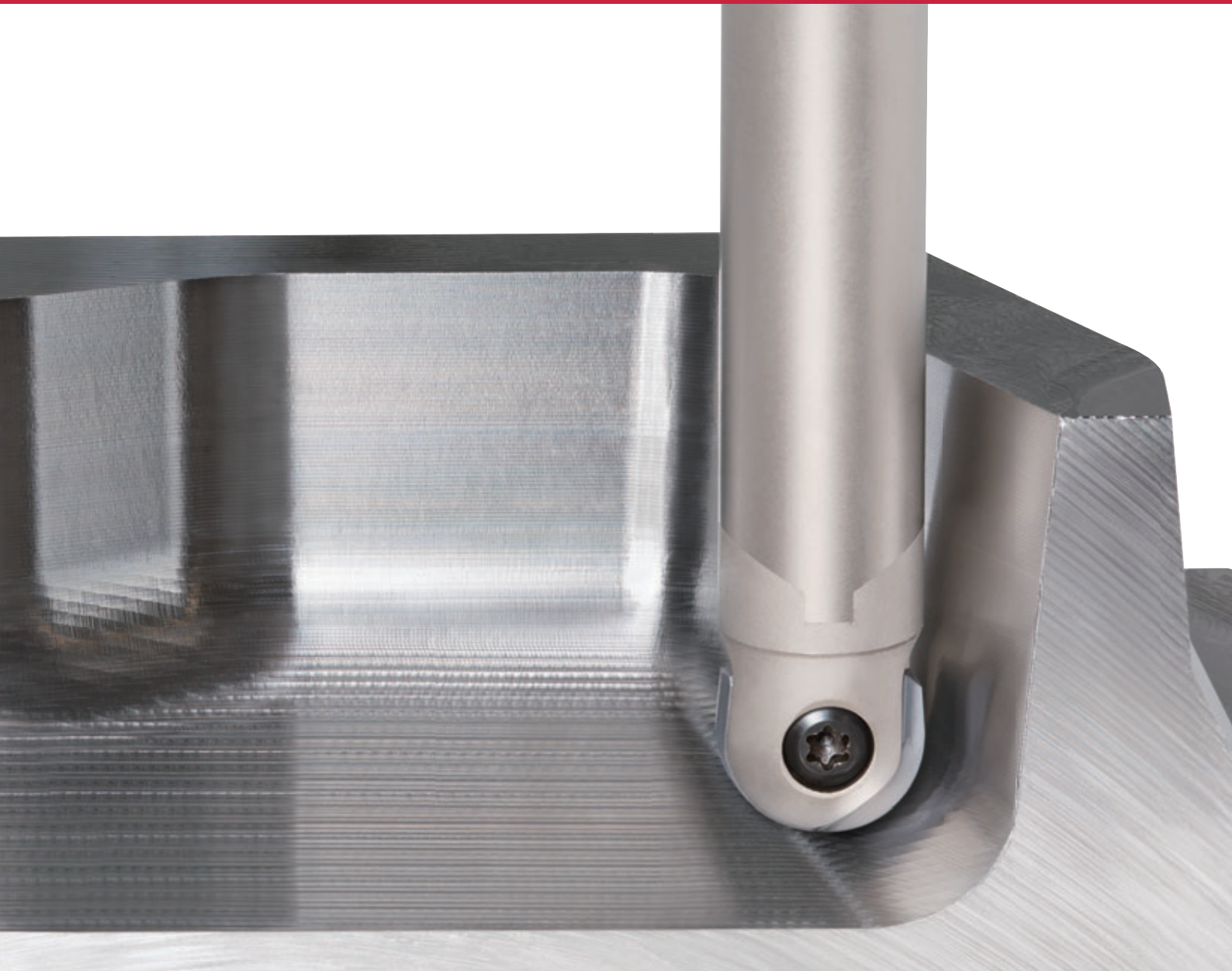


Indexable endmill **for high-precision finishing**





ACCELERATED MACHINING



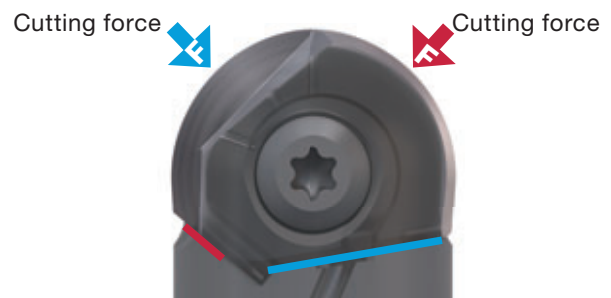
Excellent surface finish and stable machining due to
secure clamping and minimum run-out

New indexable endmill for die & mold and aerospace industries.

Secure clamping mechanism



Clamping force gathers on the flat part of the insert hole as the screw is tightened. The force pushes the insert towards the cutter body, providing high repeatability and rigidity as well as minimum run-out.



Asymmetric shape of the insert and directed clamping force maintains centrality of the insert under 3 dimensional cutting force.

Unique coolant delivery system

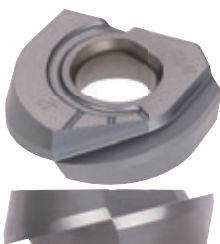


- The coolant channel on insert surface, delivers coolant to the cutting edge from three directions.
- Excellent chip evacuation and cooling effect provides good surface finish and long tool life in machining of hardened steel.

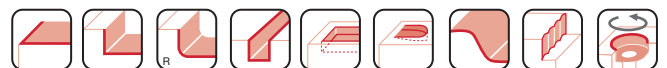
Two insert varieties

MJ chipbreaker

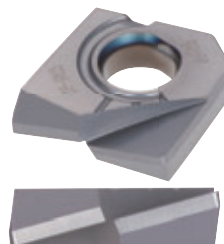
Ball nose type: ZFBM



- Suitable for finishing and three-dimensional milling of die & mold
- Applicable for a wide range of operations



Radius type: ZFRM



- Suitable for finishing of die & mold
- Designed for milling with high productivity

Versatile grade



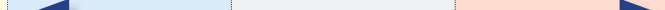
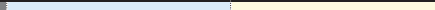
For pre-hardened steel, tool steel, and hardened steel



For steel, stainless steel, and cast iron

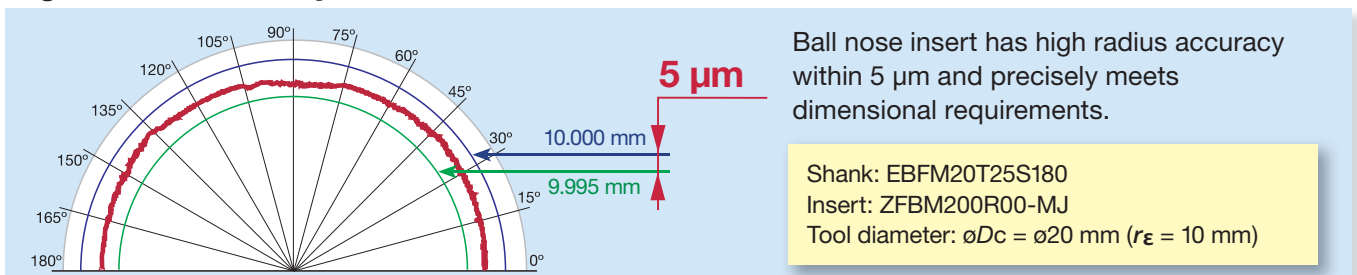
Application	Grade	Substrate			Coating layer		Features
	Application code	Relative density	Hardness HRA	T. R. S. (GPa)	Main Composition	Thickness (μm)	
P K H	AH710	15.0	93.0	2.9	(Ti, Al)N	3	For hardened steel High wear resistance due to hard substrate and coating
	P05 - P15						
P M K	AH725	14.4	91.5	3.0	(Ti, Al)N	2	For general purpose Good balance between wear and fracture resistances
	P20 - P30						

First choice

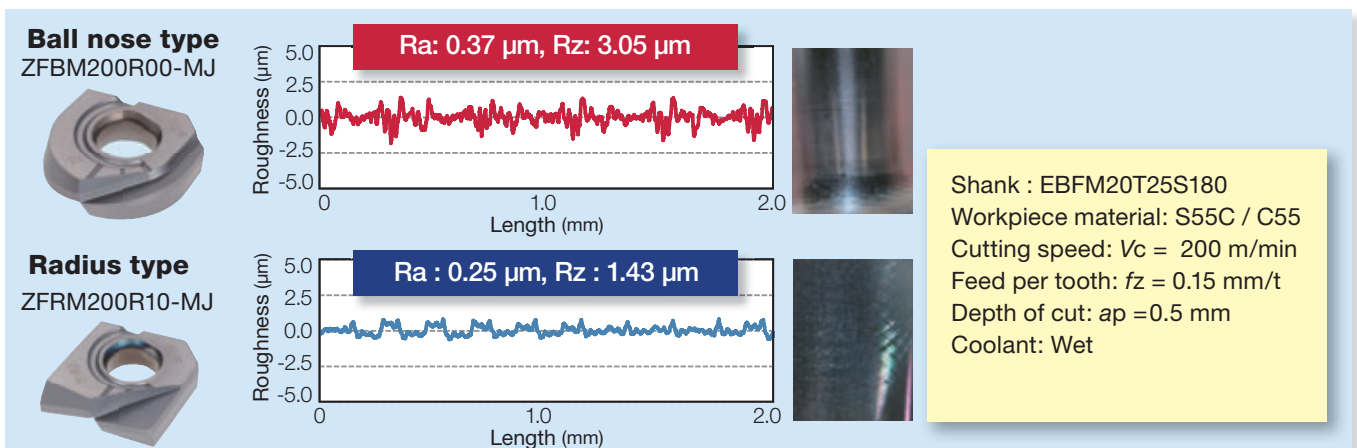
Workpiece material	P Carbon steel, Alloy steel	M Stainless steel	P Prehardend steel, Die & mold tool steel	H High hardened steel	K Cast iron
Hardness	85 - 280 HB	135 - 200 HB	HRC 40 - 48	HRC 48 - 65	150 - 240 HB
AH710					
AH725					

Excellent machining accuracy

High radius accuracy



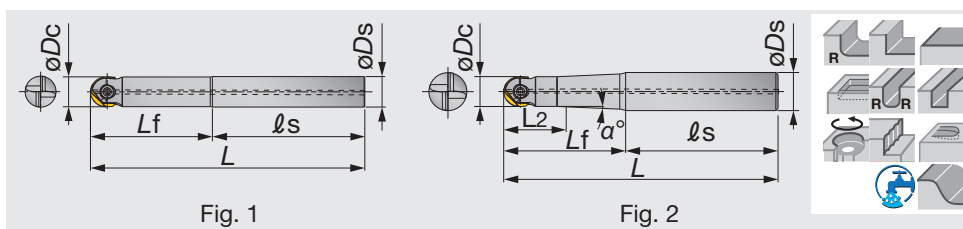
Good surface finish



ENDMILLS

EBFM

Indexable endmills for high precision finish



Designation	material	øDc	øDs	ℓs	Lf	L	L ₂	α°	Air hole	Fig	Insert
EBFM08T12S100	Steel	8	12	80	20	100	10	9.5	with	2	ZF*M080...
EBFM08S08C100	Carbide	8	8	70	30	100	-	-	without	1	ZF*M080...
EBFM08S08C140	Carbide	8	8	75	65	140	-	-	without	1	ZF*M080...
EBFM10T12S100	Steel	10	12	75	25	100	15	5	with	2	ZF*M100...
EBFM10S10C140	Carbide	10	10	65	75	140	-	-	without	1	ZF*M100...
EBFM10S10C220	Carbide	10	10	80	140	220	-	-	without	1	ZF*M100...
EBFM12S12S110	Steel	12	12	80	30	110	-	-	with	1	ZF*M120...
EBFM12S12C160	Carbide	12	12	70	90	160	-	-	without	1	ZF*M120...
EBFM12S12C220	Carbide	12	12	70	150	220	-	-	without	1	ZF*M120...
EBFM16T20S130	Steel	16	20	80	50	130	15.5	1.5	with	2	ZF*M160...
EBFM16S16C160	Carbide	16	16	80	80	160	-	-	without	1	ZF*M160...
EBFM16S16C220	Carbide	16	16	70	150	220	-	-	without	1	ZF*M160...
EBFM20T25S180	Steel	20	25	100	80	180	24	2.5	with	2	ZF*M200...
EBFM20S20C220	Carbide	20	20	100	120	220	-	-	without	1	ZF*M200...
EBFM20S20C300	Carbide	20	20	80	220	300	-	-	without	1	ZF*M200...
EBFM25T32S200	Steel	25	32	100	100	200	32	1.5	with	2	ZF*M250...
EBFM25S25C220	Carbide	25	25	100	120	220	-	-	without	1	ZF*M250...
EBFM25S25C300	Carbide	25	25	80	220	300	-	-	without	1	ZF*M250...
EBFM30T32S220	Steel	30	32	120	100	220	35	0.5	with	2	ZF*M300...
EBFM30S32C250	Carbide	30	32	100	150	250	-	-	without	1	ZF*M300...
EBFM30S32C350	Carbide	30	32	100	250	350	-	-	without	1	ZF*M300...
EBFM32S32S250	Steel	32	32	150	100	250	-	-	with	1	ZF*M320...
EBFM32S32C300	Carbide	32	32	80	220	300	-	-	without	1	ZF*M320...

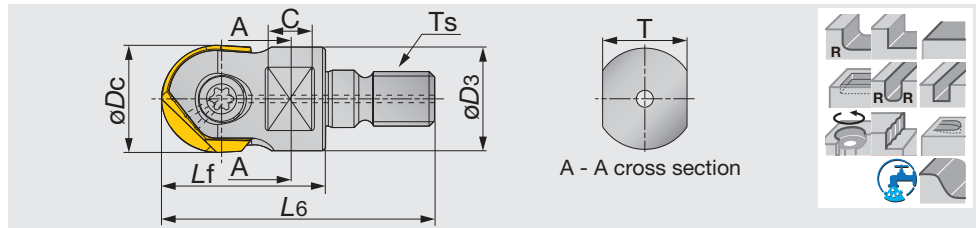
SPARE PARTS

Designation	Clamping screw	Torx bit	Grip	Wrench
EBFM08...	TS 25F080A	-	-	T-8D
EBFM10...	TS 30F100A	-	-	T-10D
EBFM12...	TS 40F120A	-	-	T-15D
EBFM16...	TS 50F160A	BT20S	H-TB2W	-
EBFM20...	TS 60F200A	BLDT25/M7	H-TB2W	-
EBFM25...	TS 70F250A	BLDT25/M7	H-TB2W	-
EBFM30...	TS 80F300A	-	-	T-T30
EBFM32...	TS 80F300A	-	-	T-T30

MODULAR TYPE

HBFM

Indexable endmills with TungFlex threaded adaptation for high precision finish

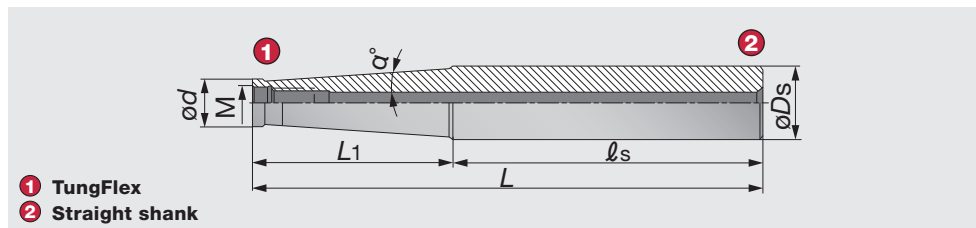


Designation	ϕD_c	L_6	L_f	C	T	ϕD_3	T_s	Air hole	Insert
HBFM10M06	10	34.5	20	5	7	9.7	M6	with	ZF*M100...
HBFM12M06	12	37.5	23	5	7	11.5	M6	with	ZF*M120...
HBFM12M08	12	40	23	8	10	13	M8	with	ZF*M120...
HBFM16M08	16	47	30	8	10	13	M8	with	ZF*M160...
HBFM20M10	20	49	30	10	15	19	M10	with	ZF*M200...
HBFM25M12	25	57	35	10	17	24	M12	with	ZF*M250...
HBFM30M16	30	66	43	12	22	29	M16	with	ZF*M300...
HBFM32M16	32	66	43	12	22	29.5	M16	with	ZF*M320...

SM

Endmills - modular shank

TUNG FLEX



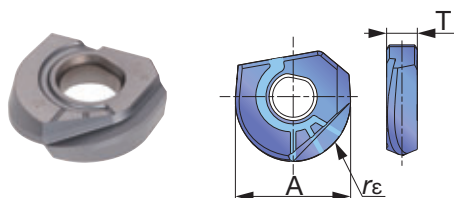
Designation	ϕD_s	L	ℓ_s	L_1	ϕd	M	α°	Shank type
SM06-L60C10	10	60	40	20	9.7	M6	0	Cylindrical
SM06-L105-C12	12	105	45	60	9.7	M6	1.2	Cylindrical
SM06-L125-C16	16	125	65	60	9.7	M6	3.3	Cylindrical
SM08-L73C16	16	73	48	25	13	M8	0	Cylindrical
SM08-L128-C16	16	128	48	80	13	M8	0.9	Cylindrical
SM08-L170-C20	20	170	103.2	66.8	13	M8	3.3	Cylindrical
SM10-L80-C20	20	80	50	30	18	M10	0	Cylindrical
SM10-L130-C20	20	130	50	80	18	M10	0.6	Cylindrical
SM10-L200-C25	25	200	142.8	57.2	19	M10	3.3	Cylindrical
SM12-L86-C25	25	86	56	30	21	M12	5.1	Cylindrical
SM12-L200-C32	32	200	122	78	21	M12	4.4	Cylindrical
SM16-L95-C32	32	95	60	35	29	M16	1.7	Cylindrical
SM16-L230-C32	32	230	180	50	29	M16	1.8	Cylindrical

SPARE PARTS

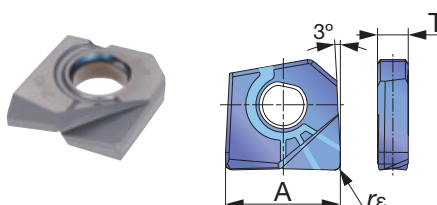
Designation	Clamping screw	Torx bit	Grip	Wrench
HBFM10...	TS 30F100A	-	-	T-10D
HBFM12...	TS 40F120A	-	-	T-15D
HBFM16...	TS 50F160A	BT20S	H-TB2W	-
HBFM20...	TS 60F200A	BLDT25/M7	H-TB2W	-
HBFM25...	TS 70F250A	BLDT25/M7	H-TB2W	-
HBFM30...	TS 80F300A	-	-	T-T30
HBFM32...	TS 80F300A	-	-	T-T30

INSERT

ZFBM-MJ



ZFRM-MJ



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

★ : First choice
☆ : Second choice

Designation	rε	Coating										A	T
		AH710	AH725										
ZFBM080R00-MJ	4	●	●									8	2.4
ZFBM100R00-MJ	5	●	●									10	2.9
ZFBM120R00-MJ	6	●	●									12	3.4
ZFBM160R00-MJ	8	●	●									16	4.4
ZFBM200R00-MJ	10	●	●									20	5.4
ZFBM250R00-MJ	12.5	●	●									25	6.4
ZFBM300R00-MJ	15	●	●									30	7.4
ZFBM320R00-MJ	16	●	●									32	7.4
ZFRM120R05-MJ	0.5	●	●									12	3.4
ZFRM120R10-MJ	1	●	●									12	3.4
ZFRM160R05-MJ	0.5	●	●									16	4.4
ZFRM160R10-MJ	1	●	●									16	4.4
ZFRM160R15-MJ	1.5	●	●									16	4.4
ZFRM200R10-MJ	1	●	●									20	5.4
ZFRM200R15-MJ	1.5	●	●									20	5.4

●: Line-up

STANDARD CUTTING CONDITIONS

ISO	Workpiece materials	Hardness	Priority	Grades	Max. depth of cut (mm)	Cutting speed Vc (m/min)	Feed per tooth: fz (mm/t)							
							D8	D10	D12	D16	D20	D25	D30	D32
P	Low carbon steel, alloy steel	85 - 180 HB	First choice	AH725	≤ 0.04D	180 - 260	0.15	0.2	0.2	0.25	0.25	0.3	0.35	0.35
		85 - 180 HB	For wear resistance	AH710	≤ 0.04D	180 - 260	0.15	0.2	0.2	0.25	0.25	0.3	0.35	0.35
	High carbon steel, alloy steel	180 - 280 HB	First choice	AH725	≤ 0.03D	150 - 230	0.15	0.2	0.2	0.25	0.25	0.3	0.35	0.35
		180 - 280 HB	For wear resistance	AH710	≤ 0.03D	180 - 230	0.15	0.2	0.2	0.25	0.25	0.3	0.35	0.35
	Prehardened steel Die & mold tool steel	40 - 48 HRC	First choice	AH710	≤ 0.03D	180 - 300	0.15	0.15	0.2	0.2	0.25	0.25	0.3	0.3
		40 - 48 HRC	For fracture resistance	AH725	≤ 0.03D	180 - 300	0.15	0.15	0.2	0.2	0.25	0.25	0.3	0.3
M	Stainless steel	135 - 200 HB	First choice	AH725	≤ 0.03D	100 - 250	0.1	0.15	0.2	0.2	0.25	0.25	0.3	0.3
K	Cast iron	150 - 240 HB	First choice	AH710	≤ 0.04D	90 - 350	0.2	0.2	0.25	0.3	0.3	0.35	0.4	0.4
		150 - 240 HB	For fracture resistance	AH725	≤ 0.04D	90 - 350	0.2	0.2	0.25	0.3	0.3	0.35	0.4	0.4
N	Aluminium	-	First choice	AH725	≤ 0.03D	200 - 400	0.25	0.25	0.35	0.35	0.35	0.4	0.4	0.45
H	High hardened steel	48 - 65 HRC	First choice	AH710	≤ 0.02D	100 - 350	0.08	0.08	0.1	0.13	0.15	0.2	0.2	0.25

· Remove excessive chip accumulation with an air blast.
 · For the operation with depth of cut which varies (ex. casting skin) and machining of workpiece materials with interrupted surface, the feed per tooth (fz) should be set to the lower recommended value shown in the above table.

· Cutting conditions maybe limited depending on machine power, workpiece 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.

How to clamp the insert

1. Clear chips and dust from the pocket.
2. Place the insert in the pocket. The insert can be placed only in one direction.
3. Tighten the screw while pressing the insert into the pocket.

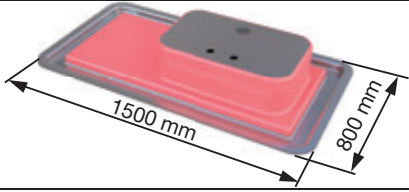
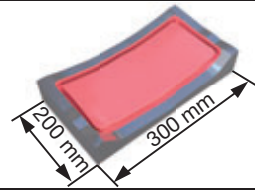
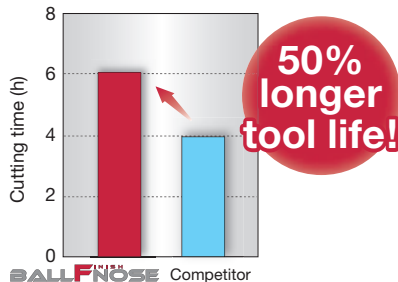
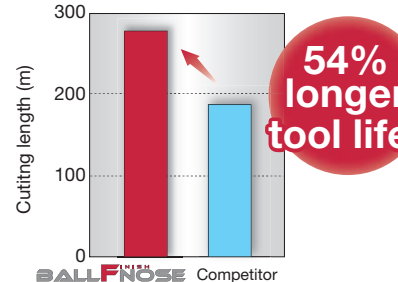
How to check the run-out

1. Clamp the insert on the shank.
2. Clamp the shank on a high-precision arbor.
3. Measure the run-out on tool presetter or by dial gauge.

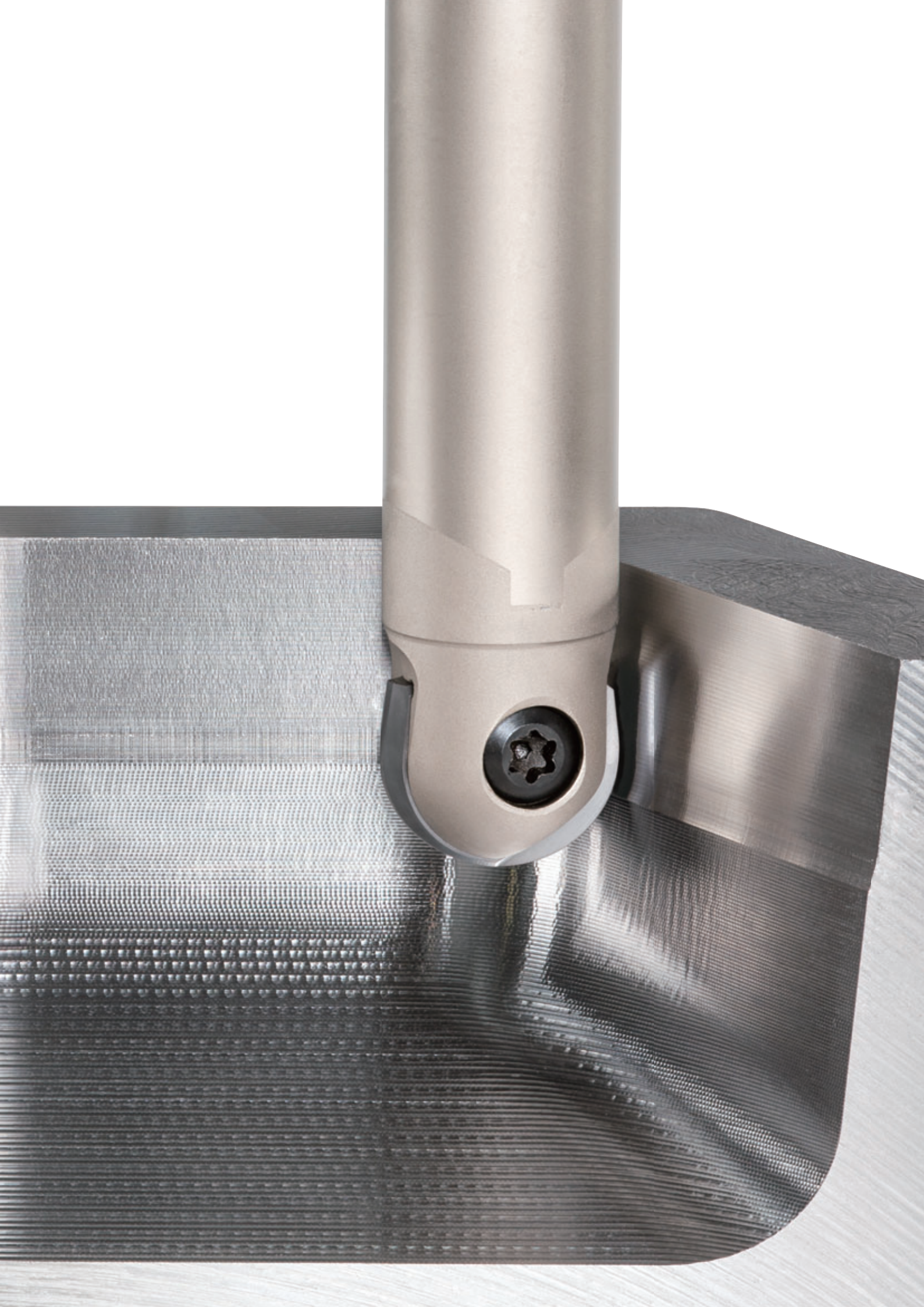
Notes:

1. Due to the helical cutting edge, it is important that the run-out is inspected with the insert clamped on the shank.
2. Do not use micrometer or caliper to inspect the insert diameter as inaccurate dimensions may be provided.

PRACTICAL EXAMPLES

Workpiece type		Mold part	Mold part
Cutter		EBFM20S20C220	EBFM12S12S110
Insert		ZFBM200R00-MJ	ZFBM120R00-MJ
Grade		AH725	AH725
		SKD11	STAVAX
Workpiece material			
Cutting conditions	Cutting speed: V_c (m/min)	350	360
	Feed per tooth: f_z (mm/t)	0.15	0.09
	Depth of cut: a_p (mm)	0.2	0.5
	Pick feed: pf (mm)	0.3	1.0
	Method of machining	Profiling	Profiling
	Coolant	Dry	Internal supply, water-soluble coolant
	Machine	M/C, BT50	M/C, BT40
Results		 BallFinishNose's tool life was 50% longer than the competitor's due to high wear resistance.	 BallFinishNose's cutting length was 54% longer than the competitor's due to excellent chip evacuation.





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