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TUNGSIX-DRILL

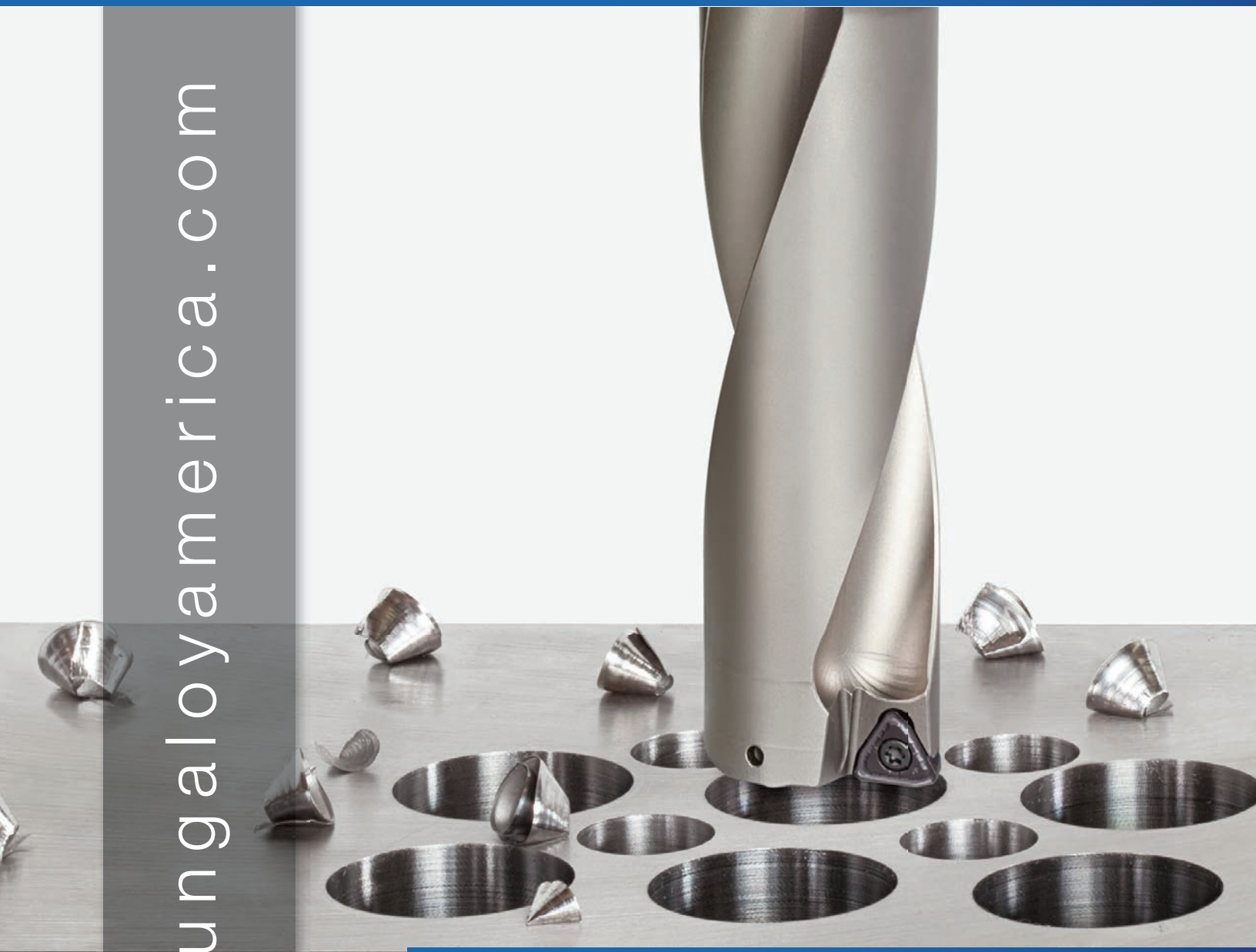
TUNGALOY

DrillLine

DRILLLINE

Tungaloy Report No. 409-US

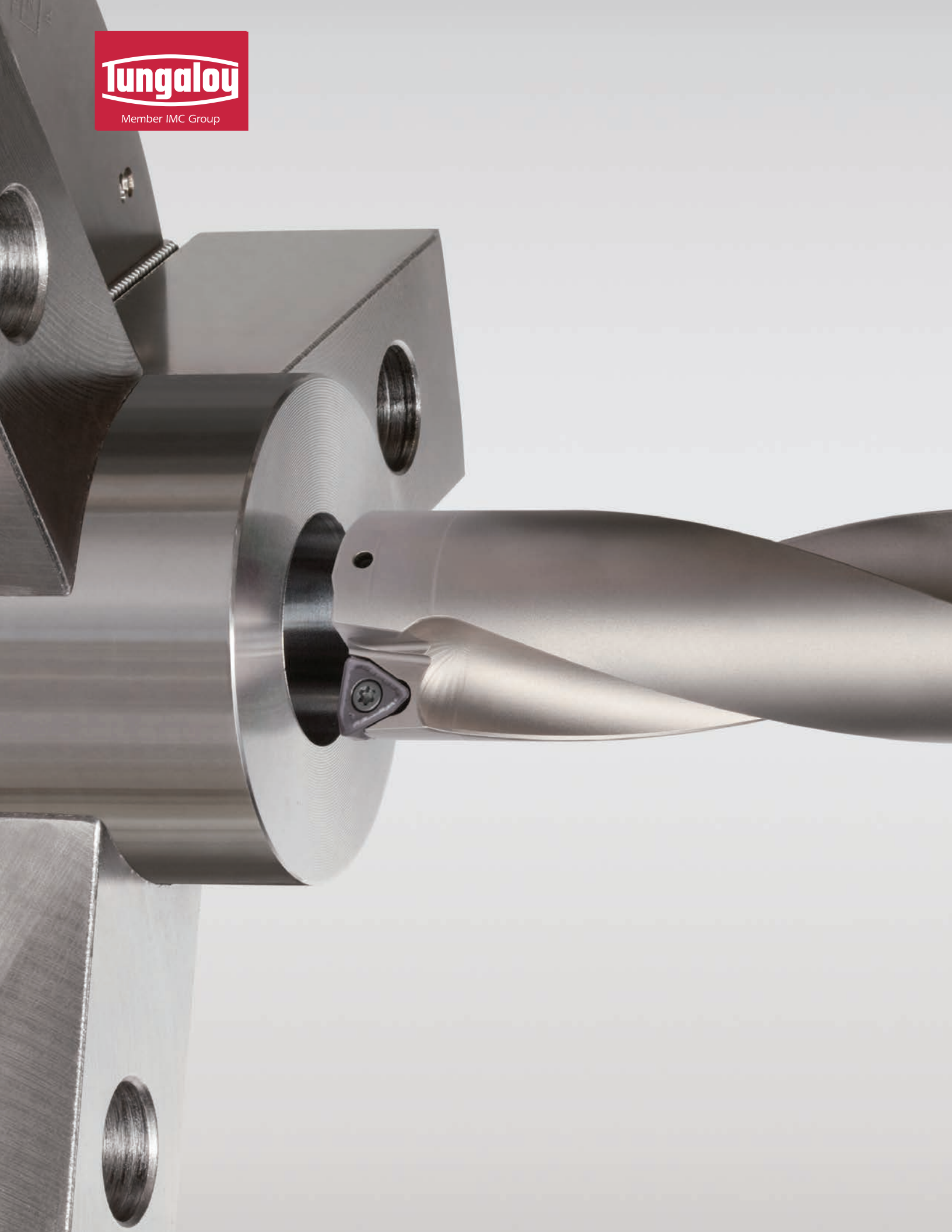
www.tungaloyamerica.com

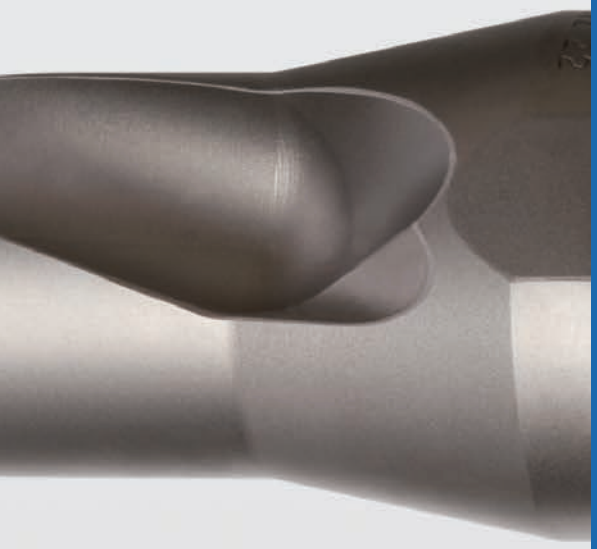


The most economical **solution** for drilling!

Tungaloy

Member IMC Group





TUNGSIX-DRILL

TUNGALOY

First double sided 6 cornered insert for drilling with superior performance.

TUNGSIX-DRILL

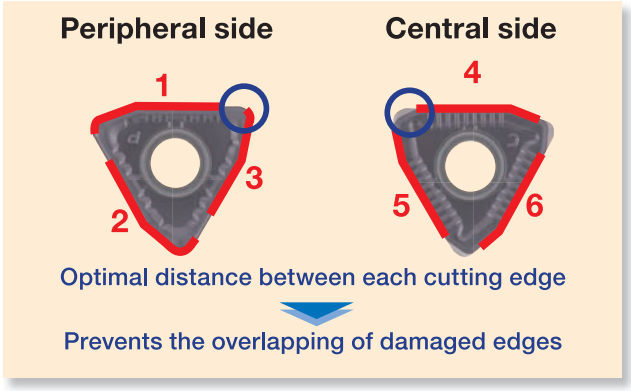
TUNGALOY

Indexable drill

Economical 6 cornered insert with excellent performance.

Double sided insert with 6 cutting edges

TungSix-Drill is the first indexable drill in the world to adapt double sided inserts with 6 cutting edges, reducing insert consumption.

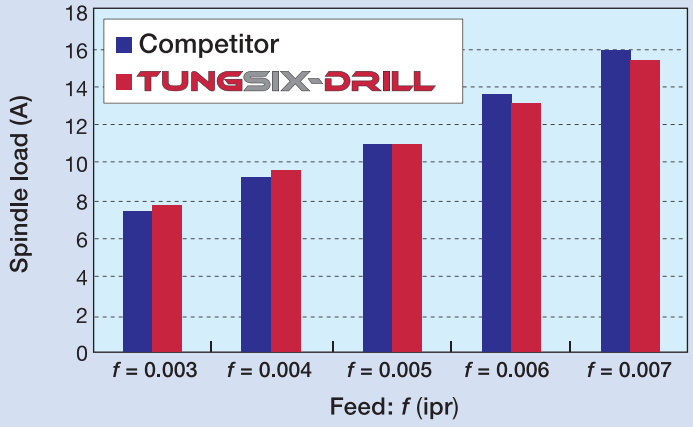


One insert type for both the central and peripheral pockets

Low cutting force even with double sided insert

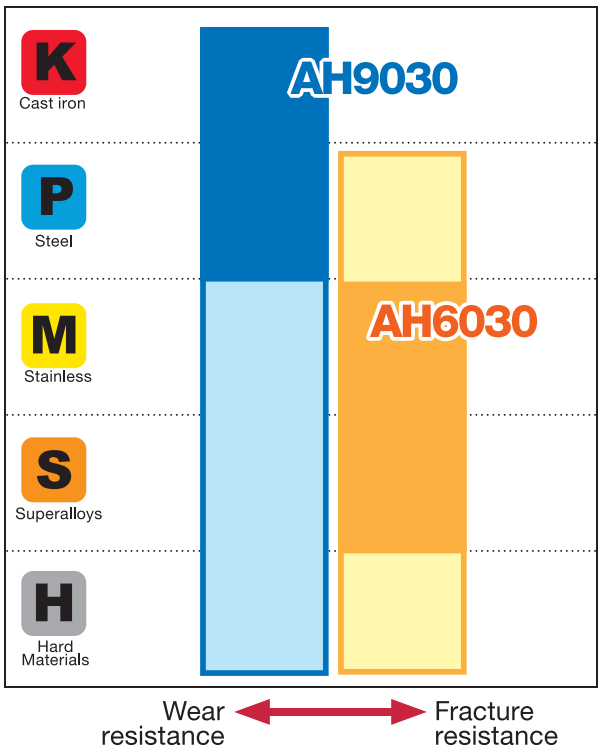
The cutting forces are almost equal to competitors positive single sided inserts, especially at higher feed rates, therefore achieving higher productivity.

■ Spindle load



Drill	: TDSU0812F-3
Insert	: WWMU05X205R-DJ
Grade	: AH9030
Workpiece	: 1055
Cutting speed	: *Vc* = 490 sfm
Feed	: *f* = 0.003 - 0.007 ipr
Hole diameter	: ø0.8"

New revolutionary grade



AH9030

Special Surface Technology

PREMIUMTEC TUNGALOY

- Smooth insert surface prevents chip adhesion and provides smooth chip flow.
- New generation PVD coating with advanced wear and oxidation resistance provides stable long tool life.
- Unique substrate with high heat resistance prevents crater wear.

AH6030

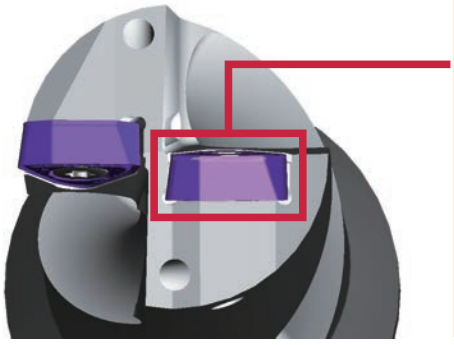
Special Surface Technology

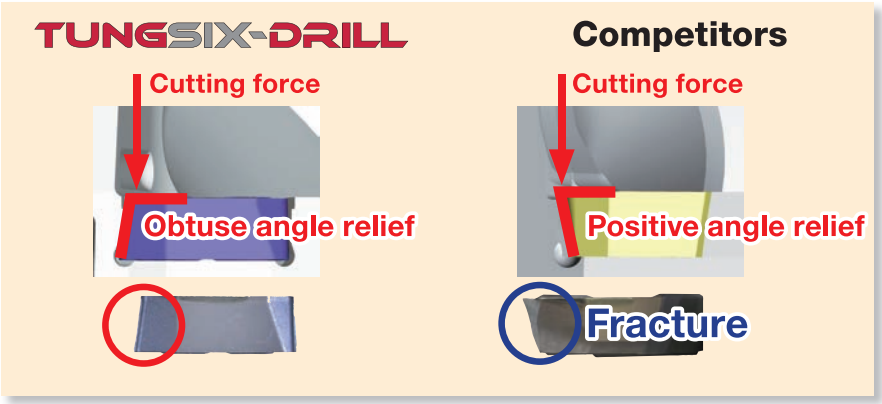
PREMIUMTEC TUNGALOY

- Smooth insert surface prevents chip adhesion and improves chip control.
- New PVD coating with high adhesion strength prevents fracture caused by chip welding.
- Exclusive carbide substrate with high fracture resistance.

Enhanced corner of central insert

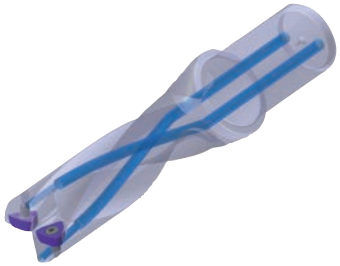
The central corner is strengthened by an obtuse relief angle increasing the corner strength and reliability.





Twisted coolant holes

Twisted coolant holes improve coolant flow, improving chip evacuation, cooling and lubrication of the cutting edges.



Chipbreakers

DJ type

For general purpose
Suitable for cutting of a wide range of work material

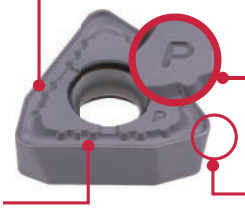
Central insert

Identification for central edge side

Chipbreaker for central edge
The chipbreaker has thick width and gentle curves. This prevents chips from packing.

Low cutting forces and long tool life
Optimized rake design reduces chip contact with the insert, reducing heat and improving tool life.

Peripheral insert



Chipbreaker for peripheral edge
The high rake angle and high breaker wall reduces cutting forces and improves chipbreaking.

Identification for peripheral edge side

Wiper design
Improves surface finish

* WWMU05... and WWMU06...does not have 'P' mark on the peripheral side.

DS type

For drilling stainless and gummy steels
Demonstrates exceptional chip control

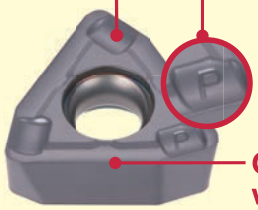
Central insert

Dimple
Creates smooth chip curling.

Identification for central edge side

Reinforced land
Prevents fracture and chipping.

Peripheral insert



Identification for peripheral edge side

Optimum chipbreaker width and contact area
Provides excellent chip control.

* WWMU05... and WWMU06...does not have 'P' mark on the peripheral side.

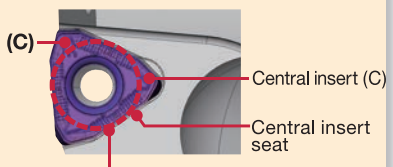
Insert clamping design

TungSix-Drill insert and pocket design ensures correct insert positioning and clamping of central and peripheral inserts in their respective pockets.

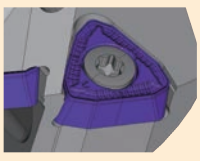
Note: The drill is designed to avoid wrong insert clamping, however please check the central (c) and peripheral (p) marks on the insert before setting the insert.

Correct clamping

OK Central insert ▸ Central insert seat



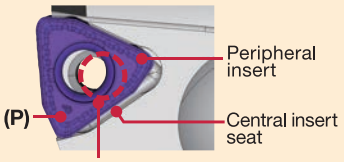
Insert hole fits screw hole



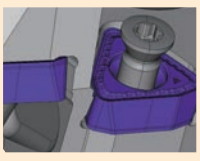
Correctly clamped !

Incorrect clamping

✕ Pheripheral insert ▸ Central insert seat



Insert hole doesn't fit screw hole

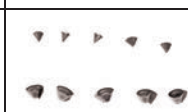
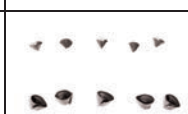
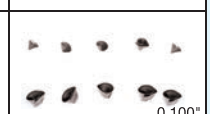


Screw can't enter screw hole

Chip control

P Steel **1045**

DJ

Feed: *f* (ipr)	Cutting speed: *Vc* (sfm) 330	500	660
0.008			
0.006			
0.004			

0.100"

The above parameter zone shows ideal chip control.

Drill	: TDSU1125-03
Insert	: WWMU08X408R-DJ
Grade	: AH9030
Machine	: NC lathe
Hool diameter	: ø1.125"
Hole depth	: H = 2.8"
Coolant	: Wet

M Stainless **316**

DS

Feed: *f* (ipr)	Cutting speed: *Vc* (sfm) 500	660
0.004		
0.003		

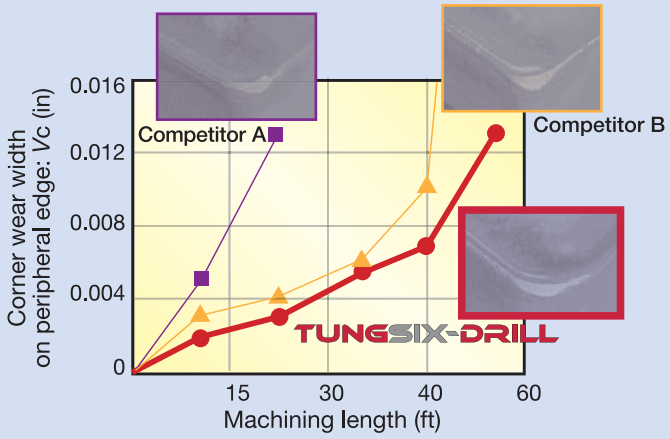
0.100"

The above parameter zone shows ideal chip control. DS chip-breaker shows excellent chip control for stainless steel and difficult to split chips.

Drill	: TDSU1125-03
Insert	: WWMU08X408R-DS
Grade	: AH6030
Machine	: Vertical M/C
Hool diameter	: ø1.125"
Hole depth	: H = 2.8"
Coolant	: Wet

Tool life

Excellent wear resistance of AH9030

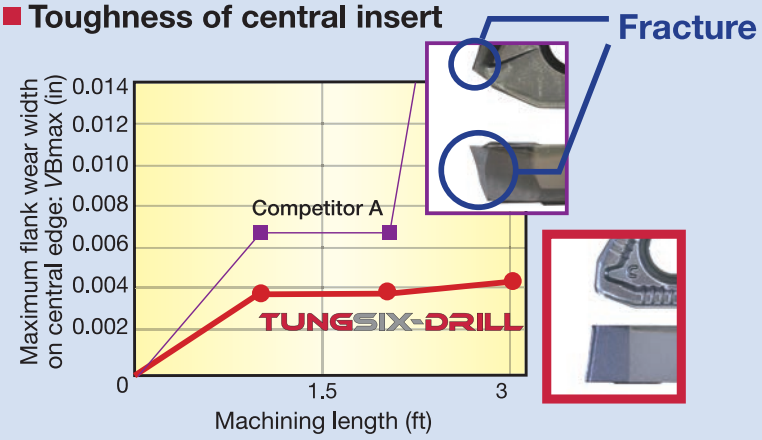


P

Drill	: TDSU1125-03
Insert	: WWMU08X408R-DJ
Grade	: AH9030
Workpiece	: 1055
Cutting speed	: *Vc* = 460 sfm
Feed	: *f* = 0.004 ipr
Hole diameter	: ø1.125"
Hole depth	: H = 2.8”
Machine	: Horizontal M/C, CAT40
Coolant	: Wet (Internal supply)

AH9030 offers superior wear resistance against competitors.

Toughness of central insert



P

Drill	: TDSU1125-03
Insert	: WWMU08X408R-DJ
Grade	: AH9030
Workpiece	: Pre-hardened steel (40HRC)
Cutting speed	: *Vc* = 330 sfm
Feed	: *f* = 0.003 ipr
Hole diameter	: ø1.125"
Hole depth	: H = 1.125”
Machine	: Vertical M/C, CAT40
Coolant	: Wet (Internal supply)

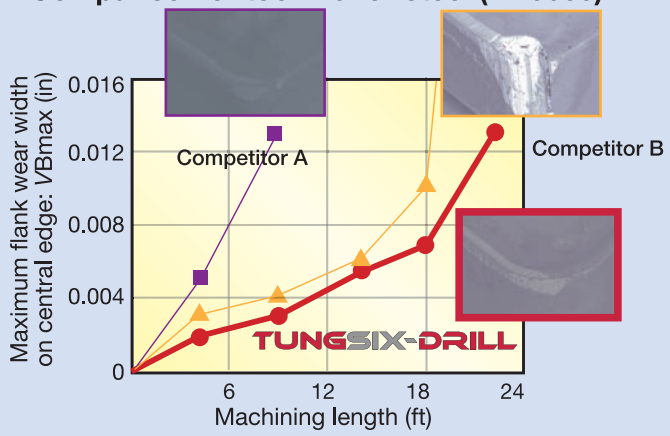
Enhanced corner of central cutting edge prevents fracture even in pre-hardened steel machining.

Standard cutting conditions

ISO	Workpiece materials	Selection criteria	Chip-breaker	Grade	Cutting speed *Vc* (sfm)
P	Low carbon steels (C < 0.3) 70, 1025 etc.	First choice	**DS**	**AH6030**	525 - 820
		Priority on wear resistance	**DJ**	**AH9030**	525 - 1050
	Carbon steels (C > 0.3) 1045C, 1055 etc.	First choice	**DJ**	**AH9030**	260 - 820
		Priority on impact resistance	**DS**	**AH6030**	260 - 820
	Low alloy steels SCM415 etc.	First choice	**DS**	**AH6030**	525 - 820
		Priority on wear resistance	**DJ**	**AH9030**	525 - 820
	Alloy steels 4140 etc.	First choice	**DJ**	**AH9030**	260 - 660
		Priority on impact resistance	**DS**	**AH6030**	260 - 660
M	Stainless steels (Austenitic) 304, 316 etc.	First choice	**DS**	**AH6030**	330 - 660
		-	**DJ**	**AH9030**	330 - 660
	Stainless steels (Martensitic and ferritic) 430, 416 etc.	First choice	**DS**	**AH6030**	330 - 660
		-	**DJ**	**AH9030**	330 - 660
	Stainless steels (Precipitation hardening) S17400 etc.	First choice	**DS**	**AH6030**	260 - 400
		-	**DJ**	**AH9030**	260 - 400
K	Gray cast irons No.250B etc.	First choice	**DJ**	**AH9030**	260 - 820
		Priority on impact resistance	**DS**	**AH6030**	260 - 660
	Ductile cast irons 700 etc.	First choice	**DJ**	**AH9030**	260 - 660
		Priority on impact resistance	**DS**	**AH6030**	260 - 500
N	Aluminum alloy	First choice	**DS**	**AH6030**	660 - 1310
		-	**DJ**	**AH9030**	660 - 1310
S	High temperature alloy Inconel718 etc	First choice	**DS**	**AH6030**	60 - 200
		-	**DJ**	**AH9030**	60 - 200
	Titanium Alooy Ti-6Al-4V etc.	First choice	**DS**	**AH6030**	130 - 400
		-	**DJ**	**AH9030**	130 - 400
H	Hardened steel Over 40HRC	First choice	**DJ**	**AH9030**	170 - 330
		Priority on impact resistance	**DS**	**AH6030**	130 - 260

• Drill body of L/D = 4 is not recommended for stainless steel or superalloys drilling

Comparison of tool life for steel (AH9030)

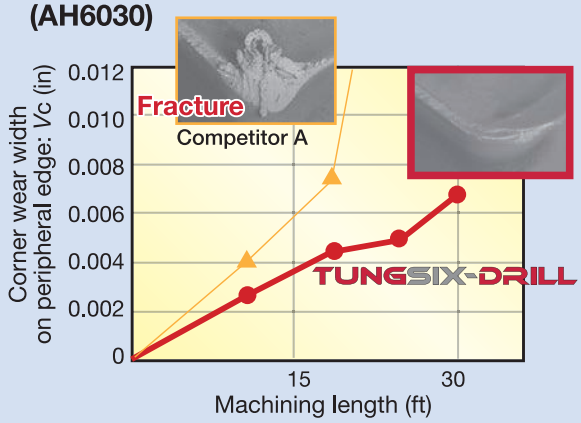


P

Drill	: TDSU1125-03
Insert	: WWMU08X408R-DJ
Grade	: AH9030
Workpiece	: 1055
Cutting speed	: *Vc* = 820 sfm
Feed	: *f* = 0.004 ipr
Hole diameter	: ø1.125"
Hole depth	: H = 2.8"
Machine	: Horizontal M/C, CAT40
Coolant	: Wet (Internal supply)

The wear and oxidation resistance of AH9030 is enhanced in high speed machining.

Comparison of tool life for stainless steel (AH6030)



Comparison of damage on edge (After 22 ft machining)

M

Drill	: TDSU1125-03
Insert	: WWMU08X408R-DS
Grade	: AH6030
Workpiece	: 304
Cutting speed	: *Vc* = 660 sfm
Feed	: *f* = 0.004 ipr
Hole diameter	: ø1.125"
Hole depth	: H = 2.8"
Machine	: Vertical M/C, CAT40
Coolant	: Wet (Internal supply)

Even when machining stainless steel, cutting edge damage on AH6030 is minimal. This is credit to its high adhesion strength.

Feed: *f* (ipr)					
L/D = 2, 3			L/D = 4		
øDc (in)					
ø0.787 - ø1.063	ø1.125 - ø1.500	ø1.562 - ø2.000	ø0.787 - ø1.063	ø1.100 - ø1.500	ø1.535 - ø2.126
0.0015 - 0.004	0.0015 - 0.004	0.0015 - 0.004	0.002 - 0.004	0.002 - 0.004	0.002 - 0.004
0.0015 - 0.004	0.0015 - 0.004	0.0015 - 0.004	0.002 - 0.004	0.002 - 0.004	0.002 - 0.004
0.002 - 0.006	0.002 - 0.006	0.003 - 0.007	0.002 - 0.006	0.002 - 0.006	0.003 - 0.007
0.0015 - 0.005	0.0015 - 0.005	0.0015 - 0.006	0.002 - 0.006	0.002 - 0.005	0.002 - 0.006
0.0015 - 0.005	0.0015 - 0.005	0.0015 - 0.005	0.002 - 0.006	0.002 - 0.005	0.002 - 0.005
0.0015 - 0.005	0.002 - 0.006	0.0015 - 0.006	0.002 - 0.006	0.002 - 0.006	0.002 - 0.006
0.002 - 0.006	0.003 - 0.006	0.003 - 0.007	0.002 - 0.006	0.002 - 0.006	0.003 - 0.007
0.002 - 0.005	0.002 - 0.005	0.002 - 0.006	0.002 - 0.005	0.002 - 0.005	0.002 - 0.006
0.0015 - 0.004	0.0015 - 0.005	0.0015 - 0.005	-	-	-
0.0015 - 0.004	0.0015 - 0.005	0.0015 - 0.005	-	-	-
0.0015 - 0.004	0.0015 - 0.005	0.0015 - 0.005	-	-	-
0.0015 - 0.004	0.0015 - 0.005	0.0015 - 0.005	-	-	-
0.0015 - 0.003	0.0015 - 0.004	0.0015 - 0.004	-	-	-
0.0015 - 0.003	0.0015 - 0.004	0.0015 - 0.004	-	-	-
0.002 - 0.006	0.002 - 0.007	0.003 - 0.008	0.002 - 0.006	0.002 - 0.006	0.003 - 0.007
0.002 - 0.005	0.003 - 0.006	0.003 - 0.007	0.002 - 0.005	0.002 - 0.006	0.003 - 0.007
0.002 - 0.006	0.002 - 0.007	0.003 - 0.008	0.002 - 0.006	0.002 - 0.006	0.003 - 0.007
0.002 - 0.005	0.002 - 0.006	0.003 - 0.007	0.002 - 0.005	0.002 - 0.006	0.003 - 0.007
0.004 - 0.007	0.004 - 0.008	0.004 - 0.01	0.004 - 0.007	0.004 - 0.008	0.004 - 0.008
0.002 - 0.007	0.004 - 0.008	0.004 - 0.01	0.002 - 0.005	0.004 - 0.008	0.004 - 0.008
0.0015 - 0.007	0.0015 - 0.003	0.0015 - 0.003	-	-	-
0.0015 - 0.007	0.0015 - 0.004	0.0015 - 0.004	-	-	-
0.002 - 0.004	0.002 - 0.005	0.002 - 0.005	-	-	-
0.002 - 0.004	0.002 - 0.005	0.002 - 0.005	-	-	-
0.0015 - 0.007	0.0015 - 0.003	0.0015 - 0.004	0.002 - 0.003	0.002 - 0.003	0.002 - 0.003
0.0015 - 0.007	0.0015 - 0.003	0.0015 - 0.004	0.002 - 0.003	0.002 - 0.003	0.002 - 0.003

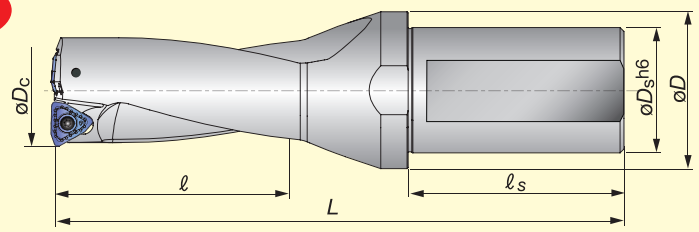
Drills

L/D = 2

Machined hole diameter may change depending upon the rigidity of the machine tool or cutting conditions.

NEW

Shank with flat

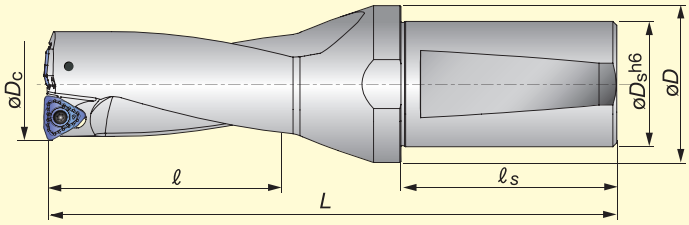


Tolerance

Tool diameter (mm)		Hole diameter tolerance (mm)
øDc	Tolerance	
ø0.812 - ø1.063	+ 0.008 / 0	+ 0.010 / 0

Cat. No.	Stock	Dimensions (mm)						Max offset (Radius)	Weight (lb)	Applicable inserts	Clamping screw	Torx driver
		øDc	øDs	øD	ℓ	ℓ s	L					
TDSU0812F-2	●	0.812	1.000	1.457	1.625	2.205	4.665	0.031	0.7	WWMU05X205R-D*	CSPB-2.2	IP-7D
TDSU0875F-2	●	0.875	1.000	1.457	1.75	2.205	4.831	0.020	0.7	WWMU05X205R-D*	CSPB-2.2	IP-7D
TDSU0937F-2	●	0.937	1.000	1.457	1.875	2.205	4.994	0.047	0.9	WWMU060306R-D*	CSPB-2.5	IP-8D
TDSU1000F-2	●	1.000	1.000	1.457	2.000	2.205	5.161	0.026	0.9	WWMU060306R-D*	CSPB-2.5	IP-8D
TDSU1062F-2	●	1.062	1.250	1.575	2.125	2.362	5.465	0.012	1.3	WWMU060306R-D*	CSPB-2.5	IP-8D

Whistle notch



Tolerance

Tool diameter (in)		Hole diameter tolerance (in)
øDc	Tolerance	
ø1.125 - ø2.000	± 0.004	+ 0.008 / - 0.004

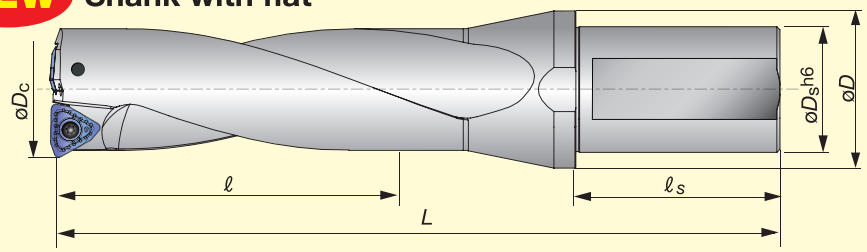
Cat. No.	Stock	Dimensions (in)						Max offset (Radius)	Weight (lb)	Applicable inserts	Clamping screw	Torx driver
		øDc	øDs	øD	ℓ	ℓ s	L					
TDSU1125-02	●	1.125	1.250	1.575	2.250	2.280	5.892	0.043	1.5	WWMU08X408R-**	CSTB-3	T-9D
TDSU1187-02	●	1.187	1.250	1.575	2.374	2.280	6.079	0.019	1.6	WWMU08X408R-**	CSTB-3	T-9D
TDSU1250-02	●	1.250	1.250	1.575	2.500	2.280	6.267	0.008	1.7	WWMU08X408R-**	CSTB-3	T-9D
TDSU1312-02	●	1.312	1.500	1.969	2.624	2.688	6.862	0.055	2.5	WWMU09X510R-**	CSTB-4	T-15D
TDSU1375-02	●	1.375	1.500	1.969	2.750	2.688	7.049	0.047	2.6	WWMU09X510R-**	CSTB-4	T-15D
TDSU1437-02	●	1.437	1.500	1.969	2.874	2.688	7.237	0.027	2.8	WWMU09X510R-**	CSTB-4	T-15D
TDSU1500-02	●	1.500	1.500	1.969	3.000	2.688	7.424	0.015	2.9	WWMU09X510R-**	CSTB-4	T-15D
TDSU1562-02	●	1.562	1.500	1.969	3.124	2.688	7.612	0.074	3.0	WWMU11X512R-**	CSTB-5	T-20D
TDSU1625-02	●	1.625	1.500	2.165	3.250	2.688	7.799	0.059	3.3	WWMU11X512R-**	CSTB-5	T-20D
TDSU1687-02	●	1.687	1.500	2.165	3.374	2.688	7.987	0.051	3.5	WWMU11X512R-**	CSTB-5	T-20D
TDSU1750-02	●	1.750	1.500	2.165	3.500	2.688	8.174	0.027	3.7	WWMU11X512R-**	CSTB-5	T-20D
TDSU1812-02	●	1.812	1.500	2.165	3.624	2.688	8.362	0.015	3.9	WWMU11X512R-**	CSTB-5	T-20D
TDSU1875-02	●	1.875	1.500	2.165	3.750	2.688	8.549	0.094	4.2	WWMU13X512R-**	CSTB-5	T-20D
TDSU1937-02	●	1.937	1.500	2.165	3.874	2.688	8.737	0.078	4.3	WWMU13X512R-**	CSTB-5	T-20D
TDSU2000-02	●	2.000	1.500	2.165	4.000	2.688	8.924	0.067	4.6	WWMU13X512R-**	CSTB-5	T-20D

● : Stocked items

L/D = 3

Machined hole diameter may change depending upon the rigidity of the machine tool or cutting conditions.

NEW Shank with flat

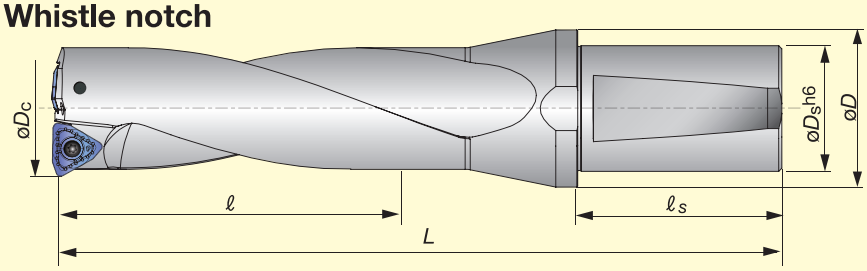


Tolerance

Tool diameter (mm)		Hole diameter tolerance (in)
øDc	Tolerance	
ø0.812 - ø1.063	+ 0.008 / 0	+ 0.010 / 0

Cat. No.	Stock	Dimensions (mm)						Max offset (Radius)	Weight (lb)	Applicable inserts	Clamping screw	Torx driver
		øDc	øDs	øD	ℓ	ℓ s	L					
TDSU0812F-3	●	0.812	1.000	1.457	2.438	2.205	5.516	0.031	0.7	WWMU05X205R-D*	CSPB-2.2	IP-7D
TDSU0875F-3	●	0.875	1.000	1.457	2.625	2.205	5.665	0.020	0.9	WWMU05X205R-D*	CSPB-2.2	IP-7D
TDSU0937F-3	●	0.937	1.000	1.457	2.813	2.205	5.894	0.047	0.9	WWMU060306R-D*	CSPB-2.5	IP-8D
TDSU1000F-3	●	1.000	1.000	1.457	3.000	2.205	6.122	0.028	1.1	WWMU060306R-D*	CSPB-2.5	IP-8D
TDSU1062F-3	●	1.062	1.250	1.575	3.186	2.342	6.488	0.012	1.3	WWMU060306R-D*	CSPB-2.5	IP-8D

Whistle notch



Tolerance

Tool diameter (mm)		Hole diameter tolerance (in)
øDc	Tolerance	
ø1.125 - ø2.000	± 0.004	+ 0.008 / - 0.004

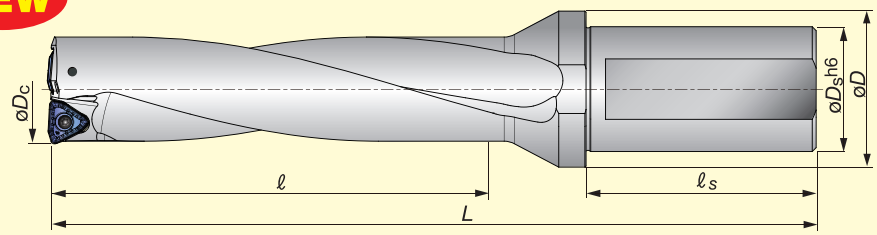
Cat. No.	Stock	Dimensions (mm)						Max offset (Radius)	Weight (lb)	Applicable inserts	Clamping screw	Torx driver
		øDc	øDs	øD	ℓ	ℓ s	L					
TDSU1125-03	●	1.125	1.250	1.575	3.375	2.280	7.017	0.043	1.7	WWMU08X408R-**	CSTB-3	T-9D
TDSU1187-03	●	1.187	1.250	1.575	3.561	2.280	7.267	0.019	1.8	WWMU08X408R-**	CSTB-3	T-9D
TDSU1250-03	●	1.250	1.250	1.575	3.750	2.280	7.517	0.008	1.9	WWMU08X408R-**	CSTB-3	T-9D
TDSU1312-03	●	1.312	1.500	1.969	3.936	2.688	8.174	0.055	2.8	WWMU09X510R-**	CSTB-4	T-15D
TDSU1375-03	●	1.375	1.500	1.969	4.125	2.688	8.424	0.047	2.9	WWMU09X510R-**	CSTB-4	T-15D
TDSU1437-03	●	1.437	1.500	1.969	4.311	2.688	8.674	0.027	3.1	WWMU09X510R-**	CSTB-4	T-15D
TDSU1500-03	●	1.500	1.500	1.969	4.500	2.688	8.924	0.015	3.3	WWMU09X510R-**	CSTB-4	T-15D
TDSU1562-03	●	1.562	1.500	1.969	4.686	2.688	9.174	0.074	3.4	WWMU11X512R-**	CSTB-5	T-20D
TDSU1625-03	●	1.625	1.500	2.165	4.875	2.688	9.424	0.059	3.8	WWMU11X512R-**	CSTB-5	T-20D
TDSU1687-03	●	1.687	1.500	2.165	5.061	2.688	9.674	0.051	4.1	WWMU11X512R-**	CSTB-5	T-20D
TDSU1750-03	●	1.750	1.500	2.165	5.250	2.688	9.924	0.027	4.3	WWMU11X512R-**	CSTB-5	T-20D
TDSU1812-03	●	1.812	1.500	2.165	5.436	2.688	10.174	0.015	4.6	WWMU11X512R-**	CSTB-5	T-20D
TDSU1875-03	●	1.875	1.500	2.165	5.625	2.688	10.424	0.094	4.9	WWMU13X512R-**	CSTB-5	T-20D
TDSU1937-03	●	1.937	1.500	2.165	5.811	2.688	10.674	0.078	5.1	WWMU13X512R-**	CSTB-5	T-20D
TDSU2000-03	●	2.000	1.500	2.165	6.000	2.688	10.924	0.067	5.5	WWMU13X512R-**	CSTB-5	T-20D

● : Stocked items

L/D = 4

Machined hole diameter may change depending upon the rigidity of the machine tool or cutting conditions.

NEW **Shank with flat**



Tolerance

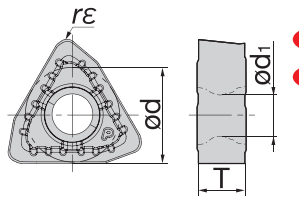
Tool diameter (in)		Hole diameter tolerance (in)
øDc	Tolerance	
ø1.125 - ø2.000	+ 0.008 / 0	+ 0.014 / 0

Cat. No.	Stock	Dimensions (in)						Max offset (Radius)	Weight (lb)	Applicable inserts	Clamping screw	Torx driver
		øDc	øDs	øD	ℓ	ℓ s	L					
TDSU1125F-4	●	1.125	1.250	1.575	4.500	2.343	7.897	0.043	1.7	WWMU08X408R-D*	CSTB-3	T-9D
TDSU1187F-4	●	1.187	1.250	1.575	4.748	2.343	8.179	0.019	1.9	WWMU08X408R-D*	CSTB-3	T-9D
TDSU1250F-4	●	1.250	1.250	1.575	5.000	2.343	8.470	0.008	2.0	WWMU08X408R-D*	CSTB-3	T-9D
TDSU1312F-4	●	1.312	1.500	1.969	5.248	2.736	9.161	0.055	2.9	WWMU09X510R-D*	CSTB-4	T-15D
TDSU1375F-4	●	1.375	1.500	1.969	5.500	2.736	9.452	0.047	3.1	WWMU09X510R-D*	CSTB-4	T-15D
TDSU1437F-4	●	1.437	1.500	1.969	5.748	2.736	9.744	0.027	3.2	WWMU09X510R-D*	CSTB-4	T-15D
TDSU1500F-4	●	1.500	1.500	1.969	6.000	2.736	10.034	0.015	3.5	WWMU09X510R-D*	CSTB-4	T-15D
TDSU1562F-4	●	1.562	1.500	1.969	6.248	2.736	10.351	0.074	3.6	WWMU11X512R-D*	CSTB-5	T-20D
TDSU1625F-4	●	1.625	1.500	2.165	6.500	2.736	10.643	0.059	4.0	WWMU11X512R-D*	CSTB-5	T-20D
TDSU1687F-4	●	1.687	1.500	2.165	6.748	2.736	10.934	0.051	4.5	WWMU11X512R-D*	CSTB-5	T-20D
TDSU1750F-4	●	1.750	1.500	2.165	7.000	2.736	11.226	0.027	5.1	WWMU11X512R-D*	CSTB-5	T-20D
TDSU1812F-4	●	1.812	1.500	2.165	7.248	2.736	11.517	0.015	5.3	WWMU11X512R-D*	CSTB-5	T-20D
TDSU1875F-4	●	1.875	1.500	2.165	7.500	2.736	11.815	0.094	5.4	WWMU13X512R-D*	CSTB-5	T-20D
TDSU1937F-4	●	1.937	1.500	2.165	7.748	2.736	12.036	0.078	5.5	WWMU13X512R-D*	CSTB-5	T-20D
TDSU2000F-4	●	2.000	1.500	2.165	8.000	2.736	12.327	0.067	5.6	WWMU13X512R-D*	CSTB-5	T-20D

● : Stocked items

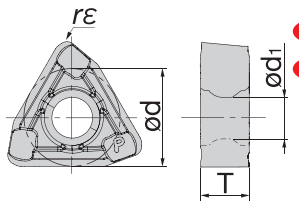
Inserts

DJ chipbreaker



Cat. No.	Stocked grades PREMIUMTEC AH9030	Dimensions (in) ød	T	ød1	rε	Applicable drill diameters øDc (in)
NEW WWMU05X205R-DJ	●	0.228	0.094	0.098	0.020	ø0.812 - ø0.875
NEW WWMU060306R-DJ	●	0.264	0.114	0.118	0.024	ø0.937 - ø1.062
WWMU08X408R-DJ	●	0.315	0.154	0.134	0.031	ø1.125 - ø1.250
WWMU09X510R-DJ	●	0.382	0.193	0.173	0.039	ø1.312 - ø1.500
WWMU11X512R-DJ	●	0.445	0.224	0.217	0.047	ø1.562 - ø1.812
WWMU13X512R-DJ	●	0.512	0.224	0.217	0.047	ø1.875 - ø2.000

DS chipbreaker

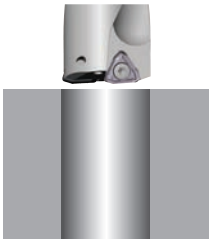
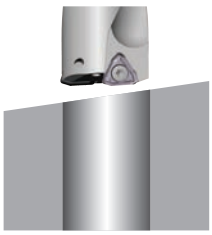
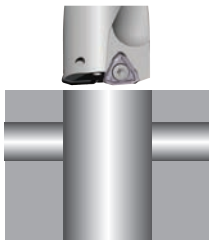
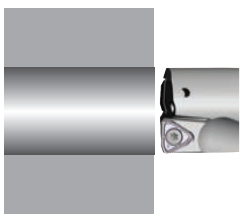
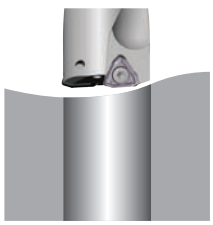
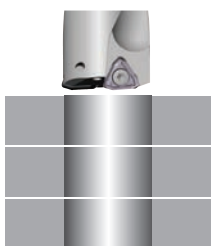


Cat. No.	Stocked grades PREMIUMTEC AH6030	Dimensions (in) ød	T	ød1	rε	Applicable drill diameters øDc (in)
NEW WWMU05X205R-DS	●	0.228	0.094	0.098	0.020	ø0.812 - ø0.925
NEW WWMU060306R-DS	●	0.264	0.114	0.118	0.024	ø0.941 - ø1.063
WWMU08X408R-DS	●	0.315	0.154	0.134	0.031	ø1.125 - ø1.250
WWMU09X510R-DS	●	0.382	0.193	0.173	0.039	ø1.312 - ø1.500
WWMU11X512R-DS	●	0.445	0.224	0.217	0.047	ø1.562 - ø1.812
WWMU13X512R-DS	●	0.512	0.224	0.217	0.047	ø1.875 - ø2.000

● : Stocked items

Application range

In case of Interrupted cutting, feed should be decreased.

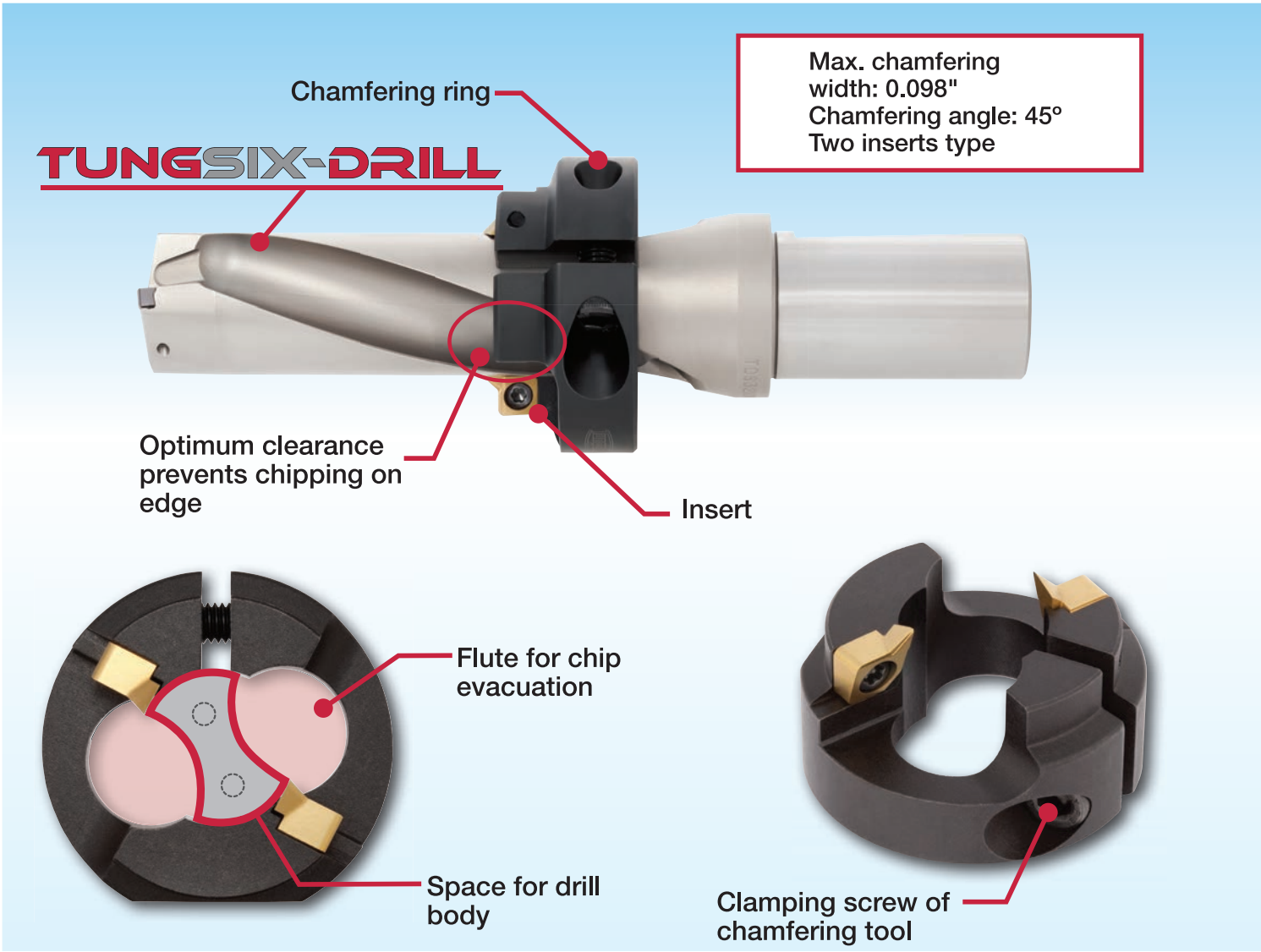
Feed *f* (ipr)	Per feed chart pg.9	0.002	0.002	0.002
Application	OK Plane surface 	OK Slant surface 	OK Cross hole 	OK Plunging 
Feed *f* (ipr)	0.004	0.002	Disapprove	Disapprove
Application	OK Boring 	OK Round surface 	✕ Stacked plate 	✕ Back boring 

Chamfering ring "TDXCF Series"

The TDXCF Series with the TungSix-Drill performs both drilling and chamfering at the same time, reducing machining processes and machining time.

Features

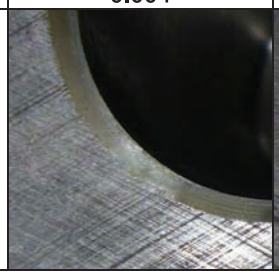
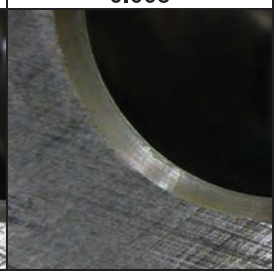
- High productivity with two inserts.
- Optimum space between the drill body and chamfering inserts prevents cutting edges from fracture.



- Insert grade is GH130 with TiCNO coating for steels.
- Suitable for machining steel, stainless steels and cast irons.

Cutting performance

Surface finish

Tool		Feed: *f* (ipr) 0.004	Feed: *f* (ipr) 0.005
TDSU1125-03 (L/D = 3)	TDXCF		

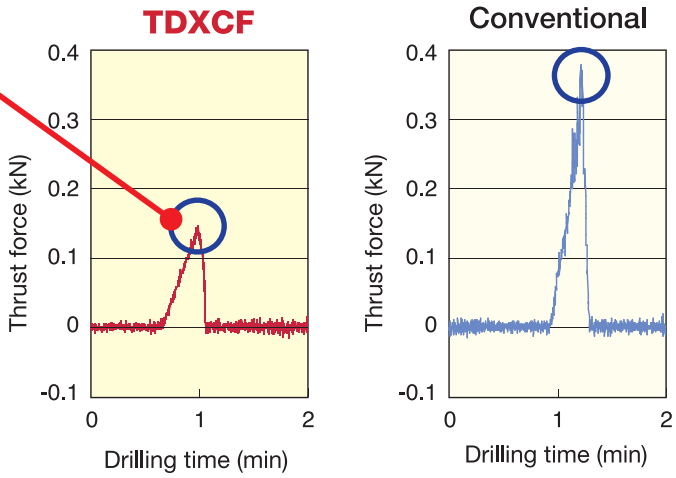
Tool : TDXCF290L30
Workpiece : Carbon steel 1055 (245HB)
Cutting speed : *Vc* = 460 sfm
Chamfering width : C = 0.08"
Machine : Vertical M/C, CAT40
Coolant : Wet

- New chamfering TDXCF provides stable surface finish.

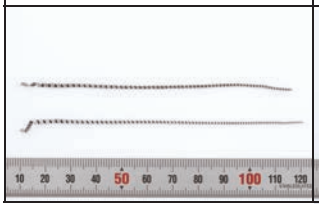
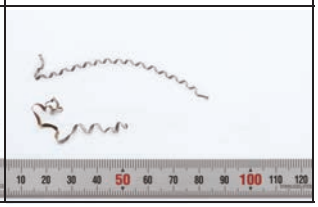
Cutting force

Sharp cutting edge decreases cutting forces by 50%!

Tool : TDXCF280L30
Workpiece : Carbon steel 1055 (245HB)
Cutting speed : *Vc* = 460 sfm
Feed : *f* = 0.004 ipr
Chamfering width : C = 0.08"
Machine : Vertical M/C, CAT40
Coolant : Wet



Chip control

TDXCF	Conventional
	

- Continuous spiral chips prevent them from wrapping around the drill body or workpiece.

Tool : TDXCF280L30
Workpiece : Carbon steel 1055 (245HB)
Cutting speed : *Vc* = 460 sfm
Chamfering width : C = 0.08"
Machine : Vertical M/C, CAT40
Coolant : Wet

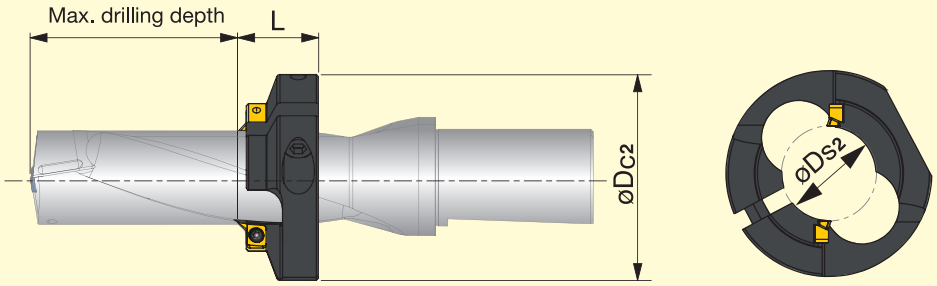
Chamfering tool insert & part list

Cat. No.	Insert	Grade GH130	Insert clamping screw	Torque (N·m)	Ring clamping screw	Torque (N·m)	Wrench for insert	Wrench for ring
TDXCF280L30 ~ TDXCF540L30	XHGX090700R-45A	●	CSPB-4S	2.58	CM8 x 20	5.90	T-15D	P-5

● : Stocked items

Chamfering ring (TDXCF Series)

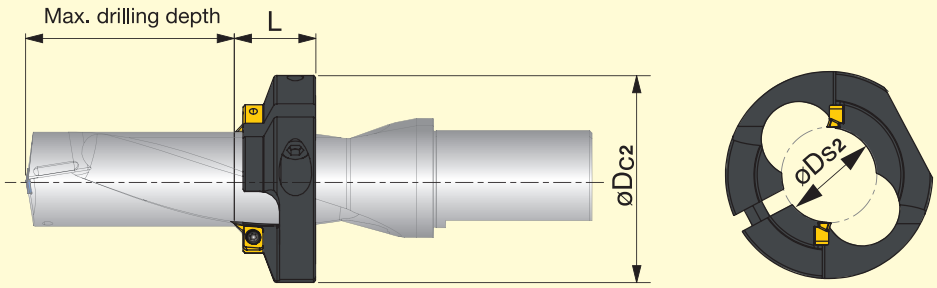
For whistle notch



Cat. No.	Stock	Dimensions (in)				Application drill	Max. drilling depth (in)	
		øDs2	øDc2	L	Drill dia. øDc		L/D = 2	L/D = 3
TDXCF280L30	●	1.059	2.520	1.181	-	-	-	-
TDXCF290L30	●	1.098	2.520	1.181	1.125	TDSU1125-*	1.338	2.463
TDXCF300L30	●	1.138	2.520	1.181	1.187	TDSU1187-*	1.456	2.643
TDXCF310L30	●	1.177	2.520	1.181	-	-	-	-
TDXCF320L30	●	1.217	2.520	1.181	1.250	TDSU1250-*	1.614	2.864
TDXCF330L30		1.252	2.520	1.181	-	-	-	-
TDXCF340L30		1.291	2.520	1.181	1.312	TDSU1312-*	1.732	3.044
TDXCF350L30		1.331	2.520	1.181	1.375	TDSU1375-*	1.889	3.264
TDXCF360L30		1.370	3.346	1.181	-	-	-	-
TDXCF370L30		1.409	3.346	1.181	1.437	TDSU1437-*	2.007	3.444
TDXCF380L30		1.449	3.346	1.181	1.500	TDSU1500-*	2.164	3.664
TDXCF390L30		1.488	3.346	1.181	-	-	-	-
TDXCF400L30		1.528	3.346	1.181	1.562	TDSU1562-*	2.322	3.884
TDXCF410L30		1.567	3.346	1.181	1.625	TDSU1625-*	2.440	4.065
TDXCF420L30		1.598	3.346	1.181	-	-	-	-
TDXCF430L30		1.638	3.346	1.181	1.687	TDSU1687-*	2.598	4.285
TDXCF440L30		1.677	3.346	1.181	-	-	-	-
TDXCF450L30		1.717	3.346	1.181	1.750	TDSU1750-*	2.755	4.505
TDXCF460L30		1.756	3.346	1.181	1.812	TDSU1812-*	2.873	4.685
TDXCF470L30		1.795	3.346	1.181	-	-	-	-
TDXCF480L30		1.835	3.346	1.181	1.875	TDSU1875-*	3.031	4.906
TDXCF490L30		1.874	3.346	1.181	-	-	-	-
TDXCF500L30		1.913	3.346	1.181	1.937	TDSU1937-*	3.188	5.125
TDXCF510L30		1.953	3.346	1.181	2.000	TDSU2000-*	3.306	5.306
TDXCF520L30		1.992	3.346	1.181	-	-	-	-
TDXCF530L30		2.031	3.346	1.181	-	-	-	-
TDXCF540L30		2.071	3.346	1.181	-	-	-	-

● : Stocked items

Shank with flat

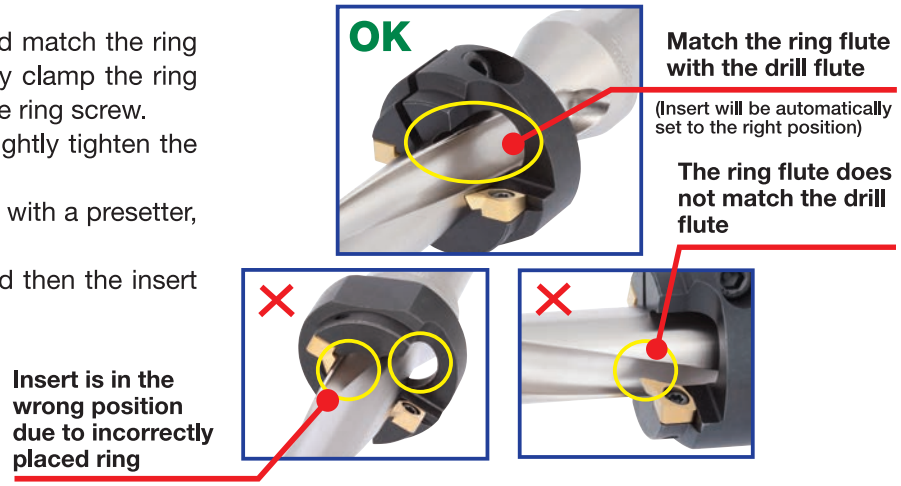


Cat. No.	Stock	Dimensions (in)				Application drill	Max. drilling depth (in)		
		øDs2	øDc2	L	Drill dia. øDc		L/D = 2	L/D = 3	L/D = 4
TDXCF210L25	●	0.791	1.929	0.984	0.812	TDSU0812F-*	0.700	1.512	-
TDXCF220L25	●	0.831	1.929	0.984	-	-	-	-	-
TDXCF230L25	●	0.870	1.929	0.984	0.875	TDSU0875F-*	0.825	1.700	-
TDXCF240L25	●	0.909	1.929	0.984	0.937	TDSU0937F-*	0.950	1.887	-
TDXCF250L25	●	0.943	1.929	0.984	-	-	-	-	-
TDXCF260L30	●	0.982	2.520	1.181	1.000	TDSU1000F-*	0.878	1.878	-
TDXCF270L30	●	1.020	2.520	1.181	1.062	TDSU1062F-*	1.003	2.065	-
TDXCF280L30	●	1.059	2.520	1.181	-	-	-	-	-
TDXCF290L30	●	1.098	2.520	1.181	1.125	TDSU1125F-*	-	-	3.486
TDXCF300L30	●	1.138	2.520	1.181	1.187	TDSU1187F-*	-	-	3.726
TDXCF310L30	●	1.177	2.520	1.181	-	-	-	-	-
TDXCF320L30	●	1.217	2.520	1.181	1.250	TDSU1250F-*	-	-	3.976
TDXCF330L30		1.252	2.520	1.181	-	-	-	-	-
TDXCF340L30		1.291	2.520	1.181	1.312	TDSU1312F-*	-	-	4.226
TDXCF350L30		1.331	2.520	1.181	1.375	TDSU1375F-*	-	-	4.476
TDXCF360L30		1.370	3.346	1.181	-	-	-	-	-
TDXCF370L30		1.409	3.346	1.181	1.437	TDSU1437F-*	-	-	4.726
TDXCF380L30		1.449	3.346	1.181	1.500	TDSU1500F-*	-	-	4.977
TDXCF390L30		1.488	3.346	1.181	-	-	-	-	-
TDXCF400L30		1.528	3.346	1.181	1.562	TDSU1562F-*	-	-	5.245
TDXCF410L30		1.567	3.346	1.181	1.625	TDSU1625F-*	-	-	5.496
TDXCF420L30		1.598	3.346	1.181	-	-	-	-	-
TDXCF430L30		1.638	3.346	1.181	1.687	TDSU1687F-*	-	-	5.746
TDXCF440L30		1.677	3.346	1.181	-	-	-	-	-
TDXCF450L30		1.717	3.346	1.181	1.750	TDSU1750F-*	-	-	5.998
TDXCF460L30		1.756	3.346	1.181	1.812	TDSU1812F-*	-	-	6.248
TDXCF470L30		1.795	3.346	1.181	-	-	-	-	-
TDXCF480L30		1.835	3.346	1.181	1.875	TDSU1875F-*	-	-	6.496
TDXCF490L30		1.874	3.346	1.181	-	-	-	-	-
TDXCF500L30		1.913	3.346	1.181	1.937	TDSU1937F-*	-	-	6.746
TDXCF510L30		1.953	3.346	1.181	2.000	TDSU2000F-*	-	-	6.996
TDXCF520L30		1.992	3.346	1.181	-	-	-	-	-
TDXCF530L30		2.031	3.346	1.181	-	-	-	-	-
TDXCF540L30		2.071	3.346	1.181	-	-	-	-	-

● : Stocked items

- Points of caution when mounting the chamfering ring on drill body

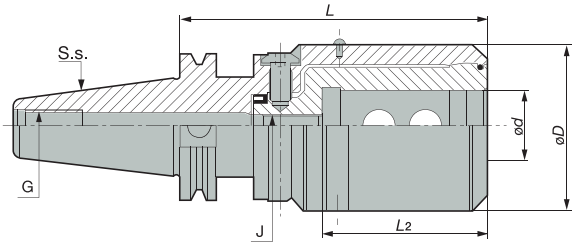
① Place the ring on the drill body and match the ring flute with the drill flute. Temporarily clamp the ring on the body by lightly tightening the ring screw.
Place the inserts on the ring and lightly tighten the insert screws.
② Adjust the ring to the right position with a presetter, height gauge or vernier caliper.
③ Securely tighten the ring screw and then the insert screw.



TUNGBORE Adjustable drilling diameter holder

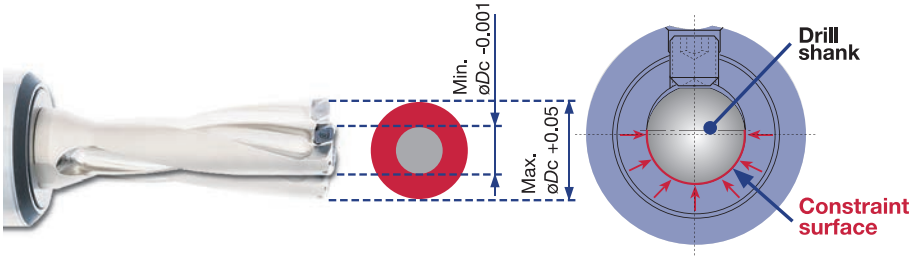
Enables diameter of TungSix-Drill to adjust easily

Specification



Cat. No.	Stock	Dimensions (in)						
		S.s.	ød	øD	L	L2	J	G
TUNGBORE CAT40 EM3/4	●	40	0.750	2.835	5.337	2.795	M10	5/8-11
TUNGBORE CAT40 EM3/4 B	●	40	0.750	2.835	5.337	2.795	M10	5/8-11
TUNGBORE CAT40 EM1	●	40	1.000	2.835	5.337	2.795	M10	5/8-11
TUNGBORE CAT40 EM1 B	●	40	1.000	2.835	5.337	2.795	M10	5/8-11
TUNGBORE CAT40 EM1-1/4	●	40	1.250	2.835	5.337	2.795	M10	5/8-11
TUNGBORE CAT40 EM1-1/4 B	●	40	1.250	2.835	5.337	2.795	M10	5/8-11
TUNGBORE CAT40 EM1-1/2	●	40	1.500	2.835	5.337	2.795	M10	5/8-11
TUNGBORE CAT40 EM1-1/2 B	●	40	1.500	2.835	5.337	2.795	M10	5/8-11
TUNGBORE CAT50 EM3/4	●	50	0.750	2.835	5.179	2.795	M10	1-8
TUNGBORE CAT50 EM1	●	50	1.000	2.835	5.179	2.795	M10	1-8
TUNGBORE CAT50 EM1 B	●	50	1.000	2.835	5.179	2.795	M10	1-8
TUNGBORE CAT50 EM1-1/4	●	50	1.250	2.835	5.179	2.795	M10	1-8
TUNGBORE CAT50 EM1-1/4 B	●	50	1.250	2.835	5.179	2.795	M10	1-8
TUNGBORE CAT50 EM1-1/2	●	50	1.500	2.835	5.179	2.795	M10	1-8
TUNGBORE CAT50 EM1-1/2 B	●	50	1.500	2.835	5.179	2.795	M10	1-8

● : Stocked items



The bore section is actually made from two shifted circular sections. The clamping screw pushes the drill shank through a narrow opening, forcing elastic deformation of the holder. Contact is made around more than 180°, providing a high clamping force.

TUNGBORE
■ TUNGSIX-DRILL

Adjustable range of TungSix-Drill combined with TungBore

Tool diameter øDc (in)	Adjustable range (in)		Tool diameter øDc (in)	Adjustable range (in)	
	Min. dia. ø	Max. dia. ø		Min. dia. ø	Max. dia. ø
0.812	0.812	0.843	1.437	1.437	1.465
0.875	0.875	0.895	1.500	1.500	1.516
0.937	0.937	0.984	1.562	1.562	1.637
1.000	1.000	1.028	1.625	1.625	1.675
1.062	1.062	1.074	1.687	1.687	1.737
1.125	1.125	1.168	1.750	1.750	1.778
1.187	1.187	1.207	1.812	1.812	1.828
1.250	1.250	1.258	1.875	1.875	1.925
1.312	1.312	1.362	1.937	1.937	1.987
1.375	1.375	1.422	2.000	2.000	2.050

Regarding adjustment, please refer to the operating instructions in the TungHold brochure (No. 389-E)

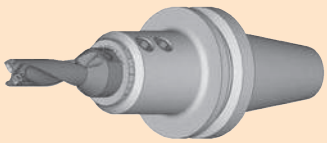
EZ sleeve (Eccentric sleeves for TungSix-Drill)

The function of EZ sleeves

Adjusting the hole diameter when drilling

Adjusting the hole diameter in tool rotating applications.

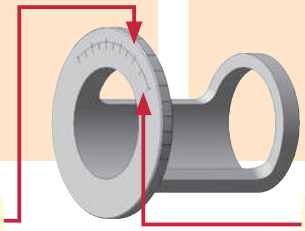
By using EZ sleeve, the hole diameter can be adjusted in the range from +0.024" to -0.008".



Adjusting cutting edge height on lathe

Adjusting the cutting edge height in rotating work applications.

By using EZ sleeve, the cutting edge height can be adjusted in the range from +0.012" to -0.008". That reduces problems caused by improper cutting edge height.



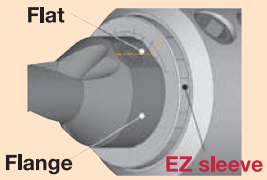
Scale for adjusting the hole diameter in milling machine (Periphery of sleeve)

Scale for adjusting cutting edge height in turning (Front face of sleeve)

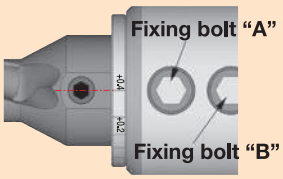
Setting of EZ sleeve

Adjusting the hole diameter on M/C

Set the EZ sleeve between the drill shank and the holder. Align the scale on the periphery of EZ sleeve with the center of the flat on drill flange.

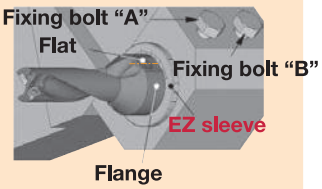


In the figure shown on the right, the sleeve is set and the hole diameter will be increased by .016".

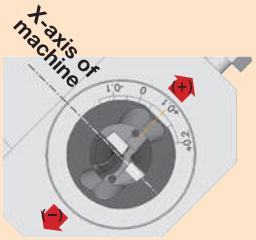


Adjusting cutting edge height on lathe

Set the EZ sleeve between the drill shank and the toolblock. Align the scale on the front face of the EZ sleeve with the center of the flat on drill flange.



In the figure shown on right, the sleeve is set and the center of the drill will shift by .004" to the plus (+) direction.

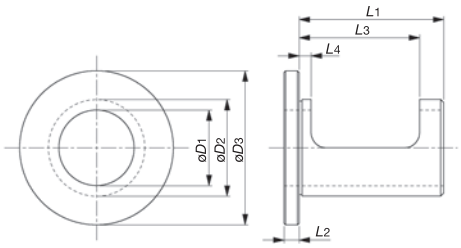


When rotating EZ sleeve, fixing bolts "A" and "B" have to be loosened. After setting the hole diameter, fix the drill body with bolt "A". Then lightly tighten bolt "B" to fix EZ sleeve. If bolt "B" is over tightened, EZ sleeve may be damaged.

Cautious points

- Cannot be used for collet chuck holders.
- For adjustments over L/D = 4, please reduce feed rate.
- For smaller adjustment, the drill itself will interfere with the hole diameter. It is recommended that hole diameter should be adjusted to a larger diameter than the drill diameter.

- Specifications



Sleeve Cat. No.	Stock	Dimensions (in)								
		øD1	øD2	øD3	L1	L2	L3	L4	Adjusting range of finishing diameter	Adjusting range of cutting edge height
EZ0.75-1.25	●	0.750	1.250	1.750	2.000	0.197	1.575	0.375	+0.016 ~ -0.008	+0.008 ~ -0.006
EZ1.00-1.50	●	1.000	1.500	2.000	2.500	0.197	1.965	0.375	+0.016 ~ -0.008	+0.008 ~ -0.006
EZ1.25-2.00	●	1.250	2.000	2.500	2.700	0.197	1.965	0.375	+0.016 ~ -0.008	+0.008 ~ -0.006
EZ1.50-2.00	●	1.500	2.000	2.750	2.900	0.197	1.965	0.375	+0.022 ~ -0.008	+0.012 ~ -0.008

Note: Select the sleeve so that the D1 of the sleeve will be same as the diameter of the drill shank.

Cautious points

Using TungSix-Drill

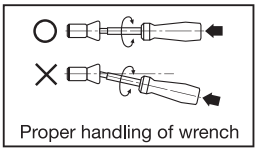
- Ensure that the drilling machine to be used has sufficient rigidity and motor output.
- Not recommended for drilling stacked plates.
- Be sure to carry out proper alignment when drilling is to be performed on a rotating workpiece.

Cutting fluid

- Be sure to supply cutting fluid through the tool.
- A water soluble emulsifiable type cutting fluid should be used.
- Fluid pressure of 1 MPa or higher and fluid quantity of 7 l/min or more are essential. For 4D and 5D type, a fluid pressure of 1.5 MPa or higher and fluid quantity of 10 l/min or more is recommended.

Cautionary points for setting inserts

- Before installing the insert in the drill body, remove all foreign matter from the insert pocket.
- When clamping and unclamping the insert, the center-line of the wrench should be aligned with the center line of the screw. Misalignment may result in deformation of the socket of the screw head or the tip of the wrench.
- When installing the insert, eliminate all play between the insert pocket and the bottom face of the insert.
- Replace the screw before it is excessively deformed or worn out by long term use.



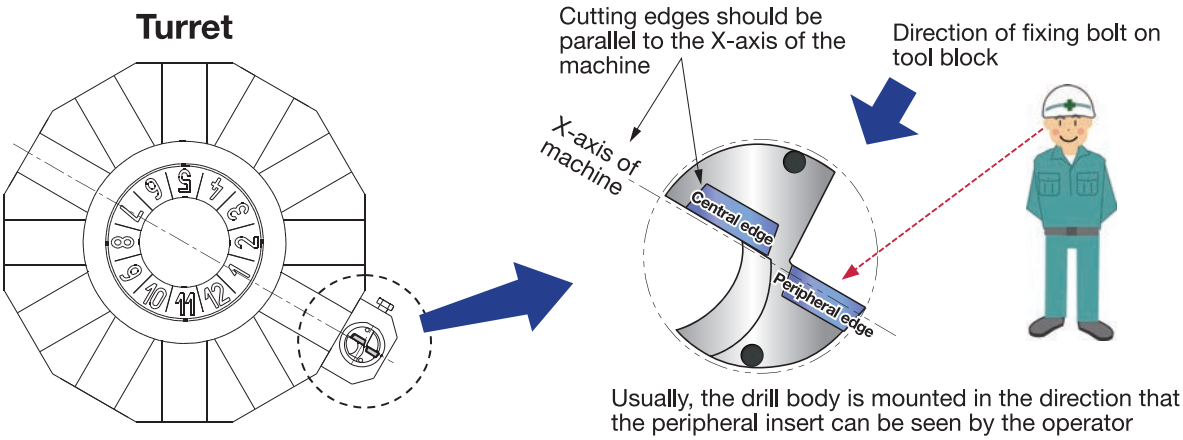
Proper handling of wrench

Use of TungSix-Drill on lathes

Setting drill body is important for stable machining

Mounting the drill on turret (tool post)

- When mounting the drill body, the cutting edges should be parallel to the X-axis of the machine.
- Usually, the drill body is mounted in the direction that the peripheral insert can be seen by the operator.
- As the flat on shank is parallel to the cutting edges, the clamping of the drill ensures that the cutting edges are parallel to the X-axis of the machine.

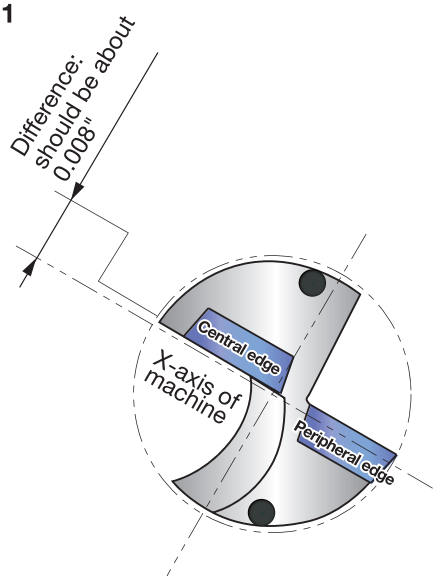


Usually, the drill body is mounted in the direction that the peripheral insert can be seen by the operator

Checking of cutting edge height

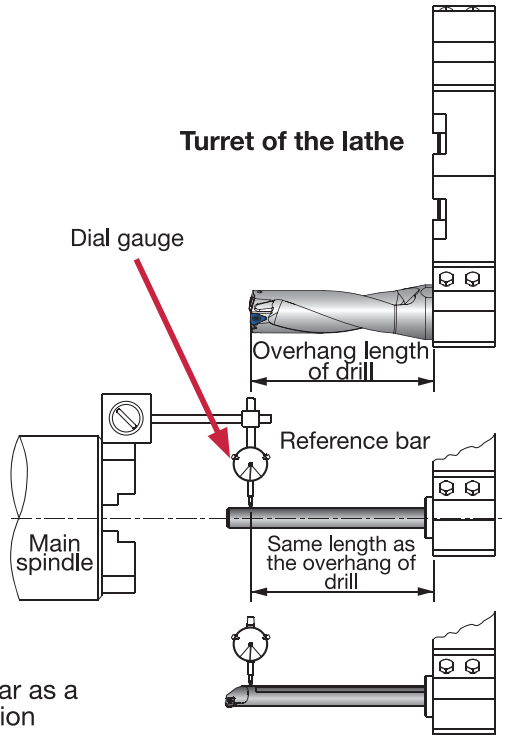
- The cutting edge height is an important factor for stable machining.
- The cutting edge of the central insert should be 0.008" lower than the rotating axis the machine.
- For checking the difference between rotating center and the tool block, please use a reference bar from ground solid bar. (Fig. 2)
- Checking the center height should be measured at the same position as the overhang length of the drill required.
- When there isn't a reference bar, the ground part of a boring bar can be used as a substitute.

Fig. 1



If the condition of the cutting edge height is not good, the height should be set by adjusting the turret.
A simple method is shown on the next page.

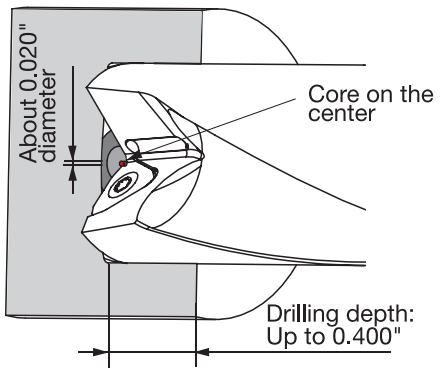
Fig. 2



Boring bar as a substitution

Checking of setting conditions by trial cutting

- After mounting the drill body, the tool center should be checked by trial cutting before production.
- When the drill body is properly set, a core with about ø0.020" diameter is left on the bottom of the hole.
- If there is no core, the drill is “above center”. If the core diameter is larger than .039", it is “excessively below center”. In these cases, the cutting edge height has to be checked again.
- When trial cutting, the feed should be 0.004" ipr or less, drilling depth should be up to 0.400".



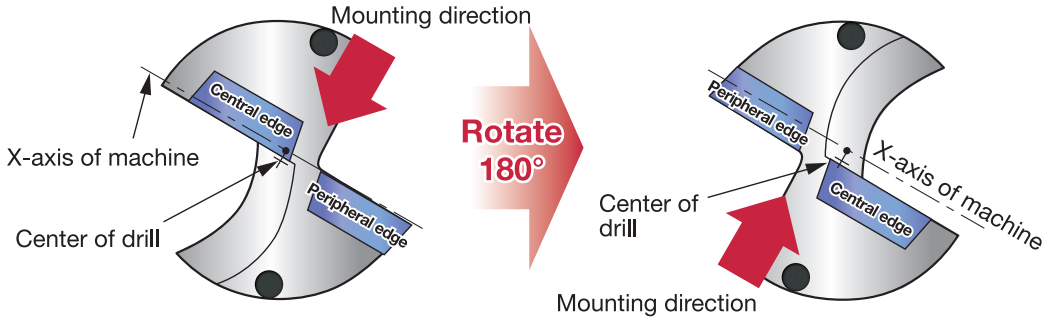
Adjusting of cutting edge height

When the condition of the cutting edge height is incorrect, the height should be adjusted with the following methods.

①“Above-center”

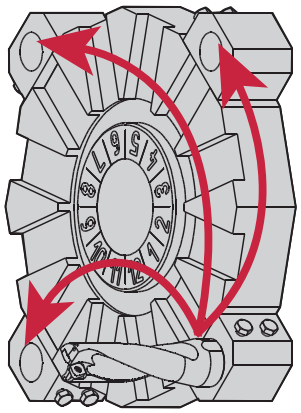
When machining in such condition, the central cutting edge may easily chip.

Solution #1: Change the mounting direction.
Solution #2: Rotate drill body 180°
In #2, additional flat is required on the opposite side.



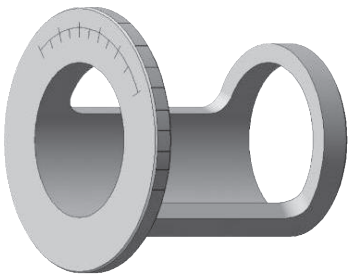
②“Slightly above-center” (about 0.002")

In this case, shifting the mounting position to another position may improve the condition.



③“Excessive below-center” (0.008" or more)

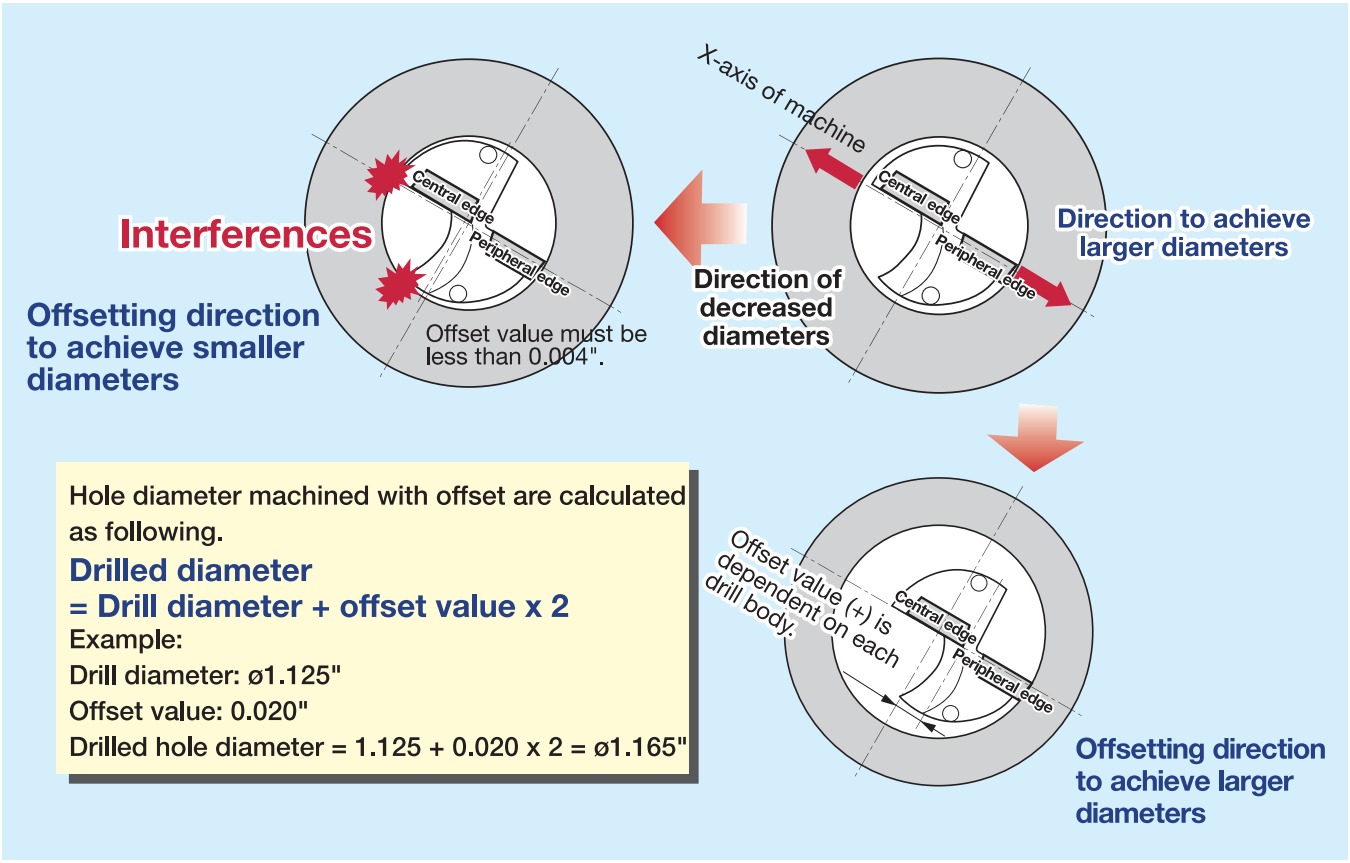
When this occurs, the large diameter of the core remains and heavy vibration may occur. To improve this situation: Use EZ sleeve (the eccentric sleeve) and adjust the cutting edge height to correct value. Information on EZ sleeve, is on page 14.



A larger hole than the drill diameter can be machined!

● Drilling with offset

- When drilling on the lathe, the hole diameter can be adjusted by offsetting the drill body along the X-axis of machine.
- When drilling with offset, the drill body must be correctly mounted with cutting edges parallel to the X-axis of the machine. “Mounting the drill on the turret” can be viewed on previous page.



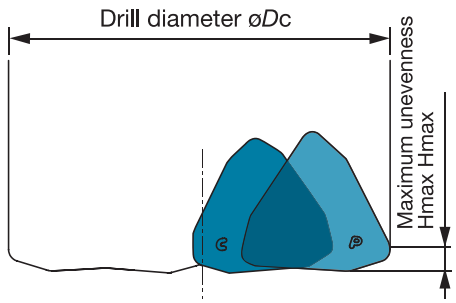
Note: Each drill depending on the cutting balance, insert tolerance, and L/D machines different size of hole. This deviation should be considered while deciding the offset value.

Shapes of hole bottom

Flatness of the hole bottom face when machined with TungSix-Drill is smaller than with HSS drills!

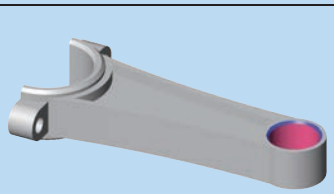
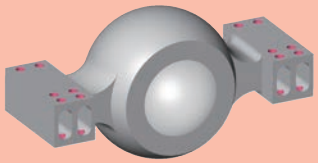
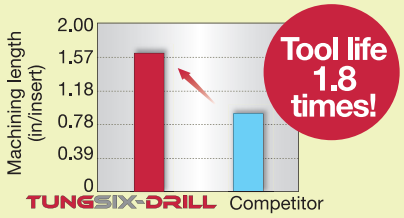
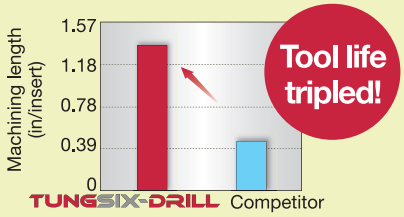
The shape of the hole bottom machined with TungSix-Drill is closer to flat compared with those machined with HSS drills.

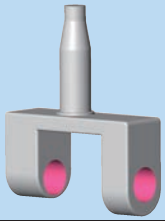
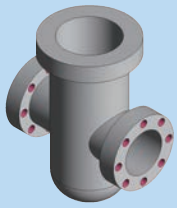
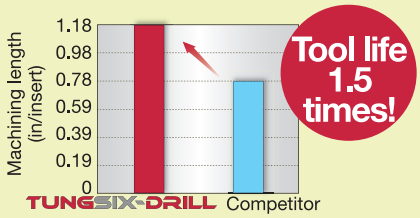
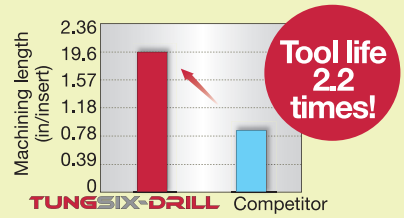
■ Hole bottom shape obtained with TungSix-Drill

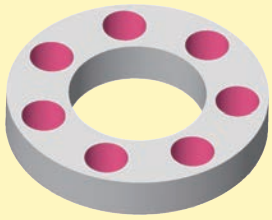
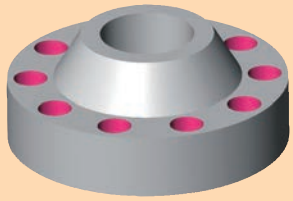
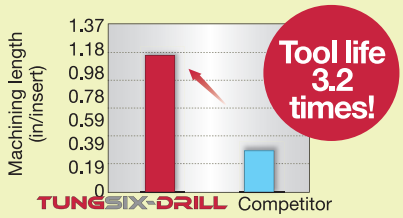
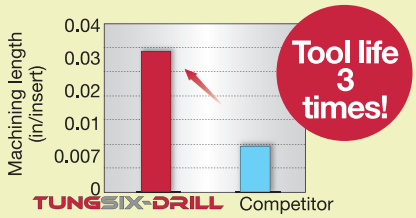


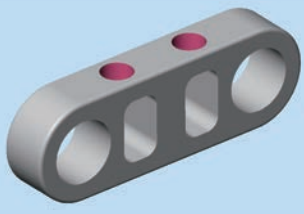
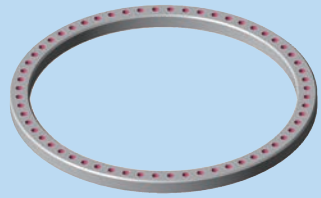
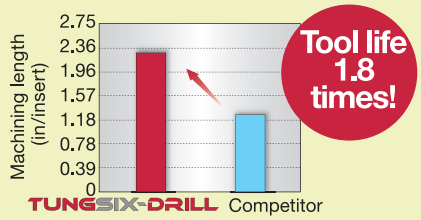
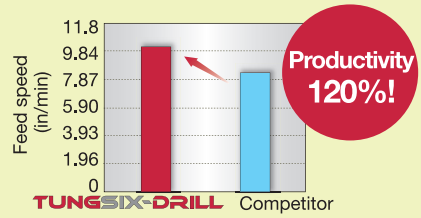
Drill diameter øDc (in)	ø0.787 - 0.925	ø0.929 - 1.080	ø1.083 - 1.295	ø1.300 - 1.335	ø1.535 - 1.846	ø1.875 - 2.000
Insert	WWMU05...	WWMU06...	WWMU08...	WWMU09...	WWMU11...	WWMU13...
Hmax (in)	0.047	0.055	0.071	0.083	0.098	0.106

Practical examples

Workpiece type		Connecting rod	Housing
Drill		TDSU0812F-2, ø*D*c = 0.812"	TDSU1625-03, ø*D*c = 1.654"
Insert		WWMU06X408R-DJ	WWMU11X512R-DJ
Grade		AH9030	AH9030
Workpiece material		1045  P	Ductile Iron  K
Cutting conditions	Cutting speed : *Vc* (sfm)	656	394
	Feed : *f* (ipr)	0.006	0.008
	Feed speed : *Vf* (ipm)	18.8	7.1
	Drilling depth : H (inch)	1.181	3.150
	Machine	Vertical M/C, CAT40	NC lathe
	Coolant	Wet	Wet
Results		 AH9030 achieves longer tool life even when machining with external coolant supply, due to the high oxidation resistance.	 Tough cutting edge prevents chipping and edge fracture, even when interrupted machining. Increasing in tool life and higher number of insert corners drastically reduce machining cost.

Workpiece type		Knuckle	Valve
Drill		TDSU2000-03, ø*D*c = 2.000"	TDSU1125-02, ø*D*c = 1.125"
Insert		WWMU13X512R-DJ	WWMU08X408R-DJ
Grade		AH9030	AH9030
Workpiece material		4140  P	4140  P
Cutting conditions	Cutting speed : *Vc* (sfm)	525	591
	Feed : *f* (ipr)	0.004	0.007
	Feed speed : *Vf* (ipm)	4.4	14.5
	Drilling depth : H (inch)	3.150, 2.560	1.970
	Machine	Horizontal M/C, CAT50	Horizontal M/C, CAT40
	Coolant	Wet	Wet
Results		 The machining of TungSix-Drill is highly stable without chattering due to lower cutting forces. No sudden fractures and 6 cornered insert reduces machining cost.	 Improved tool life per corner leads to reduction of insert consumption. DJ chipbreaker allows excellent chip control and stable machining without vibration.

Workpiece type		Flange	Flange
Drill		TDSU1187-02, ø*D*c = 1.187"	TDSU1375-03, ø*D*c =1.375"
Insert		WWMU08X408R-DS	WWMU09X510R-DS
Grade		AH6030	AH6030
Workpiece material		304 SS	Inconel 625
		 M	 S
Cutting conditions	Cutting speed : *V*c (sfm)	460	130
	Feed : *f* (ipr)	0.003	0.0024
	Feed speed : *V*f (ipm)	4.7	0.9
	Drilling depth : H (inch)	1.2	2.4
	Machine	Vertical M/C, CAT50	Vertical M/C, CAT50
	Coolant	Wet	Wet
Results		 The DS chipbreaker creates well controlled chips and the AH6030 provides longer tool life with improved chipping resistance.	 AH6030, with high reliability, allows longer tool life. When machining super alloys such as Inconel, inserts with higher number of corners are very effective for reducing tool cost.

Workpiece type		Link	Slewing ring
Drill		TDSU1000F-3, ø*D*c = 1.000"	TDSU1312F-4, ø*D*c = 1.300"
Insert		WWMU060306R-DJ	WWMU09X510R-DJ
Grade		AH9030	AH9030
Workpiece material		4140	4140
		 P	 P
Cutting conditions	Cutting speed : *V*c (sfm)	427	591
	Feed : *f* (ipr)	0.004	0.006
	Feed speed : *V*f (ipm)	6.7	10.2
	Drilling depth : H (inch)	1.575	4.000
	Machine	Vertical M/C, CAT40	Vertical M/C, CAT50
	Coolant	Wet	Wet
Results		 Tough cutting edges prevents chipping even in interrupted drilling conditions and provides longer tool life.	 Due to high rigidity, TungSix-Drill can machine without chattering even at higher cutting speeds than competitors. Increased number of cutting edge and higher productivity drastically reduces machining cost.

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