MillLine

TUNG-ALUMILL

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Tungaloy Report No. 429-G

SM TOOLS®

Shoulder mill that enables high speed machining of aluminum and non-ferrous materials now has **R2.5 inserts**

Member IMC Group Tungaloy

INDUSTRY 4.0

FEED the SPEED!


ACCELERATED MACHINING

MillLine

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

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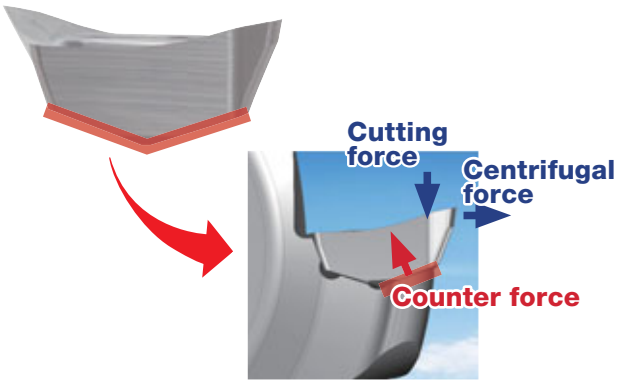
Outstanding productivity in demanding applications, such as high helical ramping, straight ramping and step milling!

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

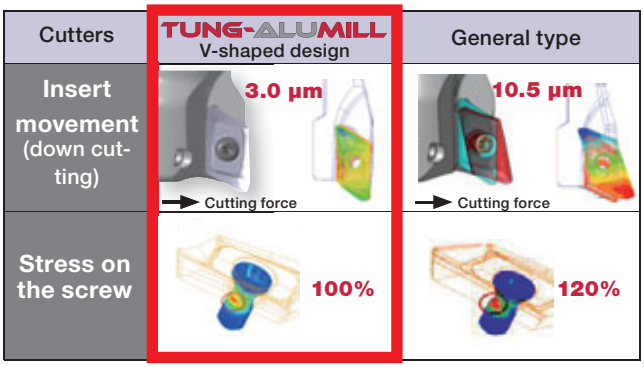
V shape provides counter force against the cutting force and centrifugal force to stabilize the insert

■ V-shaped insert bottom



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

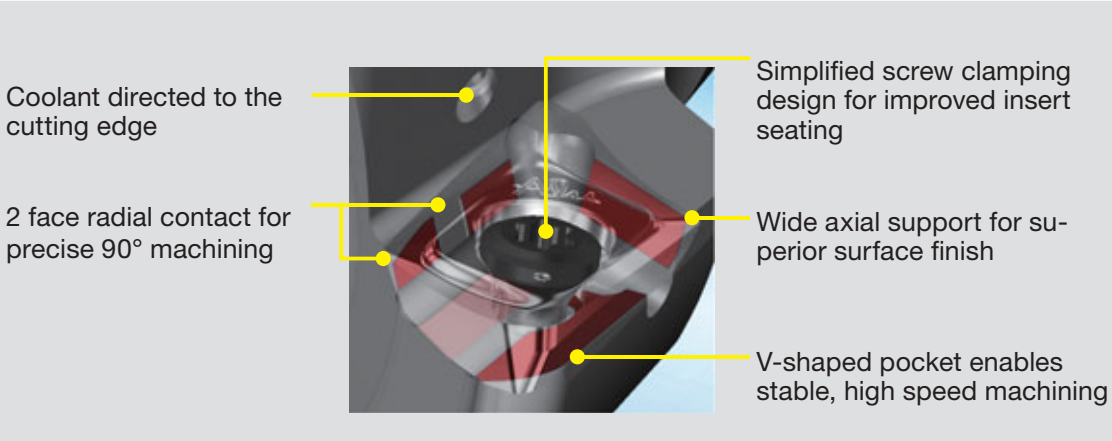
■ FE analysis



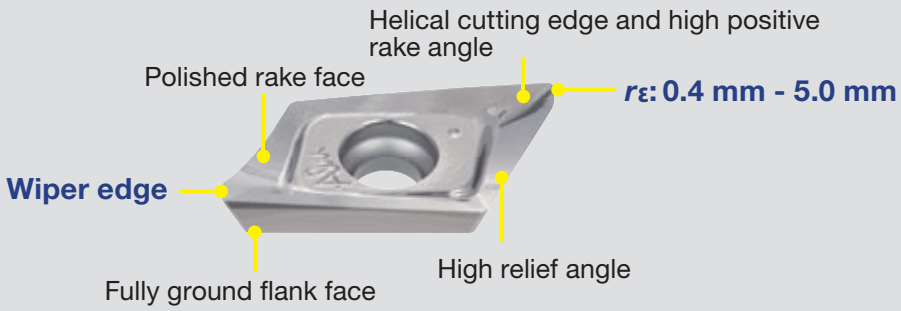
Exceptional productivity is achieved with high cutting speeds (Vc) of up to 5000 m/min.

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

Special features of the insert pocket



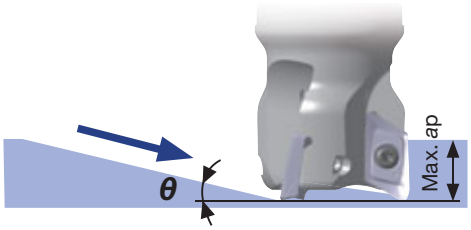
Excellent cutting edge geometry for aluminum and non-ferrous materials



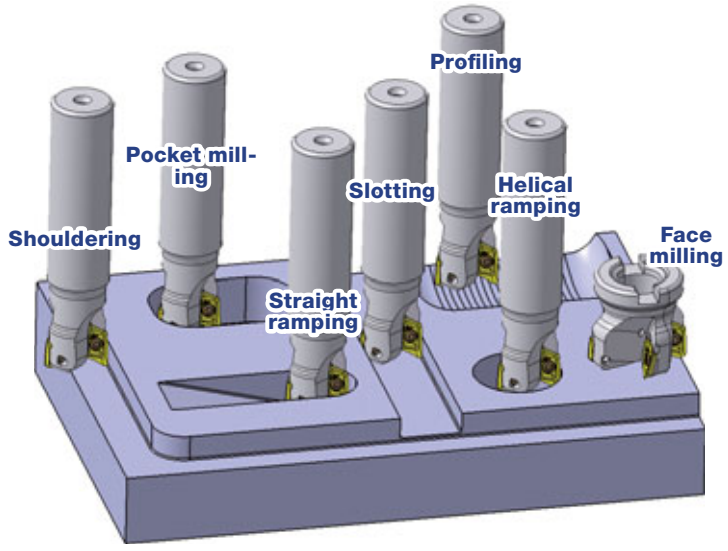
- High positive, polished rake face prevents cutting edge built-up
- High cutting edge clearance allows steep ramping

■ 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°

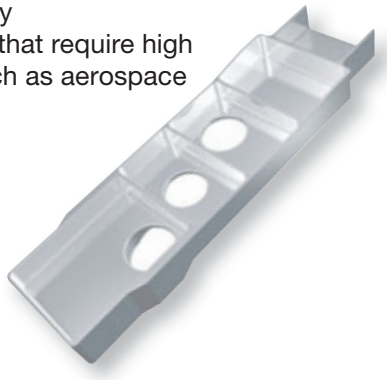


Applicable for a wide range of machining



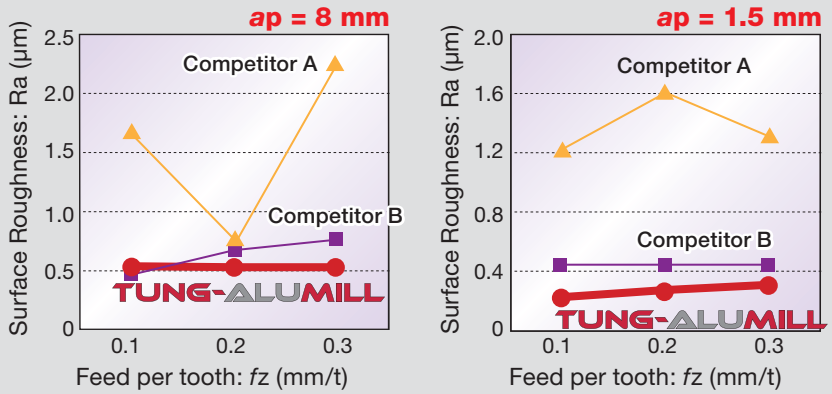
■ Target application

· 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

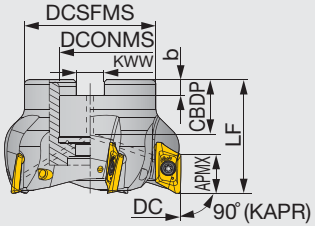


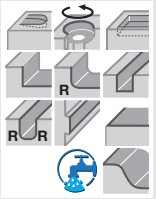
Milling cutter	: EPV16R032M32.0-02 (ø32, z = 2)
Insert	: XVCT160508R-AJ TH10
Workpiece	: Aluminium alloy
Cutting speed	: *Vc* = 600 m/min
Width of cut	: *ae* = 25 mm

TPV16

90° shoulder mill for aluminium machining, with screw clamp system, for XVCT16 inserts

GAMP = +10° ~ +11°, GAMF = -9° ~ -5.5°





Designation	DC	CICT	DCSFMS	DCONMS	CBDP	LF	b	KWW	WT(kg)	Air hole	Max. RPM (min^{-1})	Insert
TPV16R040M16.0E03	40	3	38	16	20	50	5.6	8.4	0.23	With	30,000	XVCT1605...
TPV16R050M22.0E04	50	4	45	22	22	50	6.3	10.4	0.33	With	27,000	XVCT1605...
TPV16R063M22.0E05	63	5	47	22	22	50	6.3	10.4	0.54	With	24,000	XVCT1605...
TPV16R080M27.0E05	80	5	58	27	28	50	7	12.4	0.86	With	21,000	XVCT1605...
TPV16R100M32.0E06	100	6	66	32	26	63	8	14.4	1.55	With	19,000	XVCT1605...
TPV16R125M40.0E07	125	7	85	40	32	63	9	16.4	2.53	With	17,000	XVCT1605...

SPARE PARTS



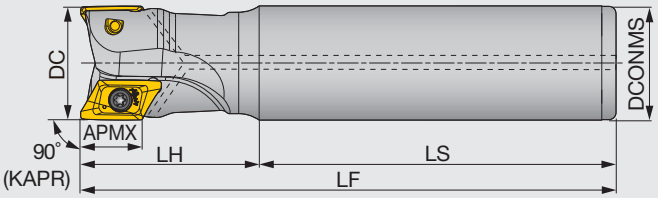

Designation	Clamping screw	Grip	Shell locking bolt	Torx bit
TPV16R040M16.0E03	TS40093I/HG	H-TBS	SHM8X1.25X35-C	BT15S
TPV16R050 - 063...	TS40093I/HG	H-TBS	SHM10X1.5X30-C	BT15S
TPV16R080M27.0E05	TS40093I/HG	H-TBS	LHM12X1.75X30-C	BT15S
TPV16R100M32.0E06	TS40093I/HG	H-TBS	SHM16X2X35-C	BT15S
TPV16R125M40.0E07	TS40093I/HG	H-TBS	SHM20X2.5X40-C	BT15S

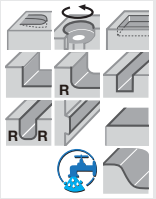
*Recommended clamping torque (N·m)：TS40093I/HG=3.5

EPV16

90° shoulder endmill for aluminium machining, shank type, with screw clamp system, for XVCT16 inserts

GAMP = +6° ~ +10°, GAMF = +12° ~ +9°





Designation	DC	CICT	DCONMS	LS	LH	LF	WT(kg)	Air hole	Max. RPM (min^{-1})	Insert
EPV16R025M25.0-02	25	2	25	70	55	125	0.37	With	38,000	XVCT1605...
EPV16R025M25.0-02L	25	2	25	100	70	170	0.53	With	38,000	XVCT1605...
EPV16R032M32.0-02	32	2	32	100	50	150	0.77	With	34,000	XVCT1605...
EPV16R032M32.0-02L	32	2	32	120	80	200	1.03	With	34,000	XVCT1605...
EPV16R032M32.0-03	32	3	32	100	50	150	0.76	With	34,000	XVCT1605...
EPV16R032M32.0-03L	32	3	32	120	80	200	1.03	With	34,000	XVCT1605...
EPV16R040M32.0-03	40	3	32	120	50	170	0.94	With	30,000	XVCT1605...
EPV16R040M32.0-03L	40	3	32	195	55	250	1.43	With	30,000	XVCT1605...

SPARE PARTS

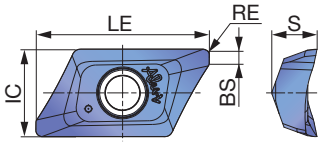


Designation	Clamping screw	Grip	Torx bit
EPV16R025M...	TS40085I/HG	H-TBS	BT15S
EPV16R032M...	TS40093I/HG	H-TBS	BT15S
EPV16R040M...	TS40093I/HG	H-TBS	BT15S

*Recommended clamping torque (N·m)：TS40085I/HG=3.5, TS40093I/HG=3.5

INSERTS

XVCT16-AJ



P	Steel	
M	Stainless	
K	Cast iron	
N	Non-ferrous	★
S	Superalloys	
H	Hard materials	

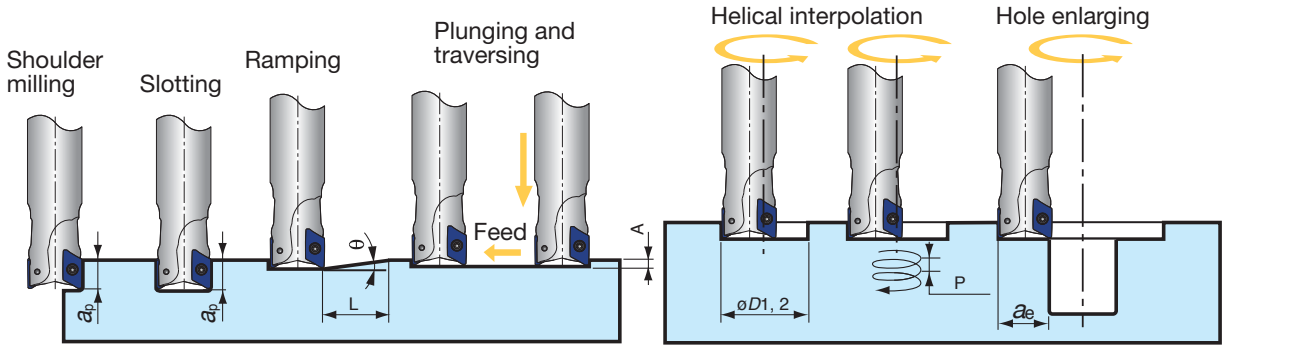
★ : First choice
☆ : Second choice

Designation	RE	APMX	Uncoated TH10	LE	IC	S	BS
XVCT160504R-AJ	0.4	16	●	22.2	11.2	5.9	1.3
XVCT160508R-AJ	0.8	16	●	22.2	11.2	5.9	1
XVCT160512R-AJ	1.2	15.5	●	21.7	11.2	5.8	1
XVCT160516R-AJ	1.6	15	●	21.2	11.2	5.75	1
XVCT160520R-AJ	2	14.5	●	20.8	11.2	5.75	1
New XVCT160525R-AJ	2.5	14	●	20.33	11.23	5.68	1
XVCT160530R-AJ	3	14	●	19.5	11.2	5.6	1
XVCT160532R-AJ	3.2	14	●	19.2	11.2	5.6	1
XVCT160540R-AJ	4	13	●	18.4	11.2	5.5	1.2
XVCT160550R-AJ	5	13	●	18.4	11.2	5.4	0.4

* When using inserts with corner radius RE ≥ 3.2 mm,
standard cutter body has to be modified with "R". "R" = RE - 0.3 mm

●: New
●: Line up

MACHINING APPLICATIONS



			Straight ramp down	Step down		Helical ramp down				Hole enlarging
		Corner radius	Max. depth of cut	Max. ramping angle	Min. length	Max. plunging	Min. machining	Min. pitch/rev	Max. machining	Max. pitvh/rev	Max. width
Designation	DC	rε	APMX	RMPX	L	A	øD1	P	øD2	P	ae
EPV16R025...	25	0.4, 0.8	16	22°	40	4.2	29.1	4.4	50	13.6	22.5
EPV16R025...	25	1.2	15.5	22°	40	4.2	29.1	4.4	50	13.6	22.5
EPV16R025...	25	1.6	15	22°	38	3.7	29.1	4.4	50	13.2	22.5
EPV16R025...	25	2.0	14.5	22°	38	3.7	29.1	4.4	50	13.2	22.5
EPV16R025...	25	2.5, 3.0, 3.2	14	21°	38	2.5	29.1	4.2	50	12.3	22.5
EPV16R025...	25	4.0, 5.0	13	18.5°	40	2.3	29.1	3.7	50	12.3	22.5
EPV16R032...	32	0.4, 0.8	16	16.5°	54	4	43.1	8.8	64	13.6	28.8
EPV16R032...	32	1.2	15.5	16.5°	54	4	43.1	8.8	64	13.6	28.8
EPV16R032...	32	1.6	15	16°	54	3.5	43.1	8.5	64	13.2	28.8
EPV16R032...	32	2.0	14.5	16°	54	3.5	43.1	8.5	64	13.2	28.8
EPV16R032...	32	2.5, 3.0, 3.2	14	15°	54	3	43.1	7.9	64	12.3	28.8
EPV16R032...	32	4.0, 5.0	13	13.5°	56	2.5	43.1	7.1	64	12.3	28.8
T/EPV16R040...	40	0.4, 0.8	16	11.5°	79	4	59.1	10.4	80	13.6	36
T/EPV16R040...	40	1.2	15.5	11.5°	79	4	59.1	10.4	80	13.6	36
T/EPV16R040...	40	1.6	15	11°	80	3.5	59.1	9.9	80	13.2	36
T/EPV16R040...	40	2.0	14.5	11°	80	3.5	59.1	9.9	80	13.2	36
T/EPV16R040...	40	2.5, 3.0, 3.2	14	10°	82	3	59.1	9	80	12.3	36
T/EPV16R040...	40	4.0, 5.0	13	8.5°	90	2.5	59.1	7.6	80	12.3	36
TPV16R050...	50	0.4, 0.8	16	9.5°	96	4	79.1	13	100	13.6	45
TPV16R050...	50	1.2	15.5	9.5°	96	4	79.1	13	100	13.6	45
TPV16R050...	50	1.6	15	9°	98	3.5	79.1	12.3	100	13.2	45
TPV16R050...	50	2.0	14.5	9°	98	3.5	79.1	12.3	100	13.2	45
TPV16R050...	50	2.5, 3.0, 3.2	14	8°	103	3	79.1	10.9	100	12.3	45
TPV16R050...	50	4.0, 5.0	13	7°	110	2.5	79.1	9.5	100	12.3	45
TPV16R063...	63	0.4, 0.8	16	7°	130	4	105.1	13.6	126	13.6	56.7
TPV16R063...	63	1.2	15.5	7°	130	4	105.1	13.6	126	13.6	56.7
TPV16R063...	63	1.6	15	6.5°	136	3.5	105.1	12.8	126	13.2	56.7
TPV16R063...	63	2.0	14.5	6.5°	136	3.5	105.1	12.8	126	13.2	56.7
TPV16R063...	63	2.5, 3.0, 3.2	14	6°	136	3	105.1	11.8	126	12.3	56.7
TPV16R063...	63	4.0, 5.0	13	5.5°	140	2.5	105.1	10.8	126	12.3	56.7
TPV16R080...	80	0.4, 0.8	16	5°	183	4	139.1	13.6	160	13.6	72
TPV16R080...	80	1.2	15.5	5°	183	4	139.1	13.6	160	13.6	72
TPV16R080...	80	1.6	15	4.5°	197	3.5	139.1	12.4	160	13.2	72
TPV16R080...	80	2.0	14.5	4.5°	197	3.5	139.1	12.4	160	13.2	72
TPV16R080...	80	2.5, 3.0, 3.2	14	4°	207	3	139.1	11	160	12.3	72
TPV16R080...	80	4.0, 5.0	13	3.5°	221	2.5	139.1	9.6	160	12.3	72
TPV16R100...	100	0.4, 0.8	16	3.5°	262	4	179.1	12.9	200	13.6	90
TPV16R100...	100	1.2	15.5	3.5°	262	4	179.1	12.9	200	13.6	90
TPV16R100...	100	1.6	15	3°	296	3.5	179.1	11.1	200	13.2	90
TPV16R100...	100	2.0	14.5	3°	296	3.5	179.1	11.1	200	13.2	90
TPV16R100...	100	2.5, 3.0, 3.2	14	2.5°	332	3	179.1	9.2	200	12.3	90
TPV16R100...	100	4.0, 5.0	13	2.5°	309	2.5	179.1	9.2	200	11.6	90
TPV16R125...	125	0.4, 0.8	16	2.5°	367	4	229.1	12.1	125	13.6	112.5
TPV16R125...	125	1.2	15.5	2.5°	367	4	229.1	12.1	125	13.6	112.5
TPV16R125...	125	1.6	15	2°	444	3.5	229.1	9.7	125	13.2	112.5
TPV16R125...	125	2.0	14.5	2°	444	3.5	229.1	9.7	125	13.2	112.5
TPV16R125...	125	2.5, 3.0, 3.2	14	1.5°	554	3	229.1	7.3	125	8.7	112.5
TPV16R125...	125	4.0, 5.0	13	1.5°	516	2.5	229.1	7.3	125	8.7	112.5

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STANDARD CUTTING CONDITIONS

ISO	Workpiece material	Hardness HB	Grade	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	0.1 - 0.25
	Cast aluminium alloy Si ≤ 12%	75	TH10	AJ	200 - 2000	0.15 - 0.3
		90	TH10	AJ	200 - 1500	0.1 - 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	0.1 - 0.15
		100	TH10	AJ	300 - 800	0.1 - 0.15
	Duroplastics, fiber plastics	-	TH10	AJ	100 - 500	0.1 - 0.15
	Hard rubber	-	TH10	AJ	100 - 300	0.1 - 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.: DC (mm), Number of revolutions : *n* (min^{-1}), Feed speed : *Vf* (mm/min), Max depth of cut *ap* = 2.0 mm, Number 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	***Vf***	***n***	***Vf***	***n***	***Vf***	***n***	***Vf***	***n***	***Vf***	***n***	***Vf***	***n***	***Vf***	***n***	***Vf***	***n***	***Vf***
19100	9600	14900	7500	14900	11200	11900	8900	9500	9500	7600	9500	6000	7500	4800	7200	3800	6700
Vc = 1500m/min, *fz* = 0.25 mm/t																	
12700	5100	9900	4000	9900	5900	8000	4800	6400	5100	5100	5100	4000	4000	3200	3800	2500	3500
Vc = 1000 m/min, *fz* = 0.2 mm/t																	
12700	5100	9900	4000	9900	5900	8000	4800	6400	5100	5100	5100	4000	4000	3200	3800	2500	3500
Vc = 1000 m/min, *fz* = 0.2 mm/t																	
10200	3100	8000	2400	8000	3600	6400	2900	5100	3100	4000	3000	3200	2400	2500	2300	2000	2100
Vc = 800 m/min, *fz* = 0.15 mm/t																	
7600	1500	6000	1200	6000	1800	4800	1400	3800	1500	3000	1500	2400	1200	1900	1100	1500	1100
Vc = 600 m/min, *fz* = 0.1 mm/t																	
6400	1300	5000	1000	5000	1500	4000	1200	3200	1300	2500	1300	2000	1000	1600	1000	1300	900
Vc = 500 m/min, *fz* = 0.1 mm/t																	
7600	1800	6000	1400	6000	2200	4800	1700	3800	1800	3000	1800	2400	1400	1900	1400	1500	1300
Vc = 600 m/min, *fz* = 0.12 mm/t																	
6400	1500	5000	1200	5000	1800	4000	1400	3200	1500	2500	1500	2000	1200	1600	1200	1300	1100
Vc = 500 m/min, *fz* = 0.12 mm/t																	
3800	900	3000	700	3000	1100	2400	900	1900	900	1500	900	1200	700	1000	700	800	700
Vc = 300 m/min, *fz* = 0.12 mm/t																	
2500	600	2000	500	2000	700	1600	600	1300	600	1000	600	800	500	600	400	500	400
Vc = 200 m/min, *fz* = 0.12 mm/t																	

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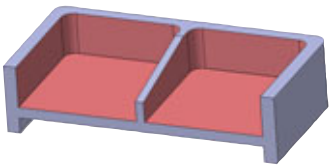
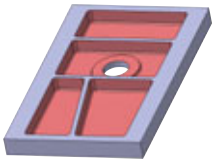
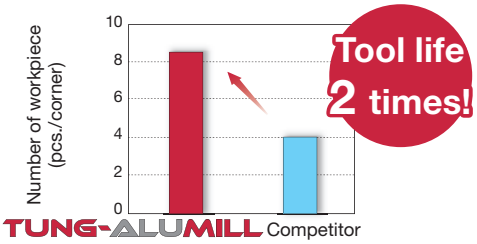
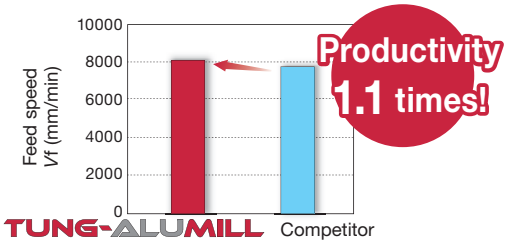
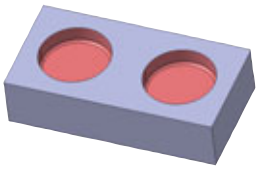
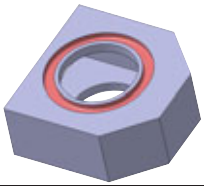
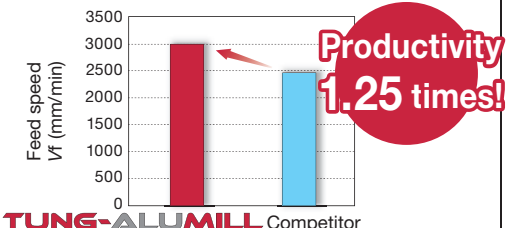
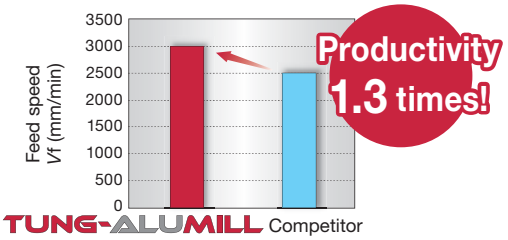
PRACTICAL EXAMPLES

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
	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)	TPA10R063M22.0E06 (ø63 mm, z = 6)
Insert		XVCT160504R-AJ	TOMT100408PDER-MJ
Grade		TH10	T1215
Workpiece material		A6061 / AlMg1AiCu	Aluminium alloy
		 N	 N
Cutting conditions	**Cutting speed : *Vc* (m/min)**	780	196
	Feed per tooth : *fz* (mm/t)	0.15	0.15
	Depth of cut : *ap* (mm)	10	900
	Width of cut : *ae* (mm)	25	2.5
	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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Check our site and our App to get more info!

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