	3.5	12	2	12	85	35	120	0.09	with	TOMT04...
EPA04R016M16.0-03	3.5	16	3	16	70	20	90	0.12	with	TOMT04...
EPA04R016M16.0-04	3.5	16	4	16	70	20	90	0.12	with	TOMT04...
EPA04R016M16.0-03L	3.5	16	3	16	105	35	140	0.19	with	TOMT04...
EPA04R020M20.0-04	3.5	20	4	20	70	30	100	0.21	with	TOMT04...
EPA04R020M20.0-05	3.5	20	5	20	70	30	100	0.21	with	TOMT04...
EPA04R020M20.0-04L	3.5	20	4	20	165	35	200	0.44	with	TOMT04...
EPA04R025M25.0-05	3.5	25	5	25	80	35	115	0.39	with	TOMT04...
EPA04R025M25.0-06	3.5	25	6	25	80	35	115	0.39	with	TOMT04...
EPA04R025M25.0-04L	3.5	25	4	25	160	40	200	0.7	with	TOMT04...

SPARE PARTS



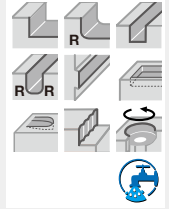
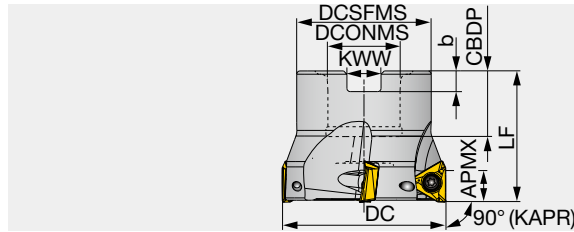
Designation	Clamping screw	Wrench
EPA04R008M08.0-01	CSPB-1.8L3.3	IP-6DB
EPA04R010 - 025...	CSPB-1.8L3.6	IP-6DB

*Recommended clamping torque (N·m): CSPB-1.8L3.3/CSPB-1.8L3.6 = 0.5

TPA06

High precision square shoulder mill, with screw clamp system, for triangular inserts

GAMP = +8.5° ~ +11.5°, GAMF = -5.5° ~ -12.5°



Designation	APMX	DC	CICT	DCSFMS	DCONMS	CBDP	LF	b	KWW	WT(kg)	Air hole	Insert
TPA06R032M16.0E05	6	32	5	30	16	18	40	5.6	8.4	0.14	with	TO*T06...
TPA06R040M16.0E06	6	40	6	35	16	18	40	5.6	8.4	0.22	with	TO*T06...
TPA06R050M22.0E08	6	50	8	41	22	20	40	6.3	10.4	0.31	with	TO*T06...

SPARE PARTS

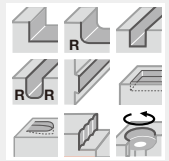
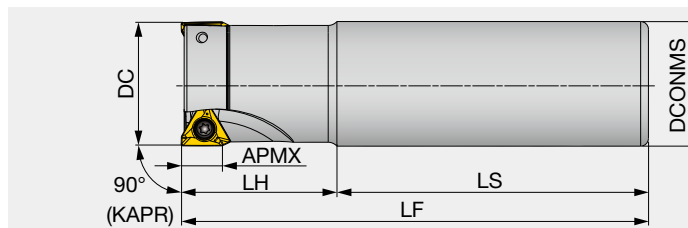
Designation	Clamping screw	Lubricant	Center bolt	Wrench
TPA06R032M16.0E05	CSTB-2.5	M-1000	FSHM8-30H	T-8D
TPA06R040M16.0E06	CSTB-2.5	M-1000	CM8X30H	T-8D
TPA06R050M22.0E08	CSTB-2.5	M-1000	CM10X30H	T-8D

*Recommended clamping torque (N·m): CSTB-2.5 = 1.3

EPA06

High precision square shoulder endmill, shank type, with screw clamp system, for triangular inserts

GAMP = +8.5° ~ +11.5°, GAMF = -5.5° ~ -12.5°



Designation	APMX	DC	CICT	DCONMS	LS	LH	LF	WT(kg)	Air hole	Insert
EPA06R012M16.0-01N	6	12	1	16	50	18	68	0.09	without	TO*T06...
EPA06R016M16.0-02N	6	16	2	16	60	24	84	0.12	without	TO*T06...
EPA06R016M16.0-02L	6	16	2	16	105	40	145	0.2	with	TO*T06...
EPA06R018M16.0-02N	6	18	2	16	60	24	84	0.13	without	TO*T06...
EPA06R018M16.0-02L	6	18	2	16	115	30	145	0.21	with	TO*T06...
EPA06R020M16.0-02N	6	20	2	16	60	30	90	0.14	without	TO*T06...
EPA06R020M20.0-02N	6	20	2	20	70	30	100	0.23	without	TO*T06...
EPA06R020M20.0-03N	6	20	3	20	70	30	100	0.22	without	TO*T06...
EPA06R020M20.0-02L	6	20	2	20	135	50	185	0.41	with	TO*T06...
EPA06R022M20.0-02N	6	22	2	20	70	30	100	0.23	without	TO*T06...
EPA06R022M20.0-03N	6	22	3	20	70	30	100	0.23	without	TO*T06...
EPA06R022M20.0-02L	6	22	2	20	145	40	185	0.42	with	TO*T06...
EPA06R025M25.0-03N	6	25	3	25	80	35	115	0.41	without	TO*T06...
EPA06R025M25.0-04N	6	25	4	25	80	35	115	0.41	without	TO*T06...
EPA06R025M25.0-02L	6	25	2	25	150	70	220	0.78	with	TO*T06...
EPA06R028M25.0-03N	6	28	3	25	80	35	115	0.42	without	TO*T06...
EPA06R028M25.0-04N	6	28	4	25	80	35	115	0.42	without	TO*T06...
EPA06R028M25.0-02L	6	28	2	25	180	40	220	0.8	with	TO*T06...

SPARE PARTS

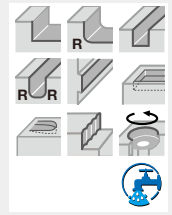
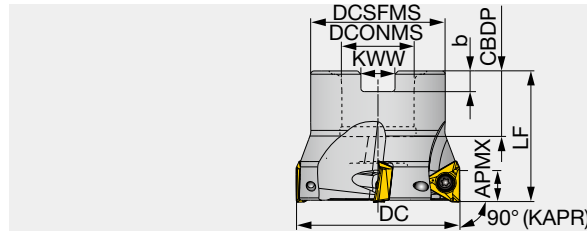
Designation	Clamping screw	Lubricant	Wrench
EPA06R012 - 018M...	CSTB-2.5S	M-1000	T-8D
EPA06R020 - 028M...	CSTB-2.5	M-1000	T-8D

*Recommended clamping torque (N·m): CSTB-2.5S/CSTB-2.5 = 1.3

TPA10

High precision square shoulder mill, with screw clamp system, for triangular inserts

GAMP = +9.5° ~ +11°, GAMF = -4.5° ~ -0.5°



Designation	APMX	DC	CICT	DCSFMS	DCONMS	CBDP	LF	b	KWW	WT(kg)	Air hole	Insert
TPA10R040M16.0E04	10	40	4	35	16	18	40	5.6	8.4	0.2	with	TO*T10...
TPA10R050M22.0E04	10	50	4	41	22	20	40	6.3	10.4	0.31	with	TO*T10...
TPA10R063M22.0E06	10	63	6	41	22	20	40	6.3	10.4	0.51	with	TO*T10...
TPA10R080M25.4-07	10	80	7	58	25.4	26	50	6	9.5	1.04	with	TO*T10...
TPA10R080M27.0E07	10	80	7	58	27	22	50	7	12.4	1.04	with	TO*T10...
TPA10R100M31.7-08	10	100	8	70	31.75	32	63	8	12.7	2.02	with	TO*T10...
TPA10R100M32.0E08	10	100	8	60	32	28.5	50	8	14.4	2.02	with	TO*T10...

SPARE PARTS

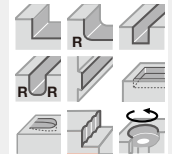
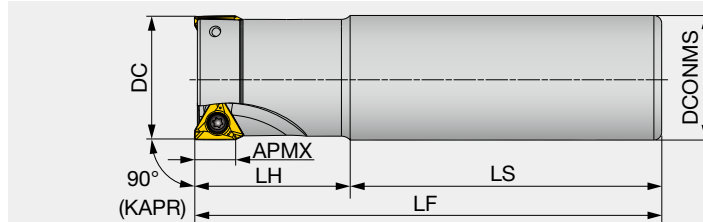
Designation	Clamping screw	Grip	Lubricant	Center bolt	Torx bit
TPA10R040M16.0E04	SR14-562/S	SW6-SD	M-1000	CM8X30H	BLDT10/S7
TPA10R050, 063M...	SR14-562/S	SW6-SD	M-1000	CM10X30H	BLDT10/S7
TPA10R080M...	SR14-562/S	SW6-SD	M-1000	CM12X30H	BLDT10/S7
TPA10R100M...	SR14-562/S	SW6-SD	M-1000	CM16X40H	BLDT10/S7

*Recommended clamping torque (N·m): SR14-562/S = 3.5

EPA10

High precision square shoulder endmill, shank type, with screw clamp system, for triangular inserts

GAMP = +9.5° ~ +11°, GAMF = -4.5° ~ -0.5°



Designation	APMX	DC	CICT	DCONMS	LS	LH	LF	WT(kg)	Air hole	Insert
EPA10R025M25.0-02N	10	25	2	25	80	35	115	0.38	without	TO*T10...
EPA10R025M25.0-02L	10	25	2	25	150	70	220	0.75	with	TO*T10...
EPA10R028M25.0-02N	10	28	2	25	80	35	115	0.39	without	TO*T10...
EPA10R028M25.0-02L	10	28	2	25	185	35	220	0.78	with	TO*T10...
EPA10R032M32.0-02N	10	32	2	32	80	40	120	0.66	without	TO*T10...
EPA10R032M32.0-03N	10	32	3	32	80	40	120	0.65	without	TO*T10...
EPA10R032M32.0-02L	10	32	2	32	175	80	255	1.46	with	TO*T10...
EPA10R035M32.0-02N	10	35	2	32	80	40	120	0.7	without	TO*T10...
EPA10R035M32.0-03N	10	35	3	32	80	40	120	0.68	without	TO*T10...
EPA10R035M32.0-02L	10	35	2	32	215	40	255	1.52	with	TO*T10...
EPA10R040M32.0-03N	10	40	3	32	80	40	120	0.72	without	TO*T10...
EPA10R040M32.0-04N	10	40	4	32	80	40	120	0.73	without	TO*T10...
EPA10R040M32.0-02L	10	40	2	32	205	50	255	1.57	with	TO*T10...

SPARE PARTS

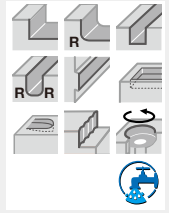
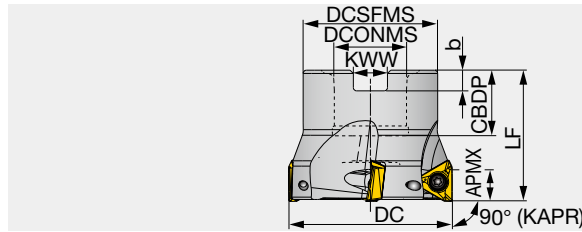
Designation	Clamping screw	Grip	Lubricant	Torx bit
EPA10...	SR14-562/S	SW6-SD	M-1000	BLDT10/S7

*Recommended clamping torque (N·m): SR14-562/S = 3.5

TPA15

High precision square shoulder mill, with screw clamp system, for triangular inserts

GAMP = +12° ~ +13.5°, GAMF = -6° ~ -3.5°



Designation	APMX	DC	CICT	DCSFMS	DCONMS	CBDP	LF	b	KWW	WT(kg)	Air hole	Insert
TPA15R050M22.0E04	15	50	4	41	22	20	40	6.3	10.4	0.27	with	TO*T15...
TPA15R063M22.0E05	15	63	5	41	22	20	40	6.3	10.4	0.41	with	TO*T15...
TPA15R080M25.4-06	15	80	6	46	25.4	26	50	6	9.5	0.83	with	TO*T15...
TPA15R080M27.0E06	15	80	6	50	27	22	50	7	12.4	0.86	with	TO*T15...
TPA15R100M31.7-07	15	100	7	60	31.75	32	50	8	12.7	1.3	with	TO*T15...
TPA15R100M32.0E07	15	100	7	60	32	28.5	50	8	14.4	1.27	with	TO*T15...
TPA15R125M38.1-08	15	125	8	80	38.1	38	63	10	15.9	2.7	with	TO*T15...
TPA15R125M40.0E08	15	125	8	71	40	32	63	9	16.4	2.47	with	TO*T15...
TPA15R160M40.0E10N	15	160	10	100	40	32	63	9	16.4	4.77	without	TO*T15...
TPA15R160M50.8-10N	15	160	10	100	50.8	46	63	11	19	4.4	without	TO*T15...

SPARE PARTS

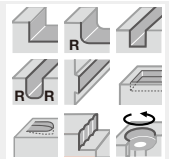
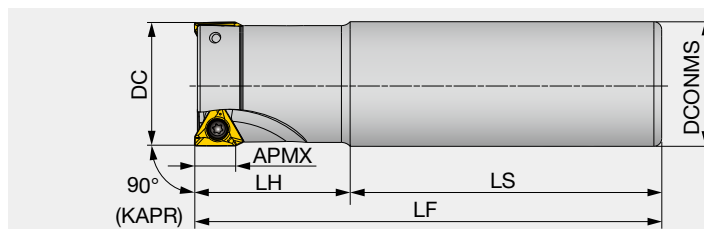
Designation	Clamping screw	Grip	Lubricant	Center bolt 1	Center bolt 2	Torx bit
TPA15R050M22.0E04	TS45120I	H-TB2W	M-1000	-	FSHM10-40H	BT20S
TPA15R063M22.0E05	TS45120I	H-TB2W	M-1000	-	CM10X30H	BT20S
TPA15R080M...	TS45120I	H-TB2W	M-1000	-	CM12X30H	BT20S
TPA15R100M...	TS45120I	H-TB2W	M-1000	TMBA-M16H	-	BT20S
TPA15R125M...	TS45120I	H-TB2W	M-1000	TMBA-M20H	-	BT20M
TPA15R160M...	TS45120I	H-TB2W	M-1000	-	-	BT20M

*Recommended clamping torque (N·m): TS45120I = 5

EPA15

High precision square shoulder endmill, shank type, with screw clamp system, for triangular inserts

GAMP = +12° ~ +13.5°, GAMF = -6° ~ -3.5°



Designation	APMX	DC	CICT	DCONMS	LS	LH	LF	WT(kg)	Air hole	Insert
EPA15R040M32.0-03N	15	40	3	32	80	40	120	0.73	without	TO*T15...
EPA15R040M32.0-02L	15	40	2	32	205	50	255	1.56	with	TO*T15...
EPA15R050M32.0-04N	15	50	4	32	80	40	120	0.83	without	TO*T15...
EPA15R050M42.0-02L	15	50	2	42	310	50	360	3.84	with	TO*T15...

SPARE PARTS

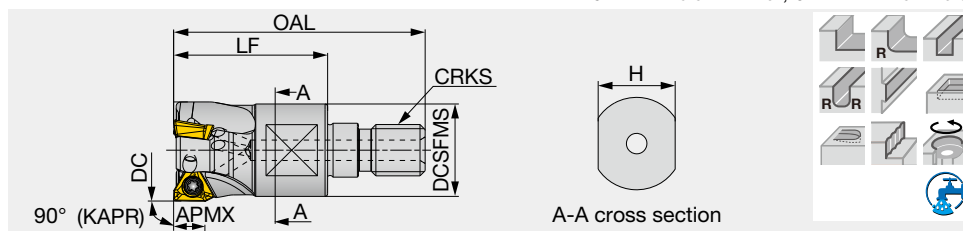
Designation	Clamping screw	Grip	Lubricant	Torx bit
EPA15...	TS45120I	H-TB2W	M-1000	BT20S

*Recommended clamping torque (N·m): TS45120I = 5

HPA06-M

High precision square shoulder endmill, modular type, for triangular inserts (TungFlex)

GAMP = +8.5° ~ +11.5°, GAMF = -12.5° ~ -5.5°



Designation	APMX	DC	CICT	OAL	LF	H	DCSFMS	CRKS	WT(kg)	Air hole	Insert
HPA06R016MM08-02	6	16	2	42	25	10	13	M8	0.03	with	TO*T06...
HPA06R020MM10-03	6	20	3	49	30	15	18	M10	0.06	with	TO*T06...
HPA06R025MM12-04	6	25	4	57	35	17	21	M12	0.1	with	TO*T06...
HPA06R032MM16-05	6	32	5	63	40	22	29	M16	0.20	with	TO*T06...

See page 15 for TungFlex modular shank.

SPARE PARTS



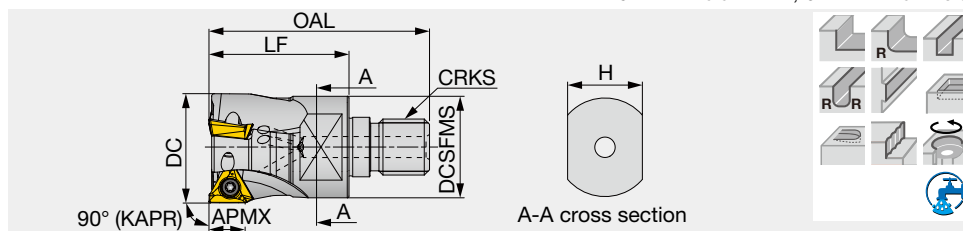
Designation	Clamping screw	Lubricant	Wrench
HPA06R016MM08-02	CSTB-2.5S	M-1000	T-8D
HPA06R020 - 032MM...	CSTB-2.5	M-1000	T-8D

*Recommended clamping torque (N·m): CSTB-2.5S/CSTB-2.5 = 1.3

HPA10-M

High precision square shoulder endmill, modular type, for triangular inserts (TungFlex)

GAMP = +9.5° ~ +11°, GAMF = -4.5° ~ -0.5°



Designation	APMX	DC	CICT	OAL	LF	H	DCSFMS	CRKS	WT(kg)	Air hole	Insert
HPA10R025MM12-02	10	25	2	57	35	17	21	M12	0.08	with	TO*T10...
HPA10R032MM16-03	10	32	3	63	40	22	29	M16	0.18	with	TO*T10...

See page 15 for TungFlex modular shank.

SPARE PARTS

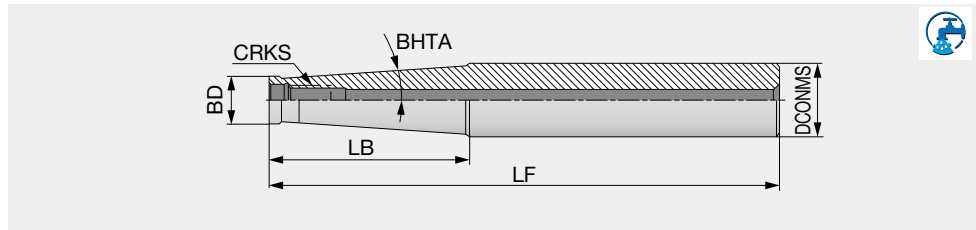


Designation	Clamping screw	Grip	Lubricant	Torx bit
HPA10...	SR14-562/S	SW6-SD	M-1000	BLDT10/S7

*Recommended clamping torque (N·m): SR14-562/S = 3.5

TungFlex

TungFlex modular shank

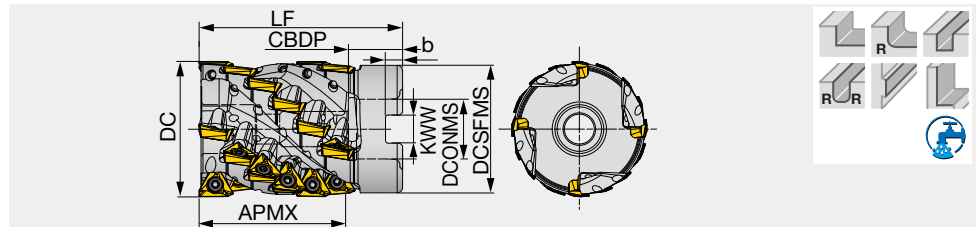


Designation	DCONMS	LF	LS	LB	BD	CRKS	BHTA	Shank type
SM06-L60C10	10	60	40	20	9.7	M6	0°	Cylindrical
SM06-L105-C12	12	105	45	60	9.7	M6	1.2°	Cylindrical
SM06-L125-C16	16	125	65	60	9.7	M6	3.3°	Cylindrical
SM08-L73C16	16	73	48	25	13	M8	0°	Cylindrical
SM08-L128-C16	16	128	48	80	13	M8	0.9°	Cylindrical
SM08-L170-C20	20	170	103.2	66.8	13	M8	3.3°	Cylindrical
SM10-L80-C20	20	80	50	30	18	M10	0°	Cylindrical
SM10-L130-C20	20	130	50	80	18	M10	0.6°	Cylindrical
SM10-L200-C25	25	200	142.8	57.2	19	M10	3.3°	Cylindrical
SM12-L86-C25	25	86	56	30	21	M12	5.1°	Cylindrical
SM12-L200-C32	32	200	122	78	21	M12	4.4°	Cylindrical
SM16-L95-C32	32	95	60	35	29	M16	1.7°	Cylindrical
SM16-L230-C32	32	230	180	50	29	M16	1.8°	Cylindrical

TLA10

Square shoulder mill for roughing, with screw clamp system, for triangular inserts

GAMP = +9.5°~ +11°, GAMF = -4.5°~ -0.5°



Designation	APMX	DC	ZEFP	CICT	DCSFMS	DCONMS	CBDP	LF	b	KWW	WT(kg)	Air hole	Insert
TLA10R050L054M22.0E04	54	50	4	24	47	22	20	75	6.3	10.4	0.64	with	TO*T10...
TLA10R063L054M25.4-04	54	63	4	24	60	25.4	26	80	6	9.5	1.26	with	TO*T10...
TLA10R063L054M27.0E04	54	63	4	24	60	27	22	80	7	12.4	1.25	with	TO*T10...

Note: Coolant needs to be supplied from the end of the arbor inlay. Coolant cannot be supplied from the set bolt.

SPARE PARTS

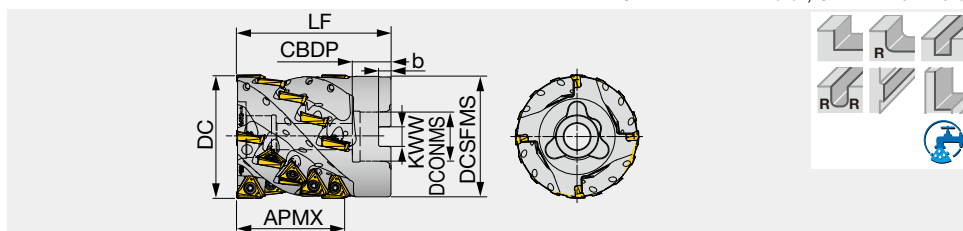
Designation	Clamping screw	Lubricant	Center bolt 1	Center bolt 2	Wrench
TLA10R050L054M22.0E04	SR14-562	M-1000	CAP-CM10X1.5X55-H	-	T-10D
TLA10R063L...	SR14-562	M-1000	-	CAP-CM12X1.75X50	T-10D

*Recommended clamping torque (N·m): SR14-562 = 3.5

TLA15-M

Square shoulder mill for roughing, with screw clamp system, for triangular inserts

GAMP = +12° ~ +13.5°, GAMF = -6° ~ -3.5°



Designation	APMX	DC	ZEFP	CICT	DCSFMS	DCONMS	CBDP	LF	b	KWW	WT(kg)	Air hole	Insert
TLA15R080L070M31.7-04M	70	80	4	20	78	31.75	32	100	8	12.7	2.29	with	TO*T15...
TLA15R080L070M32.0E04M	70	80	4	20	78	32	25	100	8	14.4	2.38	with	TO*T15...
TLA15R100L083M38.1-05M	83	100	5	30	98	38.1	38	110	10	15.9	4.24	with	TO*T15...
TLA15R100L083M40.0E05M	83	100	5	30	98	40	32	110	9	16.4	4.26	with	TO*T15...

Note: Coolant needs to be supplied from the end of the arbor inlay. Coolant cannot be supplied from the set bolt.

SPARE PARTS

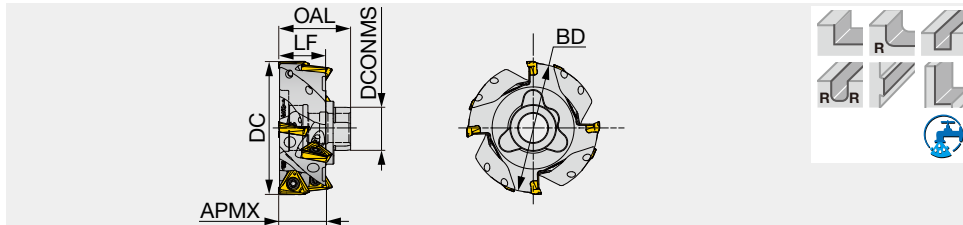
Designation	Clamping screw	Grip	Torx bit	Lubricant	Center bolt
TLA15R080...	TS45120I	H-TB2W	BT20S	M-1000	CM16X75
TLA15R100...	TS45120I	H-TB2W	BT20S	M-1000	CM20X80

*Recommended clamping torque (N·m): TS45120I = 5

TLA15-S

Subunit for TLA15-M, square shoulder mill for roughing, with screw clamp system, for triangular inserts

GAMP = +12° ~ +13.5°, GAMF = -6° ~ -3.5°



Designation	APMX	DC	ZEFP	CICT	BD	DCONMS	OAL	LF	WT(kg)	Air hole	Insert
TLA15R080L028-04S	28	80	4	8	77.6	27	43	28.2	0.65	with	TO*T15...
TLA15R100L028-05S	28	100	5	10	97.2	33	46	28	1.05	with	TO*T15...

Note: Coolant needs to be supplied from the end of the arbor inlay. Coolant cannot be supplied from the set bolt.

SPARE PARTS

Designation	Clamping screw	Grip	Lubricant	Torx bit
TLA15...	TS45120I	H-TB2W	M-1000	BT20S

*Recommended clamping torque (N·m): TS45120I = 5

CENTER BOLT

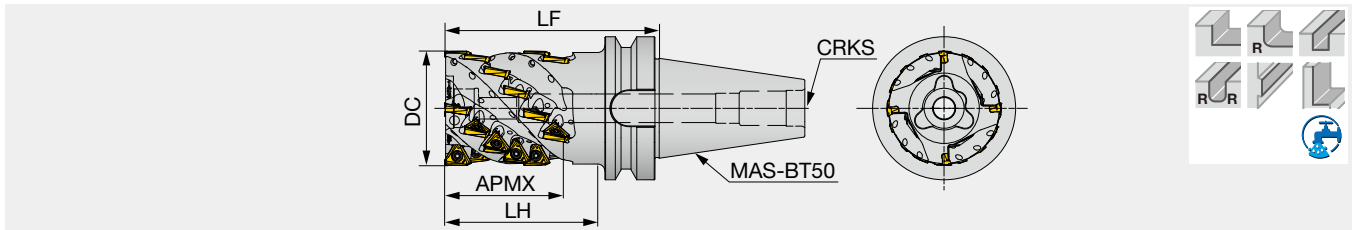
(Optional parts)

No. of subunits	1	2
TLA15R080L028-04S	CM16x120	CM16x140
TLA15R100L028-05S	CM20x120	CM20x150

TLA15-BT

Square shoulder mill for roughing, with BT tapered shank, for triangular inserts

GAMP = +12° ~ +13.5°, GAMF = -6° ~ -3.5°



Designation	APMX	DC	ZEFP	CICT	LF	LH	WT(kg)	Air hole	CRKS	Insert
TLA15R080L083BT50-04M	83	80	4	24	150	107	6.29	with	M24	TO*T15...
TLA15R100L097BT50-05M	97	100	5	35	165	126.5	8.92	with	M24	TO*T15...

SPARE PARTS

Designation	Clamping screw	Grip	Lubricant	Torx bit	Shell locking bolt
TLA15R080L083BT50-04M	TS45120I	H-TB2W	M-1000	BT20S	CAP-CM16x2.0x55
TLA15R100L097BT50-05M	TS45120I	H-TB2W	M-1000	BT20S	CAP-CM20x2.5x50

*Recommended clamping torque (N·m): TS45120I = 5

CENTER BOLT

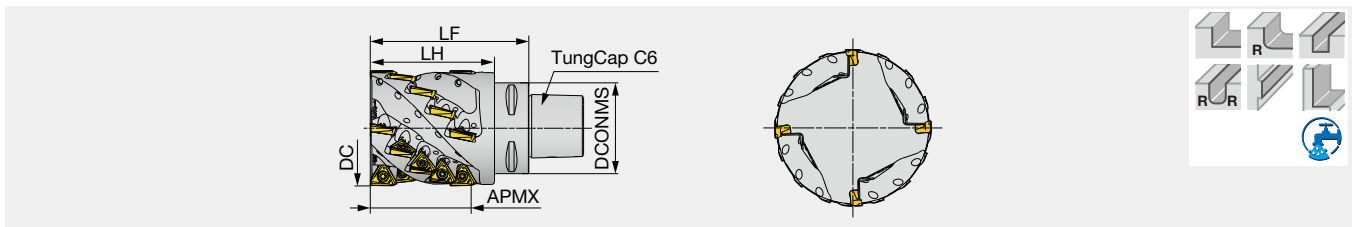
(Optional parts)

No. of subunits	1	2
TLA15R080L083BT50-04M	CAP-CM16x2.0x55	CM16x90
TLA15R100L097BT50-05M	CAP-CM20x2.5x50	CM20x80

C-TLA

Square shoulder mill for roughing, with PSC, for triangular inserts

GAMP = +13.5° ~ +17°, GAMF = -5.5° ~ -5°



Designation	APMX	DC	ZEFP	CICT	LF	LH	DCONMS	WT(kg)	Air hole	Insert
C6TLA15M063R03L100	55	63	3	12	100	78	63	2.13	with	TO*T15...
C6TLA15M080R04L110	70	80	4	20	110	86.2	63	3.17	with	TO*T15...

Applicable for 7 MPa coolant

SPARE PARTS

Designation	Clamping screw	Torx bit	Grip
C6TLA15M0**R0*L1**	TS45120I	BT20S	H-TB2W

*Recommended clamping torque (N·m): TS45120I = 5

Caution for using NMJ chipbreaker

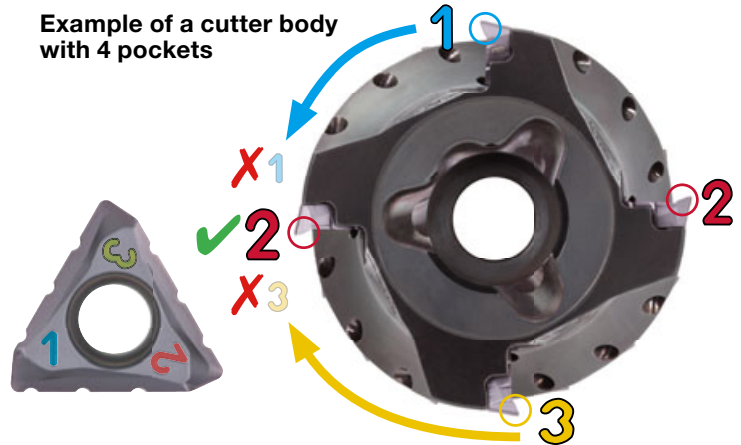


Insert with NMJ chipbreaker has a number marked on each corner.
DO NOT place the corners with the same number in adjacent flute as the cutter may be damaged.

For example, if you place the corner #1 in one flute, be sure to use #2 or #3 (and avoid #1) in the next one.

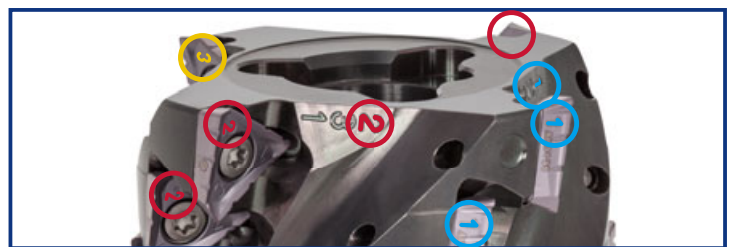
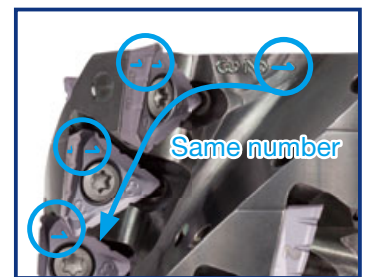
Item: TOMT150608PDER-NMJ

Example of a cutter body with 4 pockets



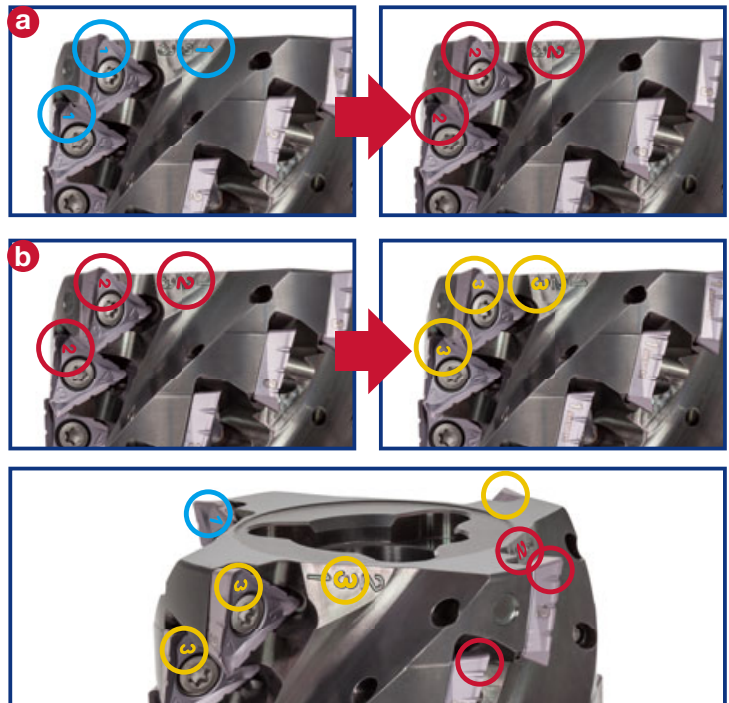
Directions for setting NMJ inserts on roughing type bodies

- 1 Attach the insert on the cutter body so that the number on the working cutting edge matches the first number marked on the cutter body.
(See the image on the right.)
- 2 Attach the remaining inserts on the same flute with the same number marked on the working cutting edge.
- 3 Repeat steps 1 and 2 for the other flutes.
- 4 Make sure the number on the working cutting edge is different from the number used on the adjacent flutes.



Directions for changing corners for inserts on roughing type bodies

- 1 **a** First time to change the corner rotate the insert clock-wise to match the number on the working cutting edge with the second number marked on the cutter body.
(See the image on the right.)
Ex: 1 → 2
2 → 3
3 → 1
- b** Second time to change the corner rotate the insert clock-wise to match the number on the working cutting edge with the last number marked on the cutter body.
(See the image on the right.)
Ex: 2 → 3
3 → 1
1 → 2
- 2 Repeat step 1 for all inserts.
- 3 Make sure the number on the working cutting edge is different from the number used on the adjacent flutes.

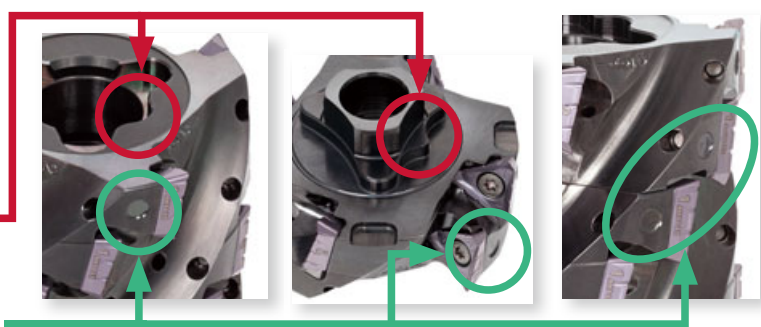


How to set a sub-unit

When setting a sub-unit on the main unit or another sub-unit, be sure to match the markings on the units. Sub-unit has a projection for error-proofing to avoid setting error.

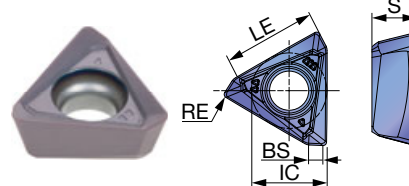
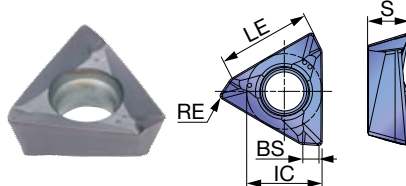
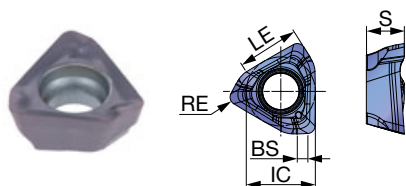
Projection for error-proofing
(Poka-yoke)

Marking



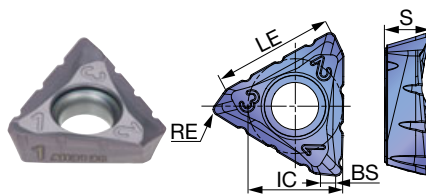
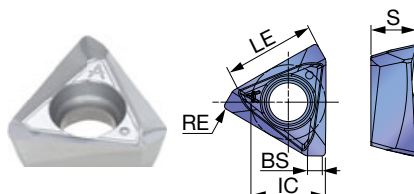
TOMT-MJ

TOET-MJ



TOGT-AJ

TOMT-NMJ

[illegible]

★ : First choice
☆ : Second choice

Insert size	Designation	RE	APMX	Coated						Un-coated					LE	IC	S	BS	
				AH120	AH3135	AH3225	AH8015	T1215	T3225		KS05F								
04	TOMT040204PXER-MM	0.4	3.5	●		●	●									3.6	4	2.2	0.6
	TOMT040208PXER-MM	0.8	3.5	●		●	●									3.6	4	2.2	0.2
06	TOMT060302PDER-MJ	0.2	6	●	●	●										6.2	5.6	3.2	1.4
	TOMT060304PDER-MJ	0.4	6	●	●	●			●							6.2	5.6	3.2	1.2
	TOMT060308PDER-MJ	0.8	6	●	●	●		●	●							6.2	5.6	3.2	0.8
	TOGT060304PDFR-AJ	0.4	6							●						6.2	5.6	3.3	1.2
	TOGT060308PDFR-AJ	0.8	6								●					6.2	5.6	3.3	0.8
	TOET060302PDER-MJ	0.2	6		●	●										6.2	5.6	3.3	1.3
	TOET060304PDER-MJ	0.4	6		●	●										6.2	5.6	3.3	1.1
	TOMT100404PDER-MJ	0.4	10	●	●	●			●							10.5	8.6	4.7	1.5
10	TOMT100408PDER-MJ	0.8	10	●	●	●		●	●							10.5	8.6	4.7	1.1
	TOMT100416PDER-MJ	1.6	10	●	●	●										10.5	8.6	4.7	0.2
	TOGT100404PDFR-AJ	0.4	10							●						10.5	8.6	5.2	1.5
	TOGT100408PDFR-AJ	0.8	10							●						10.5	8.6	5.1	1.1
	TOET100404PDER-MJ	0.4	10		●	●										10.5	8.6	5.1	1.5
	TOET100408PDER-MJ	0.8	10		●	●										10.5	8.6	5.1	1.1
	TOMT150604PDER-MJ	0.4	15	●	●	●			●							15.7	12.7	6	2.2
15	TOMT150608PDER-MJ	0.8	15	●	●	●		●	●							15.7	12.7	6	1.9
	TOMT150616PDER-MJ	1.6	15	●	●	●										15.7	12.7	6	1.1
	TOMT150620PDER-MJ	2	15	●	●	●										15.7	12.7	6	0.7
	TOMT150608PDER-NMJ	0.8	15	●	●	●			●							15.7	12.7	6	1.9
	TOGT150604PDFR-AJ	0.4	15							●						15.7	12.5	5.6	2.1
	TOGT150608PDFR-AJ	0.8	15							●						15.7	12.5	5.5	1.8
	TOET150604PDER-MJ	0.4	15		●	●										15.7	12.5	5.6	2.2
	TOET150608PDER-MJ	0.8	15		●	●										15.7	12.5	5.6	1.9

● : Line up
● : New product

STANDARD CUTTING CONDITIONS

EPA04

ISO	Workpiece materials	Hardness	Grades	Cutting speed Vc (m/min)	Feed per tooth fz (mm/t)	
P	Low carbon steel SS400, S15C , etc. E275A, C15E4, etc.	- 200 HB	AH3225	100 - 250	0.05 - 0.12	
	Carbon steel and alloy steel S55C, SCM440, etc. C55, 42CrMo4, etc.	- 300 HB	AH3225	100 - 230	0.05 - 0.12	
	Prehardened steel NAK80, PX5, etc.	30 - 40 HRC	AH3225	100 - 180	0.05 - 0.1	
M	Stainless steel SUS304, etc. X5CrNi18-9, etc.	-	AH3225	90 - 200	0.05 - 0.1	
K	Grey cast iron FC250, etc. 250, etc., GG25, etc.	150 - 250 HB	AH120	100 - 300	0.05 - 0.12	
	Ductile cast iron FCD450, etc. 450-10S, etc., GGG45, etc.	150 - 250 HB	AH120	100 - 200	0.05 - 0.12	
S	Titanium alloys Ti-6Al-4V, etc.	-	AH3225	20 - 60	0.04 - 0.07	
	Heat-resistant alloys Inconel 718, etc.	-	AH8015	20 - 40	0.04 - 0.07	
H	Hardened steel	SKD61, etc. X40CrMoV5-1, etc.	40 - 50 HRC	AH8015	50 - 150	0.04 - 0.07
		SKD11, etc. X153CrMoV12, etc.	50 - 60 HRC	AH8015	40 - 70	0.04 - 0.07

- Remove excessive chip accumulation with an air blast.
- For an operation when the depth of cut varies (ex. casting skin) or machining of workpiece materials with interrupted surface, the feed per tooth (fz) should be set to the lower recommended value shown in the above table.

- Cutting conditions may be limited depending on machine power, workpiece rigidity, and spindle output. When the cutting width, depth, or overhang length is large, set Vc and fz to the lower recommended values and check the machine power and vibration.

T/E/HPA06, T/E/HPA10, T/EPA15

ISO	Workpiece materials	Hardness	Priority	Chip-breakers	Grades	T/E/HPA06		T/E/HPA10		T/EPA15		
						Cutting speed Vc (m/min)	Feed per tooth fz (mm/t)	Cutting speed Vc (m/min)	Feed per tooth fz (mm/t)	Cutting speed Vc (m/min)	Feed per tooth fz (mm/t)	
											MJ/AJ	NMJ
P	Low carbon steel SS400, S15C, etc. E275A, C15E4, etc.	- 200 HB	First choice	MJ/NMJ	AH3225	100 - 220	0.05 - 0.15	100 - 250	0.08 - 0.2	100 - 300	0.06 - 0.22	0.06 - 0.15
			Wear resistance	MJ/NMJ	T3225	100 - 250	0.08 - 0.1	100 - 300	0.08 - 0.12	100 - 300	0.08 - 0.15	0.08 - 0.15
	Carbon steel and alloy steel S55C, SCM440, etc. C55, 42CrMo4, etc.	- 300 HB	First choice	MJ/NMJ	AH3225	100 - 170	0.05 - 0.12	100 - 250	0.06 - 0.22	100 - 250	0.06 - 0.22	0.06 - 0.15
			Wear resistance	MJ/NMJ	T3225	100 - 250	0.05 - 0.1	100 - 300	0.05 - 0.12	100 - 300	0.05 - 0.15	0.05 - 0.15
	Prehardened steel and tool steel NAK80, PX5, SKD61, etc. X40CrMoV5-1, etc.	30 - 40 HRC	First choice	MJ/NMJ	AH3225	100 - 120	0.05 - 0.12	100 - 200	0.06 - 0.22	100 - 200	0.06 - 0.22	0.06 - 0.15
			Wear resistance	MJ/NMJ	T3225	100 - 250	0.05 - 0.1	100 - 300	0.05 - 0.12	100 - 300	0.05 - 0.15	0.05 - 0.15
M	Stainless steel SUS304, etc. X5CrNi18-9, etc.	-	First choice	MJ/NMJ	AH3135	80 - 150	0.05 - 0.15	80 - 200	0.08 - 0.2	90 - 200	0.08 - 0.2	0.08 - 0.15
			Wear resistance	MJ/NMJ	T3225	90 - 200	0.05 - 0.1	90 - 250	0.05 - 0.12	90 - 250	0.05 - 0.15	0.05 - 0.15
K	Grey cast iron FC250, etc. 250, etc. GG25, etc.	150 - 250 HB	First choice	MJ/NMJ	AH120	100 - 200	0.05 - 0.15	100 - 250	0.05 - 0.15	140 - 250	0.08 - 0.25	0.08 - 0.15
			Wear resistance	MJ	T1215	150 - 250	0.05 - 0.12	150 - 300	0.08 - 0.2	200 - 300	0.08 - 0.18	-
	Ductile cast iron FCD450, etc. 450-10S, etc. GGG45, etc.	150 - 250 HB	First choice	MJ/NMJ	AH120	80 - 150	0.05 - 0.15	80 - 200	0.08 - 0.2	110 - 200	0.08 - 0.25	0.08 - 0.15
			Wear resistance	MJ	T1215	100 - 200	0.05 - 0.12	130 - 250	0.05 - 0.15	150 - 250	0.08 - 0.18	-
N	Aluminium Si < 13%	-	First choice	AJ	KS05F	300 - 900	0.08 - 0.22	300 - 1000	0.08 - 0.22	300 - 1000	0.08 - 0.22	-
	Aluminium Si ≥ 13%	-	First choice	AJ	KS05F	100 - 200	0.08 - 0.22	100 - 200	0.08 - 0.22	100 - 200	0.08 - 0.22	-
S	Titanium alloys Ti-6Al-4V, etc.	-	First choice	MJ/NMJ	AH3135	20 - 50	0.05 - 0.1	20 - 60	0.05 - 0.1	20 - 60	0.08 - 0.15	0.08 - 0.15
	Heat-resistant alloys Inconel 718, etc.	-	First choice	MJ/NMJ	AH120	20 - 35	0.03 - 0.08	20 - 40	0.05 - 0.13	20 - 40	0.07 - 0.15	0.07 - 0.15

- When you use the NMJ chipbreaker, please set up the feed less than 0.15 mm/t.
- Remove excessive chip accumulation with an air blast.
- For an operation when the depth of cut varies (ex. casting skin) or machining of workpiece materials with interrupted surface, the feed per tooth (fz) should be set to the lower recommended value shown in the above table.

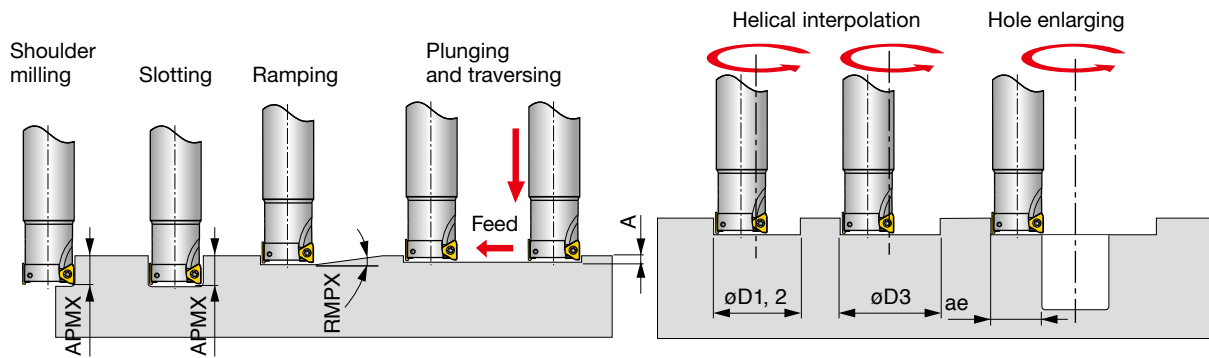
- Cutting conditions may be limited depending on machine power, workpiece rigidity, and spindle output. When the cutting width, depth, or overhang length is large, set Vc and fz to the lower recommended values and check the machine power and vibration.

TLA (Roughing type)

ISO	Workpiece materials	Hardness	Priority	Chip-breakers	Grades	TLA10		TLA15		
						Cutting speed Vc (m/min)	Feed per tooth fz (mm/t)	Cutting speed Vc (m/min)	Feed per tooth fz (mm/t)	
									MJ/AJ	NMJ
P	Low carbon steel SS400, S15C, etc. E275A, C15E4, etc.	- 200 HB	First choice	MJ/NMJ	AH3225	100 - 250	0.08 - 0.2	100 - 300	0.06 - 0.22	0.06 - 0.15
			Wear resistance	MJ/NMJ	T3225	100 - 300	0.08 - 0.12	100 - 300	0.08 - 0.15	0.08 - 0.15
	Carbon steel and alloy steel S55C, SCM440, etc. C55, 42CrMo4, etc.	- 300 HB	First choice	MJ/NMJ	AH3225	100 - 250	0.06 - 0.22	100 - 250	0.06 - 0.22	0.06 - 0.15
			Wear resistance	MJ/NMJ	T3225	100 - 300	0.05 - 0.12	100 - 300	0.05 - 0.15	0.05 - 0.15
	Prehardened steel and tool steel NAK80, PX5, SKD61, etc. X40CrMoV5-1, etc.	30 - 40 HRC	First choice	MJ/NMJ	AH3225	100 - 200	0.06 - 0.22	100 - 200	0.06 - 0.22	0.06 - 0.15
			Wear resistance	MJ/NMJ	T3225	100 - 300	0.05 - 0.12	100 - 300	0.05 - 0.15	0.05 - 0.15
M	Stainless steel SUS304, etc. X5CrNi18-9, etc.	-	First choice	MJ/NMJ	AH3135	80 - 200	0.08 - 0.2	90 - 200	0.08 - 0.2	0.08 - 0.15
			Wear resistance	MJ/NMJ	T3225	90 - 250	0.05 - 0.12	90 - 250	0.05 - 0.15	0.05 - 0.15
K	Grey cast iron FC250, etc. 250, etc. GG25, etc.	150 - 250 HB	First choice	MJ/NMJ	AH120	100 - 250	0.05 - 0.15	140 - 250	0.08 - 0.25	0.08 - 0.15
			Wear resistance	MJ	T1215	150 - 300	0.08 - 0.2	200 - 300	0.08 - 0.18	-
	Ductile cast iron FCD450, etc. 450-10S, etc. GGG45, etc.	150 - 250 HB	First choice	MJ/NMJ	AH120	80 - 200	0.08 - 0.2	110 - 200	0.08 - 0.25	0.08 - 0.15
			Wear resistance	MJ	T1215	130 - 250	0.05 - 0.15	150 - 250	0.08 - 0.18	-
N	Aluminium Si < 13%	-	First choice	AJ	KS05F	300 - 1000	0.08 - 0.22	300 - 1000	0.08 - 0.22	-
	Aluminium Si ≥ 13%	-	First choice	AJ	KS05F	100 - 200	0.08 - 0.22	100 - 200	0.08 - 0.22	-
S	Titanium alloys Ti-6Al-4V, etc.	-	First choice	MJ/NMJ	AH3135	20 - 60	0.05 - 0.1	20 - 60	0.08 - 0.15	0.08 - 0.15
	Heat-resistant alloys Inconel 718, etc.	-	First choice	MJ/NMJ	AH120	20 - 40	0.05 - 0.13	20 - 40	0.07 - 0.15	0.07 - 0.15

· When using NMJ chipbreaker, please set up the feed not to exceed 0.15 mm/t.

APPLICATION RANGE

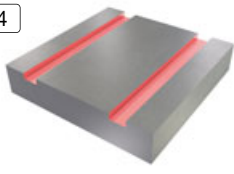
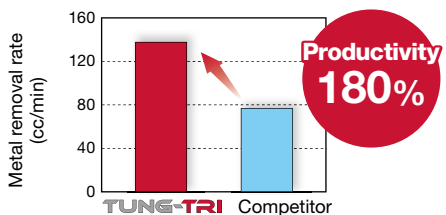
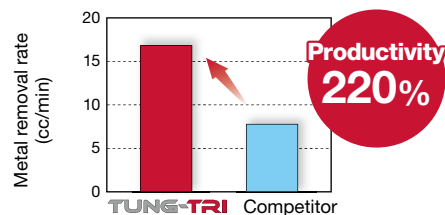
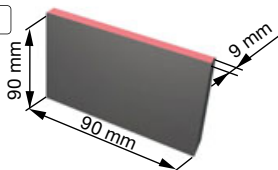
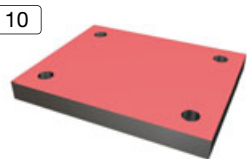
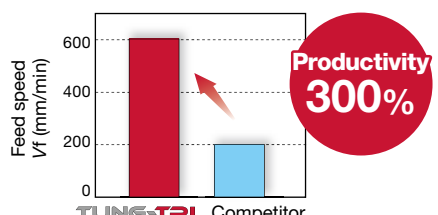
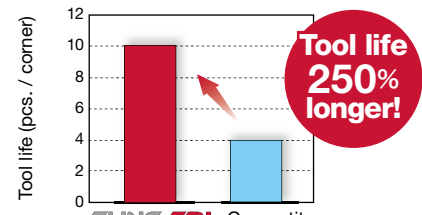


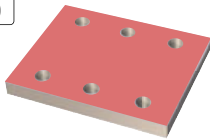
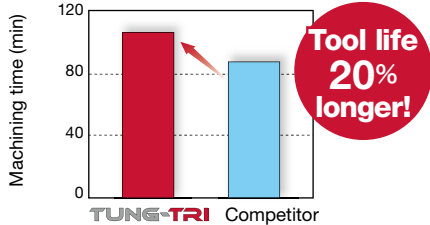
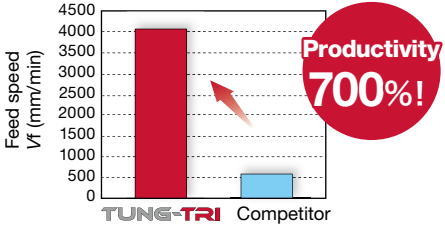
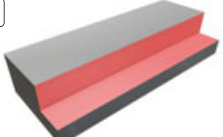
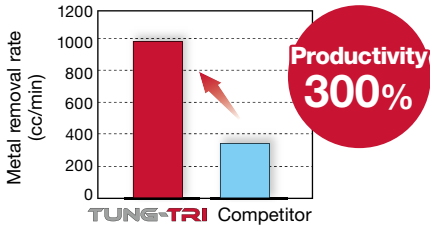
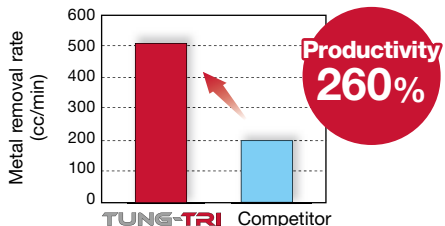
Designation	DC	Max. depth of cut APMX	Max. ramping angle RMPX	Max. plunging depth A	Min. machining diameter øD1	Max. machining diameter øD2	Max. machining diameter øD3 *	Max. cutting width in enlarging ae
EPA04R008...	8	3.5	0.3°	0.02	12.8	15.6	13.6	7.5
EPA04R010...	10	3.5	0.2°	0.02	16.8	19.6	17.6	9.5
EPA04R012...	12	3.5	0.15°	0.02	20.8	23.6	21.6	11.5
EPA04R016...	16	3.5	0.1°	0.02	28.8	31.6	29.6	15.5
EPA04R020...	20	3.5	0.1°	0.02	36.8	39.6	37.6	19.5
EPA04R025...	25	3.5	0.1°	0.02	46.8	49.6	47.6	24.5
EPA06R012...	12	6	5°	0.6	18	23.6	21	11.5
E/HPA06R016...	16	6	4.3°	0.6	25	31.6	29	15.5
EPA06R018...	18	6	3.5°	0.6	29.5	35.6	33	17.5
E/HPA06R020...	20	6	2.8°	0.6	33.5	39.6	37	19.5
EPA06R022...	22	6	2.5°	0.6	37.5	43.6	41	21.5
E/HPA06R025...	25	6	2°	0.6	43.5	49.6	47	24.5
E/HPA10R025...	25	10	2°	0.6	42.1	49.6	47	24.5
EPA06R028...	28	6	1.8°	0.6	49.5	55.6	53	27.5
EPA10R028...	28	10	2°	0.6	48.1	55.6	53	27.5
T/HPA06R032...	32	6	1.5°	0.6	57.5	63.6	61	31.5
E/HPA10R032...	32	10	2°	0.6	56.1	63.6	61	31.5
EPA10R035...	35	10	1.7°	0.6	62.1	69.6	67	34.5
TPA06R040...	40	6	1°	0.6	73.5	79.6	77	39.5
T/EPA10R040...	40	10	1.4°	0.6	72.1	79.6	77	39.5
EPA15R040...	40	15	2.3°	0.8	68.5	79.2	75.5	39
TPA06R050...	50	6	0.7°	0.6	94	99.6	97	49.5
TPA10R050...	50	10	0.9°	0.6	92.1	99.6	97	49.5
T/EPA15R050...	50	15	1.7°	0.8	88.5	99.2	95.5	49
TPA10R063...	63	10	0.8°	0.6	118.1	125.6	123	62.5
TPA15R063...	63	15	1.4°	0.8	114.5	125.2	121.5	62
TPA10R080...	80	10	0.6°	0.6	152.1	159.6	157	79.5
TPA15R080...	80	15	1°	0.8	148.5	159.2	155.5	79
TPA10R100...	100	10	0.5°	0.6	192.1	199.6	197	99.5
TPA15R100...	100	15	0.8°	0.8	188.5	199.2	195.5	99
TPA15R125...	125	15	0.6°	0.8	238.5	249.2	245.5	124
TPA15R160...	160	15	0.5°	0.8	308.5	319.2	315.5	159

* Flat bottom hole

Note: Corner RE for dimensions of øD1, øD2 and øD3: RE = 0.4 for EPA04, T/E/HPA06, T/E/HPA10 and RE = 0.8 for T/EPA15.

PRACTICAL EXAMPLES

Workpiece type		Rotator shaft	Machine part
Cutter		EPA04R025M25.0-06 ($\phi 25$ mm, $z = 6$)	EPA04R010M10.0-02 ($\phi 10$ mm, $z = 2$)
Insert		TOMT040204PXER-MM	TOMT040204PXER-MM
Grade		AH3225	AH3225
Workpiece material		SNCM439 / 40CrNiMoA	S50C / C50
		Insert size 04  P	Insert size 04  P
Cutting conditions	Cutting speed: V_c (m/min)	200	110
	Feed per tooth: f_z (mm/t)	0.12	0.12
	Feed speed: V_f (mm/min)	1833	840
	Depth of cut : a_p (mm)	3	2
	Width of cut : a_e (mm)	25	10
	Machining	Slotting	Slotting
	Coolant	Air blast	Air blast
	Overhang length (mm)	35	30
Machine		Vertical M/C, BT50	Vertical M/C, BT30
Results		 Thanks to the close pitch cutter design and large axial rake, Tung-Tri offered high productivity, while eliminating chip packing.	 Tung-Tri's large axial rake enabled smooth entry to the cut and greater depth of cut without generating chatter.
Workpiece type		Plate	Block
Cutter		EPA06R020M20.0-03N ($\phi 20$ mm, $z = 3$)	TPA10R063M22.0E06 ($\phi 63$ mm, $z = 6$)
Insert		TOMT060304PDER-MJ	TOMT100408PDER-MJ
Grade		AH3135	T1215
Workpiece material		SUS304 / X5CrNi18-9	FCD700
		Insert size 06  M	Insert size 10  K
Cutting conditions	Cutting speed: V_c (m/min)	125	196
	Feed per tooth: f_z (mm/t)	0.083	0.15
	Feed speed: V_f (mm/min)	600	900
	Depth of cut : a_p (mm)	1.5	2.5
	Width of cut : a_e (mm)	9	54.5
	Machining	Face milling	Face milling
	Coolant	Dry	Dry
	Machine	BT40	BT40
Results		 Unique cutting edge geometry delivered low cutting forces and eliminated chatter, enabling highly efficient machining of thin steel plate.	 T1215 exhibited superior wear resistance, extending the tool life by over 250%.

Workpiece type		Blank	Machine part
Cutter		EPA10R040M32.0-04N (ø40 mm, z = 4)	EPA10R025M25.0-02N (ø25 mm, z = 2)
Insert		TOMT100408PDER-MJ	TOGT100408PDER-AJ
Grade		AH3135	KS05F
Workpiece material		Titanium	AC4B
		Insert size 10  	Insert size 10  
Cutting conditions	Cutting speed: Vc (m/min)	55	457
	Feed per tooth: fz (mm/t)	0.1	0.3
	Feed speed: Vf (mm/min)	175	4072
	Depth of cut : ap (mm)	2.5	1.27
	Width of cut : ae (mm)	25	-
	Machining	Face milling	Face milling
	Coolant	Wet (External coolant)	Wet (External coolant)
Machine		Vertical M/C, BT50	Vertical M/C, BT40
Results		 Sharp cutting edge prevented chip welding, extending tool life by 20%.	 AJ chipbreaker exhibited high fracture resistance even in a demanding cutting condition.
Workpiece type		Molding machine part	Generator
Cutter		TLA15R080L070M31.7-04M (ø80 mm) TLA15R080L028-04S	TLA15R100L083M38.1-05M (ø100 mm, z = 5)
Insert		TOMT150608PDER-MJ	TOMT150608PDER-NMJ
Grade		AH120	AH3135
Workpiece material		FCD400 / 400-15S	S45C / C45
		Insert size 15  	Insert size 15  
Cutting conditions	Cutting speed: Vc (m/min)	180	160
	Feed per tooth: fz (mm/t)	0.2	0.16
	Feed speed: Vf (mm/min)	573.0	407
	Depth of cut : ap (mm)	74	50
	Width of cut : ae (mm)	24	25
	Machining	Contouring	Shoulder milling (Roughing)
	Coolant	Dry	Wet (External coolant)
Machine		Vertical M/C, BT50	Vertical M/C, BT50
Results		 MJ insert provided reduced cutting forces and dramatic improvement of machining efficiency.	 The serrated cutting edges of the NMJ chipbreaker significantly reduced vibration, while outputting a high MMR.

FIXED TORQUE WRENCH

Achieves high cutting edge precision thanks to uniform clamping force

Easy setting

Handle

Multi-component handle optimally designed for the hand enables ideal power transmission.



Mechanism

Driver clicks to alert the operator when the preset torque is attained. IDs printed on the handle end allow easy identification of the driver specs. Driver has unlimited loosening torque. Driver mechanism is industrial-lubricant-resistant.

High repeatability & robustness

Robustness / Fitting

Wiha ChromTop® finish on tip for a perfect fit every time. Durability thanks to high quality chrome-vanadium-molybdenum steel, through hardened, chrome-plated.

Versatility

Extra slim blade geometry is particularly suitable for applications with confined narrow access.

Dark green: TORX

Light green: TORX PLUS



Handle

Ex)

TW - D - 0.6NM

1

2

3

1 Torque Wrench

2 Driver type

3 Torque



Designation	Stock	Torque (N-m)	Accuracy (%)	øD	L
TW-D-0.6NM	●	0.6	10	34	130
TW-D-0.9NM	●	0.9	10	34	130
TW-D-1.1NM	●	1.1	10	34	130
TW-D-1.4NM	●	1.4	10	34	130
TW-D-2.5NM	●	2.5	10	34	130
TW-D-3.0NM	●	3.0	10	34	130
TW-D-3.5NM	●	3.5	10	34	130

1 piece per package

Blade

Ex)

TW - B - T6

1

2

3

1 Torque Wrench

2 Blade

3 TORX geom.

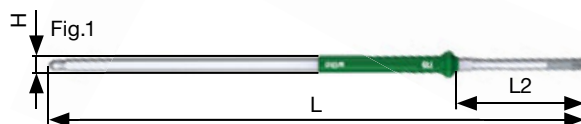


Fig.2



Designation	Stock	TORX geom.	H	L	L2	Fig.
TW-B-T6	●	T6	4	175	42	1
TW-B-T7	●	T7	4	175	42	1
TW-B-T8	●	T8	4	175	42	1
TW-B-T9	●	T9	4	175	42	1
TW-B-T10	●	T10	4	175	42	1
TW-B-T15	●	T15	4	175	42	1
TW-B-6IP	●	6IP	4	175	42	2
TW-B-7IP	●	7IP	4	175	42	2
TW-B-8IP	●	8IP	4	175	42	2
TW-B-10IP	●	10IP	4	175	42	2
TW-B-15IP	●	15IP	4	175	42	2

1 piece per package

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