

MillLine

TCB

www.tungaloy.com

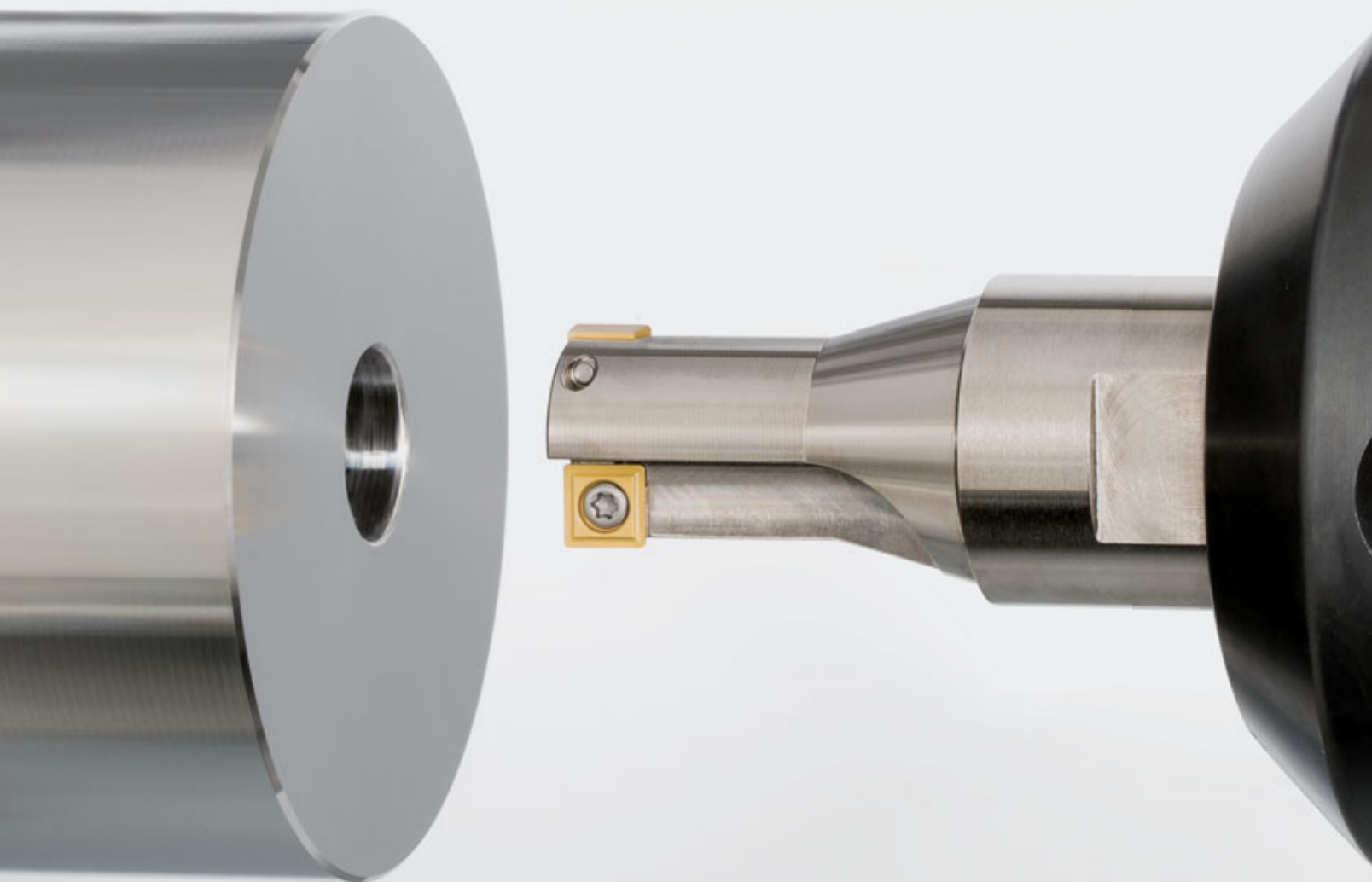
Tungaloy Report No. 512-G



Multifunctional counterboring tool to **improve your productivity**



INDUSTRY 4.0
FEED the SPEED!



ACCELERATED MACHINING

MillLine

TCB
TUNGALOY



Multifunctional tool with an enriched bore diameter lineup to **improve your production efficiency**

www.tungaloy.com

Enriched tool diameter lineup for various hole making operations

Available from tool diameter $\phi 10$ mm and up,
adjustable diameters for $\phi 26$ mm and up

Monoblock type

Tool diameters: $\phi D_c = 10 - 43$ mm



Economical insert

4-edged, positive insert enhances insert economy and smooth chip flow!

Robust cutter body

Optimized flute-core design provides tool rigidity and smooth chip flow!

New Cartridge type (adjustable tool diameter)

Tool diameters: $\phi D_c = 26 - 59$ mm



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.

Shim plates

Shim plates in various sizes are available for cutter diameter adjustments. Thin shim plates are also available for fine adjustments in $\phi 0.1$ mm increments.

A new CG style chipbreaker

New



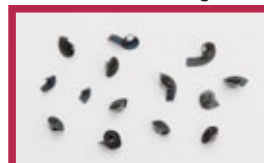
SPMP/SPMM-CG

Optimized for boring operations

Efficient for a wide range of cutting depths and materials

TCB

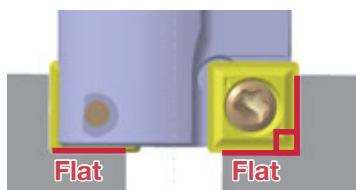
Chips from boring and countersinking



Competitor's
Flat drill
(endmill)



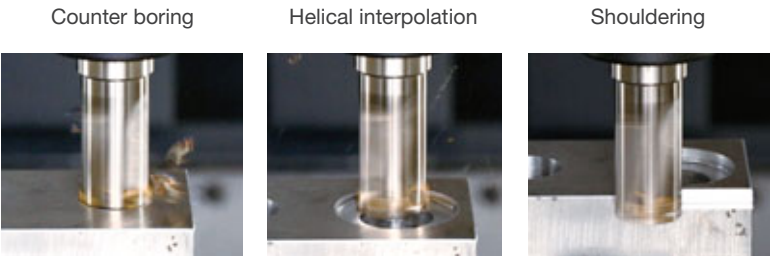
Provides a 90° flat surface



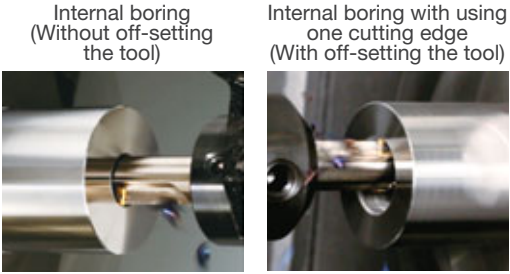
Multifunctionality

Suited not only for boring but for various other applications. Thanks to this all-in-one tool feature, a major cycle time reduction and tool inventory streamlining are possible.

For machine center



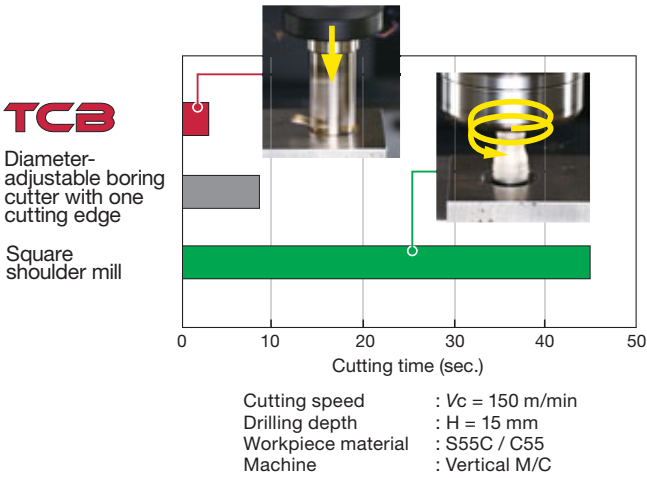
For turning operation



High efficiency machining

The expanded diameter range of the new TCB series now simplifies tool selection for an exact target diameter, therefore improving production efficiency.

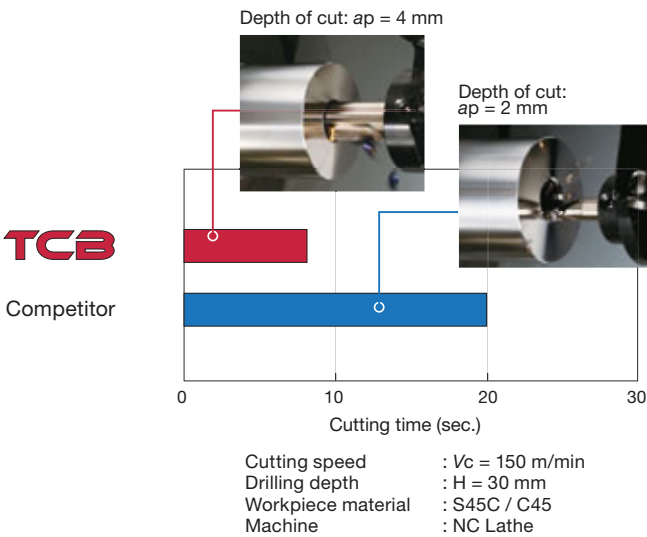
Counter boring operation on machining center



	No. of teeth z	Machining method	Feed f (mm/rev)	Pitch p (mm/rev)
TCB	2	Counterboring	0.25 (mm/rev)	-
Diameter-adjustable boring cutter	1	Boring	0.1 (mm/rev)	-
Shoulder mill	2	Helical interpolation and bore expansion	0.15 (mm/t)	0.5

- TCB now allows for plunging operations for higher efficiency, compared with helical interpolating with a shoulder mill.
- High feed motion is possible due to TCB's two effective cutting edges, as opposed to a boring cutter with one cutting edge.

Internal boring operation on lathe

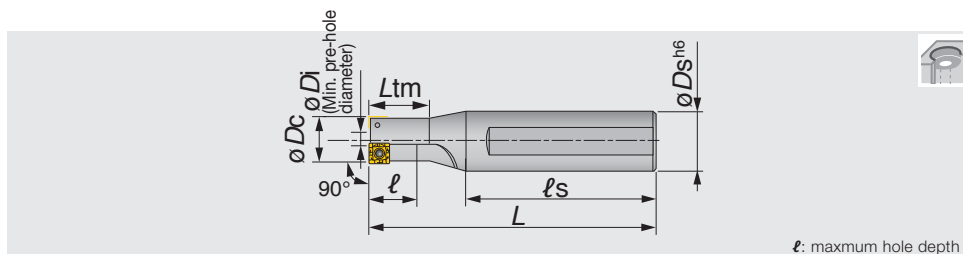


	Tool dia. ϕD_c (mm)	Prehole dia. ϕ (mm)	No. of teeth z	Roughing	
				Depth of cut ap (mm)	Feed f (mm/rev)
TCB	20	12	2	4 mm x 1 pass	0.25
Internal boring tool	-	12	1	2 mm x 2 pass	0.15

TCB's two effective cutting edges counter balance each other, allowing a high feed rate with a heavy depth of cut.

TCB

Monoblock type



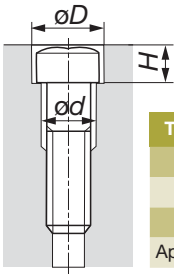
ℓ : maximum hole depth

	Designation	Stock	ϕD_c	z	ϕD_i	ℓ	L_{tm}	L	ℓ_s	ϕD_s	Insert
New	TCB100F16	●	10	1	2.8	13	17	86	60	16	SPMP771...
New	TCB110F16	●	11	1	2.8	14	18.7	87	60	16	SPMP771...
New	TCB120F20	●	12	1	3.6	15	20.5	89	60	20	SPMP771...
New	TCB130F20	●	13	2	4.5	16	22.2	91	60	20	SPMP771...
	TCB-140	●	14	1	4	11	18	117	80	25	SPMP831...
New	TCB140F25	●	14	2	5.5	18	24	113	80	25	SPMP771...
New	TCB150F25	●	15	2	6.5	19	25.7	114	80	25	SPMP771...
New	TCB160F25	●	16	2	7.5	20	27.5	116	80	25	SPMP771...
	TCB170F25	●	17	2	6.6	13	21	114	80	25	SPMP831...
	TCB175F25	●	17.5	2	7.1	14	22	115	80	25	SPMP831...
	TCB180F25	●	18	2	7.5	15	23	116	80	25	SPMP831...
	TCB190F25	●	19	2	8.5	15	24	118	80	25	SPMP831...
	TCB200F25	●	20	2	8.2	16	25	120	80	25	SPMP042...
	TCB210F25	●	21	2	9	17	26	122	80	25	SPMP042...
	TCB220F25	●	22	2	10	18	28	124	80	25	SPMP042...
	TCB-230	▲	23	2	11	19	29	126	80	25	SPMP042...
	TCB230F25	★	23	2	11	19	29	126	80	25	SPMP042...
	TCB240F25	●	24	2	12	20	-	128	80	25	SPMP042...
New	TCB250F25	●	25	2	13	25	-	130	80	25	SPMP042...
	TCB-260	●	26	2	14	21	33	132	80	32	SPMP042...
	TCB-290	●	29	2	14	23	36	138	80	32	SPMM322...
	TCB-320	●	32	2	16.9	40	-	144	80	32	SPMM322...
	TCB-350	●	35	2	14	43	-	150	80	32	SPMM432...
	TCB-390	●	39	2	17.9	48	-	158	80	32	SPMM432...
	TCB-430	●	43	2	21.7	53	-	171	85	42	SPMM432...

●: Line up
▲: To be discontinued
★: Coming soon

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

Counter sink dimensions of bolt hole



Thread size	M6	M8	M10	M12	M14	M16	M18	M20	M22	M24	M27
$\varnothing D$ (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
$\varnothing d$ (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

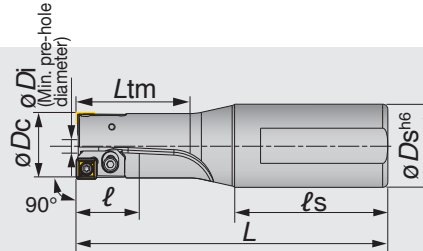


Designation	Clamping screw	Wrench
TCB100... - TCB160...	CSTB-2L040	T-6D
TCB-140...	CSTB-2.2S	T-7D
TCB170... - TCB190...	CSTB-2.2	T-7D
TCB200... - TCB260...	CSTA-NO3	T-9D
TCB-290 - TCB-320	CSTA-NO5	T-9D
TCB-350 - TCB-430	CSTA-4	T-15D

TCB

Cartridge type

New



ℓ : maximum hole depth

Body Designation	Stock	ϕD_c	ϕD_s	ϕD_i	ℓ	ℓ_s	L_{tm}	L	Kg	Cartridge set Designation	Shim plate Designation	Thickness	Insert
TCB260-290F32	★	26	32	13.2	40	59	53	120	0.6	TCB04CA-26-29	-	-	SPMP042...
TCB260-290F32	★	27	32	14.2	40	59	53	120	0.6	TCB04CA-26-29	AP16050	0.5	SPMP042...
TCB260-290F32	★	28	32	15.2	40	59	53	120	0.6	TCB04CA-26-29	AP16100	1	SPMP042...
TCB260-290F32	★	29	32	16.2	40	59	53	120	0.6	TCB04CA-26-29	AP16150	1.5	SPMP042...
TCB300-340F32	★	30	32	14.2	45	59	62	130	0.6	TCB32CA-30-39	-	-	SPMM322...
TCB300-340F32	★	31	32	15.2	45	59	62	130	0.6	TCB32CA-30-39	AP16050	0.5	SPMM322...
TCB300-340F32	★	32	32	16.2	45	59	62	130	0.6	TCB32CA-30-39	AP16100	1	SPMM322...
TCB300-340F32	★	33	32	17.2	45	59	62	130	0.6	TCB32CA-30-39	AP16150	1.5	SPMM322...
TCB300-340F32	★	34	32	18.2	45	59	62	130	0.6	TCB32CA-30-39	AP16200	2	SPMM322...
TCB350-390F32	★	35	32	19	50	59	70	140	0.7	TCB32CA-30-39	-	-	SPMM322...
TCB350-390F32	★	36	32	20	50	59	70	140	0.7	TCB32CA-30-39	AP16050	0.5	SPMM322...
TCB350-390F32	★	37	32	21	50	59	70	140	0.7	TCB32CA-30-39	AP16100	1	SPMM322...
TCB350-390F32	★	38	32	22	50	59	70	140	0.7	TCB32CA-30-39	AP16150	1.5	SPMM322...
TCB350-390F32	★	39	32	23	50	59	70	140	0.7	TCB32CA-30-39	AP16200	2	SPMM322...
TCB400-440F32	★	40	32	18	55	59	80	150	1	TCB43CA-40-59	-	-	SPMM432...
TCB400-440F32	★	41	32	19	55	59	80	150	1	TCB43CA-40-59	AP21050	0.5	SPMM432...
TCB400-440F32	★	42	32	20	55	59	80	150	1	TCB43CA-40-59	AP21100	1	SPMM432...
TCB400-440F32	★	43	32	21	55	59	80	150	1	TCB43CA-40-59	AP21150	1.5	SPMM432...
TCB400-440F32	★	44	32	22	55	59	80	150	1	TCB43CA-40-59	AP21200	2	SPMM432...
TCB450-490F32	★	45	32	23	65	59	90	160	1.2	TCB43CA-40-59	-	-	SPMM432...
TCB450-490F32	★	46	32	24	65	59	90	160	1.2	TCB43CA-40-59	AP21050	0.5	SPMM432...
TCB450-490F32	★	47	32	25	65	59	90	160	1.2	TCB43CA-40-59	AP21100	1	SPMM432...
TCB450-490F32	★	48	32	26	65	59	90	160	1.2	TCB43CA-40-59	AP21150	1.5	SPMM432...
TCB450-490F32	★	49	32	27	65	59	90	160	1.2	TCB43CA-40-59	AP21200	2	SPMM432...
TCB500-540F32	★	50	32	28	70	59	97	165	1.5	TCB43CA-40-59	-	-	SPMM432...
TCB500-540F32	★	51	32	29	70	59	97	165	1.5	TCB43CA-40-59	AP21050	0.5	SPMM432...
TCB500-540F32	★	52	32	30	70	59	97	165	1.5	TCB43CA-40-59	AP21100	1	SPMM432...
TCB500-540F32	★	53	32	31	70	59	97	165	1.5	TCB43CA-40-59	AP21150	1.5	SPMM432...
TCB500-540F32	★	54	32	32	70	59	97	165	1.5	TCB43CA-40-59	AP21200	2	SPMM432...
TCB550-590F32	★	55	32	33	75	59	105	175	1.9	TCB43CA-40-59	-	-	SPMM432...
TCB550-590F32	★	56	32	34	75	59	105	175	1.9	TCB43CA-40-59	AP21050	0.5	SPMM432...
TCB550-590F32	★	57	32	35	75	59	105	175	1.9	TCB43CA-40-59	AP21100	1	SPMM432...
TCB550-590F32	★	58	32	36	75	59	105	175	1.9	TCB43CA-40-59	AP21150	1.5	SPMM432...
TCB550-590F32	★	59	32	37	75	59	105	175	1.9	TCB43CA-40-59	AP21200	2	SPMM432...

The cartridge sets and shim plates are included.

★: Coming soon

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

Counter sink 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

Body

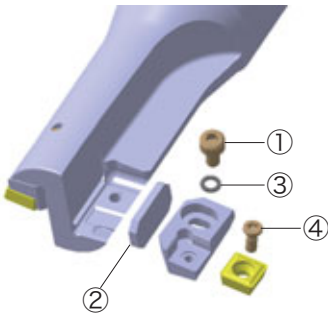
SPARE PARTS

Designation	① Cartridge screw	② Shim plate	② Shim plate	② Shim plate	② Shim plate	Wrench for cartridge	③ 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	④ 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



Fine adjustment shim plates (not included)

SPARE PARTS

Designation	Stock	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 $\phi 0.1$ 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)



Fig.1



Fig.2

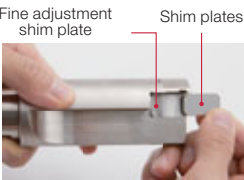


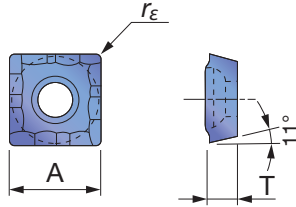
Fig.3



Fig.4

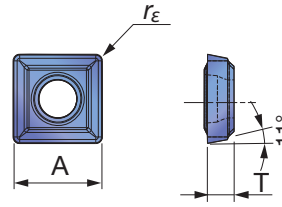
INSERT

SPMP/SPMM



SPMP-CG

New



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

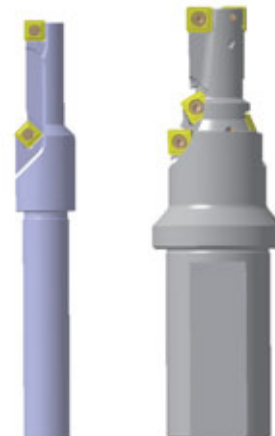
★ : First choice
☆ : Second choice

Designation	rε	Coated								A	T
		T313W	AH6030								
SPMP771-CG	0.4	●								5.4	1.61
SPMP831-CG	0.4	●								6.35	2.38
SPMP042ER-CG	0.8	●								7.94	3.18
SPMM322ER-CG	0.8	●								9.53	3.18
SPMM432ER-CG	0.8	●								12.7	4.76
SPMP831DS	0.4	●								6.35	2.38
SPMP042ERD	0.8	●								7.94	3.18
SPMM322ERD	0.8	●								9.53	3.18
SPMM432ERD	0.8	●								12.7	4.76

● : New product
● : Line up

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.



STANDARD CUTTING CONDITIONS

Counter boring

ISO	Workpiece materials	Cutting speed V_c (m/min)	Feed : f (mm/rev)	
			$\phi 10 - 12$ ($z = 1$)	$\phi 13 - 59$ ($z = 2$)
P	Carbon steel	80 - 200	0.03 - 0.08	0.1 - 0.3
M	Stainless steel	80 - 150	0.03 - 0.05	0.06 - 0.15
K	Grey cast iron	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	50 - 80	0.03 - 0.05	0.06 - 0.15
H	Hard materials	50 - 80	0.03 - 0.05	0.06 - 0.15

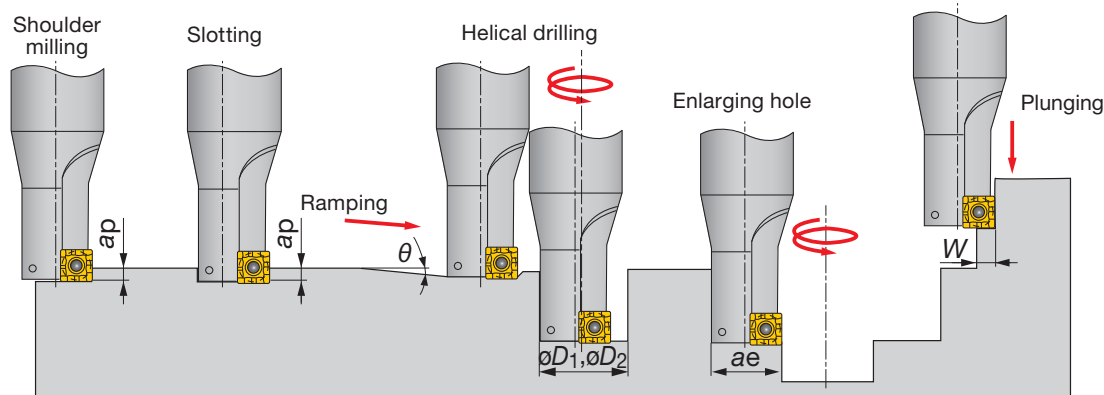
Milling

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

Internal boring (With one cutting edge)

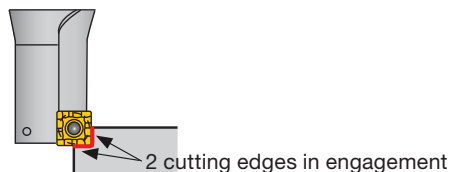
ISO	Workpiece materials	Cutting speed V_c (m/min)	Depth of cut a_p (mm)	Feed f (mm/rev)
P	Carbon steel	80 - 200	0.5 -	0.05 - 0.15
M	Stainless steel	80 - 150	0.5 -	0.05 - 0.1
K	Grey cast iron	80 - 200	0.5 -	0.05 - 0.2
N	Non-ferrous	100 - 300	0.5 -	0.1 - 0.2
S	Superalloys	50 - 80	0.5 -	0.05 - 0.08
H	Hard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

APPLICATION



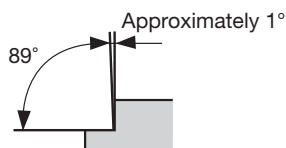
Designation	Tool dia. ϕD_c	Max. depth of cut Max a_p	Max. ramping angle θ°	Max. cutting width in plunging W	Min. machinable hole dia. ϕD_1	Max. machinable hole dia. ϕD_2	Max. cutting width in enlarging hole a_e
New TCB100F16	10	4	-	4	-	-	-
New TCB110F16	11	4	2.1	4	12	20	10
New TCB120F20	12	4	2.1	4	14	22	11
New TCB130F20	13	4	2.1	4	17	24	12
TCB-140	14	5	3	5	20	25	13
New TCB140F25	14	4	1.9	4	19	26	13
New TCB150F25	15	4	1.6	4	21	28	14
New TCB160F25	16	4	1.3	4	23	30	15
TCB170F25	17	5	2.5	5	25	32	16
TCB175F25	17.5	5	2.2	5	25.5	33	16.5
TCB180F25	18	5	2	5	26	34	17
TCB190F25	19	5	1.5	5	27	36	18
TCB200F25	20	6	3	6	29	38	19
TCB210F25	21	6	2.5	6	30	40	20
TCB220F25	22	6	2	6	31	42	21
TCB230F25	23	6	1.6	6	32	44	22
TCB240F25	24	6	1.3	6	33	46	23
New TCB250F25	25	6	1.1	6	34	48	24.5
TCB-260	26	6	1	6	35	50	25
TCB-290	29	8	3	8	37	56	28
TCB-320	32	8	2.5	8	40	62	31
TCB-350	35	10	2.5	10	45	68	34
TCB-390	39	10	2	10	49	76	38
TCB-430	43	10	1.5	10	53	84	42

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

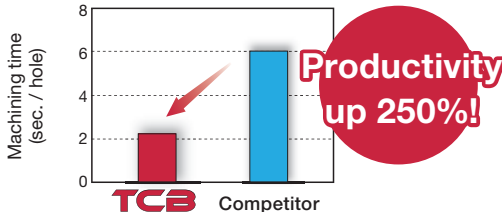
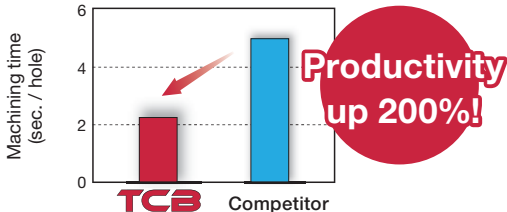
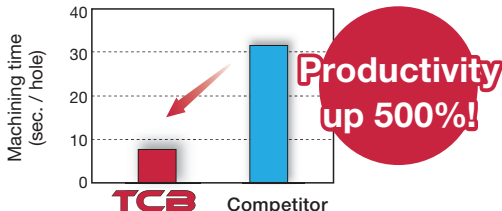
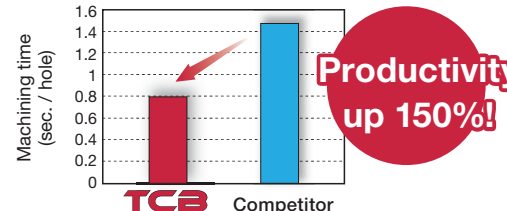


Cautions in shouldering operation

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



PRACTICAL EXAMPLES

Workpiece type		Con-rods	Valve
Drill		TCB170F25	TCB240F25
Insert		SPMP831DS	SPMP042ERD
Grade		T313W	T313W
		S55C / C55	FC250 / GG25 / 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		 The customer was using an indexable drill to bore a cast hole. Counterboring with a TCB cutter significantly decreased machining time.	 The customer was using a cutter with one effective cutting edge to make counter bore holes. Counterboring with a TCB cutter significantly shorten the machining time.
Workpiece type		Bearing	Machining parts
Drill		TCB-320	TCB140F20
Insert		SPMM322ERD	SPMP771-CG
Grade		T313W	AH6030
		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		 Competitor's turning tool required five passes to expand the hole. TCB finished the same operation in just one pass.	 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 has no longer needed, thus significantly reduced the machining time.

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