

NEW PRODUCT NEWS



Tungaloy Report No. 512-G

Multifunctional counterboring tool

TCCB

Multifunctional counterboring tool to improve your productivity



NEW PRODUCT NEWS



Tungaloy Report No. 512-G



TCB

TUNGALOY
ADD FORCE
ACCELERATED MILLING



Multifunctional tool with a broad lineup to **improve your production efficiency**

TCB

Versatile counter boring cutter with superior chip control

- Cutter diameter: 10 - 59 mm
- Optimized flute design for effective chip evacuation during counter boring for screw heads



Features

1 Flexible lineup of cutter bodies

Monoblock type

Tool diameters: DC = 10 - 43 mm



Extremely stiff tool body design optimized for counter boring operation for bolt heads

Cartridge type

Tool diameters: DC = 26 - 59 mm



Shim plates

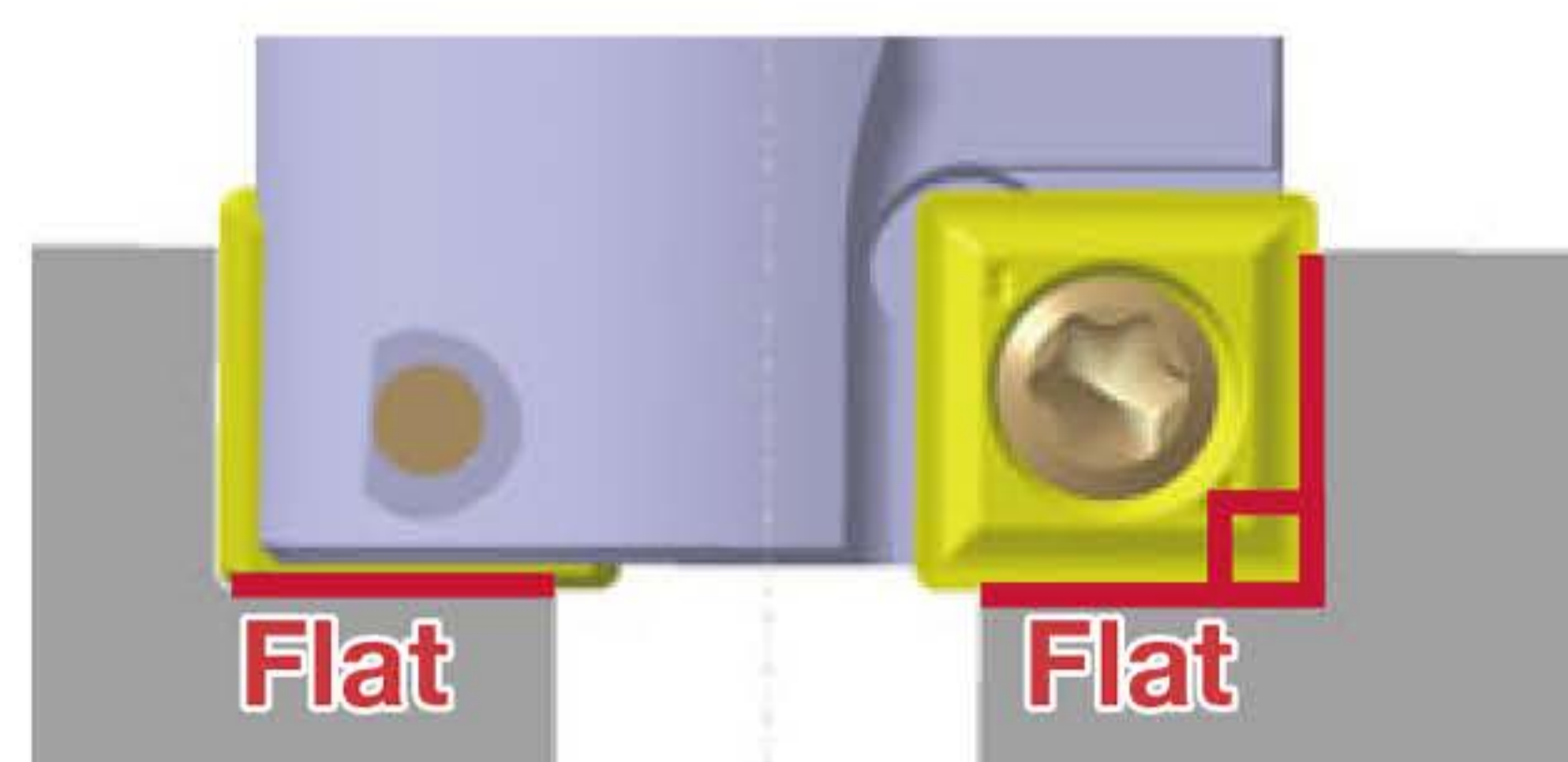
Shim plates in various sizes are available for cutter diameter adjustments.

Cartridge

Economical solution to minimize tool inventory. The cutter body is protected from damages even when the insert or cartridge is fractured during machining. Simply replace with a new cartridge, and the cutter is good to continue.



2 Provides a 90° flat surface



3 Excellent chip control

Optimized for boring operations

Efficient for a wide range of cutting depths and materials



SP*P/SP*M-CG

TCB
Chips from
counter boring



Competitor's endmill
Chips from
counter boring

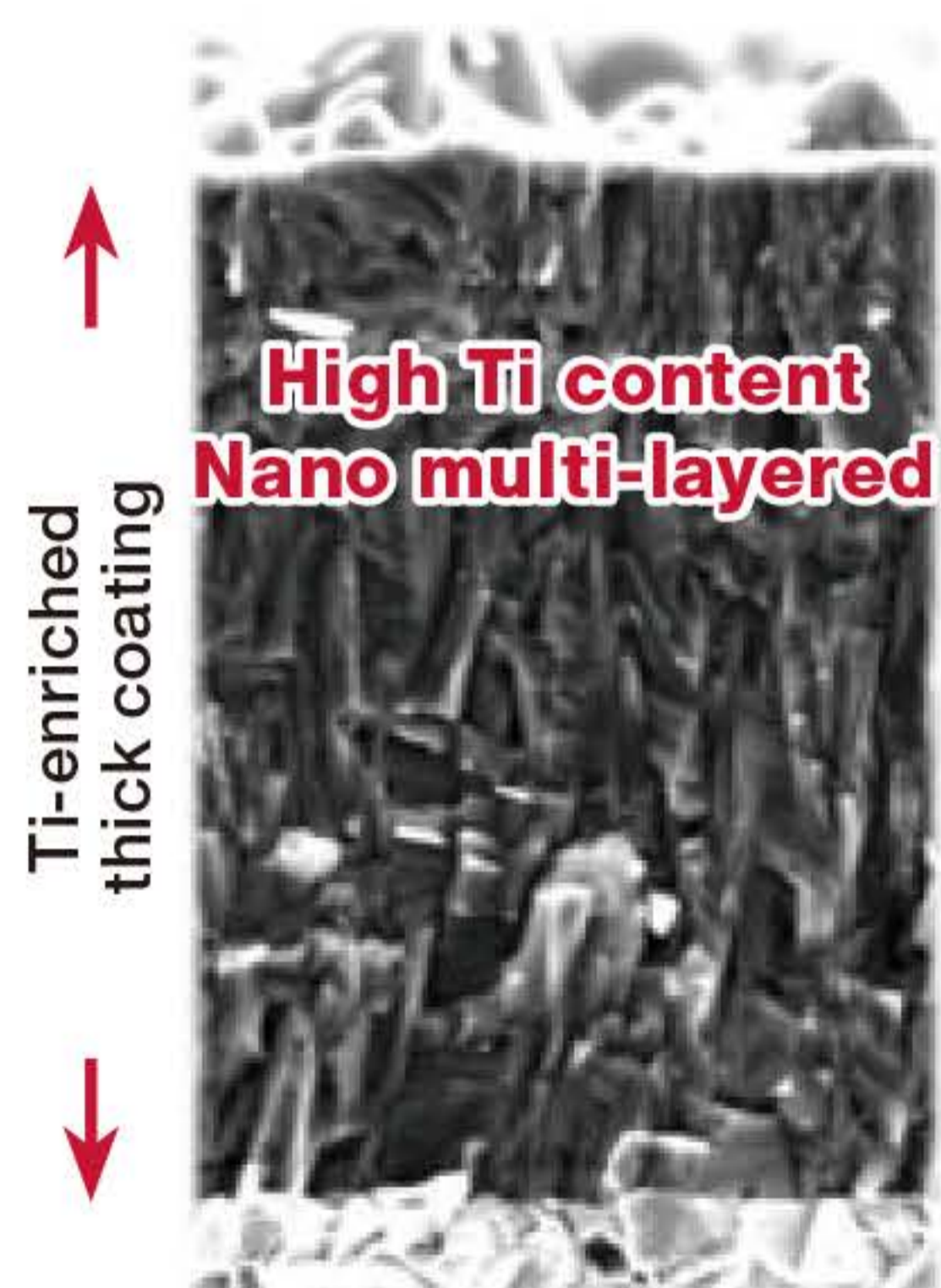


4 Enhanced insert line up

Now offering Tungaloy's unique X-tolerance inserts for closer dimensional requirements!

Inserts designation	Tolerance range	Tool diameter deviation range upon insert exchange	Corner radius			
			SPMP/SPMM		SPXP/SPXM	
			ø10 - 13	ø14 - 59	ø10 - 19	ø20 - 59
SPMP/SPMM	±0.08 - ±0.13	±0.16 - ±0.26	R0.4	R0.4, 0.8	-	-
New SPXP/SPXM	±0.04	±0.08	-	-	R0.4	R0.8

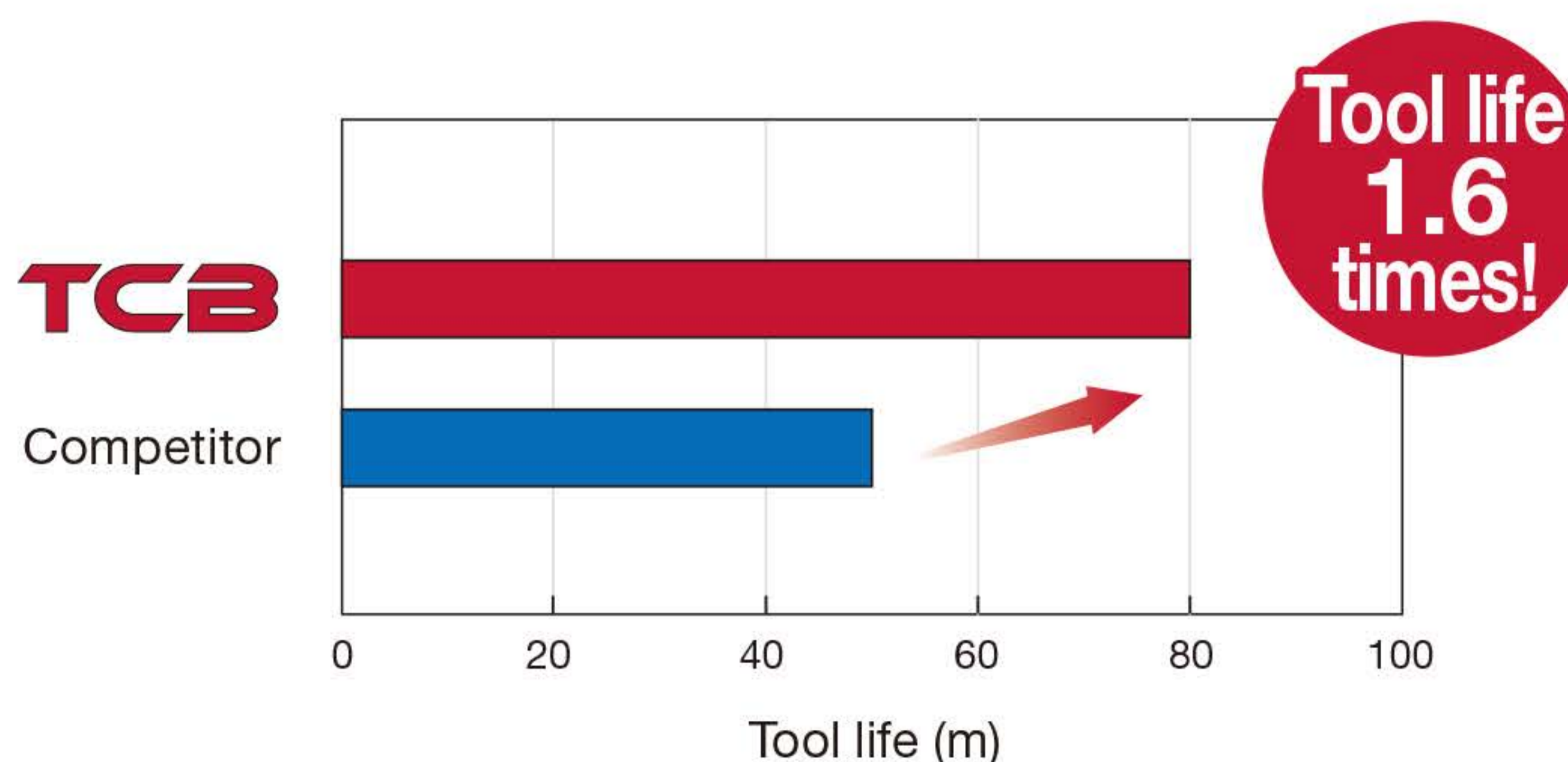
5 The latest coating grade for long insert tool life



New

AH6225 **P M K S H**

- New coated carbide grade consisted of a thick Ti-rich coating layer combined with dedicated carbide substrate.
- Increased wear and chipping resistance thanks to extremely hard coating layer and nanomultilayer coating.

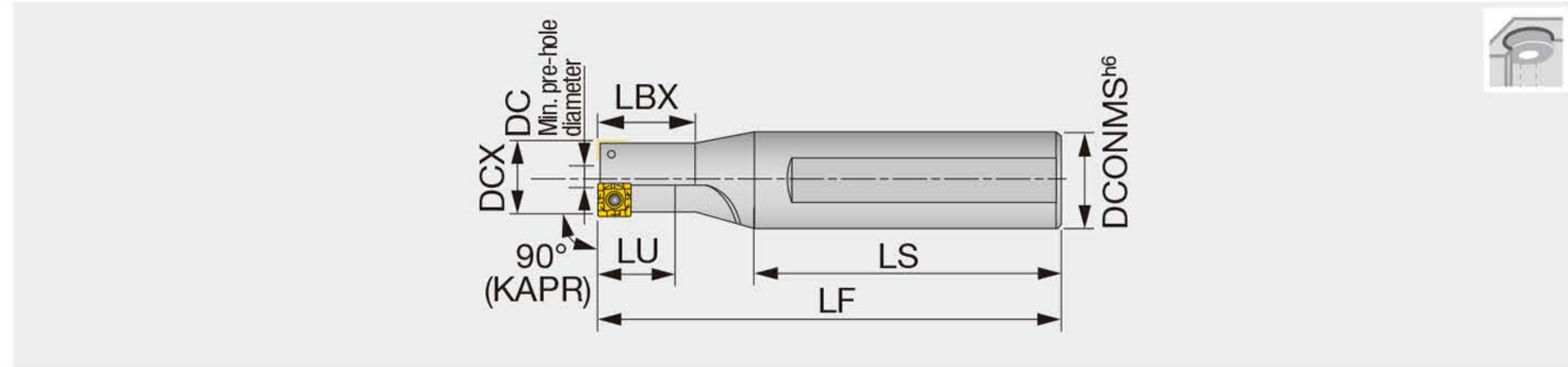


Boring endmill : TCB180F25
 Insert : SPMP831-CG AH6225
 Workpiece material : Carbon steel
 Cutting speed : $V_c = 150$ m/min
 Feed : $f = 0.2$ mm/rev
 Drilling depth : $H = 15$ mm
 Pre hole diameter : ø10 mm
 Coolant : Wet (External)
 Machine : NC lathe

AH6225 provided 1.6 times tool life increase thanks to its latest coating technology.

TCB

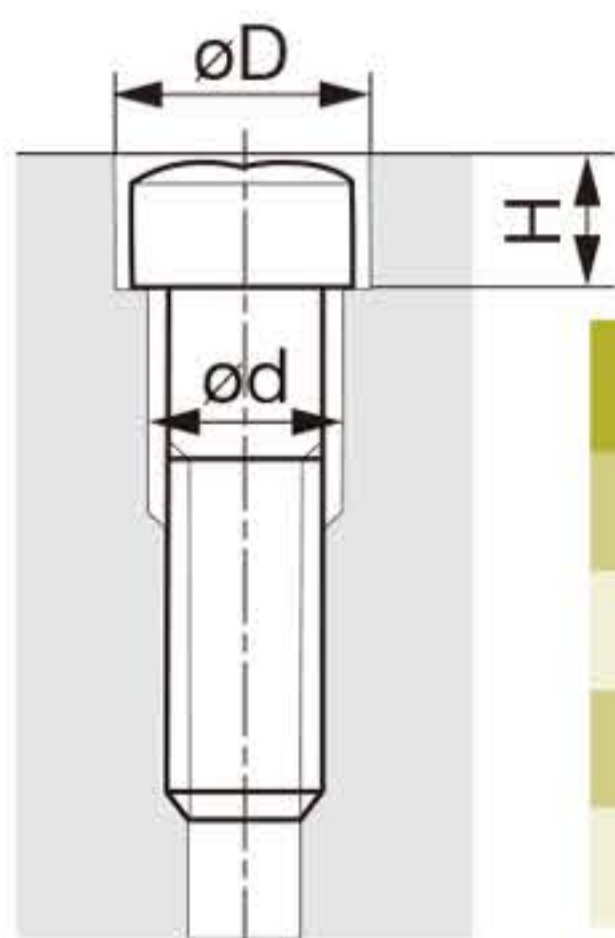
Counter boring endmill, monoblock type



Designation	DCX	CICT	DC	LU	LBX	LF	LS	DCONMS	Insert
TCB100F16	10	1	2.8	13	17	86	60	16	SP*P771...
TCB110F16	11	1	2.8	14	18.7	87	60	16	SP*P771...
TCB120F20	12	1	3.6	15	20.5	89	60	20	SP*P771...
TCB130F20	13	2	4.5	16	22.2	91	60	20	SP*P771...
TCB-140	14	1	4	11	18	117	80	25	SP*P831...
TCB140F25	14	2	5.5	18	24	113	80	25	SP*P771...
TCB150F25	15	2	6.5	19	25.7	114	80	25	SP*P771...
TCB160F25	16	2	7.5	20	27.5	116	80	25	SP*P771...
TCB170F25	17	2	6.6	13	21	114	80	25	SP*P831...
TCB175F25	17.5	2	7.1	14	22	115	80	25	SP*P831...
TCB180F25	18	2	7.5	15	23	116	80	25	SP*P831...
TCB190F25	19	2	8.5	15	24	118	80	25	SP*P831...
TCB-200	20	2	8.2	16	25	120	80	25	SP*P042...
TCB200F25	20	2	8.2	16	25	120	80	25	SP*P042...
TCB210F25	21	2	9	17	26	122	80	25	SP*P042...
TCB220F25	22	2	10	18	28	124	80	25	SP*P042...
TCB-230	23	2	11	19	29	126	80	25	SP*P042...
TCB230F25	23	2	11	19	29	126	80	25	SP*P042...
TCB240F25	24	2	12	20	-	128	80	25	SP*P042...
TCB250F25	25	2	13	25	-	130	80	25	SP*P042...
TCB-260	26	2	14	21	33	132	80	32	SP*P042...
TCB-290	29	2	14	23	36	138	80	32	SP*M322...
TCB-320	32	2	16.9	40	-	144	80	32	SP*M322...
TCB-350	35	2	14	43	-	150	80	32	SP*M432...
TCB-390	39	2	17.9	48	-	158	80	32	SP*M432...
TCB-430	43	2	21.7	53	-	171	85	42	SP*M432...

Tool diameter tolerance	Applicable tolerance range of hole diameter
+0.2 / 0	+0.3 / 0

Counter boring dimensions of bolt hole



Thread size	M6	M8	M10	M12	M14	M16	M18	M20	M22	M24	M27
øD (mm)	11	14	17.5	20	23	26	29	32	35	39	43
H (mm)	6.5	8.6	10.8	13	15.2	17.5	19.5	21.5	23.5	25.5	29
ød (mm)	6	9	11	14	16	18	20	22	24	26	30
Applicable tool	TCB110	TCB140	TCB175	TCB200	TCB230	TCB260	TCB290	TCB320	TCB350	TCB390	TCB430

SPARE PARTS



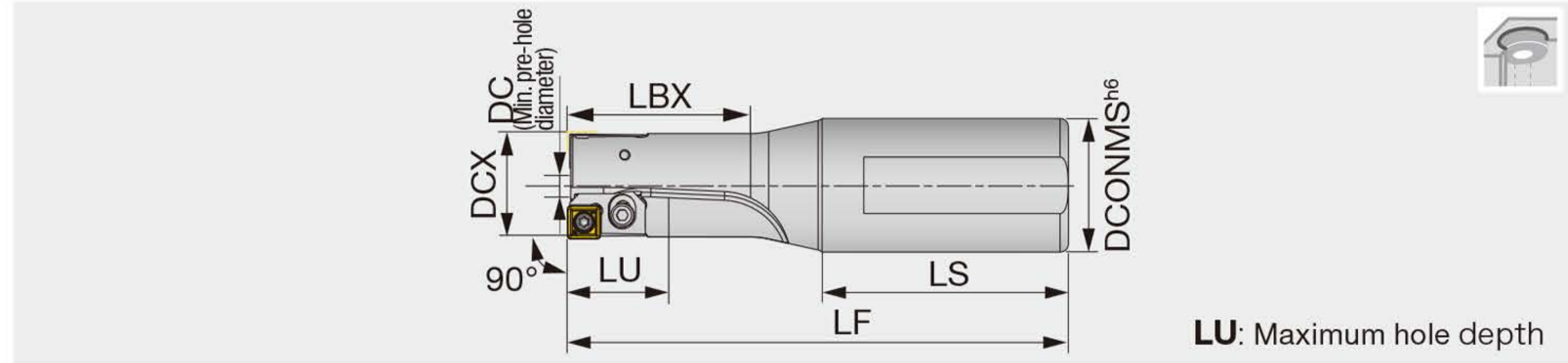
Designation	Clamping screw	Wrench
TCB100... - TCB160...	CSTB-2L040	T-6D
TCB-140...	CSTB-2.2S	T-7D
TCB170... - TCB190...	CSTB-2.2	T-7D
TCB200... - TCB260...	CSTA-NO3	T-9D
TCB-290 - TCB-320	CSTA-NO5	T-9D
TCB-350 - TCB-430	CSTA-4	T-15D

Recommended clamping torque: CSTB-2L040 = 0.7 N·m, CSTB-2.2S / CSTB-2.2 = 1 N·m, CSTA-NO3 / CSTA-NO5 = 2.3 N·m, CSTA-4 = 3.5 N·m

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TCB

Counter boring endmill, cartridge type

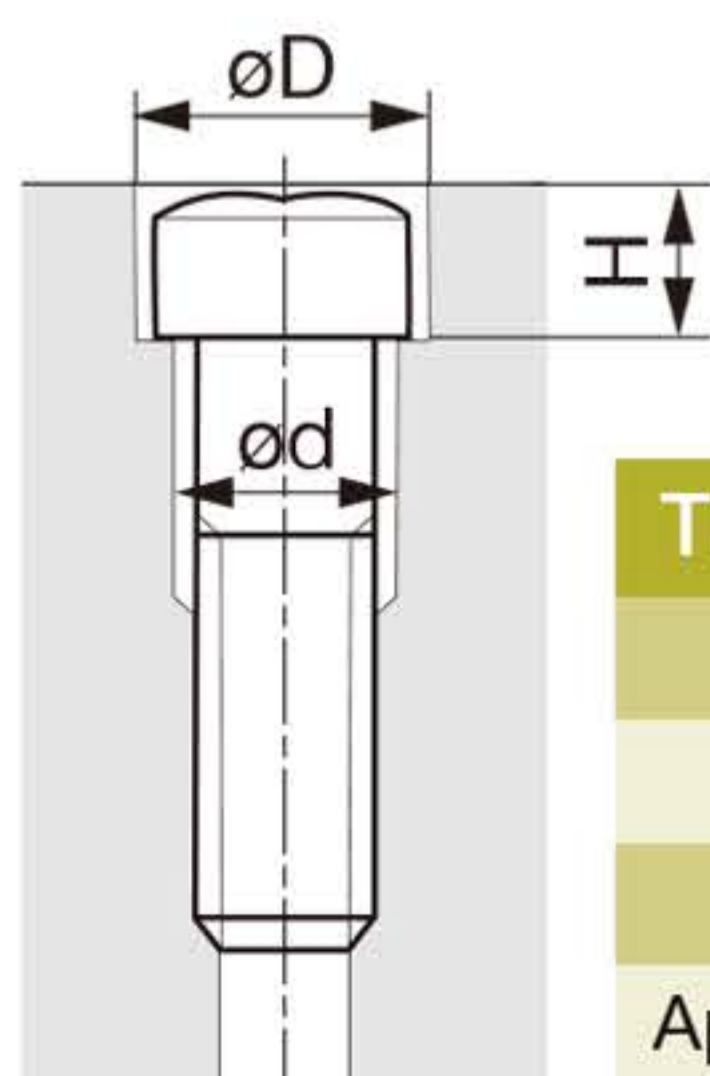


Body Designation	Cartridge set Designation	DCX	DCONMS	DC	LU	LS	LBX	LF	WT(kg)	Shim plate		Insert
										Designation	Thickness	
TCB260-290F32	TCB04CA-26-29	26	32	13.2	40	59	43	120	0.6	-	-	SP*P042...
TCB260-290F32	TCB04CA-26-29	27	32	14.2	40	59	43	120	0.6	AP16050	0.5	SP*P042...
TCB260-290F32	TCB04CA-26-29	28	32	15.2	40	59	43	120	0.6	AP16100	1	SP*P042...
TCB260-290F32	TCB04CA-26-29	29	32	16.2	40	59	43	120	0.6	AP16150	1.5	SP*P042...
TCB300-340F32	TCB32CA-30-39	30	32	14.2	45	59	55	130	0.6	-	-	SP*M322...
TCB300-340F32	TCB32CA-30-39	31	32	15.2	45	59	55	130	0.6	AP16050	0.5	SP*M322...
TCB300-340F32	TCB32CA-30-39	32	32	16.2	45	59	55	130	0.6	AP16100	1	SP*M322...
TCB300-340F32	TCB32CA-30-39	33	32	17.2	45	59	55	130	0.6	AP16150	1.5	SP*M322...
TCB300-340F32	TCB32CA-30-39	34	32	18.2	45	59	55	130	0.6	AP16200	2	SP*M322...
TCB350-390F32	TCB32CA-30-39	35	32	19	50	59	70	140	0.7	-	-	SP*M322...
TCB350-390F32	TCB32CA-30-39	36	32	20	50	59	70	140	0.7	AP16050	0.5	SP*M322...
TCB350-390F32	TCB32CA-30-39	37	32	21	50	59	70	140	0.7	AP16100	1	SP*M322...
TCB350-390F32	TCB32CA-30-39	38	32	22	50	59	70	140	0.7	AP16150	1.5	SP*M322...
TCB350-390F32	TCB32CA-30-39	39	32	23	50	59	70	140	0.7	AP16200	2	SP*M322...
TCB400-440F32	TCB43CA-40-59	40	32	18	55	59	80	150	1	-	-	SP*M432...
TCB400-440F32	TCB43CA-40-59	41	32	19	55	59	80	150	1	AP21050	0.5	SP*M432...
TCB400-440F32	TCB43CA-40-59	42	32	20	55	59	80	150	1	AP21100	1	SP*M432...
TCB400-440F32	TCB43CA-40-59	43	32	21	55	59	80	150	1	AP21150	1.5	SP*M432...
TCB400-440F32	TCB43CA-40-59	44	32	22	55	59	80	150	1	AP21200	2	SP*M432...
TCB450-490F32	TCB43CA-40-59	45	32	23	65	59	90	160	1.2	-	-	SP*M432...
TCB450-490F32	TCB43CA-40-59	46	32	24	65	59	90	160	1.2	AP21050	0.5	SP*M432...
TCB450-490F32	TCB43CA-40-59	47	32	25	65	59	90	160	1.2	AP21100	1	SP*M432...
TCB450-490F32	TCB43CA-40-59	48	32	26	65	59	90	160	1.2	AP21150	1.5	SP*M432...
TCB450-490F32	TCB43CA-40-59	49	32	27	65	59	90	160	1.2	AP21200	2	SP*M432...
TCB500-540F32	TCB43CA-40-59	50	32	28	70	59	97	165	1.5	-	-	SP*M432...
TCB500-540F32	TCB43CA-40-59	51	32	29	70	59	97	165	1.5	AP21050	0.5	SP*M432...
TCB500-540F32	TCB43CA-40-59	52	32	30	70	59	97	165	1.5	AP21100	1	SP*M432...
TCB500-540F32	TCB43CA-40-59	53	32	31	70	59	97	165	1.5	AP21150	1.5	SP*M432...
TCB500-540F32	TCB43CA-40-59	54	32	32	70	59	97	165	1.5	AP21200	2	SP*M432...
TCB550-590F32	TCB43CA-40-59	55	32	33	75	59	105	175	1.9	-	-	SP*M432...
TCB550-590F32	TCB43CA-40-59	56	32	34	75	59	105	175	1.9	AP21050	0.5	SP*M432...
TCB550-590F32	TCB43CA-40-59	57	32	35	75	59	105	175	1.9	AP21100	1	SP*M432...
TCB550-590F32	TCB43CA-40-59	58	32	36	75	59	105	175	1.9	AP21150	1.5	SP*M432...
TCB550-590F32	TCB43CA-40-59	59	32	37	75	59	105	175	1.9	AP21200	2	SP*M432...

The cartridge sets and shim plates are included.

Tool diameter tolerance	Applicable tolerance range of hole diameter
+0.2 / 0	+0.3 / 0

Counter boring dimensions of bolt hole



Thread size	M16	M18	M20	M22	M24	M27	M30	M33	M36
øD (mm)	26	29	32	35	39	43	48	54	58
H (mm)	17.5	19.5	21.5	23.5	25.5	29	32	35	38
ød (mm)	18	20	22	24	26	30	33	36	39
Applicable tool	TCB260	TCB290	TCB320	TCB350	TCB390	TCB430	TCB480	TCB540	TCB580

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Body

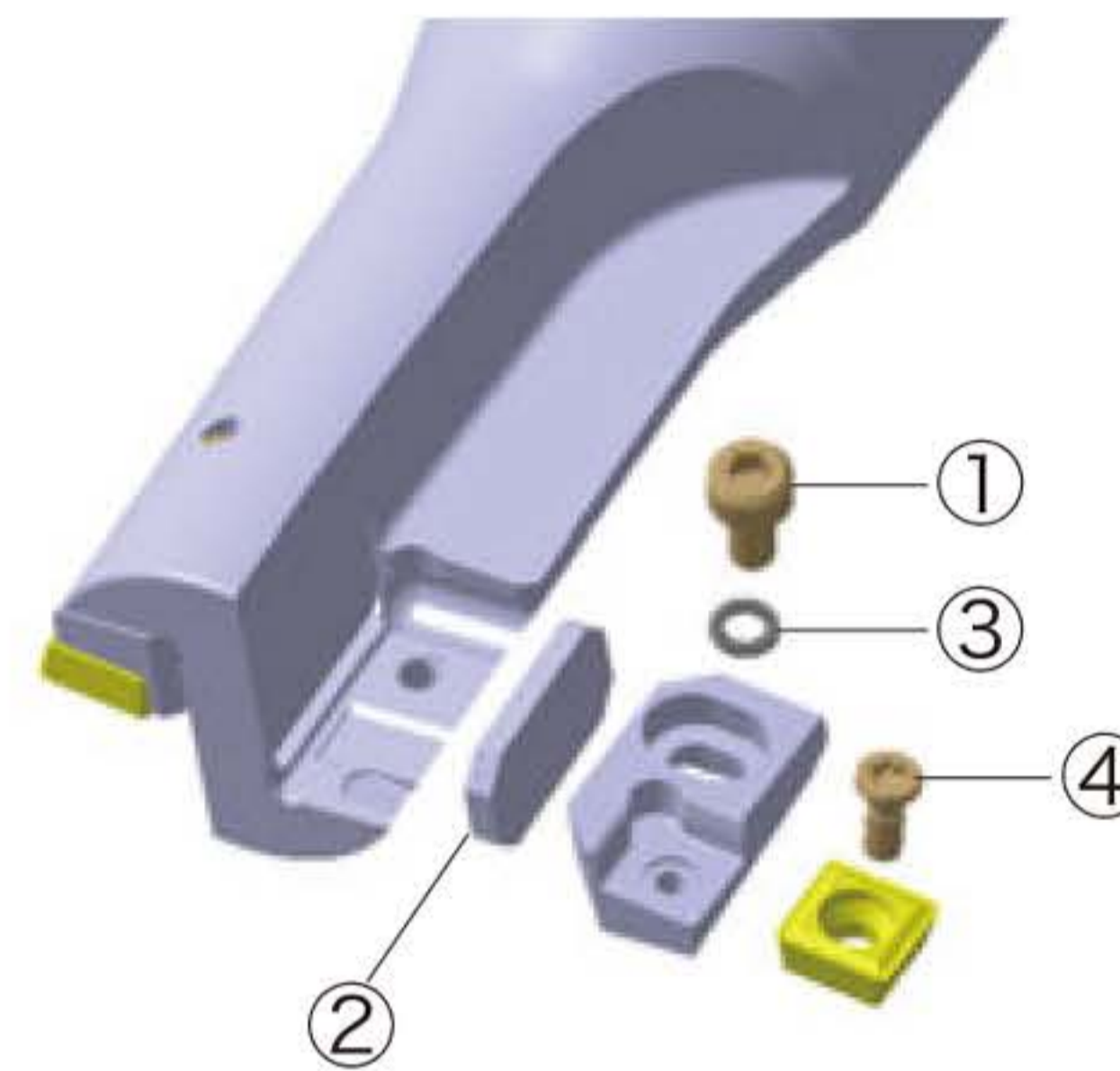
SPARE PARTS

Designation	Cartridge screw	Shim plate	Shim plate	Shim plate	Shim plate	Wrench for cartridge	Washer
TCB260-290F32	CM3×0.5×6	AP16050	AP16100	AP16150		P-2.5	3.2X6X0.5
TCB300-340F32	CM3×0.5×6	AP16050	AP16100	AP16150	AP16200	P-2.5	3.2X6X0.5
TCB350-390F32	CM3×0.5×6	AP16050	AP16100	AP16150	AP16200	P-2.5	3.2X6X0.5
TCB400-440F32	CM4×0.7×10	AP21050	AP21100	AP21150	AP21200	P-3	4.3X8X0.5
TCB450-490F32	CM4×0.7×10	AP21050	AP21100	AP21150	AP21200	P-3	4.3X8X0.5
TCB500-540F32	CM4×0.7×10	AP21050	AP21100	AP21150	AP21200	P-3	4.3X8X0.5
TCB550-590F32	CM4×0.7×10	AP21050	AP21100	AP21150	AP21200	P-3	4.3X8X0.5

Cartridge set

SPARE PARTS

Designation	Insert screw	Wrench
TCB04CA-26-29	CSTA-NO3	T-9D
TCB32CA-30-39	CSTA-NO5	T-9D
TCB32CA-30-39	CSTA-NO5	T-9D
TCB43CA-40-59	CSTA-4	T-15D
TCB43CA-40-59	CSTA-4	T-15D
TCB43CA-40-59	CSTA-4	T-15D
TCB43CA-40-59	CSTA-4	T-15D



Recommended clamping torque: CSTA-NO3 / CSTA-NO5 = 2.3 N·m, CSTA-4 = 3.5 N·m

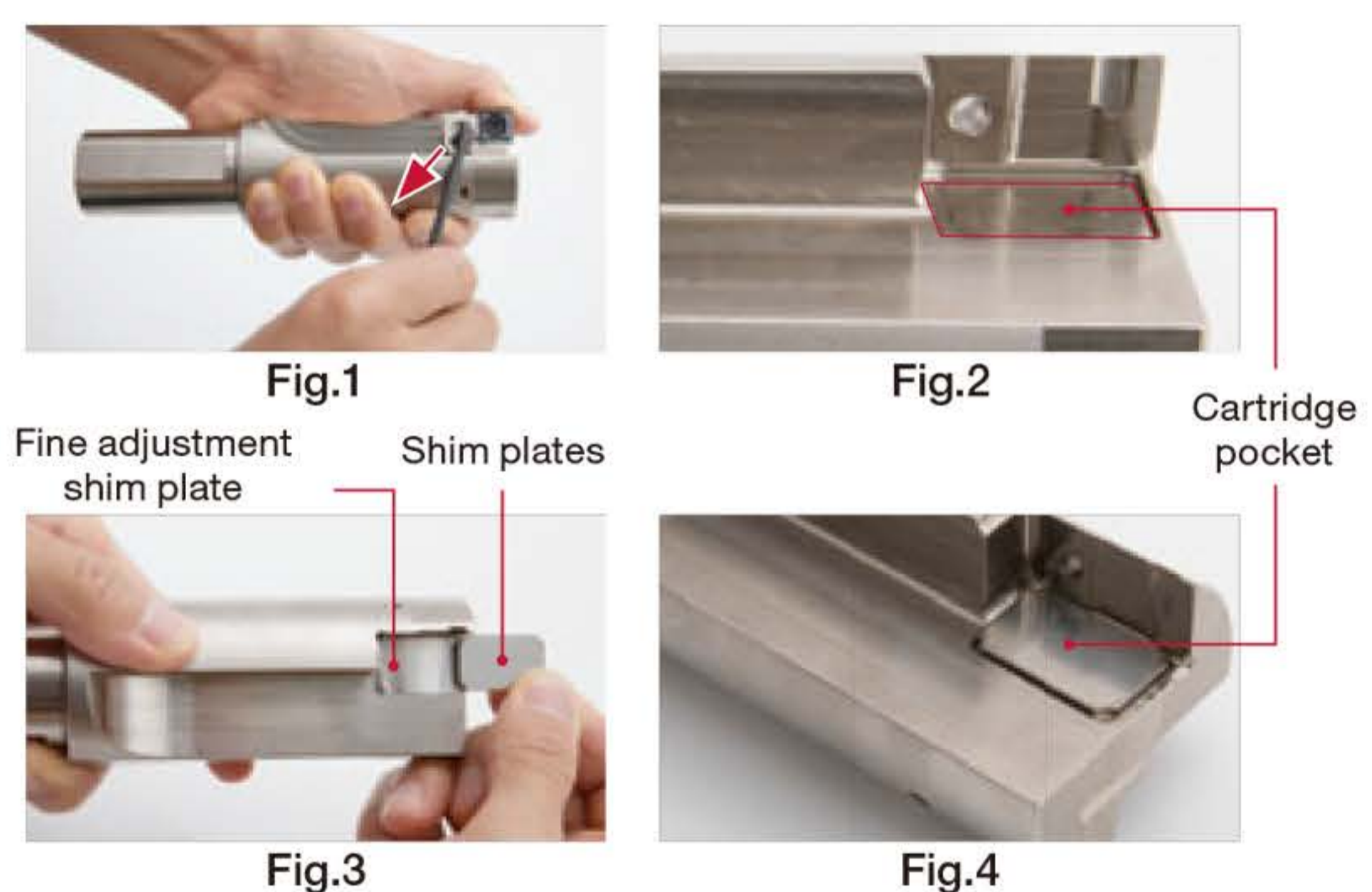
Fine adjustment shim plates (sold separately)

SPARE PARTS

Designation	Thickness
AP16005	0.05
AP16020	0.2
AP21005	0.05
AP21020	0.2

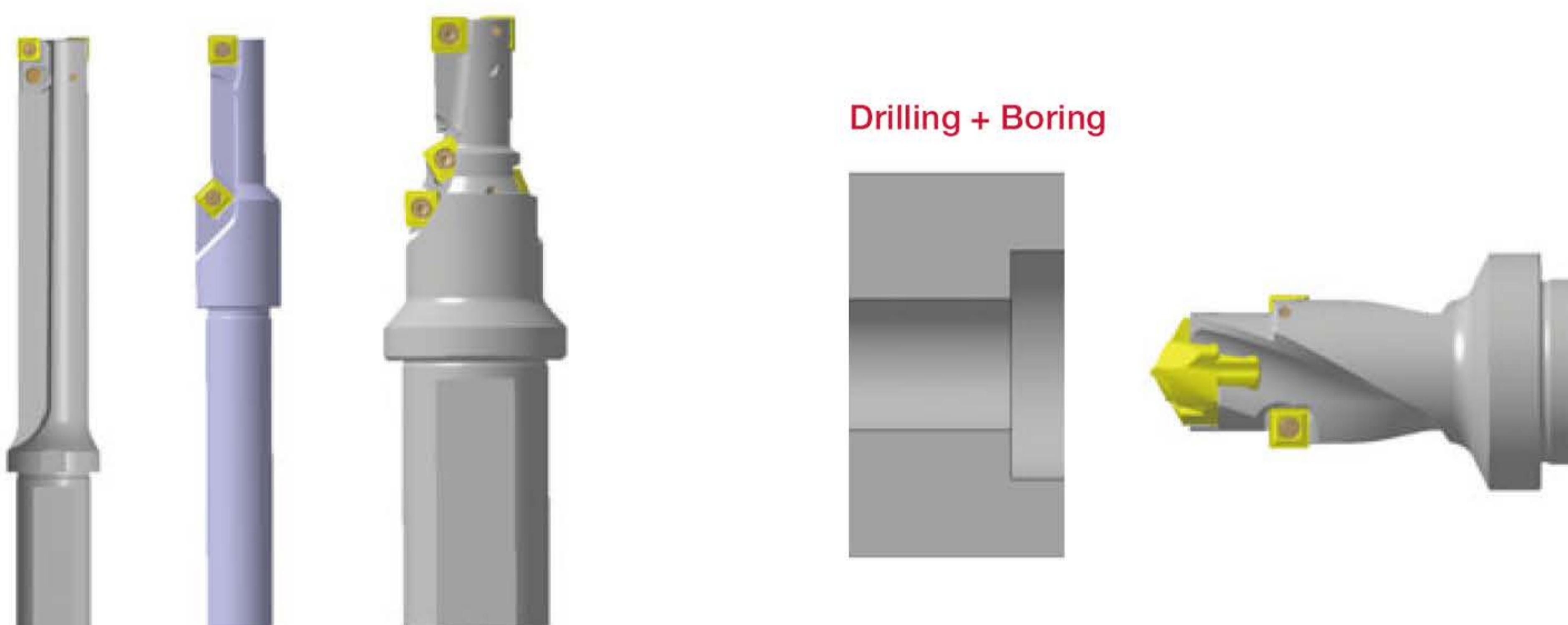
Cautions in preparing the cartridge type cutter

- Firmly press the cartridge in the arrowed direction while tightening the screw to install the cartridge on the cutter body. (Fig.1)
- Ensure that the shim plates thickness are always the same on both sides to equalize the tool diameter.
- Ensure to locate the shim plate fit within the cartridge pocket. (Fig.2)
- Use thin shim plates (not included) for fine diameter adjustments in ± 0.1 mm increments.
- When using multiple shim plates in one pocket for a diameter adjustment, always use the thinnest shim plates at the bottom to prevent them from dislocating during machining. (Fig.3)
- Ensure that the top shim is always in contact with the rim of the cartridge pocket to prevent it from dislocation during machining. (Fig.4)



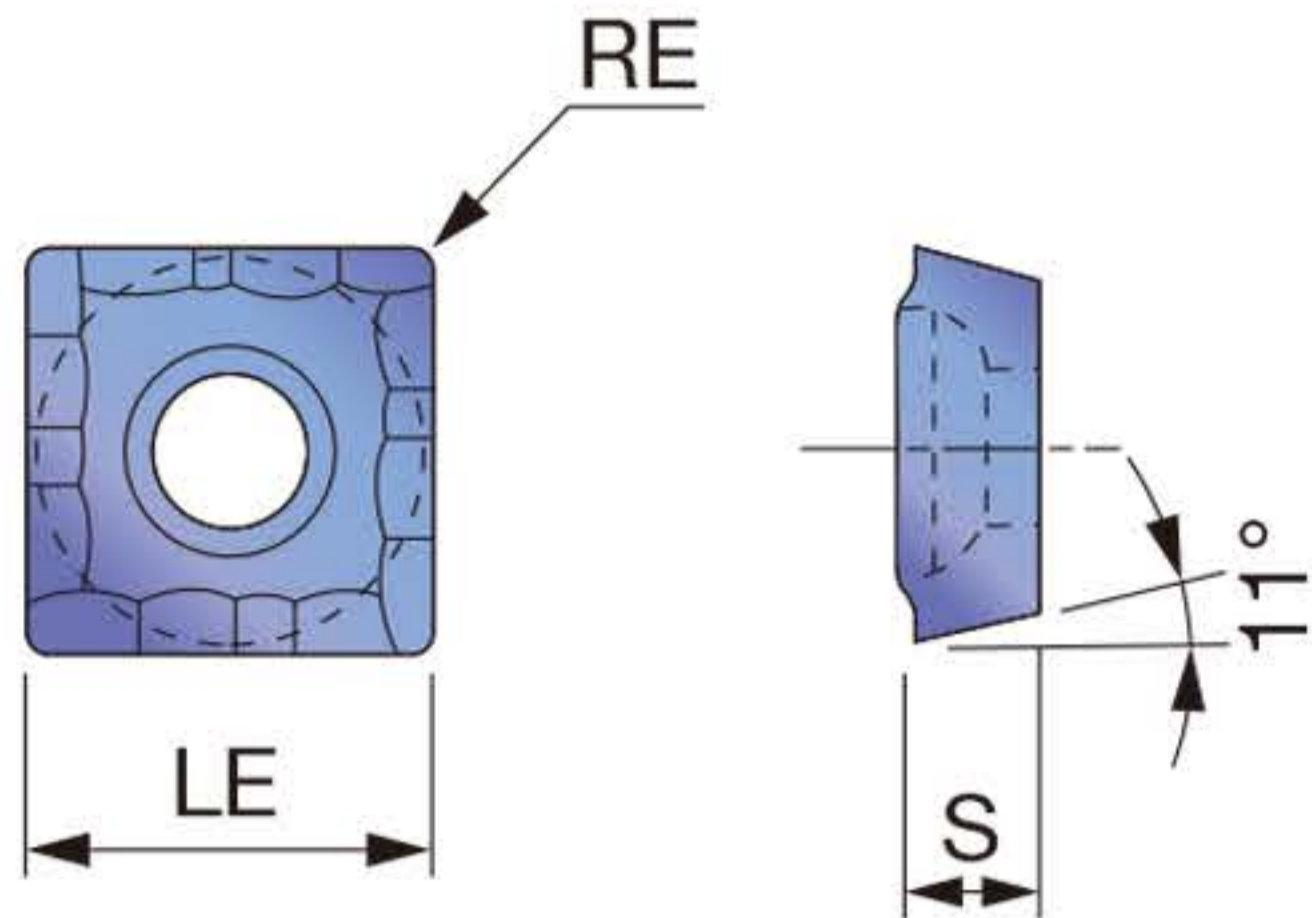
CUSTOM-BUILT TOOL SERVICE

Tungaloy also designs and fabricates semi-standard or tailor-made tools with the TCB inserts according to the desired tool specifications. Contact your Tungaloy representative for further details.

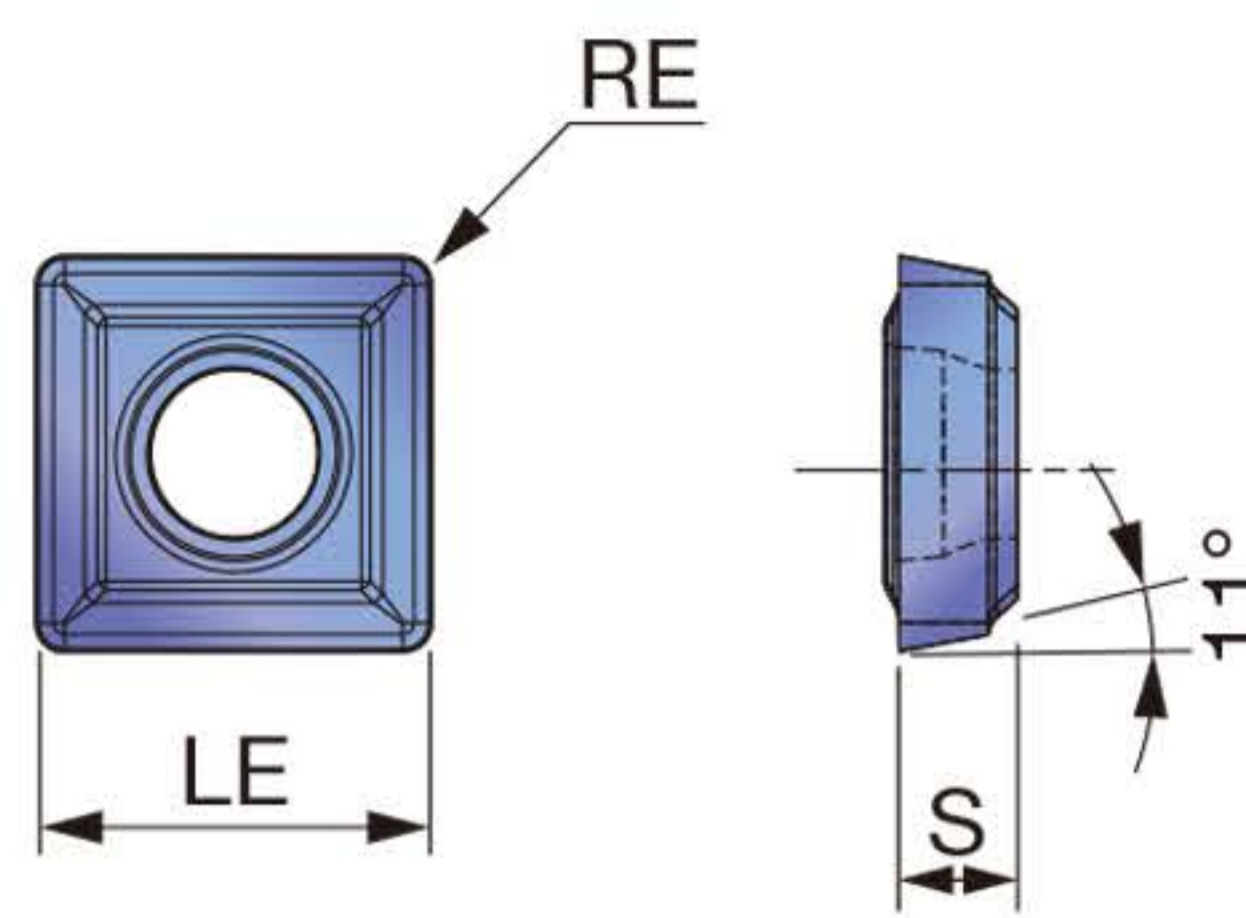


INSERT

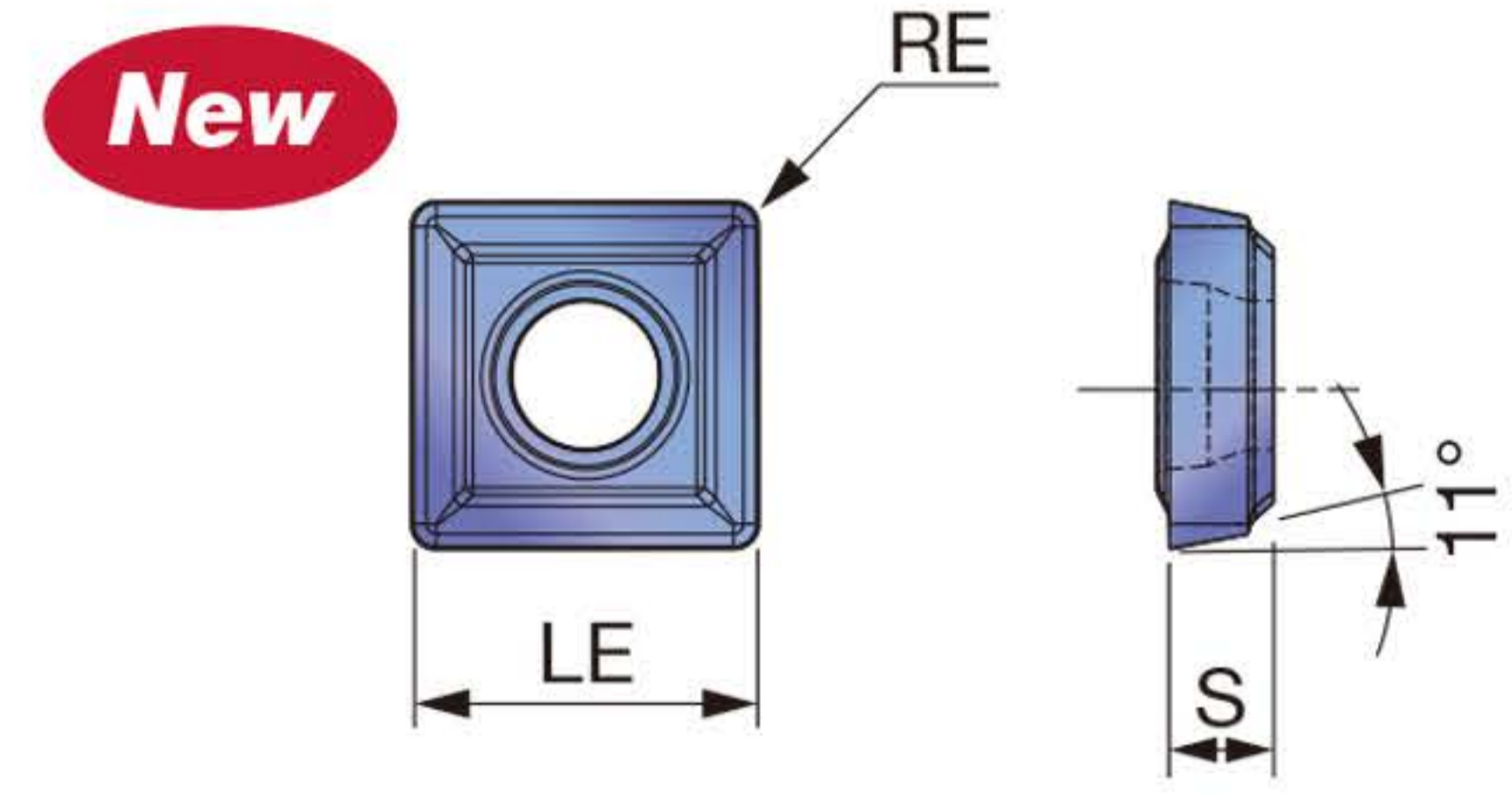
SPMP/SPMM



SPMP/SPMM-CG



SPXP/SPXM-CG



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

★ : First choice
☆ : Second choice

Designation	RE	Coated		LE	S
		T313W	AH6225		
SPMP771-CG	0.4	●		5.4	1.61
New SPXP771-CG	0.4	●		5.4	1.61
SPMP831-CG	0.4	●		6.35	2.38
SPMP831DS	0.4	●		6.35	2.38
SPMP832-CG	0.8	●		6.35	2.38
New SPXP831-CG	0.4	●		6.35	2.38
SPMP041ER-CG	0.4	●		7.94	3.18
SPMP042ER-CG	0.8	●		7.94	3.18
SPMP042ERD	0.8	●		7.94	3.18
New SPXP042ER-CG	0.8	●		7.94	3.18
SPMM321ER-CG	0.4	●		9.53	3.18
SPMM322ER-CG	0.8	●		9.53	3.18
SPMM322ERD	0.8	●		9.53	3.18
New SPXM322ER-CG	0.8	●		9.53	3.18
SPMM431ER-CG	0.4	●		12.7	4.76
SPMM432ER-CG	0.8	●		12.7	4.76
SPMM432ERD	0.8	●		12.7	4.76
New SPXM432ER-CG	0.8	●		12.7	4.76

● : New product
● : Line up



STANDARD CUTTING CONDITIONS

Counter boring

ISO	Workpiece material	Hardness	Cutting speed Vc (m/min)	Feed : f (mm/rev)	
				ø10 - 12 (z = 1)	ø13 - 59 (z = 2)
P	Carbon steel	- 300 HB	80 - 200	0.03 - 0.08	0.1 - 0.3
M	Stainless steel	- 200 HB	80 - 150	0.03 - 0.05	0.06 - 0.15
K	Grey cast iron	150 - 250 HB	80 - 200	0.05 - 0.1	0.1 - 0.4
N	Non-ferrous	-	100 - 300	0.05 - 0.2	0.1 - 0.4
S	Superalloys	- 40 HRC	50 - 80	0.03 - 0.05	0.06 - 0.15
H	Hard materials	- 50 HRC	50 - 80	0.03 - 0.05	0.06 - 0.15

Milling

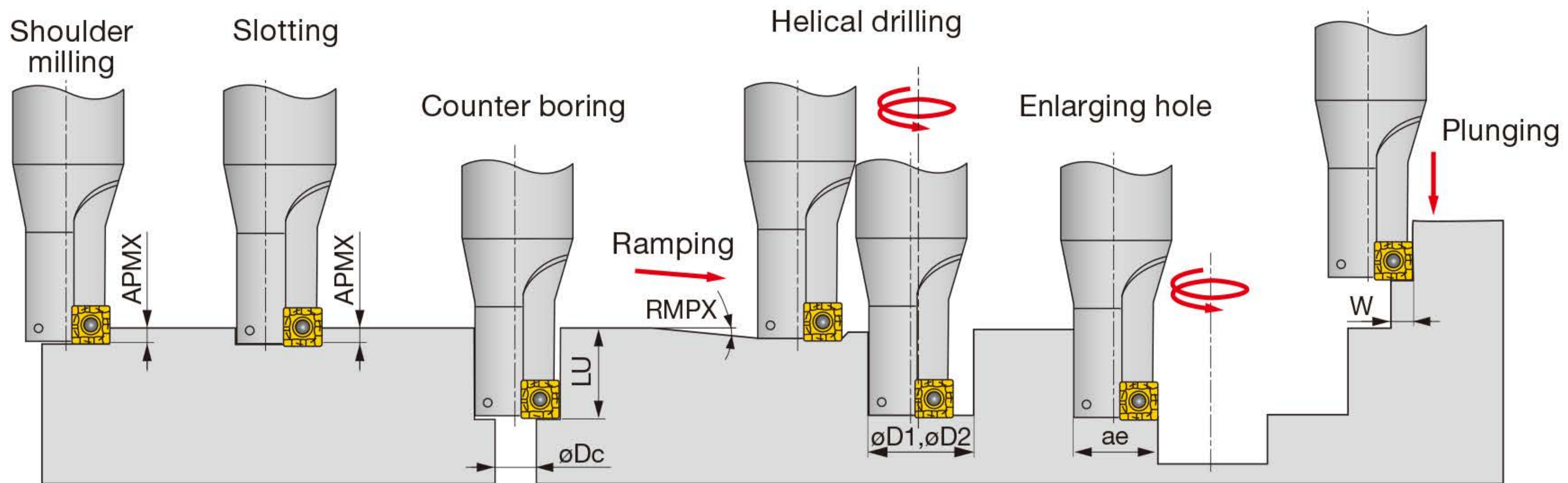
ISO	Workpiece material	Hardness	Cutting speed Vc (m/min)	Feed per tooth fz (mm/t)
P	Carbon steel	- 300 HB	80 - 200	0.05 - 0.15
M	Stainless steel	- 200 HB	80 - 150	0.05 - 0.1
K	Grey cast iron	150 - 250 HB	80 - 200	0.05 - 0.2
N	Non-ferrous	-	100 - 300	0.1 - 0.2
S	Superalloys	- 40 HRC	50 - 80	0.05 - 0.08
H	Hard materials	- 50 HRC	50 - 80	0.05 - 0.08

Internal boring (With one cutting edge)

ISO	Workpiece material	Hardness	Cutting speed Vc (m/min)	Depth of cut ap (mm)	Feed : f (mm/rev)
P	Carbon steel	- 300 HB	80 - 200	0.5 -	0.05 - 0.15
M	Stainless steel	- 200 HB	80 - 150	0.5 -	0.05 - 0.1
K	Grey cast iron	150 - 250 HB	80 - 200	0.5 -	0.05 - 0.2
N	Non-ferrous	-	100 - 300	0.5 -	0.1 - 0.2
S	Superalloys	- 40 HRC	50 - 80	0.5 -	0.05 - 0.08
H	Hard materials	- 50 HRC	50 - 80	0.5 -	0.05 - 0.08

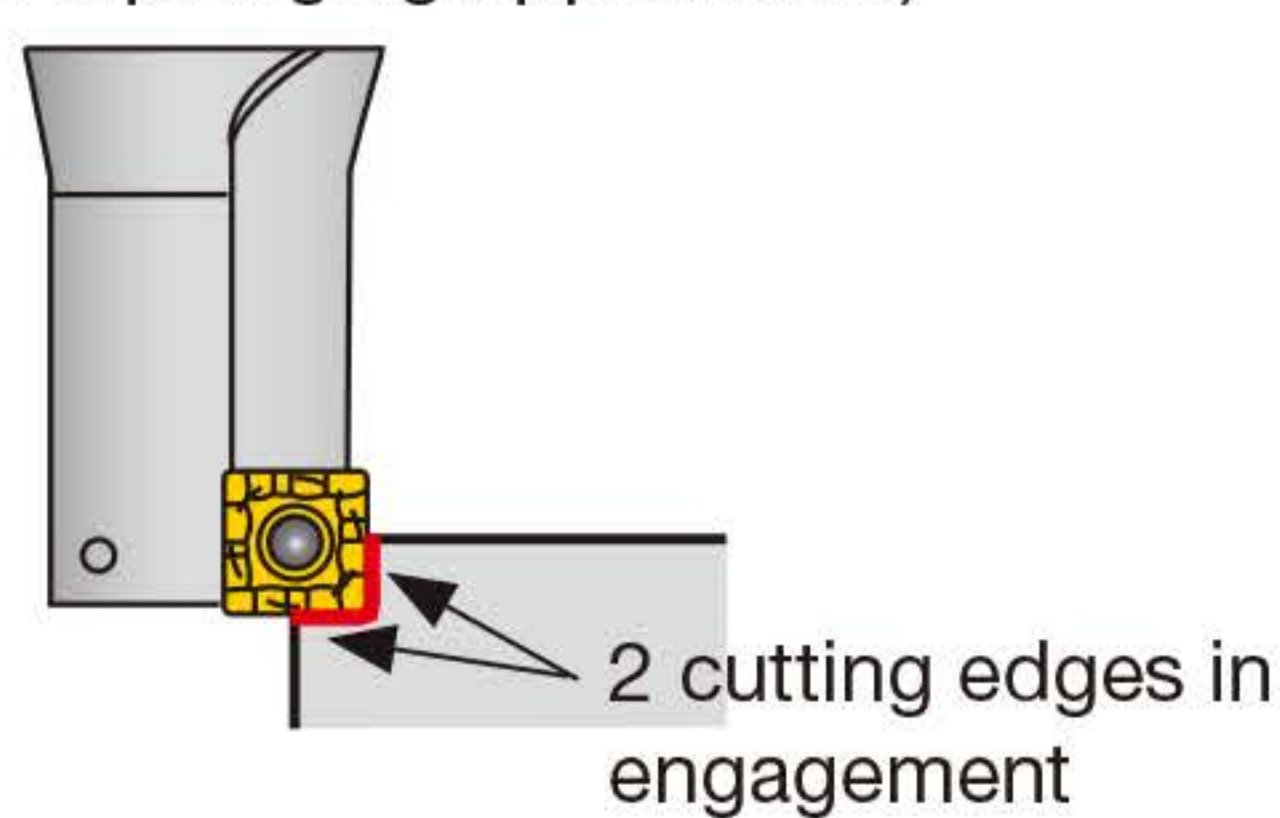
APPLICATION

Monoblock type



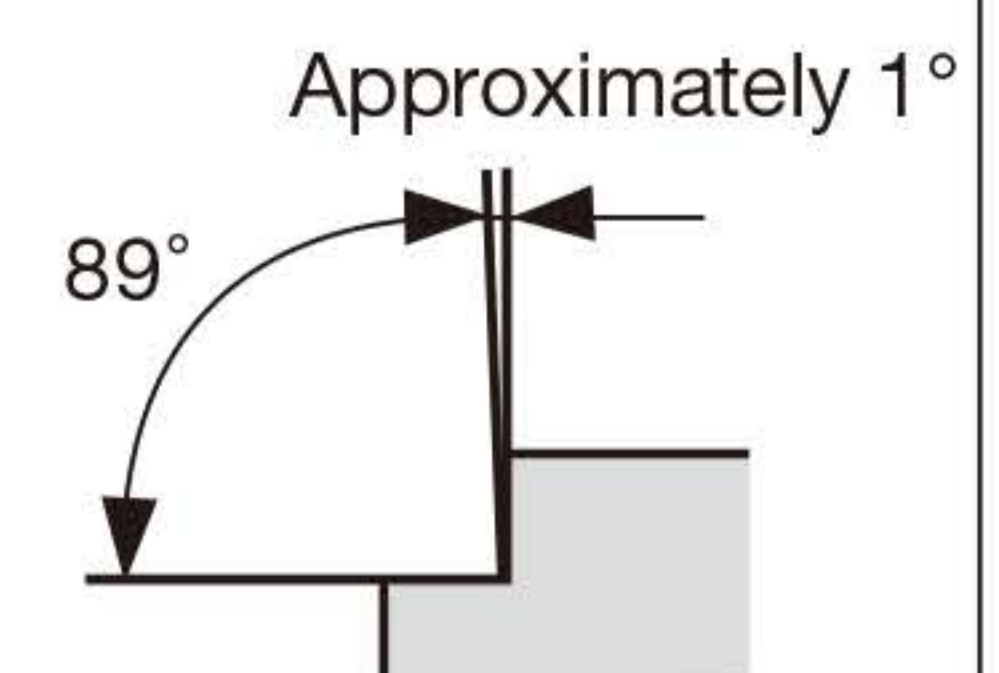
Designation	Tool dia. DCX	Max. depth of cut APMX	Max. counter boring depth LU	Min. pre-hole diameter ϕDc	Max. ramping angle RMPX	Max. cutting width in plunging W	Min. machinable hole dia. $\phi D1$	Max. machinable hole dia. $\phi D2$	Max. cutting width in enlarging hole ae
TCB100F16	10	4	13	2.8	-	4	-	-	-
TCB110F16	11	4	14	2.8	2.1°	4	12	20	10
TCB120F20	12	4	15	3.6	2.1°	4	14	22	11
TCB130F20	13	4	16	4.5	2.1°	4	17	24	12
TCB-140	14	5	11	4	3°	5	20	25	13
TCB140F25	14	4	18	5.5	1.9°	4	19	26	13
TCB150F25	15	4	19	6.5	1.6°	4	21	28	14
TCB160F25	16	4	20	7.5	1.3°	4	23	30	15
TCB170F25	17	5	13	6.6	2.5°	5	25	32	16
TCB175F25	17.5	5	14	7.1	2.2°	5	25.5	33	16.5
TCB180F25	18	5	15	7.5	2°	5	26	34	17
TCB190F25	19	5	15	8.5	1.5°	5	27	36	18
TCB-200	20	6	16	8.2	3°	6	29	38	19
TCB200F25	20	6	16	8.2	3°	6	29	38	19
TCB210F25	21	6	17	9	2.5°	6	30	40	20
TCB220F25	22	6	18	10	2°	6	31	42	21
TCB-230	23	6	19	11	3°	6	32	44	22
TCB230F25	23	6	19	11	3°	6	32	44	22
TCB240F25	24	6	20	12	1.3°	6	33	46	23
TCB250F25	25	6	25	13	1.1°	6	34	48	24
TCB-260	26	6	21	14	1°	6	35	50	25
TCB-290	29	8	23	14	3°	8	37	56	28
TCB-320	32	8	40	16.9	2.5°	8	40	62	31
TCB-350	35	10	43	14	2.5°	10	45	68	34
TCB-390	39	10	48	17.9	2°	10	49	76	38
TCB-430	43	10	53	21.7	1.5°	10	53	84	42

The insert can be used for a maximum 2 indexings. (full 4 indexing for a plunging application.)



Cautions in shouldering operation

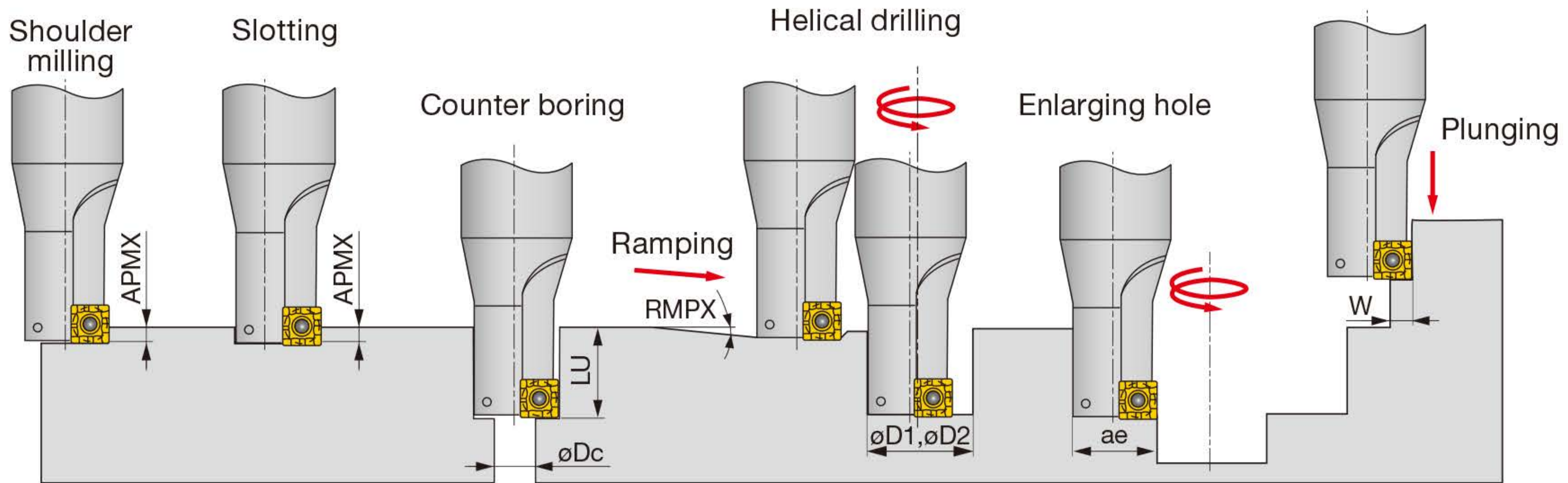
The cutter is design so that the insert provides 1° taper relief on the periphery. The wall, therefore, will be 89° when milled.



APPLICATION



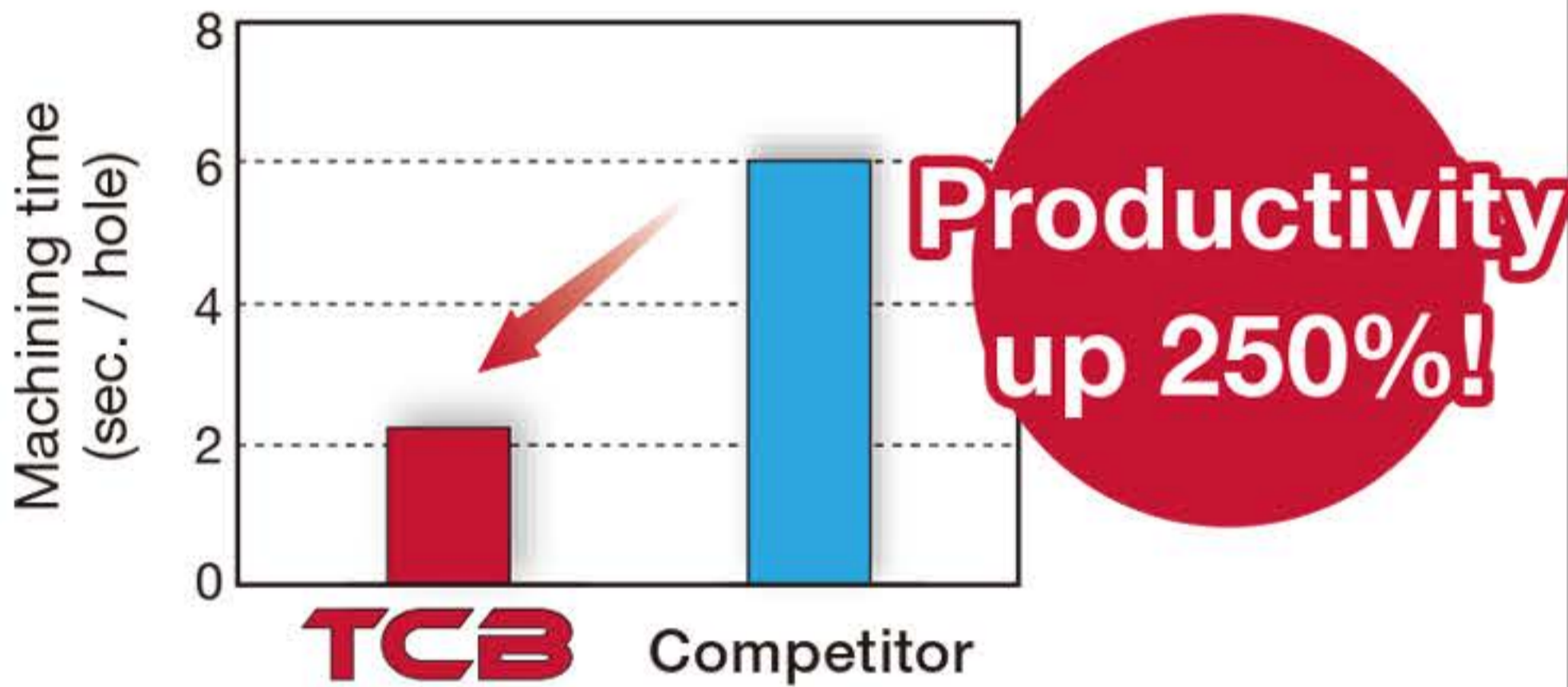
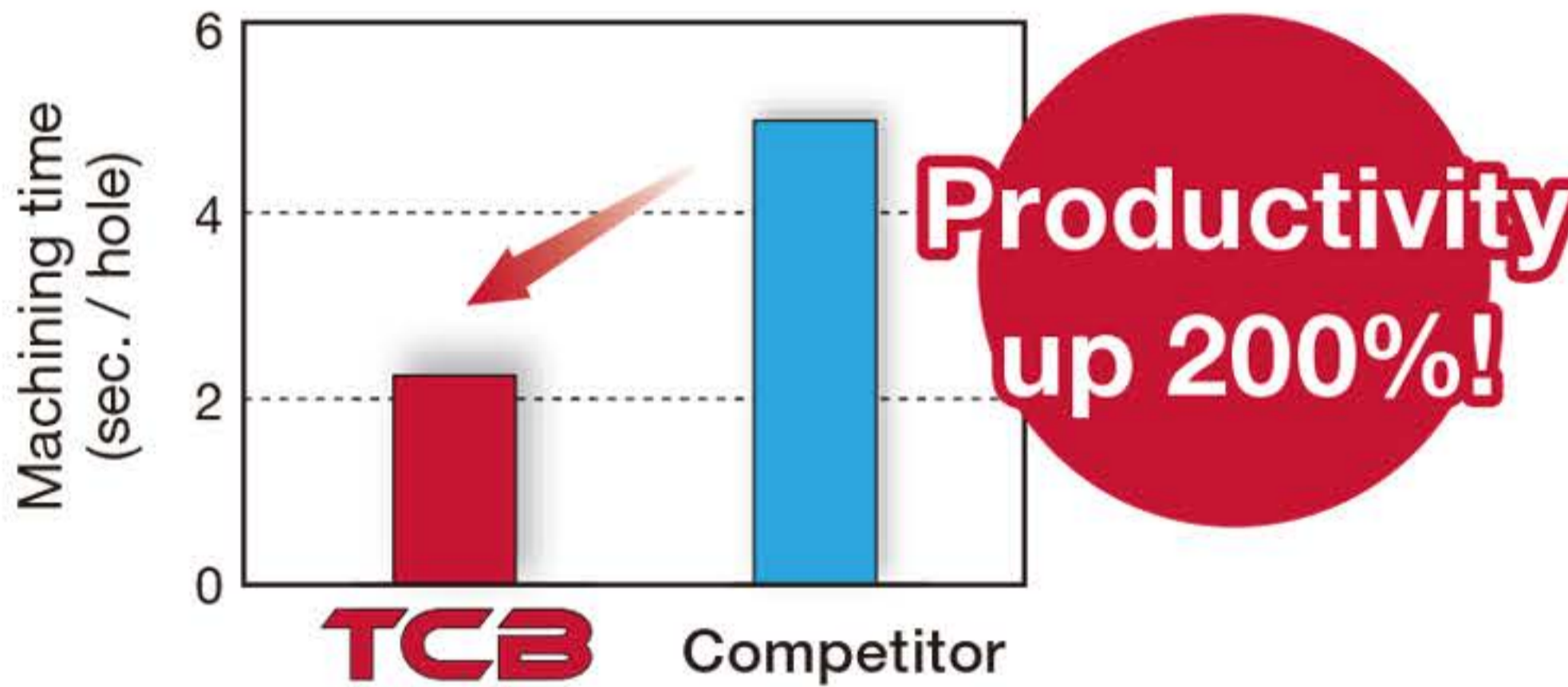


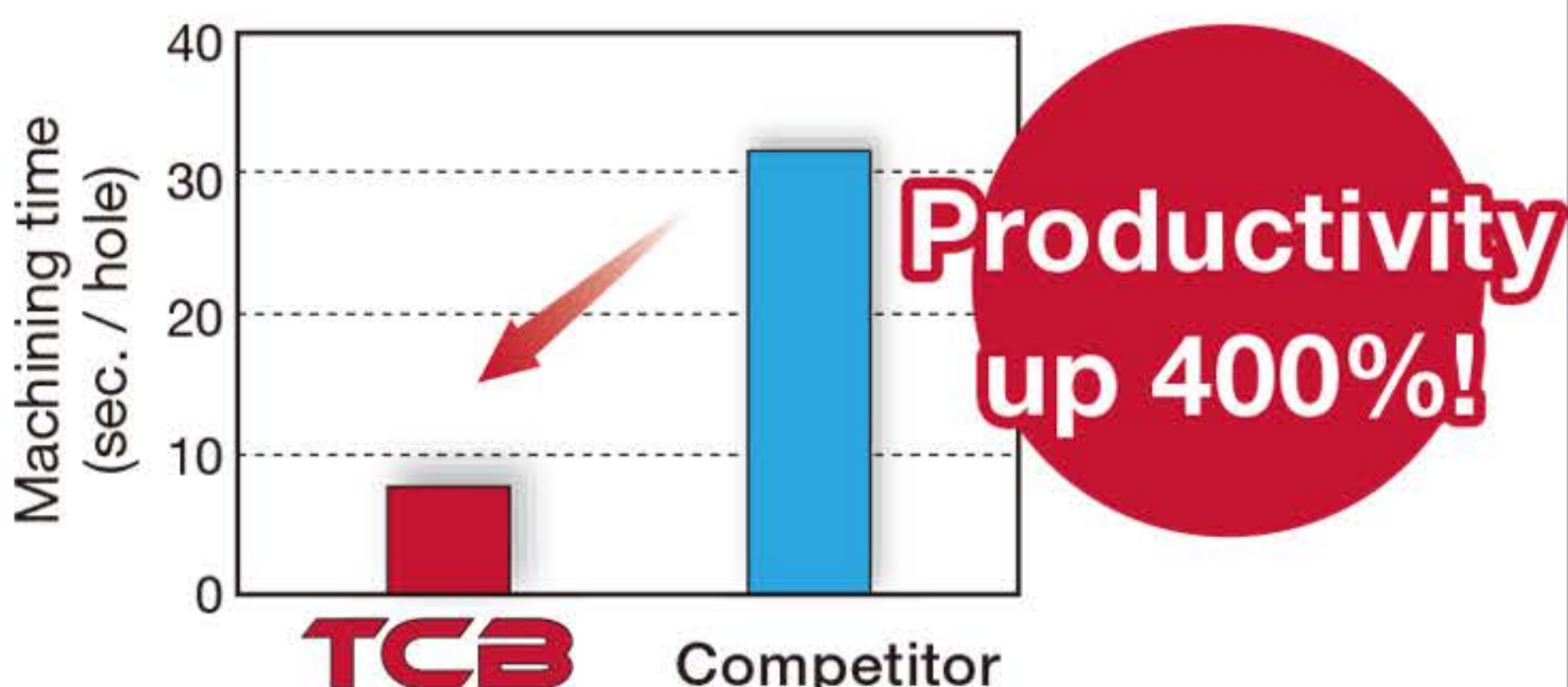
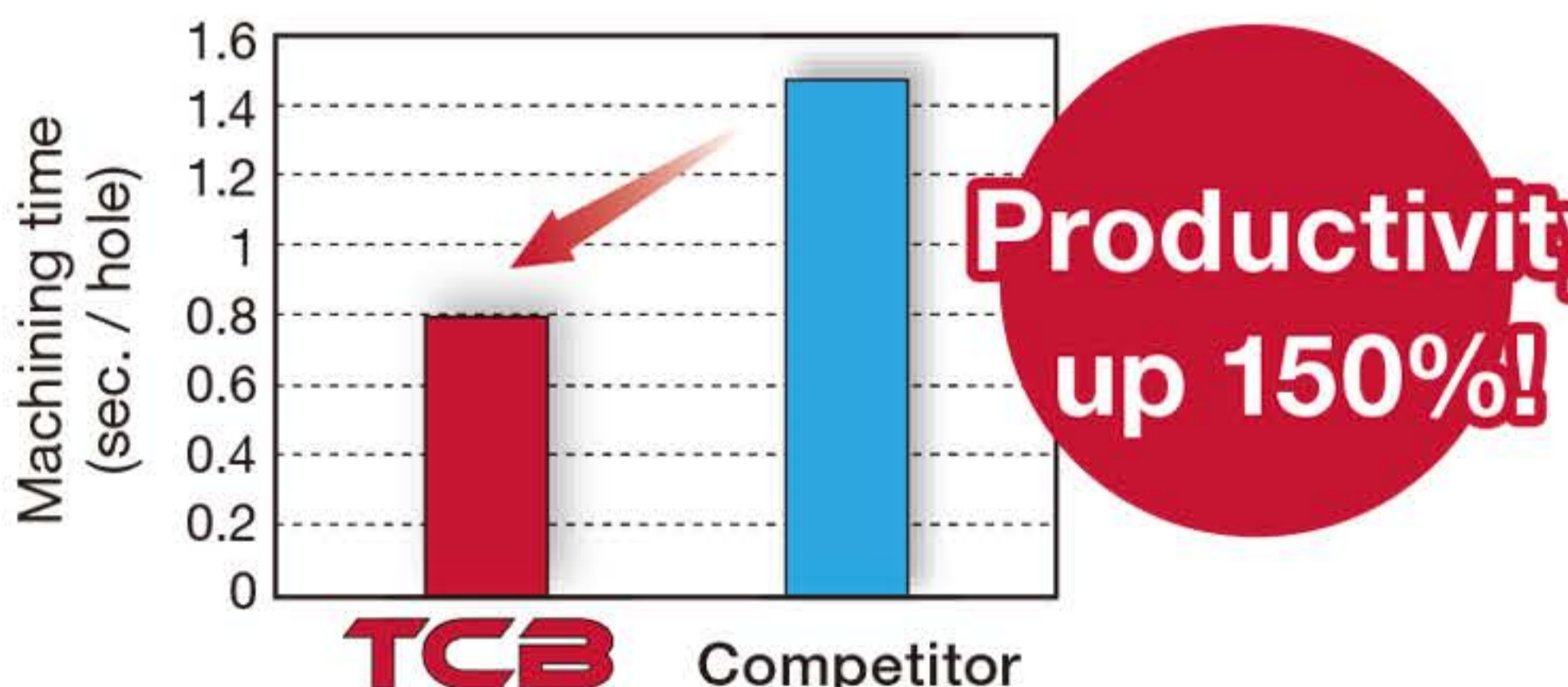
Cartridge type

TCB



Designation	Tool dia. DCX	Max. depth of cut APMX	Max. counter boring depth LU	Min. pre-hole diameter øDc	Max. ramping angle RMPX	Max. cutting width in plunging W	Min. machinable hole dia. øD1	Max. machinable hole dia. øD2	Max. cutting width in enlarging hole ae
TCB260-290F32	26	6	40	13.2	-	6	-	-	25
TCB260-290F32	27	6	40	14.2	-	6	-	-	26
TCB260-290F32	28	6	40	15.2	-	6	-	-	27
TCB260-290F32	29	6	40	16.2	-	6	-	-	28
TCB300-340F32	30	8	45	14.2	-	8	-	-	29
TCB300-340F32	31	8	45	15.2	-	8	-	-	30
TCB300-340F32	32	8	45	16.2	-	8	-	-	31
TCB300-340F32	33	8	45	17.2	-	8	-	-	32
TCB300-340F32	34	8	45	18.2	-	8	-	-	33
TCB350-390F32	35	8	50	19	-	8	-	-	34
TCB350-390F32	36	8	50	20	-	8	-	-	35
TCB350-390F32	37	8	50	21	-	8	-	-	36
TCB350-390F32	38	8	50	22	-	8	-	-	37
TCB350-390F32	39	8	50	23	-	8	-	-	38
TCB400-440F32	40	10	55	18	-	10	-	-	39
TCB400-440F32	41	10	55	19	-	10	-	-	40
TCB400-440F32	42	10	55	20	-	10	-	-	41
TCB400-440F32	43	10	55	21	-	10	-	-	42
TCB400-440F32	44	10	55	22	-	10	-	-	43
TCB450-490F32	45	10	65	23	-	10	-	-	44
TCB450-490F32	46	10	65	24	-	10	-	-	45
TCB450-490F32	47	10	65	25	-	10	-	-	46
TCB450-490F32	48	10	65	26	-	10	-	-	47
TCB450-490F32	49	10	65	27	-	10	-	-	48
TCB500-540F32	50	10	70	28	-	10	-	-	49
TCB500-540F32	51	10	70	29	-	10	-	-	50
TCB500-540F32	52	10	70	30	-	10	-	-	51
TCB500-540F32	53	10	70	31	-	10	-	-	52
TCB500-540F32	54	10	70	32	-	10	-	-	53
TCB550-590F32	55	10	75	33	-	10	-	-	54
TCB550-590F32	56	10	75	34	-	10	-	-	55
TCB550-590F32	57	10	75	35	-	10	-	-	56
TCB550-590F32	58	10	75	36	-	10	-	-	57
TCB550-590F32	59	10	75	37	-	10	-	-	58

PRACTICAL EXAMPLES

Workpiece type		Con-rods	Valve
Drill		TCB170F25	TCB240F25
Insert		SPMP831-CG	SPXP042ER-CG
Grade		AH6225	AH6225
		S55C / C55	FC250 / 250
Workpiece material		 P	 K
Cutting conditions	Cutting speed : V_c (m/min)	160	180
	Feed : f (mm/rev)	0.2	0.3
	Feed speed : V_f (mm/min)	600	720
	Drilling depth : H (mm)	24	30
	Machining application	Boring	Boring
	Machine	Dedicated machine	Horizontal M/C, BT50
	Coolant	Wet	Wet
Results		 <p>The customer was using an indexable drill to bore a cast hole. Counter boring with a TCB cutter significantly decreased machining time.</p>	 <p>The customer was using a cutter with one effective cutting edge to make counter bore holes. Counter boring with a TCB cutter significantly shorten the machining time.</p>
Workpiece type		Bearing	Machining parts
Drill		TCB-320	TCB140F20
Insert		SPMM322ER-CG	SPXP771-CG
Grade		AH6225	AH6225
		S45C / C45	S50C / C50
Workpiece material		 P	 P
Cutting conditions	Cutting speed : V_c (m/min)	150	150
	Feed : f (mm/rev)	0.25	0.13
	Feed speed : V_f (mm/min)	375	444
	Drilling depth : H (mm)	40	6
	Machining application	Boring	Boring
	Machine	NC lathe	Vertical M/C
	Coolant	Wet	Wet
Results		 <p>Competitor's turning tool required five passes to expand the hole. TCB finished the same operation in just one pass.</p>	 <p>The customer was peck milling with a solid carbide tool to facilitate smooth chip removal. Thanks to the new CG style chipbreaker's excellent chip guidance, peck milling was no longer needed, thus significantly reduced the machining time.</p>

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