

MILLLINE Shoulder milling cutter

ROUGHINGMILL SERIES



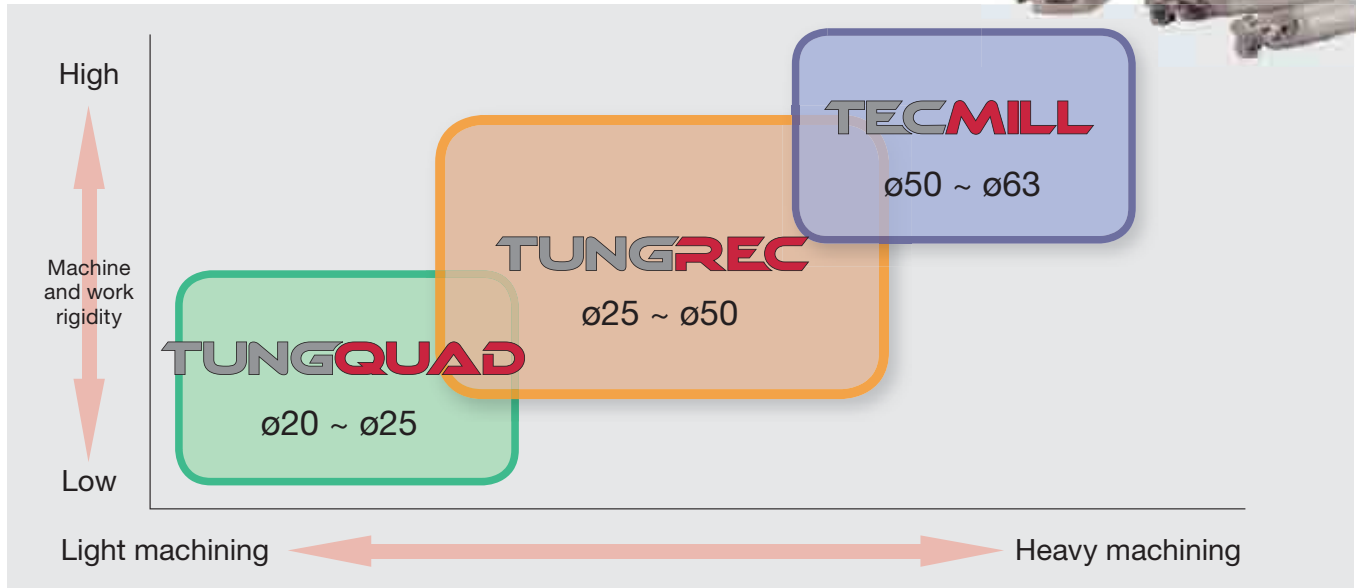
Workhorse for rough machining operations !



Highly productive cutters for large depth rough machining!



Application range of roughing series



Suitable for roughing operations on BT40 spindle taper machines

TUNGQUAD

Optimum edge position prevents chatter

High helix angle distributes and reduces the load for smoother cutting

Best solution for preventing chip recutting

- Small inserts create small chips
- Through tool air blast blows chips from the cutting area

Proven insert from standard range

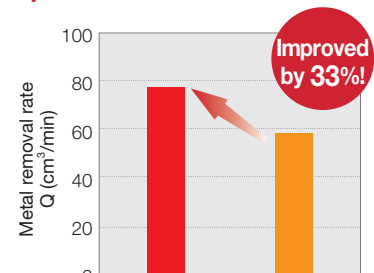
- 4 cornered insert offers higher operating profit
- Positive rake chipbreakers

MJ: for general purpose including exotic material
AJ: for machining of aluminium



Comparison of metal removal rate

Optimum cutter design allows high productivity with large depth of cut



TUNGQUAD Competitor A
 ELD05R020M20.0W02

Condition	TUNGQUAD	Competitor
Work material	S55C / C55	
Tool diameter ϕD_c (mm)	20	
Effective number of cutting edge line	2	3
Cutting speed V_c (m/min)	150	
Feed per edge line f_z (mm/t)	0.1	
Depth of cut a_p (mm)	20	10
Width of cut a_e (mm)	8	
Machine	Vertical M/C BT40	

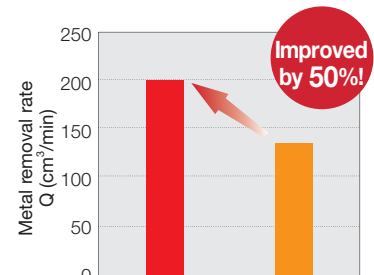
Versatile cutters for various work materials

TUNGREC



- Optimized angular positioning prevents chatter
- Cutters with high insert density delivers higher productivity
- Air blast through tool blows off chips

■ Comparison of metal removal rate
Higher number of flutes guarantees high productivity



TUNGREC Competitor A
ELS11R032M32.0W03



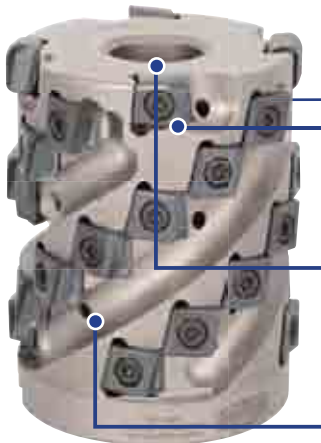
Proven insert from standard range

- Suitable for roughing operation of various materials
 - Tough cutting edge and low cutting force chipbreakers
- MJ:** for general purpose
MS: for stainless steel and exotic material machining
AJ: for machining of aluminium

Condition	TUNGREC	Competitor
Work material	S55C / C55	
Tool diameter ϕD_c (mm)	32	
Effective number of cutting edge line	3	2
Cutting speed V_c (m/min)	100	
Feed per edge line f_z (mm/t)	0.15	
Depth of cut a_p (mm)	32	
Width of cut a_e (mm)	14	
Machine	Vertical M/C BT50	

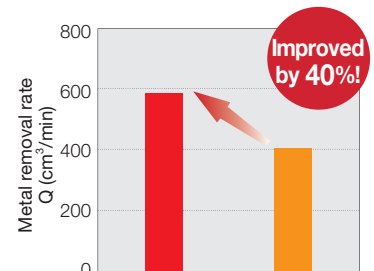
New solution for roughing operations on large machines

TECMILL



- Tangential insert with tough edge allows high feed machining
- Highly rigid body, suitable for heavy machining
- Large core thickness increases body rigidity
- Air blast through tool to blow off chips

■ Comparison of metal removal rate
Tough cutting edges provide stable machining even in heavy roughing operations



TECMILL Competitor A
TLM11R050M22.0E03

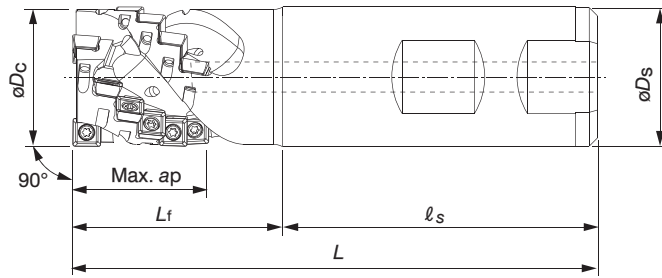


Proven insert from standard range

- 4 cornered insert offers higher operating profit

Condition	TECMILL	Competitor
Work material	S55C / C55	
Tool diameter ϕD_c (mm)	50	
Effective number of cutting edge line	3	4
Cutting speed V_c (m/min)	100	
Feed per edge line f_z (mm/t)	0.2	
Depth of cut a_p (mm)	50	40
Width of cut a_e (mm)	30	20
Machine	Vertical M/C BT50	

■ Cutters



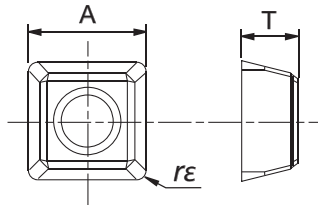
■ Replacement parts

Description	Cat. No.
Clamping screw	CSPB-2L043
Wrench	IP-6DB

Shank type

Cat. No.	Stock	No. of eff. edge lines	Dimensions (mm)						Weight (kg)	Air hole	No. of inserts	Inserts
			øDc	øDs	ℓs	Lf	L	Max. ap				
ELD05R020M20.0W02	●	2	20	20	53	32	85	20.3	0.2	with	10	SDMT050204PN-MJ
ELD05R025M25.0W03	●	3	25	25	59	36	95	24.2	0.3	with	18	SDHT050204FN-AJ

■ Inserts



Cat. No.	Accuracy	Honing	Grades			Dimensions (mm)			Cutters
			Coated		Carbide	A	T	rε	
			AH725	AH140	TH10				
SDMT050204PN-MJ	M	with	●	●		5.09	2.38	0.4	ELD05...
SDHT050204FN-AJ	H	without			●	5.09	2.39	0.4	

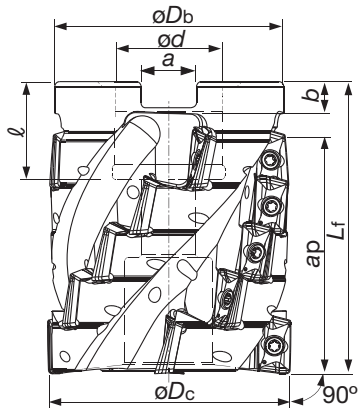
■ Standard cutting conditions

Work material	Brinell hardness HB	Grades	Cutting Speed Vc (m/min)	Feed per tooth fz (mm/t)
Low carbon steels (S15C / C15E4 etc.)	< 200	AH725	100 - 250	0.04 - 0.10
High carbon steels (S45C / C45 etc.)	200 - 300			
Alloyed steels (SCM440 / 42CrMo4 etc.)	150 - 300			
Tool steels (SKD11 / X153CrMoV12 etc.)	< 300		100 - 130	
Stainless steels (SUS304 / X5CrNi18-9 etc.)	-	AH140	100 - 150	0.03 - 0.09
Grey cast irons (FC250 / GG25 etc.)	150 - 250	AH725	100 - 250	0.05 - 0.12
Ductile cast irons (FCD450 / GGG45 etc.)			80 - 200	0.05 - 0.12
Aluminium alloys (Si < 13%)	-	TH10	200 - 500	0.05 - 0.15
Aluminium alloys (Si ≥ 13%)	-		100 - 200	

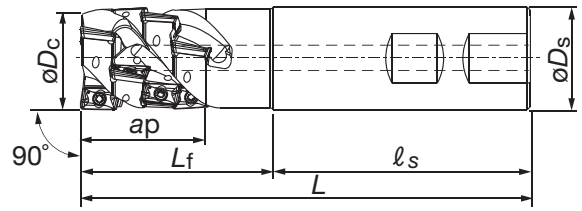
● : Stocked items

■ Cutters

Bore type



Shank type



■ Replacement parts

Description	Cat. No.	
Cutter	TLS11R...	ELS11R...
Clamping screw	CSPB-2.5	
Wrench	IP-8D	
Center bolt	CM10X40H	-

Bore type

Cat. No.	Stock	No. of eff. edge lines	Dimensions (mm)								Weight (kg)	Air hole	No. of inserts	Inserts
			$\varnothing D_c$	$\varnothing D_b$	$\varnothing d$	ℓ	L_f	b	a	Max. ap				
TLS11R050M22.0E04	●	4	50	47	22	20	60	6.3	10.4	48.8	0.5	with	20	ASMT11T3..., ASGT11T3...

Shank type

Cat. No.	Stock	No. of eff. edge lines	Dimensions (mm)						Weight (kg)	Air hole	No. of inserts	Inserts
			$\varnothing D_c$	$\varnothing D_s$	ℓ_s	L_f	L	Max. ap				
ELS11R025M25.0W02	●	2	25	25	80	40	120	30.4	0.4	with	6	ASMT11T3... ASGT11T3...
ELS11R032M32.0W03	●	3	32	32	80	60	140	39.4	0.8	with	12	
ELS11R040M42.0W03	●	3	40	42	90	60	150	40	1.4	with	12	

■ Inserts

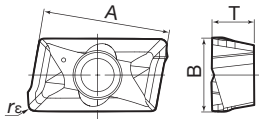


Fig. 4 MJ

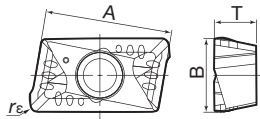


Fig. 5 MS

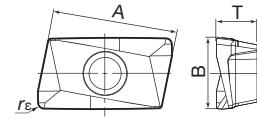


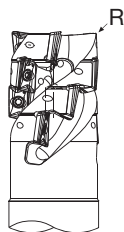
Fig. 6 AJ

Cat. No.	Accuracy	Honing	Grades								Dimensions (mm)				Shape	Cutters		
			Coated								Cermet	Carbide	A	B			T	r_e
			AH725	AH120	AH130	AH140	T3130	T1115	DS1100	NS740								
ASMT11T304PDPR-MJ	M	with	●	●			●	●		●		11.6	6.7	3.7	0.4	Fig.4	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	with						●		●		0.4	Fig.6					
ASGT11T308PDFR-AJ		with						●		●		0.8	Fig.6					

■ Cautionary point in modifying cutter bodies

When using inserts with corner radius $r_e \geq 2.0$ mm, standard cutter bodies have to be modified "R".

- From 2nd row onwards, please use insert with $r_e = 0.4$ or 0.8 mm



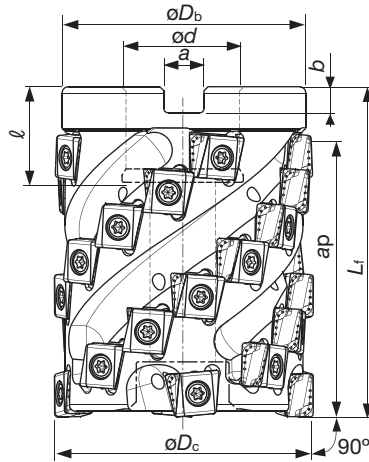
Corner radius r_e (mm)	The dimension of modifying (mm)
0.4 - 1.6	No modification required
2.0 - 3.0	2

Standard cutting conditions

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 etc.)	150 - 250	First choice	AH120	100 - 250	0.10 - 0.18	-	-
		For wear resistance	T1115				
Ductile cast iron (FCD450 / GGG45 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	-	-

TECMILL

Cutters



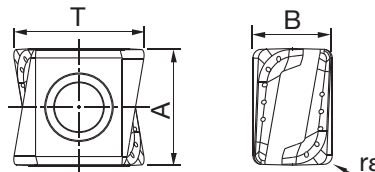
Replacement parts

Description	Cat. No.	
Applicable cutter	TLM11R050...	TLM11R063...
Clamping screw	CSTB-3.5L110	
Wrench	Torx bit	BT15S
	Grip	H-TB
Mono block type substitution wrench	T-15T	
Center bolt	SD06-A3	SD08-98

Bore type

Cat. No.	Stock	No. of eff. edge lines	Dimensions (mm)								Weight (kg)	Air hole	No. of inserts	Inserts
			ϕD_c	ϕD_b	ϕd	ℓ	L_f	b	a	Max. ap				
TLM11R050M22.0E03	●	3	50	47	22	20	70	6.3	10.4	59	0.8	with	21	LMMU1107**PNER-MJ
TLM11R063M27.0E04	●	4	63	59	27	22	80	7	12.4	66.9	1.4	with	32	
TLM11R063M25.4-04	●	4	63	59	25.4	26	80	6	9.5	67.4	1.4	with	32	

Inserts



Cat. No.	Accuracy	Honing	Stock					Dimensions (mm)				Cutters
			Coated grades					A	B	T	r_ϵ	
			AH725	T3130	AH140	AH120	T1115					
LMMU110708PNER-MJ	M	with	●	●	●	●	●	10.5	7.1	11.7	0.8	TLM11...
LMMU110716PNER-MJ	M	with	●	●	●	●	●	10.5	7.1	11.5	1.6	
LMMU110724PNER-MJ	M	with	●	●	●	●	●	10.5	7.1	11.3	2.4	
LMMU110732PNER-MJ	M	with	●	●	●	●	●	10.5	7.1	11.1	3.2	

● : Stocked items

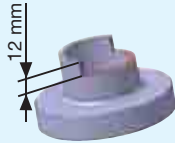



Standard cutting conditions

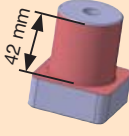
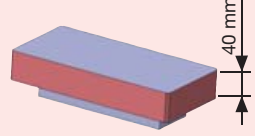
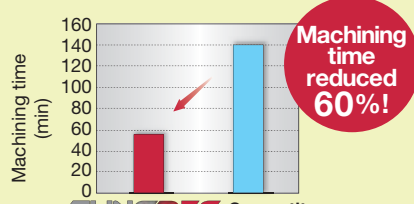
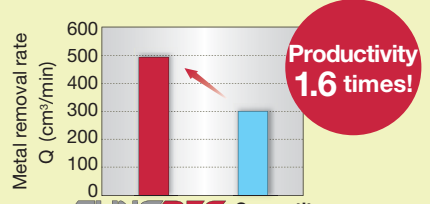
TECMILL

Work material	Brinell hardness HB	Priority	Grade	Cutting speed Vc (m/min)	Feed per tooth fz (mm/t)
Low carbon steels (S15C / C15E4 etc.)	< 200	First choice	AH725	100 - 250	0.10 - 0.23
		Priority for impact resistance	AH140	80 - 180	
		Priority for wear resistance	T3130	100 - 250	
High carbon steels (S45C / C45 etc.)	200 - 300	First choice	AH725	100 - 200	0.08 - 0.21
		Priority for impact resistance	AH140	80 - 150	
		Priority for wear resistance	T3130	100 - 200	
Alloyed steels (SCM440 / 42CrMo4 etc.)	150 - 300	First choice	AH725	100 - 200	0.08 - 0.21
		Priority for impact resistance	AH140	80 - 150	
		Priority for wear resistance	T3130	100 - 200	
Tool steels (SKD61/ X40CrMoV5-1 etc.)	< 300	First choice	AH725	100 - 150	0.08 - 0.21
		Priority for impact resistance	AH140	80 - 120	
		Priority for wear resistance	T3130	100 - 150	
Stainless steels (SUS304 / X5CrNi18-9 etc.)	-	First choice	AH140	90 - 150	0.08 - 0.21
Grey cast irons (FC250 / GG25 etc.)	150 - 250	First choice	AH120	100 - 250	0.10 - 0.25
Priority for wear resistance		T1115			
Ductile cast irons (FCD450 / GGG45 etc.)		First choice	AH120	100 - 250	0.10 - 0.25
Priority for wear resistance	T1115				
Heat-resisting alloy (Inconel 718 / Ti-6Al-4V etc.)	-	First choice	AH725	20 - 50	0.06 - 0.15

- From 2nd row onwards, please use insert with $r_{\epsilon} = 0.8 \text{ mm}$

Practical examples

Work piece type		Cover of machine	Machine part	
Cutter		ELD05R020M20.0W02 ($\phi 20, z = 2$)	TLS11R050M22.0E04 ($\phi 50, z = 4$)	
Insert		SDMT050204PN-MJ	ASMT11T308PDPR-MJ	
Grade		AH725	AH725	
Work material		SCM440 / 42CrMo4	SS400 / E275A	
				
Cutting conditions	Cutting speed: Vc (m/min)	100	150	
	Feed per tooth: fz (mm/t)	0.07	0.17	
	Feed speed: Vf (mm/min)	230	650	
	Depth of cut: ap (mm)	12	40	
	Width of cut: ae (mm)	6 x 3 passes	5	
	Method of machining	Shoulder milling	Shoulder milling	
	Coolant	Wet	Dry	
	Machine	Flexible machine BT40	Vertical M/C BT50	
Results	 <p>Machining time (min)</p> <p>Machining time reduced 20%!</p> <p>TUNGREC Competitor</p> <p>Higher productivity achieved than with competitor solid end mills. Reduction of inventory with the reduction of regrinding costs.</p>		 <p>Metal removal rate Q (cm³/min)</p> <p>Productivity 1.3 times!</p> <p>TUNGREC Competitor</p> <p>TungRec can machine at a 30% higher table speed with no chatter, even when machining on machine tools and components with low rigidity levels.</p>	

Work piece type		Power generator part	Base of machine
Cutter		TLS11R050M22.0E04 (ø50, z = 4)	TLM11R050M22.0E03 (ø50, z = 3)
Insert		ASMT11T308PDPR-MJ	LMMU110708PNER-MJ
Grade		AH725	AH120
Work material		Inconel 718	FC250 / GG25
			
Cutting conditions	Cutting speed: V_c (m/min)	30	150
	Feed per tooth: f_z (mm/t)	0.08	0.2
	Feed speed: V_f (mm/min)	60	580
	Depth of cut: a_p (mm)	42	40
	Width of cut: a_e (mm)	2	20
	Method of machining	Shoulder milling	Shoulder milling
	Coolant	Wet	Dry
	Machine	Horizontal M/C BT50	Vertical M/C BT50
Results		 <p>Machining time reduced 60%!</p> <p>Machining with large depth of cut with TungRec can drastically reduce machining time. Achieves stable tool life due to no chipping on cutting edges.</p>	 <p>Productivity 1.6 times!</p> <p>TecMill allows more stable machining without chipping on the cutting edges, this improves productivity by 60%.</p>



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