MillLine

TUNGFORCE FEED

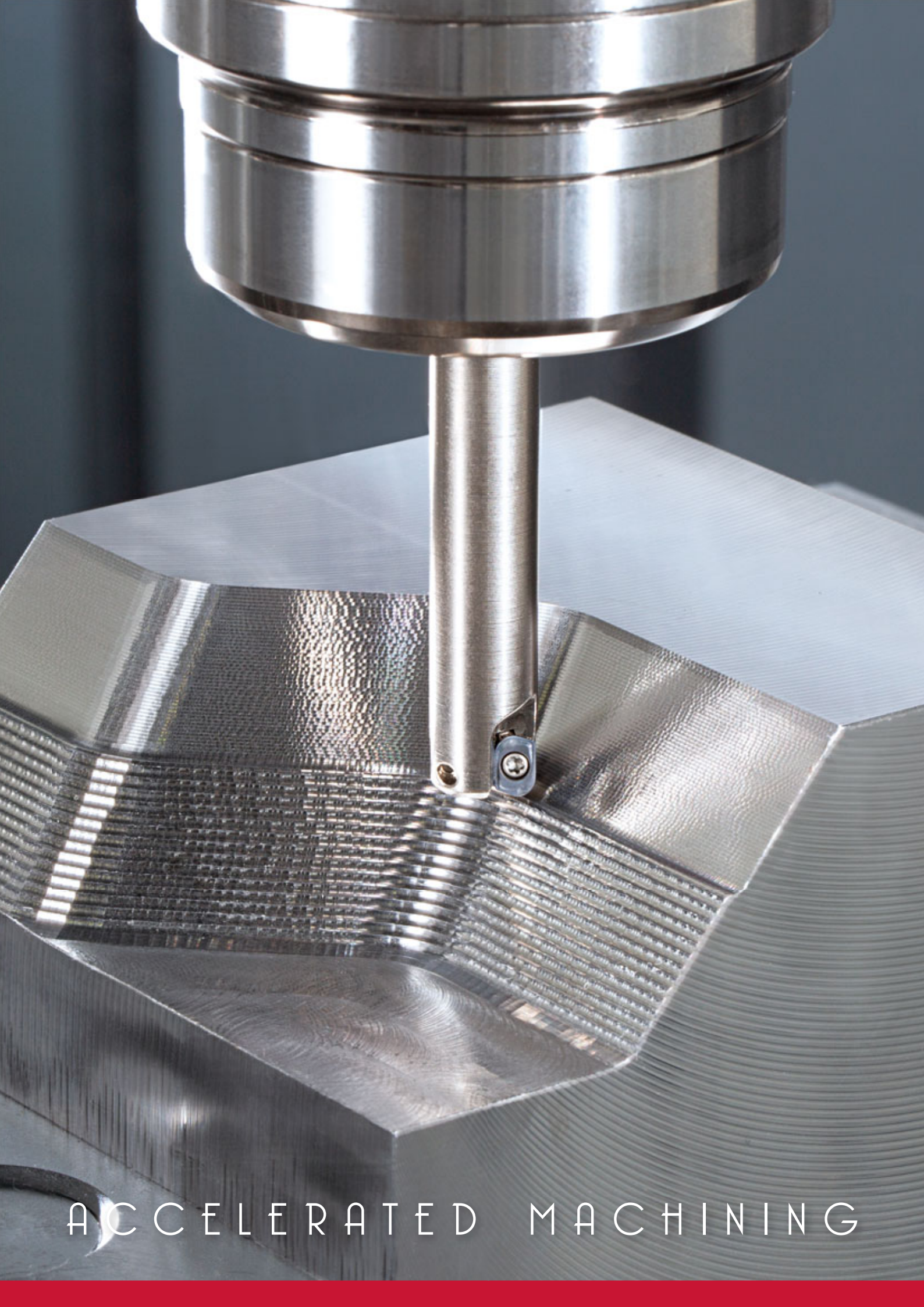
www.tungaloy.com

Tungaloy Report No. 521-G

Small-diameter high feed milling cutter
with robust design for stability and efficiency

INDUSTRY 4.0

FEED the SPEED!


ACCELERATED MACHINING

MillLine

TUNGFEED FORCE

TUNGALOY

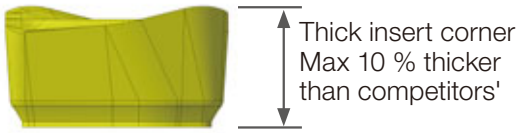
TUNGMILL FORCE

ACCELERATED MACHINING

Indexable high-feed milling cutter, available in as small as ø8 mm in diameter, offers free cutting and effective chip control in a wide range of applications.

Small-diameter high feed milling cutter with impressive machining efficiency and reliability

Built to perform at higher machining conditions



Strong insert corner for high feed operations

- Thick insert corner is designed to withstand fracturing force

Robust and easy-to-handle insert screws

- M2 screws reduce screw neck shears under high cutting forces. A larger screw enhances insert's fixation and easy handling.

TUNGFORCE FEED (M2)

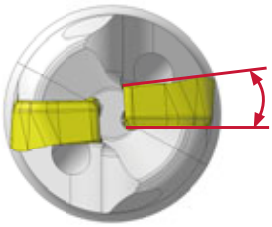
Competitor (M1.8)

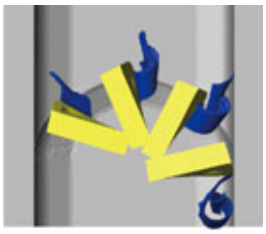
Proper chip formation assures a reliable machining process

Positive inclination angle of the insert promotes smooth chip evacuation

- The positive cutting edge position contributes to a controlled chip formation and easy chip evacuation when machining next to shoulder and slotting operation.

Positive inclination angle





Proper chip control eliminates recuts and premature insert failure

Chip formation

TUNGFORCE FEED

Ideal curled chips

Competitor

Crushed chips

Cutter	: EXLS02M010C10.0LF20R02
Insert	: LSMT0202ZER-HM AH3225
Workpiece material	: S55C
Cutting speed	: *Vc* = 200 m/min
Application	: Slotting
Cutting width	: *ae* = 0.5 mm × 20 passes
Coolant	: Dry
Machine	: Vertical M/C, BT40

Ensures high efficient machining in various operations

Effective in various 3D milling applications including helical interpolation and ramping

 Face milling

 Shoulder milling

 Helical interpolation

 Ramping

etc.

Improved machining efficiency thanks to close pitch design and wider application capability

MRR is improved as much as 5 times!

Table below shows tool performance comparisons when machining S55C carbon steel with a tool diameter of ø16 mm

	Metal removal rate MRR (cm^3/min)	Number of teeth	Cutting speed (m/min)	Feed per tooth (mm/t)	Depth of cut (mm)	Width of cut (mm)
TungForceFeed	77	5	200	0.80	0.5	10
Competitor's high feed cutter	15	4	200	0.20	0.5	10
Competitor's shoulder mill	62	4	200	0.08	5.0	10
Solid carbide endmill	39	5	100	0.08	5.0	10

High feed capability improves tool life and machining efficiency

Designed with a small entry angle for chatter stability, TungForceFeed's insert significantly improves efficiency and tool life even when machining in long reach areas

 Long reach areas

 Deep slots

 Deep shouldering

etc.

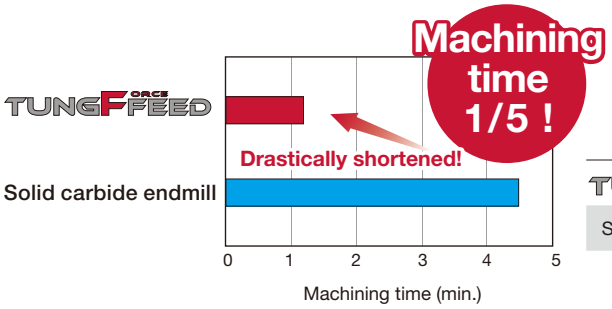
Applications requiring a long overhang tool to avoid fixture or workpiece interference

Problems with the conventional tool

- Chatter is more common with long reach areas, preventing higher parameters to be applied
- Chipping and fracture occurs due to chatter

TungForceFeed with long overhang tool performs at highest efficiency and reliability, in long reach machining application

Machining time compared with the conventional tool (L/D = 5, pocketing)



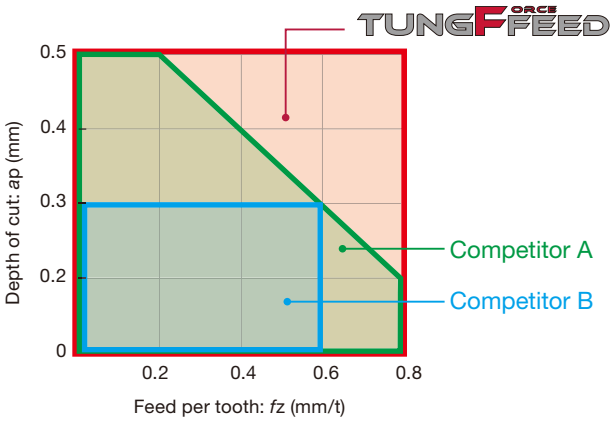
	Tool diameter	Number of teeth	Metal removal rate MRR (cm^3/min)	Long reach areas (mm)	Cutting speed (m/min)	Feed per tooth (mm/t)	Depth of cut (mm)
TungForceFeed	ø12	2	19	60	150	0.40	0.5 × 20 passes
Solid carbide endmill	ø12	4	4	60	80	0.08	0.5 × 20 passes

2 insert styles for various applications

High feed insert (LSMT-HM)

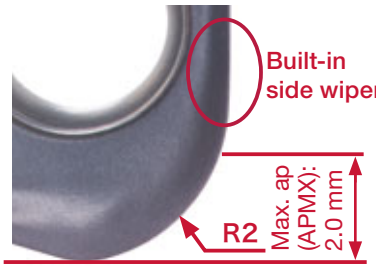
- Provides machining efficiency in a wide range of applications
- First choice insert for various applications including slotting, pocketing, or for long reach areas

Application range
(of standard length body)

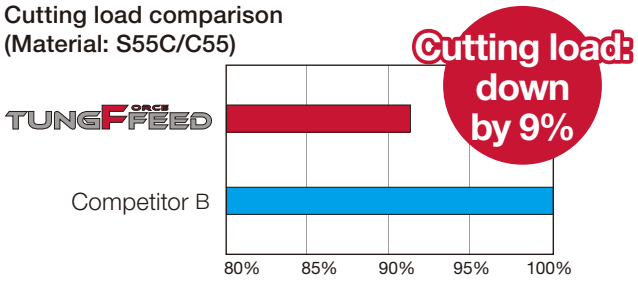


R2 insert (LSMT-MM) (To be released in 2019)

- Full profiling insert design ideal for semi-roughing and semi-finishing of die and mold parts
- Free cutting geometry eliminates chattering and improves surface finish quality
- Built-in side wiper helps reduce burr formation on walls and corners while improving wall accuracy



Cutting load comparison
(Material: S55C/C55)



Burr formations on exit

TUNGFFEED

Competitor

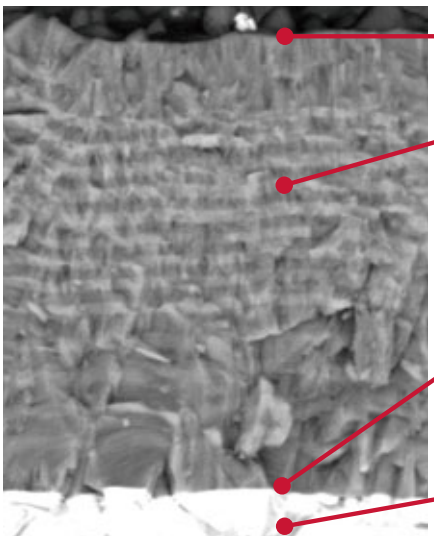
Grade lineup for various materials

New

AH3225

P M

- 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



Technology 1 - Resistance to built-up edge
The coating surface prevents built-up edge

Technology 2 - 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

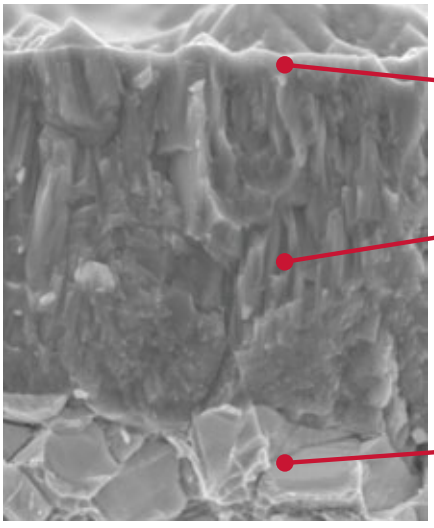
Technology 3 - Strong coating/substrate adhesion
Coating is optimized for strong adhesion property with substrate to maintain strong cutting edge integrity

Carbide substrate
High resistance to fracture

AH8015

H S K P

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



Special surface technology

PREMIUMTEC
TUNGALOY

Smooth insert surface prevents chip adhesion!

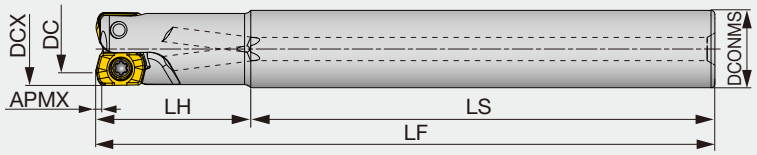
Extremely hard layer of nano multi-layered AlTiN coating with high Al content
Increases hardness by 20 %
Prevents micro cracks from developing

Carbide substrate
High resistance to wear

EXLS

Cylindrical type holder for high-feed milling, screw-on

GAMP = +4°, GAMF = -21° ~ -17°



Designation	APMX	DCX	CICT	DC	DCONMS	LS	LH	LF	WT (kg)	Air hole	Insert
EXLS02M008C08.0LH16R01	0.5	8	1	4.29	8	59	16	75	0.02	With	LSMT02...
EXLS02M008C08.0LH30R01	0.5	8	1	4.29	8	59	31	90	0.03	With	LSMT02...
EXLS02M010C10.0LH20R02	0.5	10	2	6.28	10	60	20	80	0.04	With	LSMT02...
EXLS02M010C10.0LH40R02	0.5	10	2	6.28	10	60	40	100	0.05	With	LSMT02...
EXLS02M010C08.0LH20R02	0.5	10	2	6.28	8	60	20	80	0.03	With	LSMT02...
EXLS02M012C12.0LH20R03	0.5	12	3	8.31	12	60	20	80	0.06	With	LSMT02...
EXLS02M012C12.0LH50R02	0.5	12	2	8.31	12	60	50	110	0.08	With	LSMT02...
EXLS02M012C10.0LH20R03	0.5	12	3	8.31	10	60	20	80	0.04	With	LSMT02...
EXLS02M016C16.0LH30R05	0.5	16	5	12.31	16	70	30	100	0.14	With	LSMT02...
EXLS02M016C16.0LH50R03	0.5	16	3	12.31	16	70	50	120	0.17	With	LSMT02...

SPARE PARTS

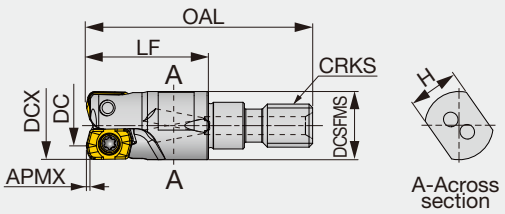
Designation	Clamping screw	Lubricant	Wrench
EXLS02M...	CSPB-2H	M-1000	IP-6DB

TUNGFLEX

HXLS

Modular head for high-feed milling, screw-on (TungFlex)

GAMP = +4°, GAMF = -21° ~ -17°



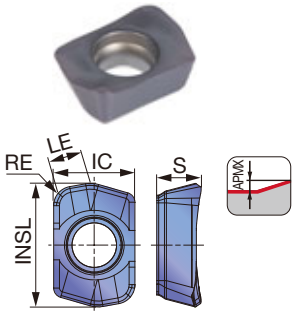
Designation	APMX	DCX	CICT	DC	OAL	LF	H	DCSFMS	CRKS	WT (kg)	Air hole	Insert
HXLS02M008M06R01	0.5	8	1	4.29	33.5	19	7	9.5	M6	0.01	With	LSMT02...
HXLS02M010M06R02	0.5	10	2	6.28	31.5	17	7	9.5	M6	0.01	With	LSMT02...
HXLS02M012M06R03	0.5	12	3	8.31	31.5	17	7	10	M6	0.01	With	LSMT02...
HXLS02M012M06R02	0.5	12	2	8.31	31.5	17	7	10	M6	0.01	With	LSMT02...
HXLS02M016M08R05	0.5	16	5	12.31	40	23	10	13	M8	0.03	With	LSMT02...
HXLS02M016M08R03	0.5	16	3	12.31	40	23	10	13	M8	0.03	With	LSMT02...

SPARE PARTS

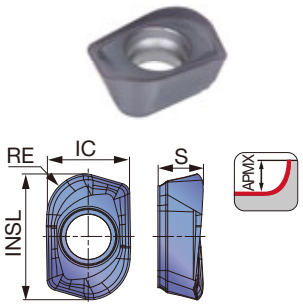
Designation	Clamping screw	Lubricant	Wrench
HXLS02M...	CSPB-2H	M-1000	IP-6DB

INSERTS

LSMT-HM (High feed)



LSMT-MM (Radius)



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

★ : First choice
☆ : Second choice

Designation	RE	APMX	Coated AH3225	Coated AH8015	LE	INSL	IC	S
LSMT0202ZER-HM	1	0.5	●	●	1.7	6.4	4.2	2.3
LSMT0202R2-MM	2	2.0	●	●	-	6.4	4.3	2.3

●: To be released in 2019
●: Line up

TUNGFORCE FEED
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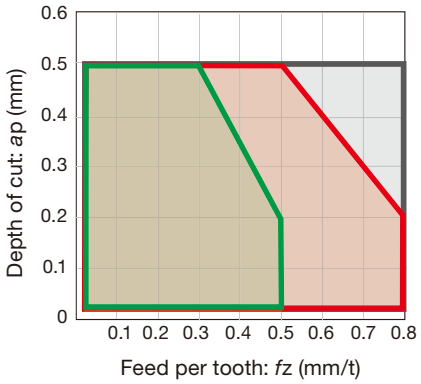
STANDARD CUTTING CONDITIONS

ISO	Workpiece materials		Hardness	Priority	Grades	Cutting speed *Vc* (m/min)	Feed per tooth *fz* (mm/t)
P	Carbon steels (S45C / C45, S55C / C55, etc)		- 300HB	First choice	AH3225	100 - 300	0.2 - 0.8
			- 300HB	For wear resistance	AH8015	100 - 300	0.2 - 0.8
	Alloy steels (SCM440 / 42CrMo4, etc)		- 300HB	First choice	AH3225	100 - 300	0.2 - 0.8
			- 300HB	For wear resistance	AH8015	100 - 300	0.2 - 0.8
	Prehardened steels (NAK80, PX5, etc)		30 - 40HRC	First choice	AH8015	100 - 200	0.2 - 0.5
			30 - 40HRC	For impact resistance	AH3225	100 - 200	0.2 - 0.5
M	Stainless steels (SUS304 / X5CrNi18-9, SUS316 / X5CrNiMo17-12-3, etc)		- 200HB	First choice	AH3225	100 - 150	0.2 - 0.5
K	Gray cast irons (FC250 / 250 / GG25, FC300 / 300 / GG30, etc)		150 - 250HB	First choice	AH8015	100 - 300	0.2 - 0.8
			150 - 250HB	For impact resistance	AH3225	100 - 300	0.2 - 0.8
	Ductile cast irons (FCD600 / 600-3 / GGG60, etc)		150 - 250HB	First choice	AH8015	80 - 200	0.2 - 0.8
			150 - 250HB	For impact resistance	AH3225	80 - 200	0.2 - 0.8
S	Titanium alloy (Ti-6Al-4V, etc)		- 40HRC	First choice	AH3225	30 - 60	0.1 - 0.3
			- 40HRC	For wear resistance	AH8015	30 - 60	0.1 - 0.3
	Heat resistance alloy (Inconel, Hastelloy, etc)		- 40HRC	First choice	AH8015	20 - 50	0.1 - 0.3
			- 40HRC	For impact resistance	AH3225	20 - 50	0.1 - 0.3
H	Hardened steel	SKD61 / X40CrMoV5-1, etc	40 - 50HRC	First choice	AH8015	80 - 150	0.1 - 0.5
		SKD11 / X153CrMoV12, etc	50~60HRC	First choice	AH8015	50 - 70	0.1 - 0.3

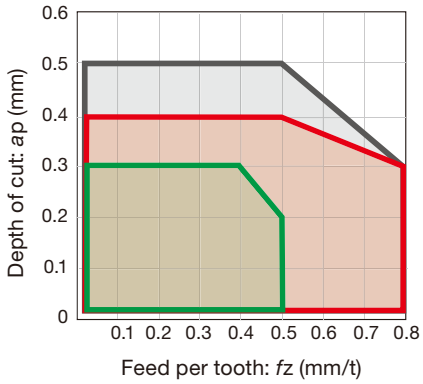
APPLICATION

LSMT02-HM



- For standard shanks in ≤ 3xD
- For long-neck shanks in ≥ 4xD
- For modular head shanks in ≥ 7xD

LSMT02-MM



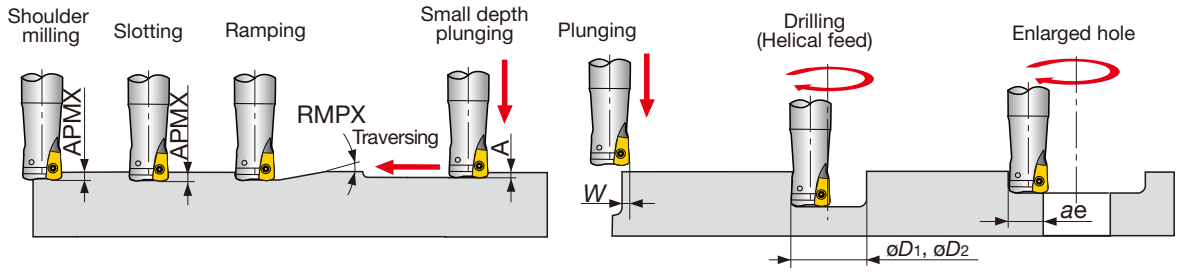
- For standard shanks in ≤ 3xD
- For long-neck shanks in ≥ 4xD
- For modular head shanks in ≥ 7xD

* When the DOC is 0.5 mm or more, the feed less than 0.15 mm/t is recommended.

Tool dia.: ø*Dc* (mm), Number of revolutions: *n* (min-1), Feed speed: *Vf* (mm/min), Max. depth of cut: *ap* = 0.5 mm, Number of teeth: CICT

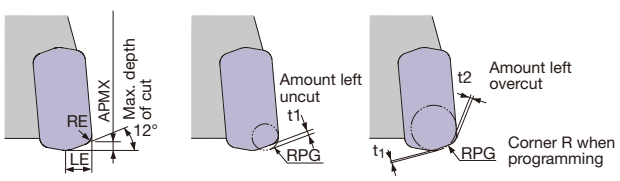
ø8, CICT = 1		ø10, CICT = 2		ø12			ø16		
n	*Vf*	*n*	*Vf*	*n*	*Vf*		*n*	*Vf*	
					CICT = 2	CICT = 3		CICT = 3	CICT = 5
7960	3980	6370	6370	5310	5310	7970	3980	5970	9950
				Vc = 200 m/min, *fz* = 0.5 mm/t					
7960	3980	6370	6370	5310	5310	7970	3980	5970	9950
				Vc = 200 m/min, *fz* = 0.5 mm/t					
5970	2390	4780	3820	3980	3180	4780	2990	3590	5980
				Vc = 150 m/min, *fz* = 0.4 mm/t					
4780	1910	3820	3060	3190	2550	3830	2390	2870	4780
				Vc = 120 m/min, *fz* = 0.4 mm/t					
7960	3980	6370	6370	5310	5310	7970	3980	5970	9950
				Vc = 200 m/min, *fz* = 0.5 mm/t					
5970	2990	4780	4780	3980	3980	5970	2990	4490	7480
				Vc = 150 m/min, *fz* = 0.5 mm/t					
1590	320	1270	510	1060	420	640	800	480	800
				Vc = 40 m/min, *fz* = 0.2 mm/t					
1190	240	1000	400	800	320	480	600	360	600
				Vc = 30 m/min, *fz* = 0.2 mm/t					
4780	1430	3820	2290	3190	1910	2870	2390	2150	3590
				Vc = 120 m/min, *fz* = 0.3 mm/t					
2390	480	1910	760	1590	640	950	1190	710	1190
				Vc = 60 m/min, *fz* = 0.2 mm/t					

MACHINING APPLICATIONS



Designation	DC	Max. depth of cut APMX	Max. ramping angle RMPX	Max. plunging depth A	Max. cutting width in plunging W	Min. machining øD_1	Max. machining øD_2	Max. cutting width in enlarged hole *ae*
E/HXLS02M008…	8	0.5	4°	0.2	2	10	15	5.9
E/HXLS02M010…	10	0.5	3.3°	0.2	2	14	19	7.9
E/HXLS02M012…	12	0.5	2°	0.2	2	18	23	9.9
E/HXLS02M016…	16	0.5	1.3°	0.2	2	26	31	13.9

Tool geometry on programming

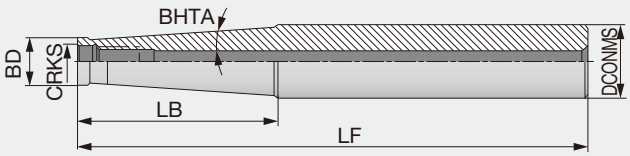


LSMT02…-HM

Corner R when programming: RPG	Amount left uncut t1 (mm)	Amount left overcut t2 (mm)
1.0 *Recommend	0.162	0
1.5	0.07	0.14
2	0	0.34

TUNGFLEX
SM

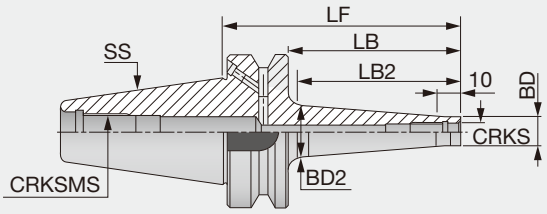
TungFlex - Modular shank



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

TUNGFLEX
BT-ODP(Screw clamping head holder)

TungFlex modular tooling system with BT shank



Designation	SS	CRKS	BD	BD2	LF	LB	LB2	CRKSMS
BT40ODP6X66	40	M6	9.8	13	66	39	30	M16
BT40ODP6X106	40	M6	9.8	23	106	79	70	M16
BT40ODP8X66	40	M8	13	15	66	39	30	M16
BT40ODP8X106	40	M8	13	23	106	79	70	M16
BT40ODP10X66	40	M10	18	20	66	39	30	M16
BT40ODP10X106	40	M10	18	28	106	79	70	M16
BT40ODP12X66	40	M12	21	24	66	39	30	M16
BT40ODP12X106	40	M12	21	31	106	79	70	M16
BT40ODP16X66	40	M16	29	28.6	66	39	-	M16
BT40ODP16X106	40	M16	29	34	106	79	70	M16
BT50ODP12X94	50	M12	23	30	94	56	50	M24
BT50ODP12X144 (1)	50	M12	23	40	144	106	100	M24
BT50ODP12X194 (1)	50	M12	23	40	194	156	150	M24
BT50ODP12X244 (1)	50	M12	23	46	244	206	200	M24
BT50ODP16X94 (1)	50	M16	29	34	94	56	50	M24
BT50ODP16X144 (1)	50	M16	29	40	144	106	100	M24
BT50ODP16X194 (1)	50	M16	29	55	194	156	150	M24
BT50ODP16X244 (1)	50	M16	29	60	244	206	200	M24

• Applicable for 10 MPa pressure coolant (1) Balanced to G6.3 at 12,000 min^{-1}

RED screw arbor

(Manufactured by MST corporation)

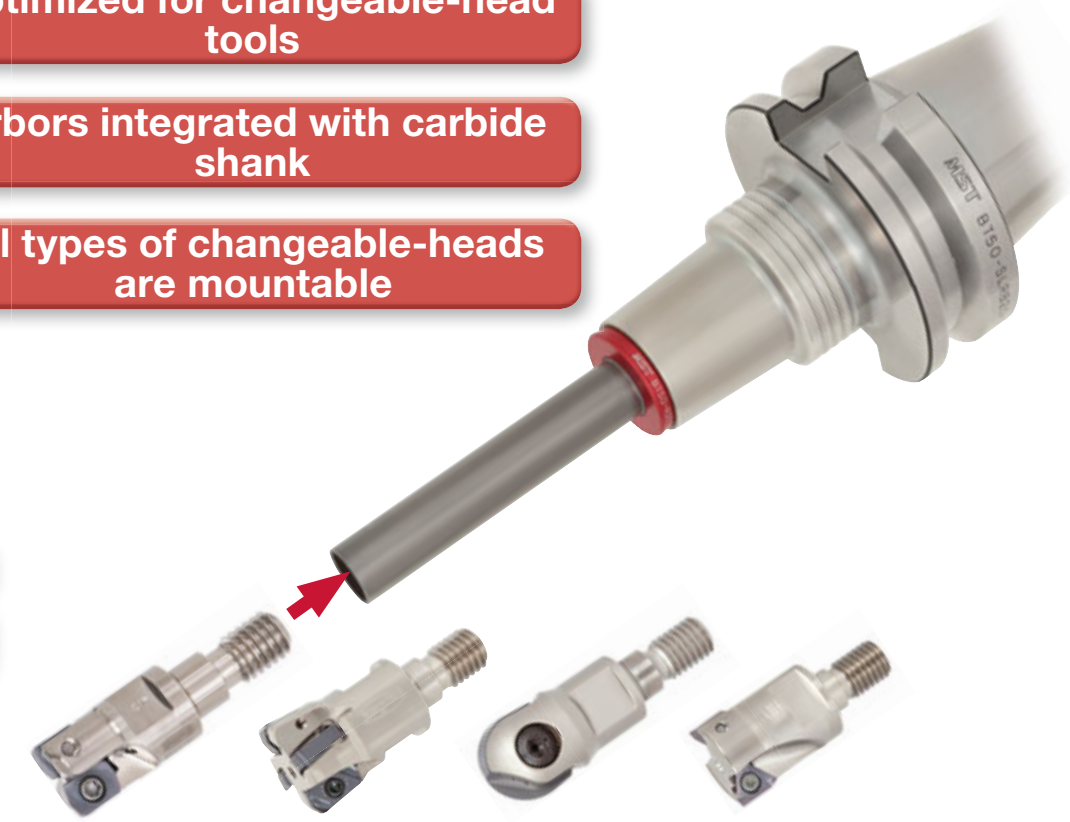
- Arbor integrated with carbide shank
- Carbide shank provides high rigidity
- Eliminates shank slip-off when rotated at high torque thanks to integrated shank-arbor design
- Chatter-free machining is possible even with long overhang

Ensures the highest performance with changeable-head tools

Optimized for changeable-head tools

Arbors integrated with carbide shank

All types of changeable-heads are mountable



TUNGFEED HXLS...

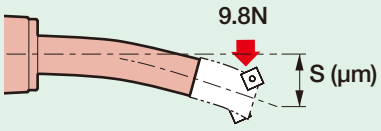
DOFEED HXN03...

BALLFINISH NOSE HBFM...

TUNG-TRI HPA...

Tool rigidity index

Values in "S" column in the table on page 14 indicates the amount of deflection at the tool tip when working load of 9.8N is applied. The smaller the value is, the more rigid the tool is.

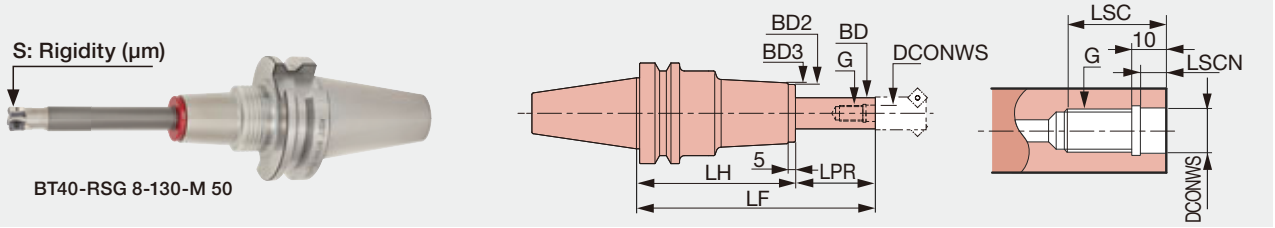


Manufactured by: MST corporation

TUNGFLEX

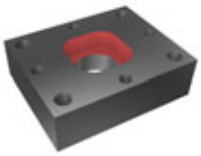
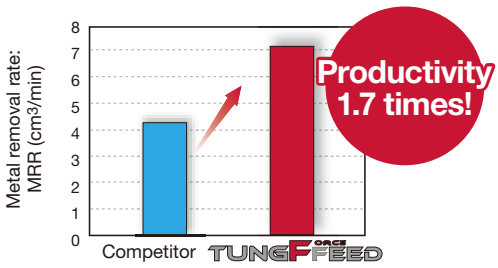
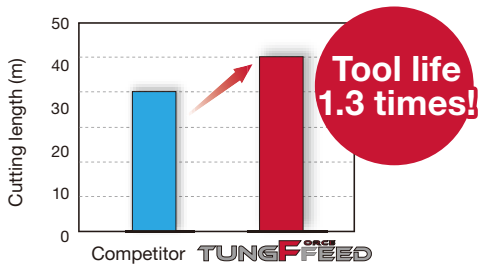
BT-RSG (Screw clamping head holder)

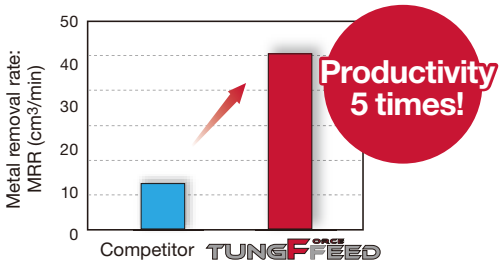
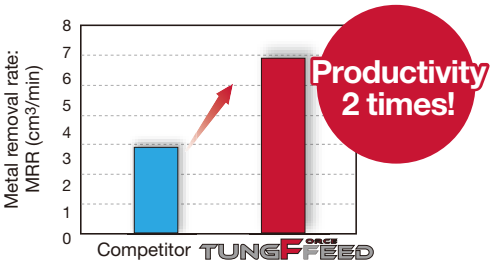
TungFlex modular tooling system with BT shank



Designation	DCONWS	LSC	LSCN	BD	LF	LPR	LH	BD2	BD3	S	WT (kg)	G
BT40-RSG 8-105-M 25	8.5	18	6.5	15	105	25	80	30	32	0.6	1.4	M8
BT40-RSG 8-135-M 25	8.5	18	6.5	15	135	25	110	30	32	0.7	1.8	M8
BT40-RSG 8-130-M 50	8.5	18	6.5	15	130	50	80	30	32	1.5	1.4	M8
BT40-RSG 8-160-M 50	8.5	18	6.5	15	160	50	110	30	32	1.7	1.8	M8
BT40-RSG 8-155-M 75	8.5	18	6.5	15	155	75	80	30	32	3.1	1.5	M8
BT40-RSG 8-185-M 75	8.5	18	6.5	15	185	75	110	30	32	3.4	1.9	M8
BT40-RSG 8-165-M 85	8.5	18	6.5	15	165	85	80	30	32	4	1.5	M8
BT40-RSG 10-125-M 25	10.5	22	6.5	19	125	25	100	36	38	0.4	1.8	M10
BT40-RSG 10-155-M 25	10.5	22	6.5	19	155	25	130	36	38	0.5	2.2	M10
BT40-RSG 10-150-M 50	10.5	22	6.5	19	150	50	100	36	38	0.9	1.9	M10
BT40-RSG 10-180-M 50	10.5	22	6.5	19	180	50	130	36	38	1	2.3	M10
BT40-RSG 10-175-M 75	10.5	22	6.5	19	175	75	100	36	38	1.6	2	M10
BT40-RSG 10-205-M 75	10.5	22	6.5	19	205	75	130	36	38	1.8	2.4	M10
BT40-RSG 10-200-M100	10.5	22	6.5	19	200	100	100	36	38	2.8	2	M10
BT40-RSG 10-230-M100	10.5	22	6.5	19	230	100	130	36	38	3	2.4	M10
BT40-RSG 12-125-M 25	12.5	22	6	24	125	25	100	43	45	0.3	2	M12
BT40-RSG 12-155-M 25	12.5	22	6	24	155	25	130	43	45	0.4	2.4	M12
BT40-RSG 12-150-M 50	12.5	22	6	24	150	50	100	43	45	0.5	2.1	M12
BT40-RSG 12-180-M 50	12.5	22	6	24	180	50	130	43	45	0.7	2.5	M12
BT40-RSG 12-175-M 75	12.5	22	6	24	175	75	100	43	45	0.9	2.3	M12
BT40-RSG 12-205-M 75	12.5	22	6	24	205	75	130	43	45	1.1	2.7	M12
BT40-RSG 12-200-M100	12.5	22	6	24	200	100	100	43	45	1.4	2.4	M12
BT40-RSG 12-230-M100	12.5	22	6	24	230	100	130	43	45	1.6	2.8	M12
BT50-RSG 8-120-M 25	8.5	18	6.5	15	120	25	95	30	32	0.6	4	M8
BT50-RSG 8-150-M 25	8.5	18	6.5	15	150	25	125	30	32	0.7	4.3	M8
BT50-RSG 8-145-M 50	8.5	18	6.5	15	145	50	95	30	32	1.5	4	M8
BT50-RSG 8-175-M 50	8.5	18	6.5	15	175	50	125	30	32	1.7	4.3	M8
BT50-RSG 8-170-M 75	8.5	18	6.5	15	170	75	95	30	32	3	4.1	M8
BT50-RSG 8-200-M 75	8.5	18	6.5	15	200	75	125	30	32	3.3	4.4	M8
BT50-RSG 8-180-M 85	8.5	18	6.5	15	180	85	95	30	32	3.9	4.1	M8
BT50-RSG 10-140-M 25	10.5	22	6.5	19	140	25	115	36	38	0.4	4.3	M10
BT50-RSG 10-170-M 25	10.5	22	6.5	19	170	25	145	36	38	0.5	4.6	M10
BT50-RSG 10-165-M 50	10.5	22	6.5	19	165	50	115	36	38	0.8	4.4	M10
BT50-RSG 10-195-M 50	10.5	22	6.5	19	195	50	145	36	38	0.9	4.7	M10
BT50-RSG 10-190-M 75	10.5	22	6.5	19	190	75	115	36	38	1.6	4.5	M10
BT50-RSG 10-220-M 75	10.5	22	6.5	19	220	75	145	36	38	1.7	4.8	M10
BT50-RSG 10-215-M100	10.5	22	6.5	19	215	100	115	36	38	2.7	4.5	M10
BT50-RSG 10-245-M100	10.5	22	6.5	19	245	100	145	36	38	2.9	4.8	M10
BT50-RSG 12-140-M 25	12.5	22	6	24	140	25	115	43	45	0.2	4.6	M12
BT50-RSG 12-170-M 25	12.5	22	6	24	170	25	145	43	45	0.3	5	M12
BT50-RSG 12-165-M 50	12.5	22	6	24	165	50	115	43	45	0.5	4.7	M12
BT50-RSG 12-195-M 50	12.5	22	6	24	195	50	145	43	45	0.6	5.1	M12
BT50-RSG 12-190-M 75	12.5	22	6	24	190	75	115	43	45	0.8	4.9	M12
BT50-RSG 12-220-M 75	12.5	22	6	24	220	75	145	43	45	1	5.3	M12
BT50-RSG 12-215-M100	12.5	22	6	24	215	100	115	43	45	1.3	5	M12
BT50-RSG 12-245-M100	12.5	22	6	24	245	100	145	43	45	1.5	5.4	M12
BT50-RSG 12-240-M125	12.5	22	6	24	240	125	115	43	45	2	5.2	M12
BT50-RSG 16-140-M 25	17	25	6	29	140	25	115	52	54	0.2	5.4	M16
BT50-RSG 16-165-M 50	17	25	6	29	165	50	115	52	54	0.3	5.6	M16
BT50-RSG 16-190-M 75	17	25	6	29	190	75	115	52	54	0.5	5.8	M16
BT50-RSG 16-215-M100	17	25	6	29	215	100	115	52	54	0.7	6	M16
BT50-RSG 16-240-M125	17	25	6	29	240	125	115	52	54	1.1	6.2	M16

PRACTICAL EXAMPLES

Workpiece type		Stator shaft	Stamping die part
Cutter		EXLS02M008C8.0LH16R01 (ø8, CICT = 1)	HXLS02M010M06R02 (ø10, CICT = 2)
Insert		LSMT0202ZER-HM	LSMT0202ZER-HM
Grade		AH3225	AH3225
Workpiece material		S45C	SKD11 (before hardening)
		 P	 P
Cutting conditions	Cutting speed : *Vc* (m/min)	150	120
	Feed per tooth: *fz* (mm/t)	0.5 (Competitor : *fz* = 0.3)	0.6
	Depth of cut : *ap* (mm)	0.3	0.3
	Width of cut : *ae* (mm)	8	5
	Machining	Grooving	Pocketing
	Coolant	Wet	Dry
	Machine	Vertical MC, BT30	Vertical MC, BT40
Results		 TungForceFeed insert's light cutting action ensured reliable high feed milling improving MRR by 1.7x	 AH3225 prevented wear and chipping, while improving tool life by 1.3 times.

Workpiece type		Stamping die part	Turbine blade
Cutter		EXLS02M012C12.0LH50R02 (ø12, CICT = 2)	EXLS02M008C8.0LH16R01 (ø8, CICT = 1)
Insert		LSMT0202ZER-HM	LSMT0202ZER-HM
Grade		AH3225	AH8015
Workpiece material		SKD61 (45HRC)	Inconel 939
		 H	 S
Cutting conditions	Cutting speed : *Vc* (m/min)	113	30
	Feed per tooth: *fz* (mm/t)	0.5 (Competitor : *fz* = 0.1)	0.2 (Competitor : *fz* = 0.05)
	Depth of cut : *ap* (mm)	0.3	0.3
	Width of cut : *ae* (mm)	12	8
	Machining	Face milling	Grooving
	Coolant	Air	Dry
	Machine	Vertical MC, BT50	Vertical MC, BT50
Results		 Strong TungForceFeed inserts ensured reliable machining of hard material, improving MRR by 5 times.	 Higher feed per tooth improved MRR by double, while reducing tool cost thanks to indexability.

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