

Square shoulder milling cutter for titanium alloys and cast iron

EXTENDED F MILL

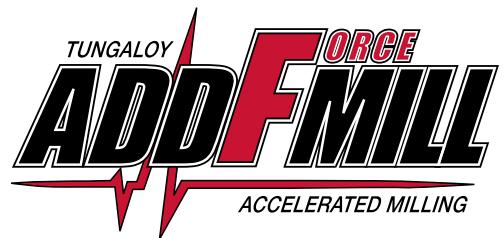
Tungaloy Report No. 560-G

Extended-flute rough milling cutter with double-sided inserts for maximum productivity and cost efficiency





INDUSTRY 4.0
FEED the SPEED!



EXTENDED F^{ORCE}MILL



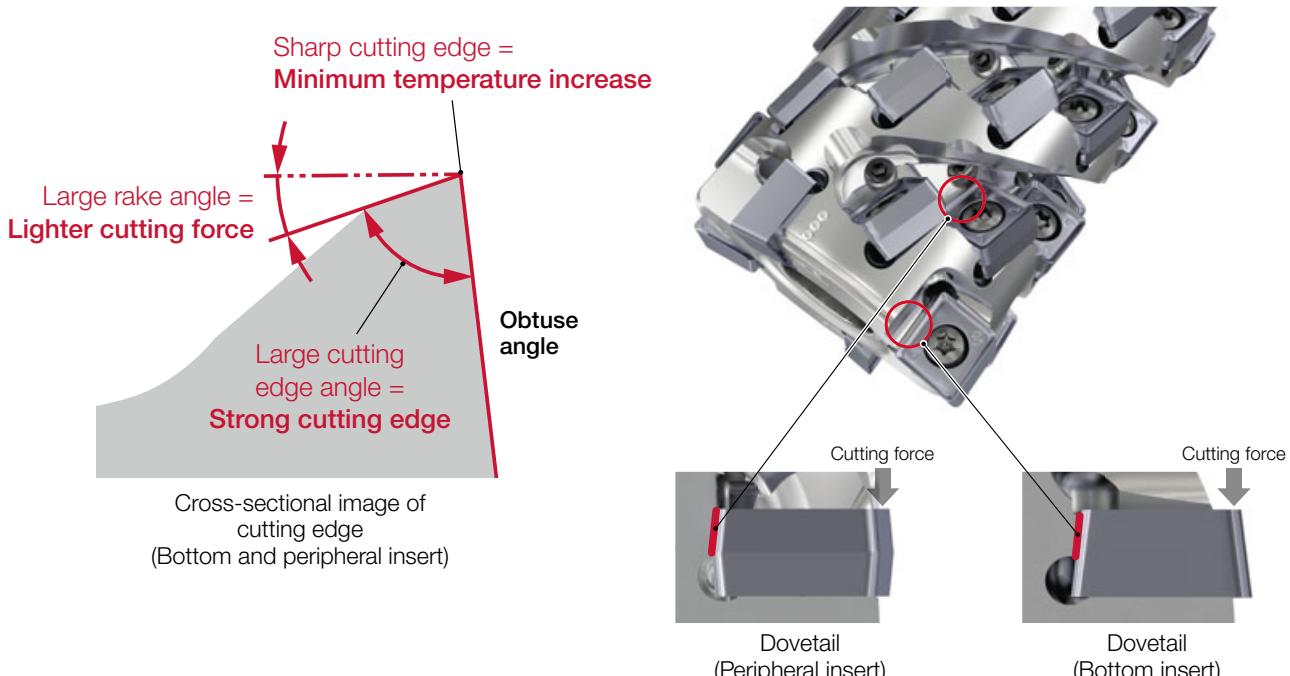
Indexable extended-flute cutters for high-efficiency rough milling operations of titanium alloy and cast iron parts

Rough milling cutter with exceptional reliability for titanium alloys and cast iron parts

■ Rough milling cutter optimized for machining titanium alloy parts

Titanium alloys generally exhibit excellent elastic deformation ability and low thermal conductivity. To meet these challenges, Tungaloy has developed the insert with unique and optimal features:

- A combination of sharp cutting edge and large rake angle generates lighter cutting action and reduced cutting forces.
- An obtuse-angled cutting edge design ensures the cutting edge's robustness and sharpness.
- The dovetail interlocking of the insert and pocket adds to tool reliability during aggressive machining.



■ Multiple edge double-sided inserts for maximum cost efficiency

8 total cutting edges for the peripheral insert and 4 for the bottom insert for maximum cost efficiency.

Peripheral insert

SXHU...



8
cutting edges

Bottom insert

AXHU...



4
cutting edges

■ Precision coolant

Coolant jet is directed precisely to the cutting point through the fixed coolant nozzle, exerting maximum cooling effect for the cutting edge and workpiece.

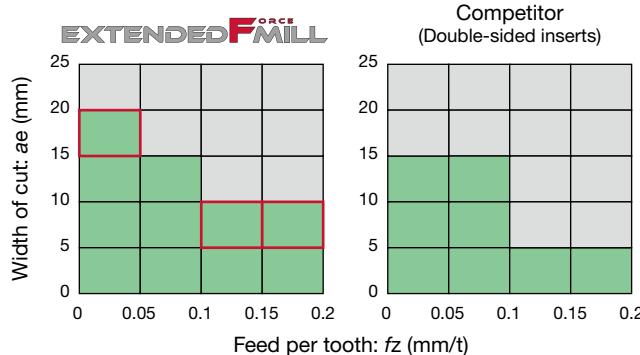


CUTTING PERFORMANCE

■ Application range comparisons

S Ti-6Al-4V (34HRC)

ExtendedForceMill vs competitor's double-sided inserts



Cutter : LPSX10M050B22.0L076R04
 Insert : AXHU100431PER-MM AH130 (for bottom)
 Shoulder milling Effective # of teeth : 4
Cutting speed : $V_c = 55$ m/min
Depth of cut : $a_p = 75$ mm
Coolant : Wet
Machine : Vertical M/C, BT50

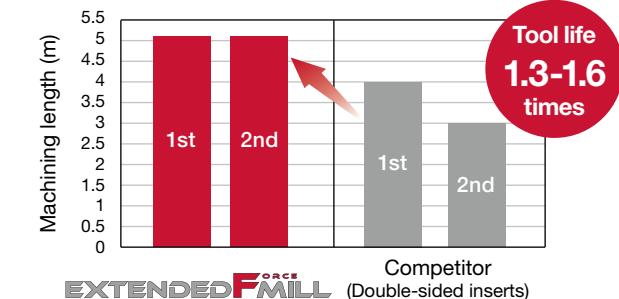
ExtendedForceMill generated lower cutting loads vs the competitor and allowed machining over a broader application range.

Light cutting geometry of ExtendedForceMill negative inserts allows the use of productive cutting parameters as used with the positive inserts.

■ Tool life comparisons

S Ti-6Al-4V (34HRC)

ExtendedForceMill vs competitor's double-sided inserts



Cutter : LPSX10M050B22.0L076R04
 Insert : AXHU100431PER-MM AH130 (for bottom)
 Shoulder milling Effective # of teeth : 1
Cutting speed : $V_c = 55$ m/min
Feed per tooth : $f_z = 0.15$ mm/t
Depth of cut : $a_p = 24$ mm
Width of cut : $a_e = 10$ mm
Coolant : Wet
Machine : Vertical M/C, BT50

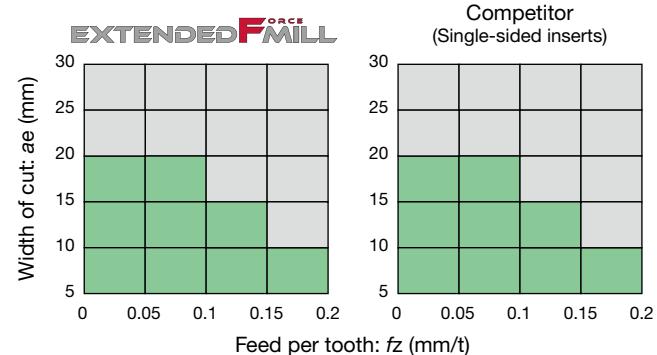
ExtendedForceMill provided longer tool life vs the competitor's double-sided inserts thanks to its sharp cutting edge.

Up-sharp cutting edge helps prevent the cutting point temperatures from increasing

during machining, while its thick, strong design eliminates edge chipping.

ExtendedForceMill provides long, predictable tool life.

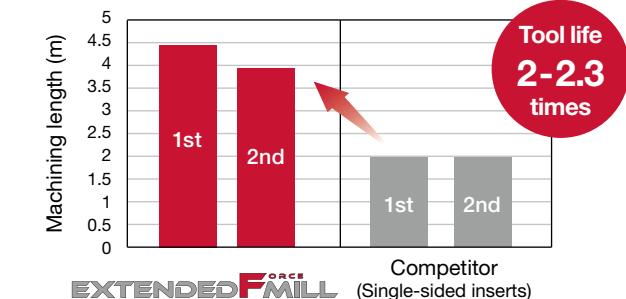
ExtendedForceMill vs competitor's single-sided inserts



Cutter : LPSX10M050B22.0L054R04
 Insert : AXHU100431PER-MM AH130 (for bottom)
 Shoulder milling Effective # of teeth : 4
Cutting speed : $V_c = 55$ m/min
Depth of cut : $a_p = 50$ mm
Coolant : Wet
Machine : Vertical M/C, BT50

ExtendedForceMill double-sided inserts were as efficient as competitor's single-sided positive inserts with no compromise on cutting parameters.

ExtendedForceMill vs competitor's single-sided inserts



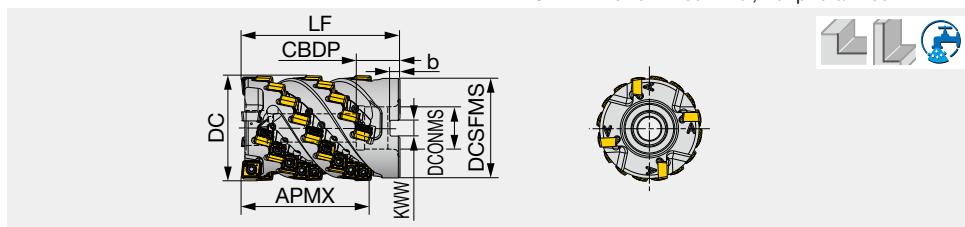
Cutter : LPSX10M050B22.0L076R04
 Insert : AXHU100431PER-MM AH130 (for bottom)
 Shoulder milling Effective # of teeth : 1
Cutting speed : $V_c = 55$ m/min
Feed per tooth : $f_z = 0.15$ mm/t
Depth of cut : $a_p = 17$ mm
Width of cut : $a_e = 15$ mm
Coolant : Wet
Machine : Vertical M/C, BT50

ExtendedForceMill provided longer tool life vs the competitor's single-sided inserts.

LPSX10

Square shoulder mill for roughing, with screw clamp system

GAMP: Bottom insert +0.3°, Peripheral insert +15.5°
GAMF: Bottom insert -18°, Peripheral insert -22°



Designation	APMX	DC	ZEFP	CICT	DCSMFS	DCONMS	CBDP	LF	b	KWW	WT(kg)	Air hole	Insert
LPSX10M050B22.0L054R04	54	50	4	28	45	22	20	68	6.3	10.4	0.63	With	AXHU10..., SXHU10...
LPSX10M050B22.0L076R04	76.5	50	4	40	45	22	20	91	6.3	10.4	0.87	With	AXHU10..., SXHU10...

Note: Coolant needs to be supplied from the end of the arbor inlay. Coolant cannot be supplied from the set bolt.

SPARE PARTS



Designation	Clamping screw	Grip	Torx bit	Coolant nozzle	Shell locking bolt
LPSX10M050B22.0L054R04	CSTB-4M	H-TBS	BT15S	SSHM4-4-OH08	CAP-CM10X1.5X55-H
LPSX10M050B22.0L076R04	CSTB-4M	H-TBS	BT15S	SSHM4-4-OH08	CM10X80

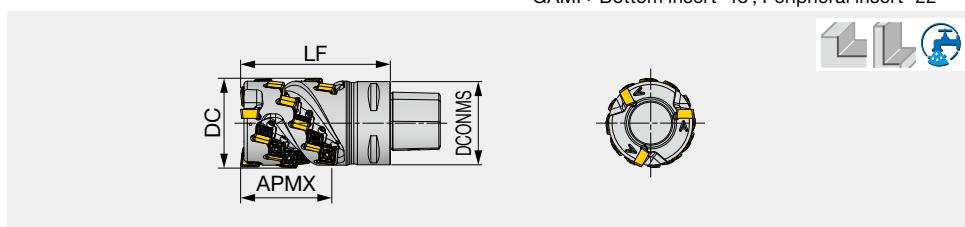
*Recommended clamping torque (N·m): CSTB-4M = 3.5

LPSX10**C

Square shoulder mill for roughing, with screw clamp system, with TungCap connection

TUNGCAP

GAMP: Bottom insert +0.3°, Peripheral insert +15.5°
GAMF: Bottom insert -18°, Peripheral insert -22°



Designation	APMX	DC	ZEFP	CICT	DCONMS	LF	WT(kg)	Air hole	Insert
LPSX10M054C5L055R03	54	54	3	21	50	90	1.34	With	AXHU10..., SXHU10...
LPSX10M066C6L054R04	54	66	4	28	63	90	2.05	With	AXHU10..., SXHU10...

SPARE PARTS

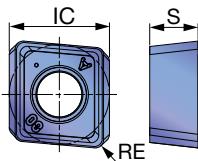


Designation	Clamping screw	Grip	Torx bit	Coolant nozzle
LPSX10M...	CSTB-4M	H-TBS	BT15S	SSHM4-4-OH08

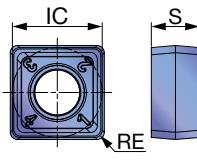
*Recommended clamping torque (N·m): CSTB-4M = 3.5

■ INSERTS

AXHU10-MM (for bottom)



SXHU10-MM (for peripheral)



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

★ : First choice
☆ : Second choice

Designation	RE	Coated		IC	S	BS
		AH130	AH8015			
AXHU100408PER-MM	0.8	●	●			11.16 5.38 -
AXHU100412PER-MM	1.2	●				11.16 5.38 -
AXHU100416PER-MM	1.6	●				11.16 5.38 -
AXHU100420PER-MM	2	●	●			11.16 5.38 -
AXHU100424PER-MM	2.4	●	●			11.16 5.38 -
AXHU100431PER-MM	3.1	●				11.16 5.38 -
SXHU100408EN-MM	0.8	●	●			10 5.38 -

● : Line up

■ GRADES

AH130 S

- Demonstrates high wear and chipping resistance in the machining of Titanium alloy or heat-resistant alloys
- Remarkable reliability in wet machining

AH8015 K S

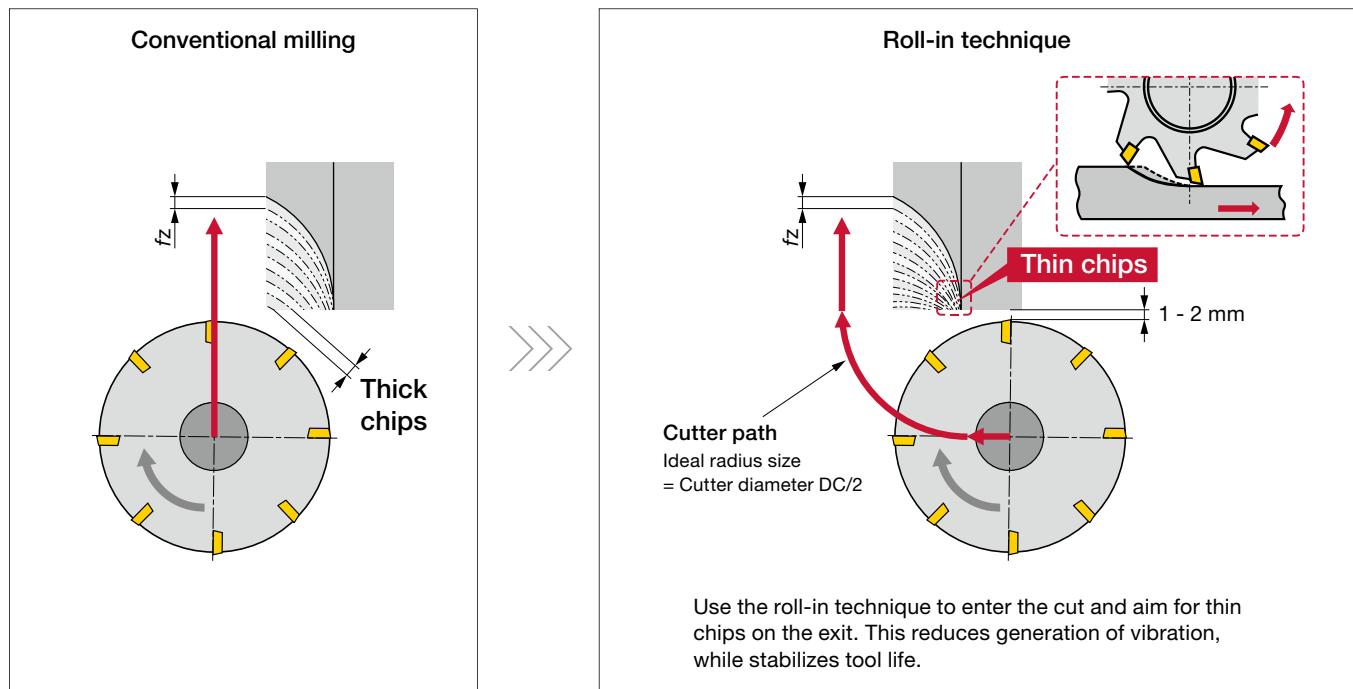
- Incorporates a hard coating layer and carbide substrate
- Strong resistance to wear, heat, and built-up edge, ideal for machining difficult materials

STANDARD CUTTING CONDITIONS

ISO	Workpiece materials	Hardness	Priority	Grades	Cutting speed V_c (m/min)	Feed per tooth f_z (mm/t)
K	Grey cast iron FC250, FC300, etc. 250, 300, etc.	150 - 250 HB	First choice	AH8015	100 - 300	0.1 - 0.25
	Ductile cast iron FCD400, FCD600, etc. 400-15S, 600-3, etc.	150 - 250 HB	First choice	AH8015	100 - 200	0.1 - 0.25
S	Titanium alloys Ti-6Al-4V, etc.	-	First choice	AH130	30 - 60	0.06 - 0.2
	Superalloys Inconel 718, etc.	-	First choice	AH130	20 - 50	0.05 - 0.1

Tips on cutter entry into the cut

In conventional end milling method, the cutter generates thick chips when exiting the cut, which causes vibrations and edge chipping. To avoid such results, use the roll-in technique, as shown below, in which the cutter is rolled into the cut in the same direction as the cutter rotation.



Cautions when installing the inserts

Please make sure the correct inserts are mounted in their respective pockets as shown below. Incorrect installation may result in tool damage and possible human injury.



Scan the QR code to watch the tutorial video

Insert Positioning

Mount the AXHU inserts on the bottom pockets marked with the matching "A" sign on the cutter body. On the remaining peripheral pockets, install the SXHU inserts.



AXHU
Inserts for bottom



NO protrusion line
on flank surfaces



SXHU
Inserts for peripheral



Protrusion line
on flank surfaces

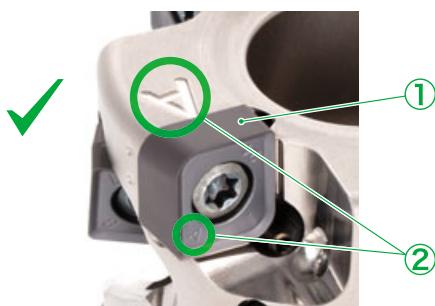


Check points

Ensure the following two points for the correct installation of the bottom inserts:

- ① The bottom inserts have a flat flank surface with NO protruded line.
- ② An "A" sign appears on the rake surface of the bottom inserts.

Bottom: **AXHU...** insert



Bottom: **SXHU...** insert



PRACTICAL EXAMPLES

Workpiece type		Parts for aerospace	Parts for aerospace											
Cutter	LPSX10U2.00B1.00L2.0R04 (DC = 50.8mm (2"), ZEFP = 4)	LPSX10U2.50B1.00L3.0R05 (DC = 63.5mm (2.5"), ZEFP = 5)												
Insert (for bottom)	AXHU100408PER-MM	AXHU100408PER-MM												
Insert (for peripheral)	SXHU100408EN-MM	SXHU100408EN-MM												
Grade	AH130	AH130												
	Ti-6Al-4V	Ti-6Al-4V												
Workpiece material														
Cutting conditions														
Cutting speed: V_c (m/min)	45.6	61												
Feed per tooth: f_z (mm/t)	0.1	0.1												
Feed speed: V_f (mm/min)	114	122												
Depth of cut : a_p (mm)	50.8	14												
Width of cut : a_e (mm)	Up to 38.1	4.4												
Machining	Shoulder milling	Shoulder milling												
Coolant	Internal	Internal												
Machine	Vertical M/C, CAT50	Vertical M/C, CAT50												
Results	<p>Tool life (min)</p> <table border="1"> <caption>Tool life comparison (min)</caption> <thead> <tr> <th>Tool</th> <th>Tool life (min)</th> </tr> </thead> <tbody> <tr> <td>ExtendedForceMill</td> <td>45.6</td> </tr> <tr> <td>Competitor</td> <td>6.5</td> </tr> </tbody> </table> <p>EXTENDEDFORCEMILL Competitor</p> <p>Thanks to robust cutting edge, ExtendedForceMill offered longer tool life without chipping.</p>	Tool	Tool life (min)	ExtendedForceMill	45.6	Competitor	6.5	<p>Tool life (min)</p> <table border="1"> <caption>Tool life comparison (min)</caption> <thead> <tr> <th>Tool</th> <th>Tool life (min)</th> </tr> </thead> <tbody> <tr> <td>ExtendedForceMill</td> <td>122</td> </tr> <tr> <td>Competitor</td> <td>15.5</td> </tr> </tbody> </table> <p>EXTENDEDFORCEMILL Competitor</p> <p>Thanks to AH130 grade, ExtendedForceMill offered longer tool life without chipping. Additionally, an optimized arrangement of cutting edges allowed stable machining without chattering even at an increased cutting speed and with greater number of teeth.</p>	Tool	Tool life (min)	ExtendedForceMill	122	Competitor	15.5
Tool	Tool life (min)													
ExtendedForceMill	45.6													
Competitor	6.5													
Tool	Tool life (min)													
ExtendedForceMill	122													
Competitor	15.5													
Workpiece type		Parts for aerospace	Parts for aerospace											
Cutter	LPSX10M050B22.0L054R04 (DC = 50 mm, ZEFP = 4)	LPSX10M050B22.0L054R04 (DC = 50 mm, ZEFP = 4)												
Insert (for bottom)	AXHU100408PER-MM	AXHU100408PER-MM												
Insert (for peripheral)	SXHU100408EN-MM	SXHU100408EN-MM												
Grade	AH130	AH130												
	Ti-6Al-4V	Ti-6Al-4V												
Workpiece material														
Cutting conditions														
Cutting speed: V_c (m/min)	47	55												
Feed per tooth: f_z (mm/t)	0.058	0.15												
Feed speed: V_f (mm/min)	70	210												
Depth of cut : a_p (mm)	45	25												
Width of cut : a_e (mm)	6	5												
Machining	Shoulder milling	Shoulder milling												
Coolant	Internal	Internal												
Machine	Vertical M/C, BT50	Vertical M/C, BT50												
Results	<p>Tool life (min)</p> <table border="1"> <caption>Tool life comparison (min)</caption> <thead> <tr> <th>Tool</th> <th>Tool life (min)</th> </tr> </thead> <tbody> <tr> <td>ExtendedForceMill</td> <td>110</td> </tr> <tr> <td>Competitor</td> <td>55</td> </tr> </tbody> </table> <p>EXTENDEDFORCEMILL Competitor</p> <p>Thanks to robust cutting edge, ExtendedForceMill offered longer tool life without chipping.</p>	Tool	Tool life (min)	ExtendedForceMill	110	Competitor	55	<p>Tool life (min)</p> <table border="1"> <caption>Tool life comparison (min)</caption> <thead> <tr> <th>Tool</th> <th>Tool life (min)</th> </tr> </thead> <tbody> <tr> <td>ExtendedForceMill</td> <td>4.0</td> </tr> <tr> <td>Competitor</td> <td>2.0</td> </tr> </tbody> </table> <p>EXTENDEDFORCEMILL Competitor</p> <p>Thanks to sharp edge preparation and obtuse cutting edge design, ExtendedForceMill offered longer tool life without chipping.</p>	Tool	Tool life (min)	ExtendedForceMill	4.0	Competitor	2.0
Tool	Tool life (min)													
ExtendedForceMill	110													
Competitor	55													
Tool	Tool life (min)													
ExtendedForceMill	4.0													
Competitor	2.0													

FIXED TORQUE WRENCH

Achieves high cutting edge precision thanks to uniform clamping force

■ Easy setting

Handle

Multi-component handle optimally designed for the hand enables ideal power transmission.



Mechanism

Driver clicks to alert the operator when the preset torque is attained.
IDs printed on the handle end allow easy identification of the driver specs.
Driver has unlimited loosening torque.
Driver mechanism is industrial-lubricant-resistant.

■ High repeatability & robustness

Robustness / Fitting

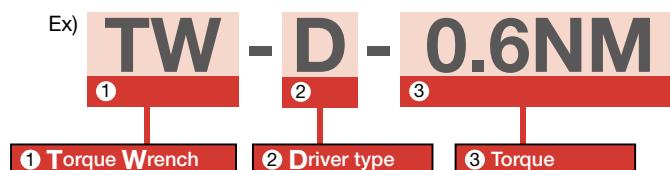
Wiha ChromTop® finish on tip for a perfect fit every time.
Durability thanks to high quality chrome-vanadium-molybdenum steel, through hardened, chrome-plated.

Versatility

Extra slim blade geometry is particularly suitable for applications with confined narrow access.



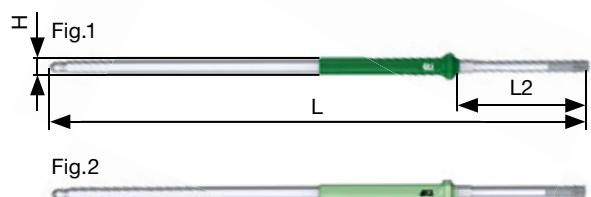
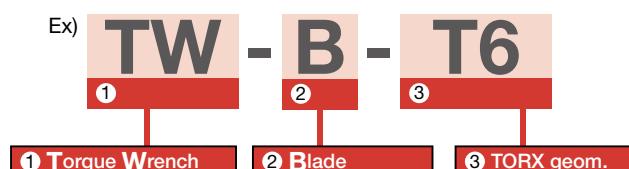
Handle



Designation	Stock	Torque (N·m)	Accuracy (%)	ØD	L
TW-D-0.6NM	●	0.6	10	34	130
TW-D-0.9NM	●	0.9	10	34	130
TW-D-1.1NM	●	1.1	10	34	130
TW-D-1.4NM	●	1.4	10	34	130
TW-D-2.5NM	●	2.5	10	34	130
TW-D-3.0NM	●	3.0	10	34	130
TW-D-3.5NM	●	3.5	10	34	130

1 piece per package

Blade



Designation	Stock	TORX geom.	H	L	L2	Fig.
TW-B-T6	●	T6	4	175	42	1
TW-B-T7	●	T7	4	175	42	1
TW-B-T8	●	T8	4	175	42	1
TW-B-T9	●	T9	4	175	42	1
TW-B-T10	●	T10	4	175	42	1
TW-B-T15	●	T15	4	175	42	1
TW-B-6IP	●	6IP	4	175	42	2
TW-B-7IP	●	7IP	4	175	42	2
TW-B-8IP	●	8IP	4	175	42	2
TW-B-10IP	●	10IP	4	175	42	2
TW-B-15IP	●	15IP	4	175	42	2

1 piece per package

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