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TUNG-ALUMILL

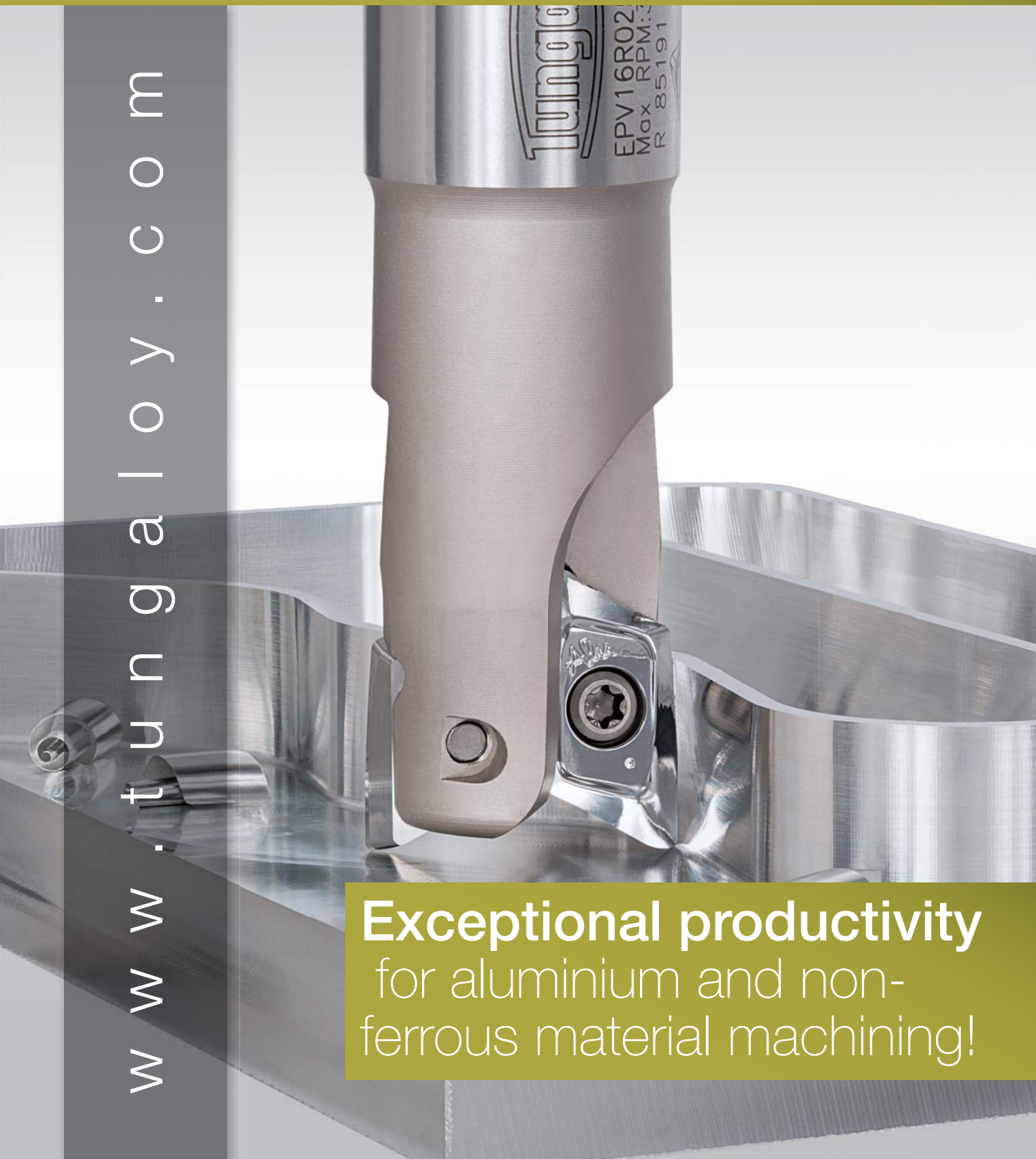
TUNGALOY

MillLine

MILLLINE

Tungaloy Report No. 429-G

www.tungaloy.com



Exceptional productivity

for aluminium and non-ferrous material machining!


Tungaloy
EPV16R025M25
Max RPM:38000
R 85191

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MillLine

TUNG-ALUMILL

TUNGALOY

V-shaped bottom secures insert on the cutter and supports **high speed machining as well as helical ramping!**

Member IMC Group Tungaloy

TUNG-ALUMILL

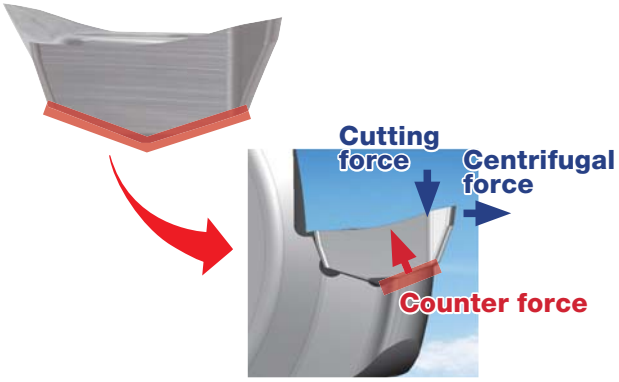
TUNGALOY

Outstanding productivity in demanding applications, such as high helical ramping, straight ramping and step milling!

Secure, stable insert clamping design with unique V-shaped bottom

V shape provides counter force against the cutting force and centrifugal force to stabilize the insert

■ V-shaped insert bottom



V-shaped clamping restricts insert movement even during high ramp machining and reduces shear force on the screw

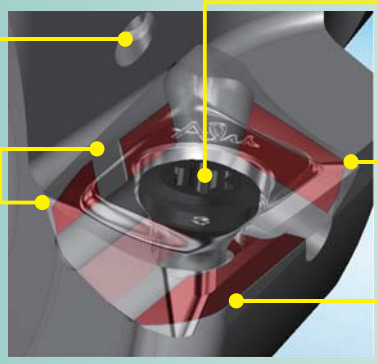
■ FE analysis

Cutters	TUNG-ALUMILL V-shaped design	General type
Insert movement (down cutting)	3.0 µm, Cutting force	10.5 µm, Cutting force
Stress on the screw	100%	120%

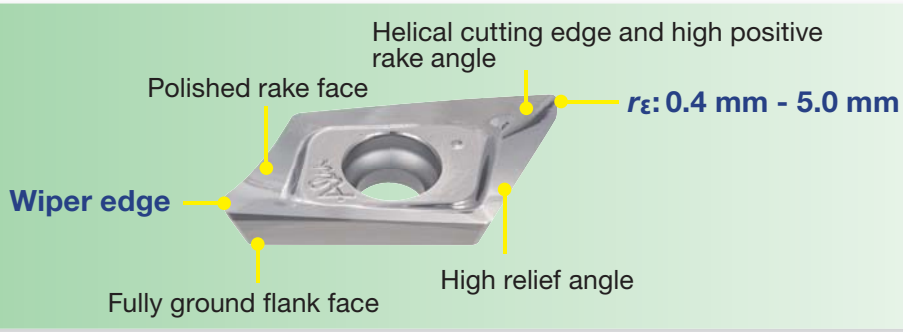
Milling cutter	: EPV16R032M32.0-02 (ø32, z = 2)
Insert	: XVCT160508R-AJ TH10
Workpiece	: Aluminium alloy
Cutting speed	: *Vc* = 2000 m/min
Feed per tooth	: *fz* = 0.15 mm/t
Depth of cut	: *ap* = 5 mm
Width of cut	: *ae* = 10 mm

Exceptional productivity is achieved with high cutting speeds (*Vc*) of up to 5000 m/min.

Special features of the insert pocket



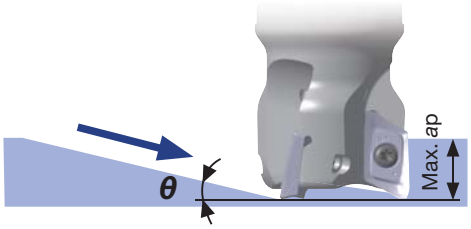
Excellent cutting edge geometry for aluminum and non-ferrous materials



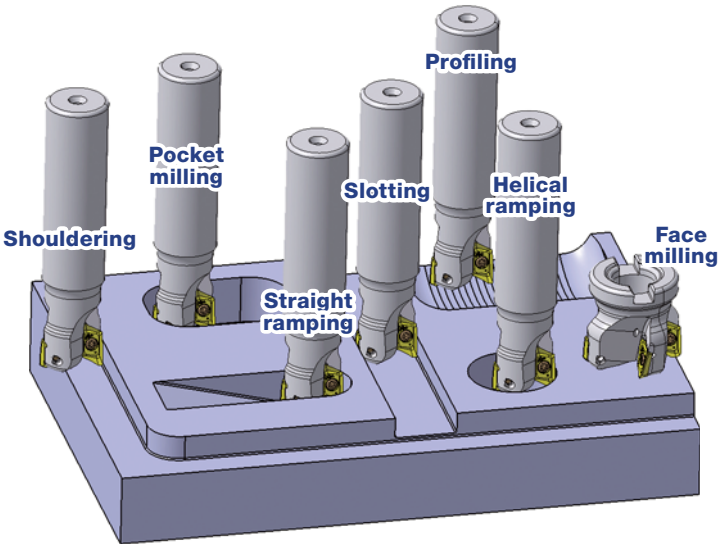
- **High positive, polished rake face prevents cutting edge built-up**
- **High cutting edge clearance allows steep ramping**

■ Comparison of maximum ramping angle

Tool diameter øDc: ø40 mm	TUNG-ALUMILL	Competitor		
		A	B	C
Max. ramping angle θ	11.5°	11°	9°	9°



Applicable for a wide range of machining

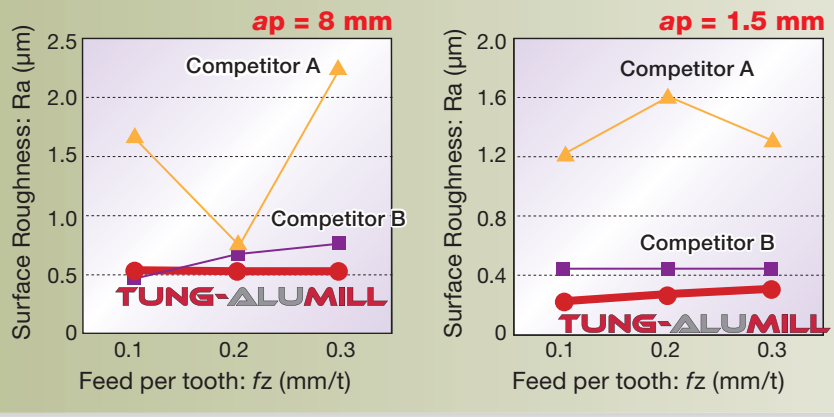


■ Target application

- Where productivity needs to be increased while maintaining accurate machining and high surface quality
- Components that require high precision, such as aerospace frame parts

- **Excellent surface finish for both roughing and finishing**

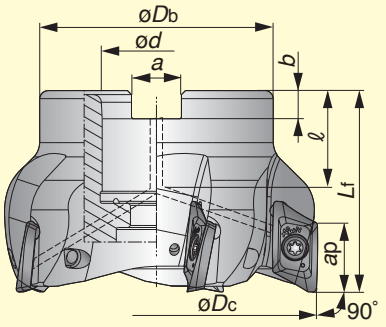
■ Comparison of surface roughness



Milling cutter	: EPV16R032M32.0-02 (ø32, z = 2)
Insert	: XVCT160508R-AJ TH10
Workpiece	: Aluminium alloy
Cutting speed	: *Vc* = 600 m/min
Width of cut	: *ae* = 25 mm

Cutter

Bore type



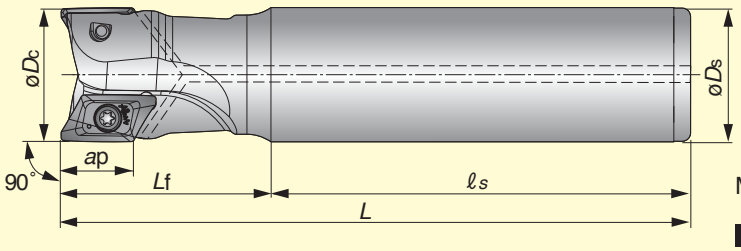
Max. *ap* = 13 - 16 mm

Parts

Descriptions		Parts Cat. No.
		TPV16R...
Clamping screw		TS40093I/HG
Wrench	Bit	BT15S
	Grip	H-TBS

Cat. No.	Stock	No. of inserts	Dimensions (mm) øDc	øDb	ød	ℓ	Lf	b	a	Weight (kg)	Air hole	Max. RPM (min^{-1})	Center bolt	Inserts
TPV16R040M16.0E03	●	3	40	38	16	20	50	5.6	8.4	0.229	with	30,000	SHM8X1.25X35-C	XVCT1605...
TPV16R050M22.0E04	●	4	50	45	22	22	50	6.3	10.4	0.327	with	27,000	SHM10X1.5X30-C	XVCT1605...
TPV16R063M22.0E05	●	5	63	47	22	22	50	6.3	10.4	0.535	with	24,000	SHM10X1.5X30-C	XVCT1605...
TPV16R080M27.0E05	●	5	80	58	27	28	50	7	12.4	0.861	with	21,000	LHM12X1.75X30-C	XVCT1605...
TPV16R100M32.0E06	●	6	100	66	32	26	63	8	14.4	1.547	with	19,000	SHM16X2X35-C	XVCT1605...
TPV16R125M40.0E07	●	7	125	85	40	32	63	9	16.4	2.526	with	17,000	SHM20X2.5X40-C	XVCT1605...

Shank type



Max. *ap* = 13 - 16 mm

Parts

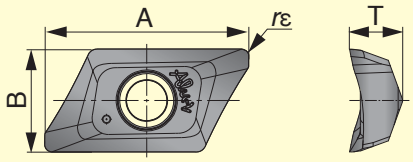
Descriptions		Parts Cat. No.	
		EPV16R025...	EPV16R032/040...
Clamping screw		TS40085I/HG	TS40093I/HG
Wrench	Bit	BT15S	
	Grip	H-TBS	

Cat. No.	Stock	No. of inserts	Dimensions (mm) øDc	øDs	ℓ s	Lf	L	Weight (kg)	Air hole	Max. RPM (min^{-1})	Inserts
EPV16R025M25.0-02	●	2	25	25	70	55	125	0.373	with	38,000	XVCT1605...
EPV16R025M25.0-02L	●	2	25	25	100	70	170	0.532	with	38,000	XVCT1605...
EPV16R032M32.0-02	●	2	32	32	100	50	150	0.765	with	34,000	XVCT1605...
EPV16R032M32.0-02L	●	2	32	32	120	80	200	1.034	with	34,000	XVCT1605...
EPV16R032M32.0-03	●	3	32	32	100	50	150	0.76	with	34,000	XVCT1605...
EPV16R032M32.0-03L	●	3	32	32	120	80	200	1.029	with	34,000	XVCT1605...
EPV16R040M32.0-03	●	3	40	32	120	50	170	0.942	with	30,000	XVCT1605...
EPV16R040M32.0-03L	●	3	40	32	195	55	250	1.426	with	30,000	XVCT1605...

* When using inserts with corner radius $r\varepsilon \geq 3.2$ mm, standard cutter body has to be modified with "R". "R" = $r\varepsilon$ - 0.3 mm

●: Stocked items

Inserts



Cat. No.	Accuracy	Honing	Grades	Dimensions (mm)					Cutter
			TH10	A	B	T	r_ε	Max. *ap*	
XVCT160504R-AJ	C	without	●	22.24	11.23	5.9	0.4	16	E/TPV16R
XVCT160508R-AJ	C	without	●	22.24	11.23	5.9	0.8	16	E/TPV16R
XVCT160512R-AJ	C	without	●	21.74	11.23	5.8	1.2	15.5	E/TPV16R
XVCT160516R-AJ	C	without	●	21.22	11.23	5.75	1.6	15	E/TPV16R
XVCT160520R-AJ	C	without	●	20.78	11.23	5.75	2.0	14.5	E/TPV16R
XVCT160530R-AJ	C	without	●	19.49	11.23	5.6	3.0	14	E/TPV16R
XVCT160532R-AJ	C	without	●	19.24	11.23	5.6	3.2	14	E/TPV16R
XVCT160540R-AJ	C	without	●	18.4	11.23	5.5	4.0	13	E/TPV16R
XVCT160550R-AJ	C	without	●	18.35	11.23	5.4	5.0	13	E/TPV16R

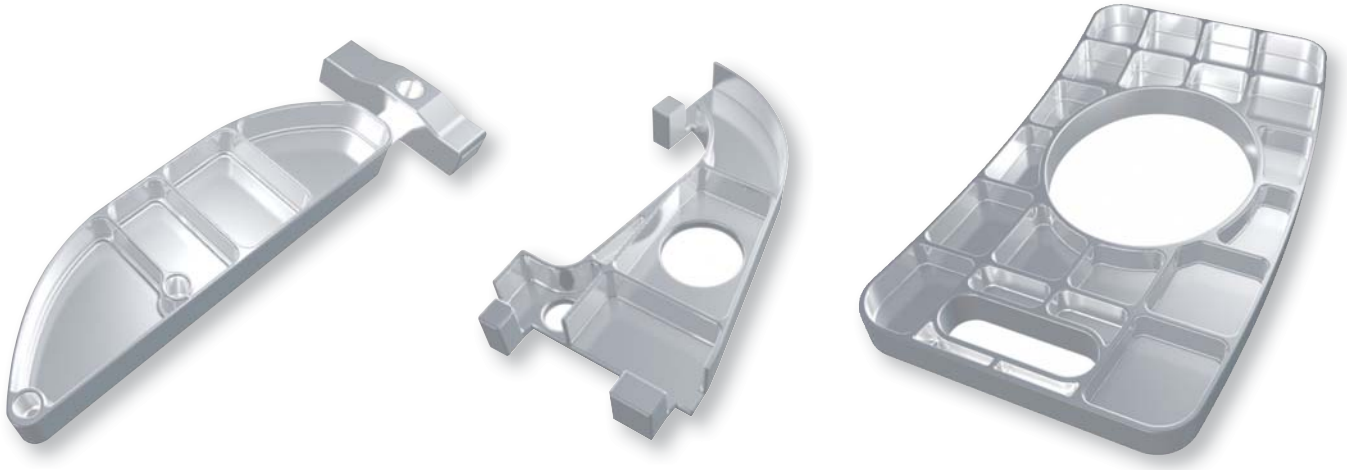
●: Stocked items

Standard cutting conditions

ISO	Workpiece materials	Hardness HB	Grades	Chip-breaker	Cutting speed *Vc* (m/min)	Feed per tooth *fz* (mm/t)
N	Aluminium alloy	60	**TH10**	**AJ**	300 - 5000	0.15 - 0.35
		100	**TH10**	**AJ**	200 - 2000	0.10 - 0.25
	Cast aluminium alloy (Si ≤ 12%)	75	**TH10**	**AJ**	200 - 2000	0.15 - 0.30
		90	**TH10**	**AJ**	200 - 1500	0.10 - 0.25
	Cast aluminium alloy (Si > 12%)	130	**TH10**	**AJ**	200 - 1000	0.07 - 0.15
	Copper alloys (Pb > 1%)	110	**TH10**	**AJ**	200 - 800	0.07 - 0.15
	Copper alloys	90	**TH10**	**AJ**	300 - 1000	0.10 - 0.15
		100	**TH10**	**AJ**	300 - 800	0.10 - 0.15
	Duroplastics, fiber plastics	-	**TH10**	**AJ**	100 - 500	0.10 - 0.15
	Hard rubber	-	**TH10**	**AJ**	100 - 300	0.10 - 0.15

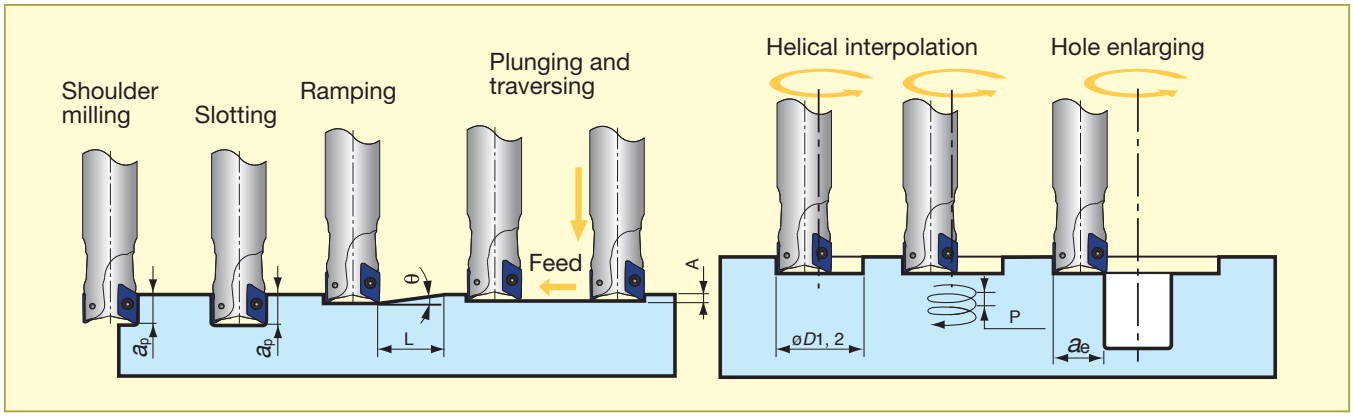
Safety guidelines

1. Use only the original inserts, cutters and spare parts.
2. Insert pocket must be cleaned before clamping the insert.
3. Clamp torque of screw should be 4.5 N·m.
4. For safety reasons, use a new screw when changing the insert.
5. Maximum RPM values are determined based on the burst test. Using RPM beyond maximum values may cause insert breakage, machine damage or personal injury.
6. XVCT insert has sharp cutting edges. Always wear gloves for protection from injury when handling.



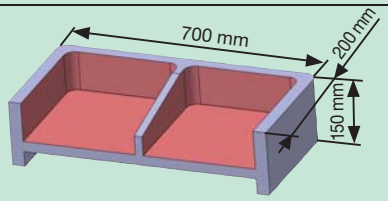
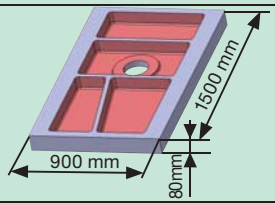
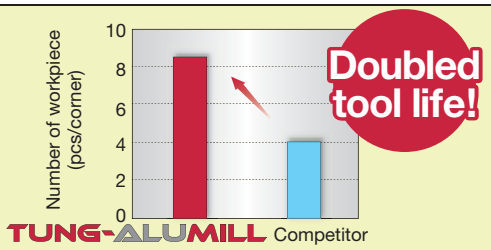
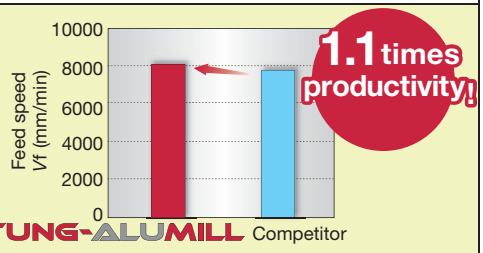
Tool dia.: ø*D*c (mm), Number of revolutions: *n* (min^{-1}), Feed speed: *V*f (mm/min), Depth of cut: *a*p = 2.0 mm, No. of inserts: z																	
ø25		ø32				ø40		ø50		ø63		ø80		ø100		ø125	
z = 2		z = 2		z = 3		z = 3		z = 4		z = 5		z = 5		z = 6		z = 7	
n	*V*f	*n*	*V*f	*n*	*V*f	*n*	*V*f	*n*	*V*f	*n*	*V*f	*n*	*V*f	*n*	*V*f	*n*	*V*f
19100	9600	14900	7500	14900	11200	11900	8900	9500	9500	7600	9500	6000	7500	4800	7200	3800	6700
*V*c = 1500m/min, *f*z = 0.25 mm/t																	
12700	5100	9900	4000	9900	5900	8000	4800	6400	5100	5100	5100	4000	4000	3200	3800	2500	3500
*V*c = 1000 m/min, *f*z = 0.2 mm/t																	
12700	5100	9900	4000	9900	5900	8000	4800	6400	5100	5100	5100	4000	4000	3200	3800	2500	3500
*V*c = 1000 m/min, *f*z = 0.2 mm/t																	
10200	3100	8000	2400	8000	3600	6400	2900	5100	3100	4000	3000	3200	2400	2500	2300	2000	2100
*V*c = 800 m/min, *f*z = 0.15 mm/t																	
7600	1500	6000	1200	6000	1800	4800	1400	3800	1500	3000	1500	2400	1200	1900	1100	1500	1100
*V*c = 600 m/min, *f*z = 0.1 mm/t																	
6400	1300	5000	1000	5000	1500	4000	1200	3200	1300	2500	1300	2000	1000	1600	1000	1300	900
*V*c = 500 m/min, *f*z = 0.1 mm/t																	
7600	1800	6000	1400	6000	2200	4800	1700	3800	1800	3000	1800	2400	1400	1900	1400	1500	1300
*V*c = 600 m/min, *f*z = 0.12 mm/t																	
6400	1500	5000	1200	5000	1800	4000	1400	3200	1500	2500	1500	2000	1200	1600	1200	1300	1100
*V*c = 500 m/min, *f*z = 0.12 mm/t																	
3800	900	3000	700	3000	1100	2400	900	1900	900	1500	900	1200	700	1000	700	800	700
*V*c = 300 m/min, *f*z = 0.12 mm/t																	
2500	600	2000	500	2000	700	1600	600	1300	600	1000	600	800	500	600	400	500	400
*V*c = 200 m/min, *f*z = 0.12 mm/t																	

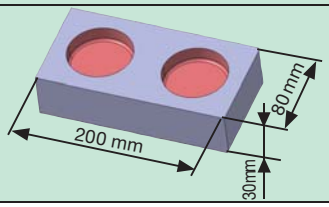
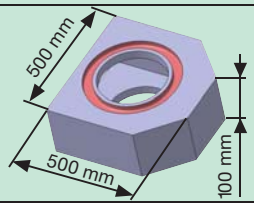
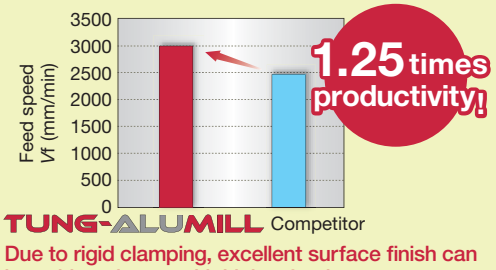
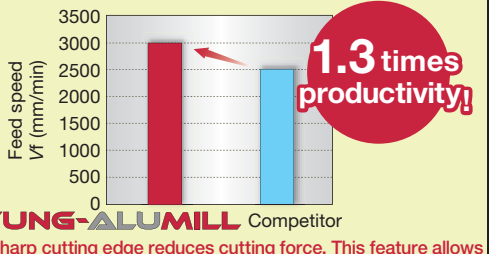
Machining applications



Cat. No.	Tool ø øDc (mm)	Corner radius rε (mm)	Max. depth of cut ap (mm)	Straight ramp down		Step down	Helical ramp down				Hole enlarging
				Max. ramping angle θ	Min. length L (mm)	Max. plunging A (mm)	Min. machining øD1 (mm)	Min. pitch/rev P (mm)	Max. machining øD2 (mm)	Max. pitch/rev P (mm)	Max. width ae (mm)
EPV16R025...	ø25	0.4, 0.8	16	22°	40	4.2	29.1	4.4	50	13.6	22.5
EPV16R025...	ø25	1.2	15.5	22°	40	4.2	29.1	4.4	50	13.6	22.5
EPV16R025...	ø25	1.6	15	22°	38	3.7	29.1	4.4	50	13.2	22.5
EPV16R025...	ø25	2.0	14.5	22°	38	3.7	29.1	4.4	50	13.2	22.5
EPV16R025...	ø25	3.0, 3.2	14	21°	38	2.5	29.1	4.2	50	12.3	22.5
EPV16R025...	ø25	4.0, 5.0	13	18.5°	40	2.3	29.1	3.7	50	12.3	22.5
EPV16R032...	ø32	0.4, 0.8	16	16.5°	54	4	43.1	8.8	64	13.6	28.8
EPV16R032...	ø32	1.2	15.5	16.5°	54	4	43.1	8.8	64	13.6	28.8
EPV16R032...	ø32	1.6	15	16°	54	3.5	43.1	8.5	64	13.2	28.8
EPV16R032...	ø32	2.0	14.5	16°	54	3.5	43.1	8.5	64	13.2	28.8
EPV16R032...	ø32	3.0, 3.2	14	15°	54	3	43.1	7.9	64	12.3	28.8
EPV16R032...	ø32	4.0, 5.0	13	13.5°	56	2.5	43.1	7.1	64	12.3	28.8
T/EPV16R040...	ø40	0.4, 0.8	16	11.5°	79	4	59.1	10.4	80	13.6	36
T/EPV16R040...	ø40	1.2	15.5	11.5°	79	4	59.1	10.4	80	13.6	36
T/EPV16R040...	ø40	1.6	15	11°	80	3.5	59.1	9.9	80	13.2	36
T/EPV16R040...	ø40	2.0	14.5	11°	80	3.5	59.1	9.9	80	13.2	36
T/EPV16R040...	ø40	3.0, 3.2	14	10°	82	3	59.1	9	80	12.3	36
T/EPV16R040...	ø40	4.0, 5.0	13	8.5°	90	2.5	59.1	7.6	80	12.3	36
TPV16R050...	ø50	0.4, 0.8	16	9.5°	96	4	79.1	13	100	13.6	45
TPV16R050...	ø50	1.2	15.5	9.5°	96	4	79.1	13	100	13.6	45
TPV16R050...	ø50	1.6	15	9°	98	3.5	79.1	12.3	100	13.2	45
TPV16R050...	ø50	2.0	14.5	9°	98	3.5	79.1	12.3	100	13.2	45
TPV16R050...	ø50	3.0, 3.2	14	8°	103	3	79.1	10.9	100	12.3	45
TPV16R050...	ø50	4.0, 5.0	13	7°	110	2.5	79.1	9.5	100	12.3	45
TPV16R063...	ø63	0.4, 0.8	16	7°	130	4	105.1	13.6	126	13.6	56.7
TPV16R063...	ø63	1.2	15.5	7°	130	4	105.1	13.6	126	13.6	56.7
TPV16R063...	ø63	1.6	15	6.5°	136	3.5	105.1	12.8	126	13.2	56.7
TPV16R063...	ø63	2.0	14.5	6.5°	136	3.5	105.1	12.8	126	13.2	56.7
TPV16R063...	ø63	3.0, 3.2	14	6°	136	3	105.1	11.8	126	12.3	56.7
TPV16R063...	ø63	4.0, 5.0	13	5.5°	140	2.5	105.1	10.8	126	12.3	56.7
TPV16R080...	ø80	0.4, 0.8	16	5°	183	4	139.1	13.6	160	13.6	72
TPV16R080...	ø80	1.2	15.5	5°	183	4	139.1	13.6	160	13.6	72
TPV16R080...	ø80	1.6	15	4.5°	197	3.5	139.1	12.4	160	13.2	72
TPV16R080...	ø80	2.0	14.5	4.5°	197	3.5	139.1	12.4	160	13.2	72
TPV16R080...	ø80	3.0, 3.2	14	4°	207	3	139.1	11	160	12.3	72
TPV16R080...	ø80	4.0, 5.0	13	3.5°	221	2.5	139.1	9.6	160	12.3	72
TPV16R100...	ø100	0.4, 0.8	16	3.5°	262	4	179.1	12.9	200	13.6	90
TPV16R100...	ø100	1.2	15.5	3.5°	262	4	179.1	12.9	200	13.6	90
TPV16R100...	ø100	1.6	15	3°	296	3.5	179.1	11.1	200	13.2	90
TPV16R100...	ø100	2.0	14.5	3°	296	3.5	179.1	11.1	200	13.2	90
TPV16R100...	ø100	3.0, 3.2	14	2.5°	332	3	179.1	9.2	200	12.3	90
TPV16R100...	ø100	4.0, 5.0	13	2.5°	309	2.5	179.1	9.2	200	11.6	90
TPV16R125...	ø125	0.4, 0.8	16	2.5°	367	4	229.1	12.1	125	13.6	112.5
TPV16R125...	ø125	1.2	15.5	2.5°	367	4	229.1	12.1	125	13.6	112.5
TPV16R125...	ø125	1.6	15	2°	444	3.5	229.1	9.7	125	13.2	112.5
TPV16R125...	ø125	2.0	14.5	2°	444	3.5	229.1	9.7	125	13.2	112.5
TPV16R125...	ø125	3.0, 3.2	14	1.5°	554	3	229.1	7.3	125	8.7	112.5
TPV16R125...	ø125	4.0, 5.0	13	1.5°	516	2.5	229.1	7.3	125	8.7	112.5

Practical examples

Workpiece type		Airplane part	Airplane part
Cutter		TPV16R050M22.0E04 (ø50, z = 4)	EPV16R032M32.0-03 (ø32, z = 3)
Insert		XVCT160504R-AJ	XVCT160530R-AJ
Grade		TH10	TH10
Workpiece material		A7050 / AlZn5.5MgCu	A7050 / AlZn5.5MgCu
		 N	 N
Cutting conditions	Cutting speed: *Vc* (m/min)	2200	900
	Feed per tooth: *fz* (mm/t)	0.17	0.3
	Depth of cut: *ap* (mm)	5.2	30
	Width of cut: *ae* (mm)	35	25
	Method of machining	Pocket milling	Pocket milling
	Coolant	Wet	Wet
	Machine	Vertical M/C, BT50	Vertical M/C, BT50
Results		 Excellent sharpness drastically reduces cutting force, achieving longer tool life.	 Lower cutting force allows higher feed machining, providing higher productivity.

Workpiece type		Robot component	Robot component
Cutter		EPV16R025M25.0-02 (ø25, z = 2)	TPV16R050M22.0E04 (ø50, z = 4)
Insert		XVCT160504R-AJ	XVCT160504R-AJ
Grade		TH10	TH10
Workpiece material		A6061 / AlMg1AiCu	Aluminium alloy
		 N	 N
Cutting conditions	Cutting speed: *Vc* (m/min)	780	1000
	Feed per tooth: *fz* (mm/t)	0.15	0.2
	Depth of cut: *ap* (mm)	10.0	6
	Width of cut: *ae* (mm)	25	45
	Method of machining	Pocket milling	Slot milling
	Coolant	Wet	Wet
	Machine	Vertical M/C, BT40	Vertical M/C, BT50
Results		 Due to rigid clamping, excellent surface finish can be achieved even with higher feed rates.	 Sharp cutting edge reduces cutting force. This feature allows the feed to be incrcased and achieves high productivity.

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