Tungaloy
Member IMC Group

Keeping the Customer First

Tungaloy Report No. 380-G2

MILLLINE Shoulder milling cutter

TUNGREC

TPO / EPO, TPS / EPS / TLS / ELS type

Extended version with Roughing type

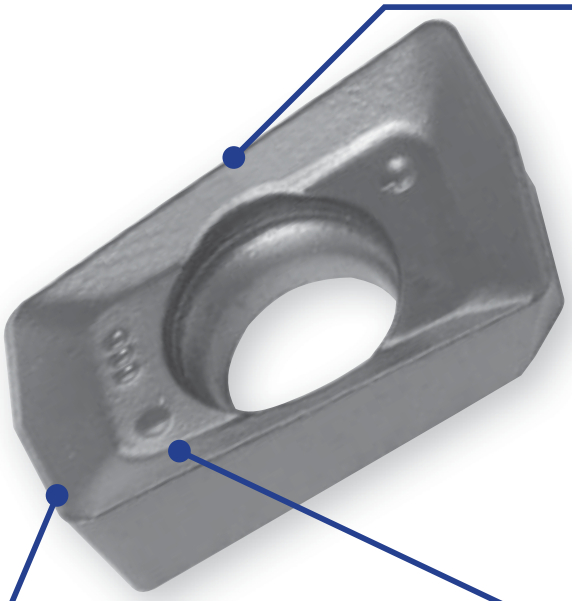
New multi purpose high precision cutter

Highly productive semi fi
with high accuracy 90 de

Helical cutting edges and high axial rake

Features

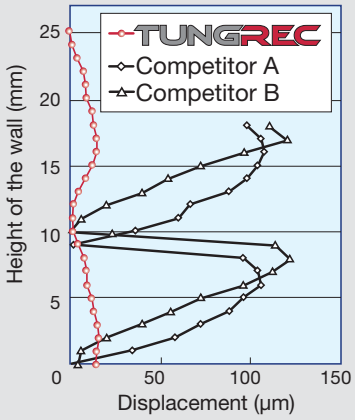
High performance inserts

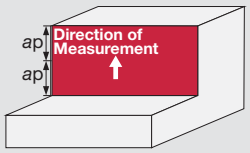


Helical cutting edges

Excellent wall straightness!

■ Comparison of straightness





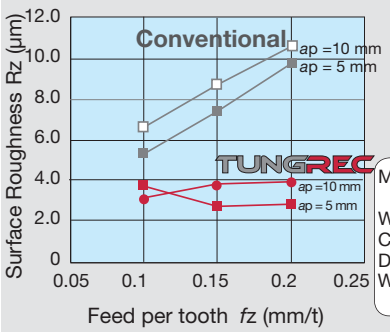
ap = 14 mm / pass

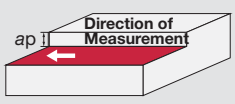
Milling cutter : EPO18R025M25.0-02 (ø25, z = 2)
Work material : S55C / C55
Cutting speed : *Vc* = 150 m/min
Feed per tooth : *fz* = 0.1 mm/t
Depth of cut : *ap* = 14 mm x 2 passes
Width of cut : *ae* = 5 mm

Wiper edges

Excellent surface finish!

■ Comparison of surface roughness



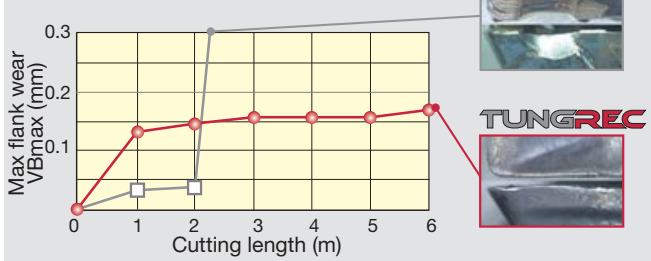


Milling cutter : EPO18R025M25.0-02 (ø25, z = 2)
Work material : S55C / C55
Cutting speed : *Vc* = 150 m/min
Depth of cut : *ap* = 5 mm / 10 mm
Width of cut : *ae* = 20 mm

Optimized rake angle

Provides sharpness and reliability!

■ Comparison of tool life



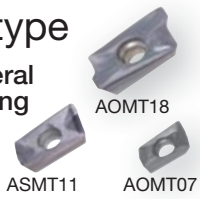
Milling cutter : EPO18R025M25.0-02 (ø25, z = 2, only one insert used)
Grade : AH140
Work material : SUS304 / X5CrNi18-9
Cutting speed : *Vc* = 150 m/min
Feed per tooth : *fz* = 0.15 mm/t
Depth of cut : *ap* = 5 mm
Width of cut : *ae* = 10 mm

nish milling cutter
gree shoulders
angles provide free cutting.

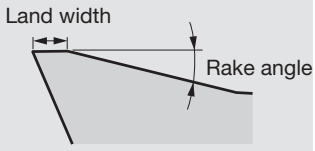
Chipbreakers

4 types of chipbreaker cater for a wide range of applications

MJ type
for general machining

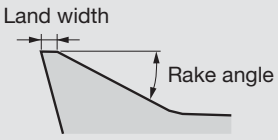


P Steel, M Stainless, K Cast Iron, S Superalloys

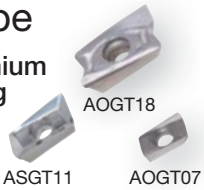


MS type
for stainless steel machining

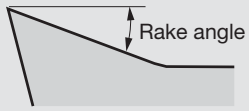
M Stainless, S Superalloys



AJ type
for aluminium machining

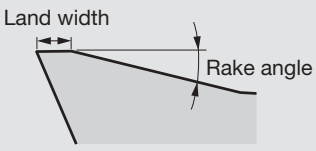


N Non-ferrous



HJ type
for high feed machining

P Steel, M Stainless, K Cast Iron, S Superalloys



High performance cutter bodies

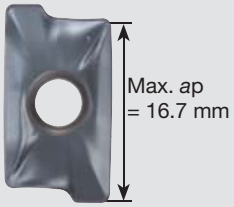
Air holes ➧ For improved chip evacuation!

Coarse pitch, close pitch and long shank cutters available!

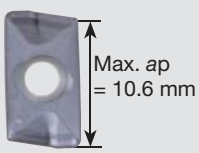
➧ Choose the optimum cutter body for your application!

■ Max. depth of cut: *ap* / with MJ chipbreaker

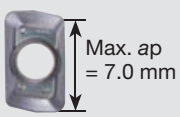
AOMT18



ASMT11



AOMT07

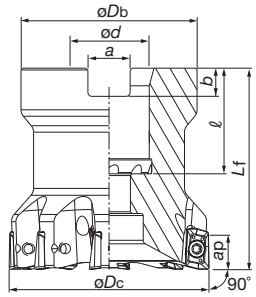


Coarse pitch — 3 inserts

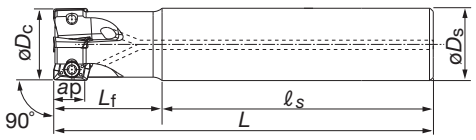
Close pitch — 7 inserts

Milling cutter TPO07 / EPO07

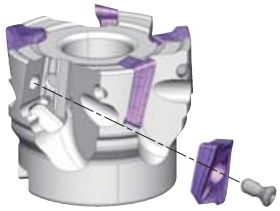
Bore type



Shank type



MJ chipbreaker: Max. *ap* = 7 mm
AJ chipbreaker: Max. *ap* = 6.4 mm
HJ chipbreaker: Max. *ap* = 0.8 mm



Description	Cat. No.
Wrench	**T-7DB**

Bore type JIS / ISO

Cat. No.	Stock	No. of inserts	Dimensions (mm)							Weight (kg)	Air hole	Centre bolt	Clamping screw	Inserts
			*øDc	øDb	ød	ℓ	**Lf	b	a					
TPO07R032M16.0E08	●	8	32	30	16	21	40	5.6	8.4	0.1	with	CM8x30H	CSTB-2.5L046	AOMT0702... AOGT0702...
TPO07R040M16.0E10	●	10	40	35	16	21	40	5.6	8.4	0.2	with	CM8x30H		
TPO07R050M22.0E12	●	12	50	41	22	22	40	6.3	10.4	0.3	with	CM10x30H		

Shank type JIS / ISO

Type	Cat. No.	Stock	No. of inserts	Dimensions (mm)					Weight (kg)	Air hole	Clamping Screw	Inserts
				*øDc	øDs	ℓ s	**Lf	**L				
Coarse pitch	**EPO07R016M12.0-02**	●	2	16	12	50	20	70	0.1	with	CSTB-2.5L046	AOMT0702... AOGT0702...
	EPO07R020M16.0-03	●	3	20	16	60	30	90	0.1	with		
	EPO07R025M20.0-03	●	3	25	20	60	35	95	0.3	with		
Close pitch	**EPO07R012M12.0-02**	●	2	12	12	50	18	68	0.1	with		
	EPO07R016M16.0-04	●	4	16	16	60	24	84	0.1	with		
	EPO07R018M16.0-04	●	4	18	16	60	24	84	0.1	with		
	EPO07R020M20.0-05	●	5	20	20	70	30	100	0.2	with		
	EPO07R022M20.0-05	●	5	22	20	70	30	100	0.2	with		
	EPO07R025M25.0-07	●	7	25	25	80	35	115	0.4	with		
	EPO07R028M25.0-07	●	7	28	25	80	35	115	0.4	with		
Long shank	**EPO07R012M12.0-02L**	●	2	12	12	95	30	125	0.1	with		
	EPO07R016M16.0-02L	●	2	16	16	105	40	145	0.2	with		
	EPO07R018M16.0-02L	●	2	18	16	105	40	145	0.2	with		
	EPO07R020M20.0-03L	●	3	20	20	135	50	185	0.4	with		
	EPO07R022M20.0-03L	●	3	22	20	135	50	185	0.4	with		
	EPO07R025M25.0-03L	●	3	25	25	150	70	220	0.7	with		
	EPO07R028M25.0-03L	●	3	28	25	150	70	220	0.7	with		

*The *øDc* in the above table shows the diameter when MJ and AJ chipbreakers are used. When HJ chipbreaker is used, the tool diameter is equal to the above shown *øDc* + 0.6 mm.

**The *Lf* and *L* in the above table show the lengths when MJ chipbreaker is used. When AJ chipbreaker is used, the lengths are equal to *Lf*, *L* + 0.1 mm. When HJ chipbreaker is used, the lengths are equal to *Lf*, *L* + 0.5 mm.

Inserts TPO07 / EPO07

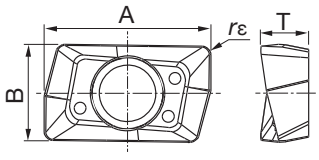


Fig. 1 **MJ**

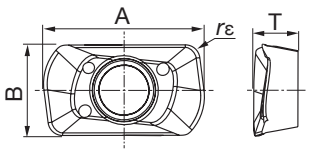


Fig. 2 **HJ**

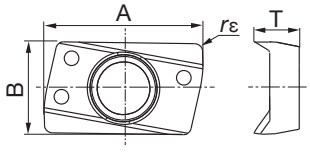


Fig. 3 **AJ**

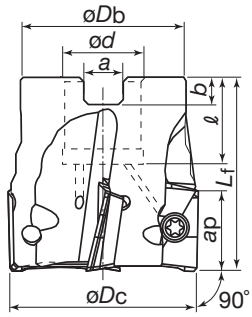
JIS / ISO

Cat. No.	Accuracy	Honing	Grades			Dimensions (mm)				Shape	Cutter
			Coated		Carbide						
			AH725	**AH140**	**KS15F**	A	B	T	rε		
AOMT070202PDPR-MJ	M	with	●	●		8.0	4.7	2.3	0.2	Fig. 1	EPO07R TPO07R
AOMT070204PDPR-MJ	M	with	●	●		8.0	4.7	2.3	0.4	Fig. 1	
AOMT070208PDPR-MJ	M	with	●	●		8.0	4.7	2.3	0.8	Fig. 1	
AOMT070216PDPR-MJ	M	with	●	●		8.0	4.7	2.3	1.6	Fig. 1	
AOMT070208PDPR-HJ	M	with	●	●		8.8	4.9	2.4	0.8	Fig. 2	
AOGT070204PDFR-AJ	G	without			●	8.1	4.7	2.3	0.4	Fig. 3	

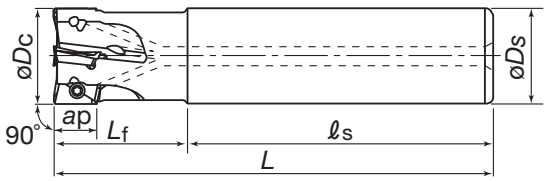
● : Stocked items

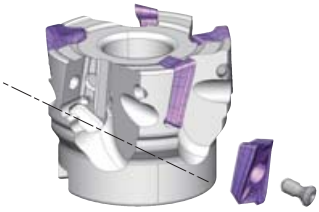
Milling cutter TPS11 / EPS11 / TLS11 / ELS11

Bore type



Shank type





Max. *ap* = 10.6 mm

Description	Cat. No.
Wrench	**IP-8D**

Bore type JIS

Cat. No.	Stock	No. of inserts	Dimensions (mm)							Weight (kg)	Air hole	Centre bolt	Clamping screw	Inserts
			øDc	*øDb*	*ød*	*ℓ*	*Lf*	*b*	*a*					
TPS11040RB	●	6	40	35	16	18	40	5.6	8.2	0.2	with	CM8X30H	CSPB-2.5	ASMT11T3... ASGT11T3...
TPS11050RB	●	7	50	41	22	20	40	6	10	0.4	with	CM10X30H		
TPS11063RB	●	8	63	41	22	20	40	6	10	0.6	with			
TPS11080RB	●	10	80	58	25.4	26	50	6	9.5	1.2	with	CM12X30H		
TPS11100RB	●	11	100	70	31.75	32	63	8	12.7	2.4	with	CM16X40H		

ISO

Cat. No.	Stock	No. of inserts	Dimensions (mm)							Weight (kg)	Air hole	Centre bolt	Clamping screw	Inserts
			øDc	*øDb*	*ød*	*ℓ*	*Lf*	*b*	*a*					
TPS11040RB-E	●	6	40	35	16	19	40	5.6	8.4	0.2	without	CM8X30	CSPB-2.5	ASMT11T3... ASGT11T3...
TPS11050RB-E	●	7	50	41	22	20	40	6.3	10.4	0.4	without	CM10X30		
TPS11063RB-E	●	8	63	41	22	20	45	6.3	10.4	0.6	without			

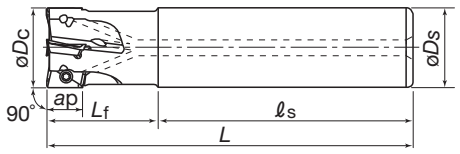
Shank type JIS / ISO

Type	Cat. No.	Stock	No. of inserts	Dimensions (mm)					Weight (kg)	Air hole	Clamping Screw	Inserts
				øDc	*øDs*	*ℓ s*	*Lf*	*L*				
Coarse pitch	**EPS11012RS**	●	1	12	16	60	25	85	0.1	with	CSPB-2.5S	ASMT11T3... ASGT11T3...
	EPS11016RS	●	2	16					0.1	with		
	EPS11018RS	●	2	18					0.1	with		
	EPS11020RS	●	2	20	20	70	30	100	0.2	with		
	EPS11021RS	●	2	21					0.2	with		
	EPS11025RS	●	3	25	25	80	35	115	0.4	with	CSPB-2.5	
	EPS11026RS	●	3	26					0.4	with		
	EPS11030RS	●	3	30					0.4	with		
	EPS11032RS	●	3	32	32		40	120	0.7	with		
	EPS11033RS	●	3	33					0.7	with		
	EPS11040RS	●	4	40					0.8	with		
	EPS11050RS	●	5	50					1.0	with		
Close pitch	**EPS11020RSB**	●	3	20	20	70	30	100	0.2	with	CSPB-2.5S	
	EPS11021RSB	●	3	21					0.2	with		
	EPS11025RSB	●	4	25	25	80	35	115	0.4	with	CSPB-2.5	
	EPS11026RSB	●	4	26					0.4	with		
	EPS11030RSB	●	4	30					0.4	with		
	EPS11032RSB	●	5	32	32	80	40	120	0.7	with		
	EPS11033RSB	●	5	33					0.7	with		
	EPS11040RSB	●	6	40					0.8	with		
	EPS11050RSB	●	7	50					1.0	with		

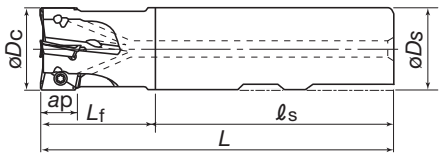
● : Stocked items

Shank type

Cylindrical



Weldon



Max. *ap* = 10.6 mm

Shank type JIS / ISO

Type	Cat. No.	Stock	No. of inserts	Dimensions (mm)					Weight (kg)	Air hole	Clamping Screw	Inserts
				*ø*Dc	*ø*Ds	ℓ s	*L*f	*L*				
Long shank	**EPS11012RL**	●	1	12	16	95	30	125	0.2	with	CSPB-2.5S	ASMT11T3... ASGT11T3...
	EPS11016RL	●	2	16		105	40	145	0.2	with		
	EPS11018RL	●	2	18					0.2	with		
	EPS11020RL	●	2	20	20	135	50	185	0.4	with		
	EPS11021RL	●	2	21					0.4	with		
	EPS11025RL	●	2	25	25	150	70	220	0.8	with	CSPB-2.5	
	EPS11026RL	●	2	26					0.8	with		
	EPS11030RL	●	2	30					0.9	with		
	EPS11032RL	●	2	32	32	175	80	255	1.5	with		
	EPS11033RL	●	2	33					1.5	with		
	EPS11040RL	●	2	40		205	50		1.6	with		
	EPS11040RLS42	●	2	40	42	210	100	310	3.0	with		
	EPS11050RL	●	3	50		310	50	360	3.9	with		
For BT30 taper MC	**EPS11025RSS20**	●	2	25	20	60	35	95	0.2	with	CSPB-2.5	ASMT11T3... ASGT11T3...
	EPS11030RSS20	●	2	30					0.3	with		
	EPS11032RSS20	●	2	32					0.3	with		
	EPS11040RSS20	●	3	40					0.4	with		
	EPS11050RSS20	●	3	50					0.5	with		

Shank type EPS11 ISO

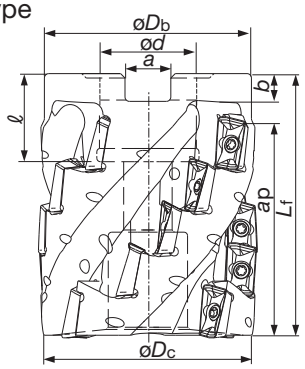
Type		Cat. No.	Stock	No. of inserts	Dimensions (mm)					Weight (kg)	Air hole	Clamping Screw	Inserts
					*ø*Dc	*ø*Ds	ℓ s	*L*f	*L*				
Weldon	Coarse pitch	**EPS11012RS-E**	●	1	12	16	55	25	80	0.1	with	CSPB-2.5S	ASMT11T3... ASGT11T3...
		EPS11016RS-E	●	2	16		60		85	0.1	with		
	Close pitch	**EPS11020RSB-E**	●	3	20	20		30	90	0.2	with		
		EPS11025RSB-E	●	4	25	25		35	95	0.4	with	CSPB-2.5	
		EPS11032RSB-E	●	5	32	32	70	40	110	0.7	with		

● : Stocked items

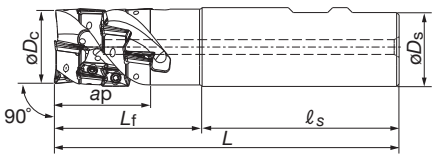
Roughing type TLS11 / ELS11

NEW

Bore type



Shank type



Descriptions	Cat. No.	
Applicable cutter	TLS11R...	ELS11R...
Clamping screw	**CSPB-2.5**	
Wrench	**IP-8D**	
Centre bolt	**CM10X40H**	-

Bore type JIS / ISO

Cat. No.	Stock	No. of eff. edge lines / inserts	Dimensions (mm)								Weight (kg)	Air hole	Inserts
			øDc	øDb	ød	ℓ	Lf	b	a	Max. ap			
NEW **TLS11R050M22.0E04**	★	4/20	50	47	22	20	60	6.3	10.4	48.8	0.5	with	ASMT11T3..., ASGT11T3...

Shank type JIS / ISO

Cat. No.	Stock	No. of eff. edge lines / inserts	Dimensions (mm)						Weight (kg)	Air hole	Inserts
			øDc	øDs	ℓ s	Lf	L	Max. ap			
NEW **ELS11R025M25.0W02**	★	2/6	25	25	80	40	120	30.4	0.4	with	ASMT11T3... ASGT11T3...
NEW **ELS11R032M32.0W03**	●	3/12	32	32	80	60	140	39.4	0.8	with	
NEW **ELS11R040M42.0W03**	●	3/12	40	42	90	60	150	40	1.4	with	

Inserts TPS11 / EPS11 /TLS11 / ELS11

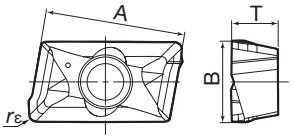


Fig. 4 **MJ**

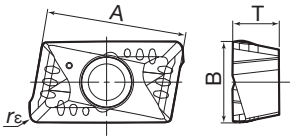


Fig. 5 **MS**

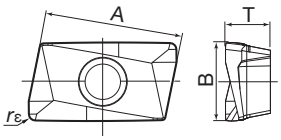


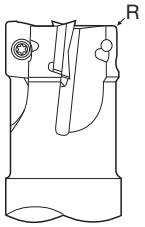
Fig. 6 **AJ**

JIS / ISO

Cat. No.	Accuracy	Honing	Grades									Dimensions (mm)				Shape	Cutter
			Coated						DLC coated	Cermet	Uncoated						
			AH725	AH120	AH130	AH140	T3130	T1115	DS1100	NS740	KS05F	A	B	T	rε		
ASMT11T304PDPR-MJ	M	with	●	●			●	●		●		11.6	6.7	3.7	0.4	Fig. 4	EPS11R TPS11R ELS11R TLS11R
ASMT11T308PDPR-MJ		with	●	●			●	●		●					0.8	Fig. 4	
ASMT11T312PDPR-MJ		with	●	●			●								1.2	Fig. 4	
ASMT11T316PDPR-MJ		with	●	●			●			●					1.6	Fig. 4	
ASMT11T320PDPR-MJ		with		●											2.0	Fig. 4	
ASMT11T330PDPR-MJ		with		●											3.0	Fig. 4	
ASMT11T304PDPR-MS		with			●	●									0.4	Fig. 5	
ASGT11T304PDFR-AJ	G	without							●		●				0.4	Fig. 6	
ASGT11T308PDFR-AJ		without							●		●				0.8	Fig. 6	

Cautionary point in modifying cutter bodies

When using inserts with corner radius $r_\varepsilon \geq 2.0$ mm, standard cutter bodies have to be modified "R".
(Only for TPS11, EPS11)

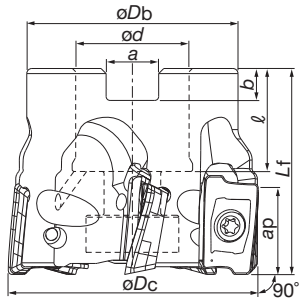


Corner radius r_ε (mm)	The dimension of modifying (mm)
0.4 ~ 1.6	Unnecessary
2.0 ~ 3.2	2

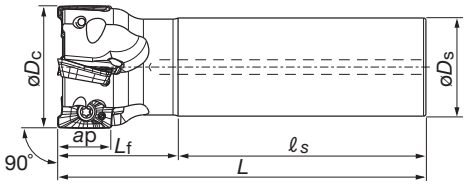
● : Stocked items
★ : Available in 2012

Milling cutter TPO18 / EPO18

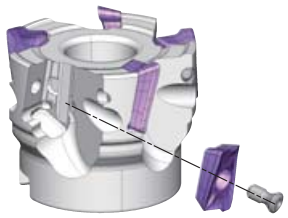
Bore type



Shank type



Max. *ap* = 16.7 mm



Description		Cat. No.	
Applicable cutter		TPO18R...	EPO18R...
Wrench	Torx bit	**BT15M**	-
	Grip	**H-TBS**	-
Mono block type wrench		-	**T-15DB**

Bore type JIS

Cat. No.	Stock	No. of inserts	Dimensions (mm)							Weight (kg)	Air hole	Centre bolt	Clamping screw	Inserts
			*øDc	øDb	ød	ℓ	Lf	b	a					
TPO18R040M16.0-04	●	4	40	35	16	18	40	5.6	8.2	0.2	with	FSHM8-30H	CSTB-4L093	AOMT1805... AOGT1805...
TPO18R050M22.0-05	●	5	50	41	22	20	40	6	10	0.2	with	CM10x30H		
TPO18R063M22.0-06	●	6	63	41	22	20	40	6	10	0.4	with	CM10x30H		
TPO18R080M25.4-07	●	7	80	46	25.4	26	50	6	9.5	0.8	with	CM12x30H	CSTB-4L120	
TPO18R100M31.7-08	●	8	100	60	31.75	32	50	8	12.7	1.2	with	TMBA-M16H		
TPO18R125M38.1-09	●	9	125	80	38.1	38	63	10	15.9	2.8	with	TMBA-M20H		
TPO18R160M50.8-10	●	10	160	100	50.8	46	63	11	19	4.9	without	-		

Bore type ISO

Cat. No.	Stock	No. of inserts	Dimensions (mm)							Weight (kg)	Air hole	Centre bolt	Clamping screw	Inserts
			*øDc	øDb	ød	ℓ	Lf	b	a					
TPO18R040M16.0E04	●	4	40	35	16	18	40	5.6	8.4	0.2	with	FSHM8-30H	CSTB-4L093	AOMT1805... AOGT1805...
TPO18R050M22.0E05	●	5	50	41	22	20	40	6.3	10.4	0.3	with	CM10x30H		
TPO18R063M22.0E06	●	6	63	41	22	20	40	6.3	10.4	0.5	with	CM10x30H		
TPO18R080M27.0E07	●	7	80	50	27	22	50	7	12.4	1.0	with	CM12x30H	CSTB-4L120	
TPO18R100M32.0E08	●	8	100	60	32	28.5	50	8	14.4	1.4	with	TMBA-M16H		
TPO18R125M40.0E09	●	9	125	71	40	32	63	9	16.4	2.8	with	TMBA-M20H		
TPO18R160M40.0E10	●	10	160	100	40	29	63	9	16.4	4.9	without	-		

● : Stocked items

Shank type JIS / ISO

Type	Cat. No.	Stock	No. of inserts	Dimensions (mm) *øDc	øDs	ℓs	Lf	L	Weight (kg)	Air hole	Clamping Screw	Inserts
Coarse pitch	**EPO18R025M25.0-02**	●	2	25	25	80	35	115	0.4	with	CSTB-4L085	AOMT1805... AOGT1805...
	EPO18R028M25.0-02	●	2	28	25	80	35	115	0.4	with		
	EPO18R030M32.0-02	●	2	30	32	80	40	120	0.6	with		
	EPO18R032M32.0-02	●	2	32	32	80	40	120	0.7	with	CSTB-4L093	
	EPO18R035M32.0-02	●	2	35	32	80	40	120	0.7	with		
	EPO18R040M32.0-03	●	3	40	32	80	40	120	0.7	with		
	EPO18R050M32.0-03	●	3	50	32	80	40	120	0.8	with		
	EPO18R063M32.0-04	●	4	63	32	80	45	125	1.0	with	CSTB-4L120	
Close pitch	**EPO18R030M32.0-03**	●	3	30	32	80	40	120	0.6	with	CSTB-4L085	
	EPO18R032M32.0-03	●	3	32	32	80	40	120	0.6	with	CSTB-4L093	
	EPO18R035M32.0-03	●	3	35	32	80	40	120	0.7	with		
	EPO18R040M32.0-04	●	4	40	32	80	40	120	0.7	with		
	EPO18R050M32.0-05	●	5	50	32	80	40	120	0.8	with		
	EPO18R063M32.0-06	●	6	63	32	80	45	125	1.1	with	CSTB-4L120	
Long shank	**EPO18R025M25.0-02L**	●	2	25	25	150	70	220	0.8	with	CSTB-4L085	
	EPO18R028M25.0-02L	●	2	28	25	150	70	220	0.8	with		
	EPO18R030M32.0-02L	●	2	30	32	175	80	255	1.4	with		
	EPO18R032M32.0-02L	●	2	32	32	175	80	255	1.5	with	CSTB-4L093	
	EPO18R035M32.0-02L	●	2	35	32	175	80	255	1.5	with		
	EPO18R040M32.0-02L	●	2	40	32	205	50	255	1.6	with		
	EPO18R040M42.0-02L	●	2	40	42	210	100	310	3.0	with		
	EPO18R050M42.0-03L	●	3	50	42	310	50	360	3.8	with		
	EPO18R063M42.0-03L	●	3	63	42	310	50	360	4.0	with	CSTB-4L120	

* The *øDc* in the above table shows the diameter when MJ chipbreaker is used. When AJ chipbreaker is used, the diameter is equal to the above shown *øDc* + 0.2 mm.

Inserts TPO18 / EPO18

Fig. 7 **MJ**

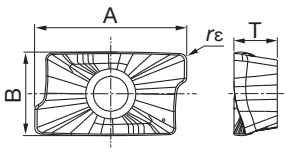
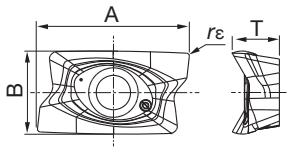


Fig. 8 **AJ**

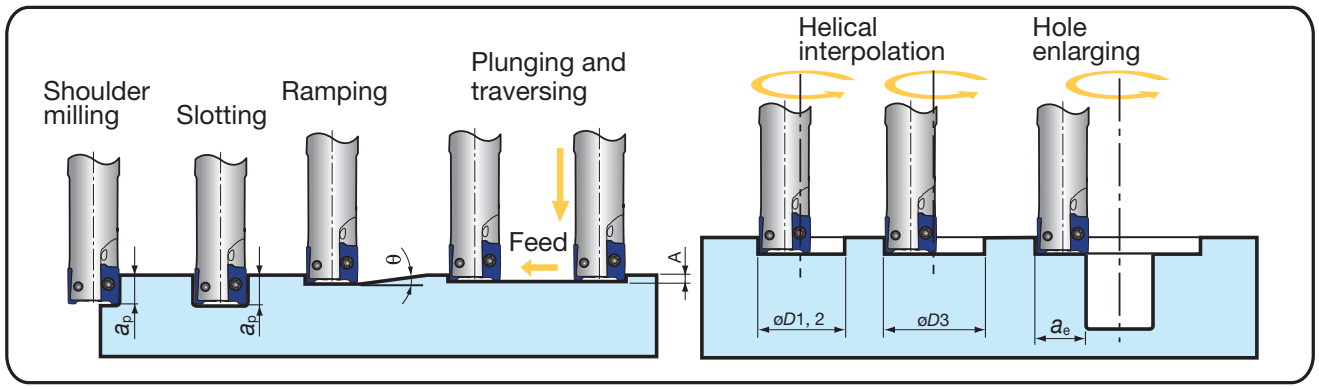


JIS / ISO

Cat. No.	Accuracy	Honing	Grades Coated AH725	Coated AH140	Carbide KS15F	Dimensions (mm) A	B	T	rε	Shape	Cutter
AOMT180508PDPR-MJ	M	with	●	●		19.5	10.7	5.6	0.8	Fig. 7	EPO18R TPO18R
AOMT180516PDPR-MJ	M	with	●	●		19.5	10.7	5.6	1.6	Fig. 7	
AOMT180524PDPR-MJ	M	with	●	●		19.5	10.7	5.6	2.4	Fig. 7	
AOMT180532PDPR-MJ	M	with	●	●		19.5	10.7	5.6	3.2	Fig. 7	
AOGT180504PDFR-AJ	G	without			●	19.8	10.8	6.1	0.4	Fig. 8	
AOGT180508PDFR-AJ	G	without			●	19.8	10.8	6.1	0.8	Fig. 8	

● : Stocked items

Machining applications



Cat. No.	Tool-ø øDc (mm)	Max. depth of cut ap (mm)	Max. ramping angle θ	Max. plunging A (mm)	Min. machining øD1 (mm)	Max. machining øD2 (mm)	*Max. machining øD3 (mm)	Max. cutting width in enlarging ae (mm)
EPO07R012...	ø12	7	8°	0.5	16	23	20.5	11.5
EPO07R016...	ø16	7	5°	0.5	24	31	28.5	15.5
EPO07R018...	ø18	7	4°	0.5	28	35	32.5	17.5
EPO07R020...	ø20	7	3.5°	0.5	32	39	36.5	19.5
EPO07R022...	ø22	7	3°	0.5	36	43	40.5	21.5
EPO07R025...	ø25	7	2.5°	0.5	42	49	46.5	24.5
EPO07R028...	ø28	7	2°	0.5	48	55	52.5	27.5
TPO07R032M16.0E08	ø32	7	1.8°	0.5	56	63	60.5	31.5
TPO07R040M16.0E10	ø40	7	1.2°	0.5	72	79	76.5	39.5
TPO07R050M22.0E12	ø50	7	0.9°	0.5	92	99	96.5	49.5
EPS11012R...	ø12	10.6	6°	0.5	15	23	21	11.5
EPS11016R...	ø16	10.6	5°	0.5	20	31	29	15.5
EPS11018R...	ø18	10.6	4°	0.5	26	35	33	17.5
EPS11020R...	ø20	10.6	3°	0.5	28	39	37	19.5
EPS11021R...	ø21	10.6	3°	0.5	30	41	39	20.5
EPS11025R...	ø25	10.6	2°	0.5	38	49	47	24.5
EPS11026R...	ø26	10.6	2°	0.5	40	51	49	25.5
EPS11030R...	ø30	10.6	1.5°	0.5	48	59	57	29.5
EPS11032R...	ø32	10.6	1.5°	0.5	52	63	61	31.5
EPS11033R...	ø33	10.6	1.5°	0.5	54	65	63	32.5
E/TPS11040R...	ø40	10.6	1°	0.5	68	79	77	39.5
EPS11040RLS42	ø40	10.6	1°	0.5	68	79	77	39.5
E/TPS11050R...	ø50	10.6	0.7°	0.5	68	99	97	49.5
TPS11063RB	ø63	10.6	0.5°	0.5	114	125	123	62.5
TPS11080RB	ø80	10.6	0.4°	0.5	148	159	157	79.5
TPS11100RB	ø100	10.6	0.3°	0.5	188	199	197	99.5
EPO18R025...	ø25	16.7	6°	1	31.5	48	44	24
EPO18R028...	ø28	16.7	4.5°	1	37.5	54	50	27
EPO18R030...	ø30	16.7	4°	1	41.5	58	54	29
EPO18R032...	ø32	16.7	3.5°	1	45.5	62	58	31
EPO18R035...	ø35	16.7	3°	1	51.5	68	64	34
TPO/EPO18R040...	ø40	16.7	2.5°	1	61.5	78	74	39
TPO/EPO18R050...	ø50	16.7	1.9°	1	81.5	98	94	49
TPO/EPO18R063...	ø63	16.7	1.4°	1	107.5	124	120	62
TPO18R080...	ø80	16.7	1°	1	141.5	158	154	79
TPO18R100...	ø100	16.7	0.8°	1	181.5	198	194	99
TPO18R125...	ø125	16.7	0.6°	1	231.5	248	244	124
TPO18R160...	ø160	16.7	0.4°	1	301.5	318	314	159

*Flat bottom hole
Notes: Corner r_ε for dimensions of ø*D*1, ø*D*2, and ø*D*3: r_ε = 0.4 for EPO07 / EPS11 and r_ε = 0.8 for EPO18.

Standard cutting conditions

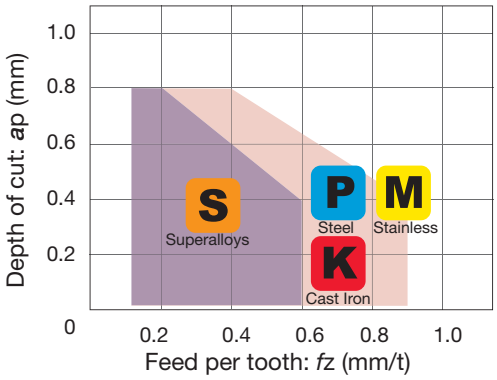
TPO07 / EPO07 type

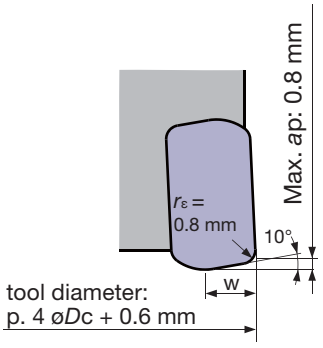
Work material	Brinell hardness HB	Grades	Cutting Speed *Vc* (m/min)	Feed per tooth: *fz* (mm/t)		
				MJ	**HJ**	**AJ**
Low carbon steels (S15C / C15E4 etc.)	~ 200	**AH725**	90 - 200	0.05 - 0.1	0.4 - 0.9	-
High carbon steels and Alloyed steels (S55C / C55, SCM440 / 42CrMo4 etc.)	200 ~ 300	**AH725**	90 - 150	0.05 - 0.1	0.4 - 0.9	-
Tool Steel (SKD11 / X153CrMoV12 etc.)	150 ~ 300	**AH725**	80 - 120	0.05 - 0.1	0.4 - 0.9	-
Stainless steel (SUS304 / X5CrNi18-9 etc.)	-	**AH140**	90 - 150	0.05 - 0.1	0.4 - 0.9	-
Grey cast iron (FC250 / GG25 / 250 etc.)	150 ~ 250	**AH725**	100 - 180	0.05 - 0.1	0.4 - 0.9	-
Ductile cast iron (FCD450 / GGG45 / 450-10S etc.)	150 ~ 250	**AH725**	80 - 150	0.05 - 0.1	0.4 - 0.9	-
Aluminium alloys (Si < 13%)	-	**KS15F**	300 - 1000	-	-	0.08 - 0.2
Aluminium alloys (Si ≥ 13%)	-	**KS15F**	100 - 200	-	-	0.08 - 0.2
Titanium alloys (Ti-6Al-4V etc.)	-	**AH725**	20 - 50	0.05 - 0.1	0.4 - 0.9	-
Heat resistant alloys (Inconel718 etc.)	-	**AH725**	20 - 35	0.05 - 0.08	0.2 - 0.6	-

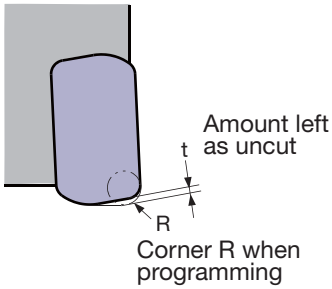
Cautionary points when using HJ inserts

HJ type inserts are designed for high feed machining.
Please note the following when using HJ inserts:
1. The shape of HJ insert differs from that of other inserts (MJ, AJ). However the same insert pocket can be used.
2. When using HJ inserts, all the inserts on the cutter body must be HJ type. Do not use other types of inserts (MJ and AJ types) with HJ inserts on the same cutter body.
3. When using CAD/CAM, please program it as a radius cutter. The table below shows the corner R when programming and the uncut area (t).
4. With HJ inserts, the tool diameter is equal to the diameters shown on p. 4 ø*Dc* + 0.6 mm

TungRec 07 type HJ inserts Standard conditions







Max. depth of cut max ap (mm)	Main cutting edge length W (mm)	Amount left as uncut t (mm)	Corner R when program-ming
0.8	3.0	0.4	R 0.5
		0.3	R 1.0

TPS11 / EPS11 type

Work material	Brinell hardness HB	Priority	Grade	Cutting speed *Vc* (m/min)	Feed per tooth *fz* (mm/t)		
					MJ	**MS**	**AJ**
Low carbon steels (S15C / C15E4 etc.)	~ 200	First choice	**AH725**	100 - 250	0.1 - 0.2	-	-
		For wear resistance	**T3130**				
		For surface appearance	**NS740**		0.05 - 0.15		
High carbon steels and Alloyed steels (S55C / C55, SCM440 / 42CrMo4 etc.)	200 ~ 300	First choice	**AH725**	100 - 200	0.1 - 0.15	-	-
		For wear resistance	**T3130**				
		For surface appearance	**NS740**		0.05 - 0.12		
Tool Steel (SKD11 / X153CrMoV12 etc.)	150 ~ 300	First choice	**AH725**	100 - 150	0.1 - 0.15	-	-
		For wear resistance	**T3130**				
Stainless steel (SUS304 / X5CrNi18-9 etc.)	-	-	**AH130**	80 - 200	-	0.08 - 0.2	-
Grey cast iron (FC250 / GG25 / 250 etc.)	150 ~ 250	First choice	**AH120**	100 - 250	0.12 - 0.2	-	-
		For wear resistance	**T1115**				
Ductile cast iron (FCD450 / GGG45 / 450-10S etc.)	150 ~ 250	First choice	**AH120**	80 - 200	0.12 - 0.2	-	-
		For wear resistance	**T1115**				
Aluminium alloys (Si < 13%)	-	-	**DS1100**	300 - 1000	-	-	0.05 - 0.2
Aluminium alloys (Si ≥ 13%)	-	-	**DS1100**	100 - 200	-	-	0.05 - 0.2
Copper alloys	-	-	**KS05F**	200 - 500	-	-	0.05 - 0.2
Titanium alloys (Ti-6Al-4V etc.)	-	-	**AH130**	20 - 60	-	0.08 - 0.15	-
Heat resistant alloys (Inconel718 etc.)	-	-	**AH725**	20 - 40	0.08 - 0.13	-	-

Roughing type TLS11 / ELS11

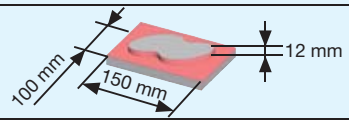
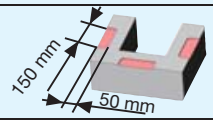
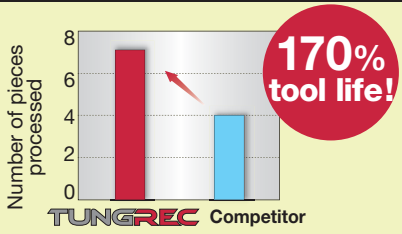
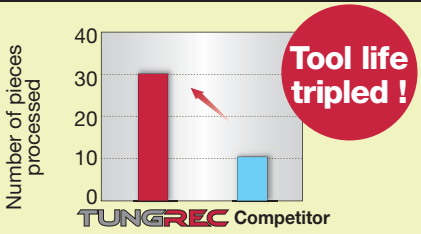
Work material	Brinell hardness HB	Priority	Grade	Cutting speed *Vc* (m/min)	Feed per tooth *fz* (mm/t)		
					MJ	**MS**	**AJ**
Low carbon steels (S15C / C15E4 etc.)	~ 200	First choice	**AH725**	100 - 250	0.10 - 0.18	-	-
		For wear resistance	**T3130**				
High carbon steels and Alloyed steels (S55C / C55, SCM440 / 42CrMo4 etc.)	200 ~ 300	First choice	**AH725**	100 - 200	0.08 - 0.14	-	-
		For wear resistance	**T3130**				
Tool Steel (SKD11 / X153CrMoV12 etc.)	150 ~ 300	First choice	**AH725**	100 - 150	0.08 - 0.14	-	-
		For wear resistance	**T3130**				
Stainless steel (SUS304 / X5CrNi18-9 etc.)	-	-	**AH130**	100 - 150	-	0.08 - 0.15	-
Grey cast iron (FC250 / GG25 / 250 etc.)	150 ~ 250	First choice	**AH120**	100 - 250	0.10 - 0.18	-	-
		For wear resistance	**T1115**				
Ductile cast iron (FCD450 / GGG45 / 450-10S etc.)	150 ~ 250	First choice	**AH120**	80 - 200	0.10 - 0.18	-	-
		For wear resistance	**T1115**				
Aluminium alloys (Si < 13%)	-	-	**DS1100**	200 - 500	-	-	0.05 - 0.18
Aluminium alloys (Si ≥ 13%)	-	-	**DS1100**	100 - 200	-	-	0.05 - 0.18
Titanium alloys (Ti-6Al-4V etc.)	-	-	**AH130**	20 - 60	-	0.08 - 0.14	-
Heat resistant alloys (Inconel718 etc.)	-	-	**AH725**	20 - 40	0.06 - 0.12	-	-

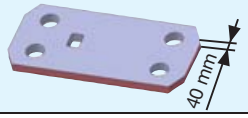
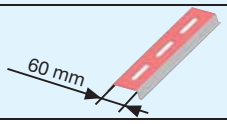
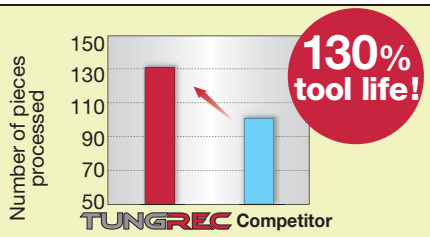
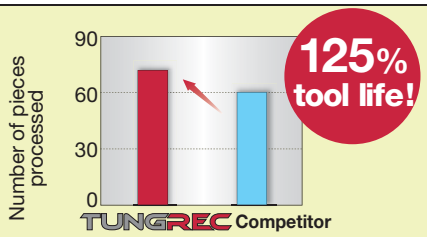
TPO18 / EPO18 type

Work material	Brinell hardness HB	Grades	Cutting Speed *Vc* (m/min)	Feed per tooth: *fz* (mm/t)	
				MJ	**AJ**
Low carbon steels (S15C / C15E4 etc.)	~ 200	**AH725**	100 - 250	0.08 - 0.25	-
High carbon steels and Alloyed steels (S55C / C55, SCM440 / 42CrMo4 etc.)	200 ~ 300	**AH725**	100 - 230	0.08 - 0.2	-
Tool Steel (SKD11 / X153CrMoV12 etc.)	150 ~ 300	**AH725**	100 - 180	0.08 - 0.2	-
Stainless steel (SUS304 / X5CrNi18-9 etc.)	-	**AH140**	90 - 200	0.08 - 0.2	-
Grey cast iron (FC250 / GG25 / 250 etc.)	150 ~ 250	**AH725**	140 - 250	0.08 - 0.25	-
Ductile cast iron (FCD450 / GGG45 / 450-10S etc.)	150 ~ 250	**AH725**	110 - 200	0.08 - 0.25	-
Aluminium alloys (Si < 13%)	-	**KS15F**	300 - 1000	-	0.05 - 0.25
Aluminium alloys (Si ≥ 13%)	-	**KS15F**	100 - 200	-	0.05 - 0.25
Titanium alloys (Ti-6Al-4V etc.)	-	**AH725**	20 - 60	0.08 - 0.18	-
Heat resistant alloys (Inconel718 etc.)	-	**AH725**	20 - 40	0.08 - 0.15	-

· To remove excessive chip accumulation use an air blast.
· When chips stick to the cutting edges (aluminium machining), use a water soluble coolant.
· When cutting an interrupted surface or a casted skin, the feed per tooth (*fz*) should be reduced to the lower recommended value shown in the above table.
· Cutting conditions are limited by machine power, work piece 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.

Practical examples

Work piece type		Machine parts	Compressor parts
Cutter		**TPO07R040M16.0E10 (ø40, z = 10)**	**EPS11033RSB (ø33, z = 5)**
Insert		**AOMT070208PDPR-MJ**	**ASMT11T304PDPR-MJ**
Grade		**AH725**	**NS740**
Work material		**SCM440 / 42CrMo4**	**SS400 / E275A**
			
Cutting conditions	Cutting speed: ***Vc* (m/min)**	130	150
	Feed per tooth: ***fz* (mm/t)**	0.1	0.13
	Feed speed: ***Vf* (mm/min)**	1000	940
	Depth of cut: ***ap* (mm)**	3.0	5
	Width of cut: ***ae* (mm)**	~ 30	15
	Method of machining	Shoulder milling	Shoulder milling
	Coolant	Dry	Dry
	Machine	Vertical MC, BT40	Vertical MC, BT50
Results		 *Vf* = 600 ➡ 1000 mm/min **Improves productivity and makes tool life very stable.**	 **Improves tool life and surface finish, drastically.**

Work piece type		Machine parts	Transportation rail
Cutter		TLS11R050M22.0E04	TPO18R050M22.0-05 (ø50, z = 5)
Insert		ASMT11T308PDPR-MJ	AOMT180516PDPR-MJ
Grade		AH725	AH725
Work material		SS400 / E275A	S20C / C22
			
Cutting conditions	Cutting speed: *Vc* (m/min)	150	220
	Feed per tooth: *fz* (mm/t)	0.17	0.16
	Feed speed: *Vf* (mm/min)	649	1200
	Depth of cut: *ap* (mm)	40	6
	Width of cut: *ae* (mm)	5	20
	Method of machining	Shoulder milling	Face milling
	Coolant	Dry	Dry
	Machine	Vertical MC, BT50	Vertical MC, BT50
Results		 Even in the machining of low rigid work piece, TungRec enables the productivity to improve 30% higher due to the low cutting force.	 Reduces machining noise with low cutting force.

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