

DrillLine

**DRILLFORCE** MEISTER

www.tungaloy.com

Tungaloy Report No. 509-G

DRILLFORCE-MEISTER

## Head-changeable drill for drilling large holes





ACCELERATED MACHINING



DrillLine

**DRILL FORCE**  
**MEISTER**  
TUNGALOY

**TUNG FORCE**  
**DRILL**  
ACCELERATED MACHINING



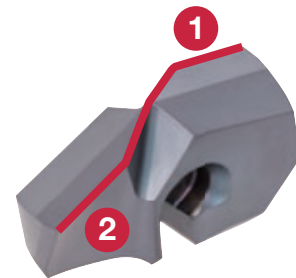
Unique clamping concept and two effective cutting edges on the drill head provide excellent hole quality and high productivity

[www.tungaloy.com](http://www.tungaloy.com)

# Improves productivity and reliability in heavy drilling with unique drill head and clamping concept

## Two effective cutting edges

- The drill head with two effective cutting edges provides high productivity and reliability



## Optimized drill body

- The drill body has an optimized flute design for smooth chip evacuation and enhanced stiffness



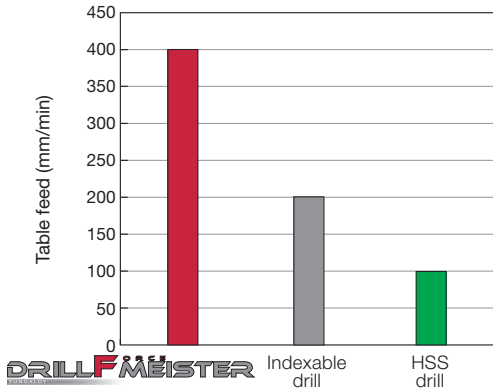
## Unique clamping system

Easy and quick yet rigid and reliable clamping method for excellent hole quality and long tool life

- The drill head change is possible without removing the drill body from the tool holder or the spindle, eliminating re-adjustments
- Asymmetric shaped drill head not only secures stability in heavy machining but also error-proofs drill head installation
- The drill body has a wide supporting area for the drill head for rigid insert clamping
- By replacing the head screw regularly, the drill body can be used for an even longer period



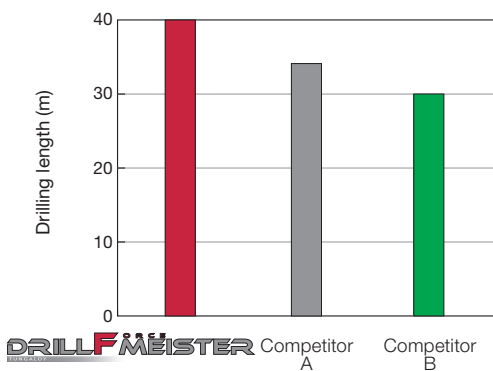
## High productivity



Drill :  $\varnothing 33$  mm, L/D = 5  
Workpiece material : S55C / C55

	Cutting speed $V_c$ (m/min)	Feed $f$ (mm/rev)	Feed speed $V_f$ (mm/min)
<b>DRILLFMEISTER</b>	100	0.4	430
Indexable drill	150	0.15	240
HSS drill	20	0.4	85

## AH725, a highly reliable PVD grade



Drill :  $\varnothing 26$  mm  
Workpiece material : S55C / C55  
Cutting speed :  $V_c = 100$  m/min  
Feed :  $f = 0.35$  mm/rev  
Drilling depth :  $H = 120$  mm

AH725 achieves smooth and flat coating surface to improve resistance to build-up edge and chipping, thus extending tool life in heavy machining.

An smart combination of optimized edge preparation and dedicated PVD grade extends tool life in heavy drilling

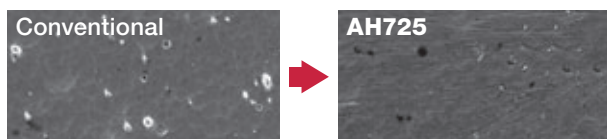
### AH725, a highly reliable PVD grade

**AH725** **PREMIUMTEC**  
TUNGALOY

Improved coating adhesion  
Sub-micron grain carbide substrate with superior toughness and resistance to plastic-deformation

### Super-flash coating:

Eliminates droplets on the surface



### Optimized edge preparation

- Enlarged images of the edges before use



The cutting edge is honed to enhance coating adhesion

### No coating delamination



**DRILLFMEISTER**  
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### Coating is delaminated



## CUTTING PERFORMANCE

### Hole size

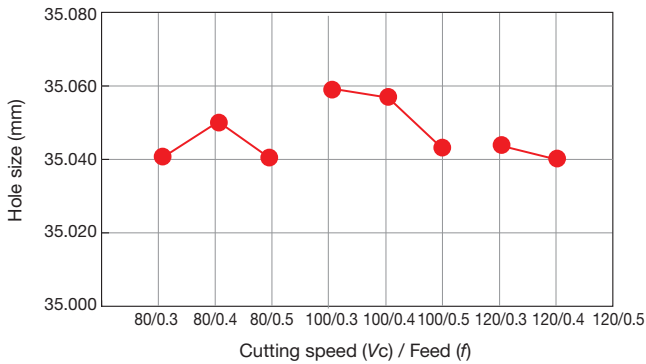


The hole size is stable in various cutting conditions and materials

Drill : TIS350F40-5 (ø35 mm)  
 Head : SMP350  
 Grade : AH725  
 Workpiece material : SCM440 / 42CrMo4, SUS304 / X5CrNi18-9  
 Cutting speed :  $V_c = 80 - 120$  m/min (SCM440 / 42CrMo4)  
                   :  $V_c = 40 - 70$  m/min (SUS304 / X5CrNi18-9)  
 Feed :  $f = 0.3 - 0.5$  mm/rev (SCM440 / 42CrMo4)  
           :  $f = 0.2 - 0.3$  mm/rev (SUS304 / X5CrNi18-9)  
 Drilling depth :  $H = 100$  mm  
 Machine : Horizontal M/C (BT50)  
 Coolant : Wet (Internal)

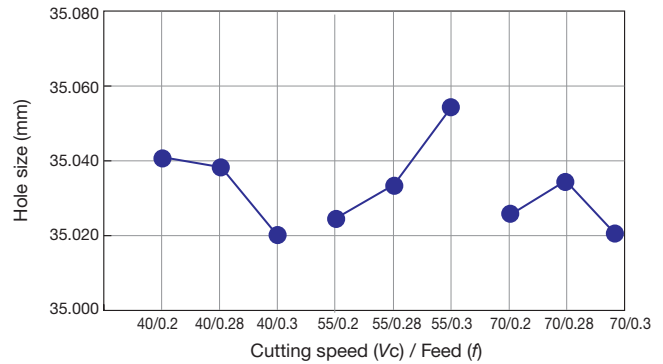
**P**

Hole size: 35.038 ~ 35.056 mm



**M**

Hole size: 35.022 ~ 35.052 mm



### Chip control

DrillForceMeister provides good chip control even in drilling low carbon steel

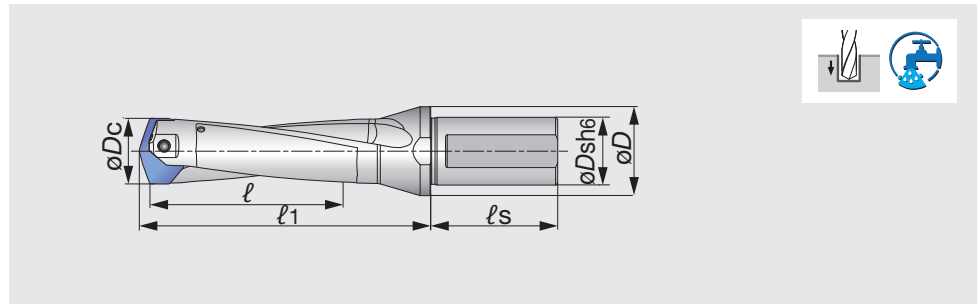
0.2			
0.3			
0.4			
Feed: f (mm/rev)	DRILLFORCE MEISTER	Competitor A	Competitor B

Drill : TIS260F32-5 (ø26 mm)  
 Head : SMP260  
 Grade : AH725  
 Workpiece material : SS400 / E275A  
 Cutting speed :  $V_c = 100$  m/min  
 Feed :  $f = 0.2 - 0.4$  mm/rev  
 Drilling depth :  $H = 100$  mm  
 Machine : Horizontal M/C (BT50)  
 Coolant : Wet (Internal)

## Head indexable large drill

### DRILL - L/D = 3

DrillForceMeister TIS L/D =3



Designation	$\varnothing D_c$ min	$\varnothing D_c$ max	$\varnothing D_s$	$\varnothing D$	$\ell$	$\ell_1$	$\ell_s$	Pocket size	Coolant	Head
TIS260F32-3	26.00	26.90	32.0	40.00	78.00	117.0	60.0	26	Y	SMP26*
TIS270F32-3	27.00	27.90	32.0	40.00	81.00	120.0	60.0	27	Y	SMP27*
TIS280F32-3	28.00	28.90	32.0	40.00	84.00	128.4	60.0	28	Y	SMP28*
TIS290F32-3	29.00	29.90	32.0	40.00	87.00	131.4	60.0	29	Y	SMP29*
TIS300F32-3	30.00	30.90	32.0	42.00	90.00	134.7	60.0	30	Y	SMP30*
TIS310F32-3	31.00	31.90	32.0	42.00	93.00	137.7	60.0	31	Y	SMP31*
TIS320F40-3	32.00	32.90	40.0	48.00	96.00	143.0	68.0	32	Y	SMP32*
TIS330F40-3	33.00	33.90	40.0	48.00	99.00	146.0	68.0	33	Y	SMP33*
TIS340F40-3	34.00	34.90	40.0	48.00	102.00	149.0	68.0	34	Y	SMP34*
TIS350F40-3	35.00	35.90	40.0	48.00	105.00	152.4	68.0	35	Y	SMP35*
TIS360F40-3	36.00	36.90	40.0	48.00	108.00	155.4	68.0	36	Y	SMP36*
TIS370F40-3	37.00	37.90	40.0	48.00	111.00	158.4	68.0	37	Y	SMP37*
TIS380F40-3	38.00	38.90	40.0	50.00	114.00	166.9	68.0	38	Y	SMP38*
TIS390F40-3	39.00	39.90	40.0	50.00	117.00	169.9	68.0	39	Y	SMP39*
TIS400F40-3	40.00	41.00	40.0	50.00	120.00	172.9	68.0	40	Y	SMP40*

#### SPARE PARTS



Designation	Clamping screw	Wrench	
		Torx Bit	Grip
TIS260F32-*	TS50230D3	BLDT20/S7	H-TB2W
TIS270F32-*	TS50230D3	BLDT20/S7	H-TB2W
TIS280F32-*	TS50250D35	BLDT25/S7	H-TB2W
TIS290F32-*	TS50250D35	BLDT25/S7	H-TB2W
TIS300F32-*	TS60265D4	BLDT25/S7	H-TB2W
TIS310F32-*	TS60265D4	BLDT25/S7	H-TB2W
TIS320F40-*	TS60285D42	BLDT25/S7	H-TB2W
TIS330F40-*	TS60285D42	BLDT25/S7	H-TB2W
TIS340F40-*	TS60285D42	BLDT25/S7	H-TB2W
TIS350F40-*	TS60320D5	BLDT25/S7	H-TB2W
TIS360F40-*	TS60320D5	BLDT25/S7	H-TB2W
TIS370F40-*	TS60320D5	BLDT25/S7	H-TB2W
TIS380F40-*	TS80340D6	BLDT25/S7	H-TB2W
TIS390F40-*	TS80340D6	BLDT25/S7	H-TB2W
TIS400F40-*	TS80340D6	BLDT25/S7	H-TB2W

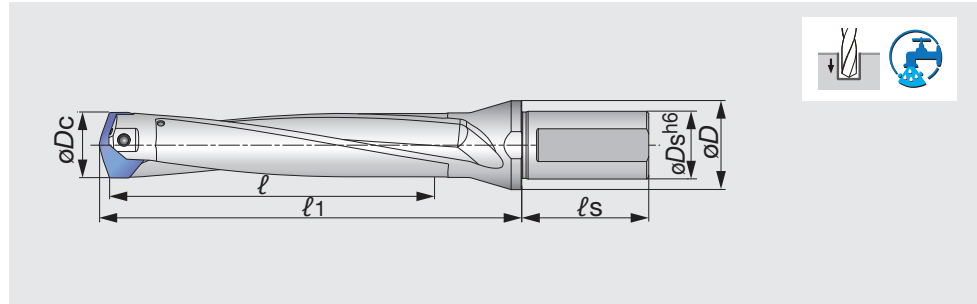
$\varnothing D_c$	Hole diameter tolerance*
$\varnothing 26.0 - \varnothing 29.9$	+0.05 / 0
$\varnothing 30.0 - \varnothing 41.0$	+0.06 / 0

\* Just for reference.

## Head indexable large drill

## DRILL - L/D = 5

### DrillForceMeister TIS L/D = 5



Designation	$\varnothing D_c$ min	$\varnothing D_c$ max	$\varnothing D_s$	$\varnothing D$	$\ell$	$\ell_1$	$\ell_s$	Pocket size	Coolant	Head
TIS260F32-5	26.00	26.90	32.0	40.00	130.00	169.0	60.0	26	Y	SMP26*
TIS270F32-5	27.00	27.90	32.0	40.00	135.00	174.0	60.0	27	Y	SMP27*
TIS280F32-5	28.00	28.90	32.0	40.00	140.00	184.4	60.0	28	Y	SMP28*
TIS290F32-5	29.00	29.90	32.0	40.00	145.00	189.4	60.0	29	Y	SMP29*
TIS300F32-5	30.00	30.90	32.0	42.00	150.00	194.7	60.0	30	Y	SMP30*
TIS310F32-5	31.00	31.90	32.0	42.00	155.00	199.7	60.0	31	Y	SMP31*
TIS320F40-5	32.00	32.90	40.0	48.00	160.00	207.0	68.0	32	Y	SMP32*
TIS330F40-5	33.00	33.90	40.0	48.00	165.00	212.0	68.0	33	Y	SMP33*
TIS340F40-5	34.00	34.90	40.0	48.00	170.00	217.0	68.0	34	Y	SMP34*
TIS350F40-5	35.00	35.90	40.0	48.00	175.00	222.4	68.0	35	Y	SMP35*
TIS360F40-5	36.00	36.90	40.0	48.00	180.00	227.4	68.0	36	Y	SMP36*
TIS370F40-5	37.00	37.90	40.0	48.00	185.00	232.4	68.0	37	Y	SMP37*
TIS380F40-5	38.00	38.90	40.0	50.00	190.00	242.9	68.0	38	Y	SMP38*
TIS390F40-5	39.00	39.90	40.0	50.00	195.00	247.9	68.0	39	Y	SMP39*
TIS400F40-5	40.00	41.00	40.0	50.00	200.00	252.9	68.0	40	Y	SMP40*

### SPARE PARTS



Designation	Clamping screw	Wrench	
		Torx Bit	Grip
TIS260F32-*	TS50230D3	BLDT20/S7	H-TB2W
TIS270F32-*	TS50230D3	BLDT20/S7	H-TB2W
TIS280F32-*	TS50230D35	BLDT25/S7	H-TB2W
TIS290F32-*	TS50230D35	BLDT25/S7	H-TB2W
TIS300F32-*	TS60265D4	BLDT25/S7	H-TB2W
TIS310F32-*	TS60265D4	BLDT25/S7	H-TB2W
TIS320F40-*	TS60285D42	BLDT25/S7	H-TB2W
TIS330F40-*	TS60285D42	BLDT25/S7	H-TB2W
TIS340F40-*	TS60285D42	BLDT25/S7	H-TB2W
TIS350F40-*	TS60320D5	BLDT25/S7	H-TB2W
TIS360F40-*	TS60320D5	BLDT25/S7	H-TB2W
TIS370F40-*	TS60320D5	BLDT25/S7	H-TB2W
TIS380F40-*	TS80340D6	BLDT25/S7	H-TB2W
TIS390F40-*	TS80340D6	BLDT25/S7	H-TB2W
TIS400F40-*	TS80340D6	BLDT25/S7	H-TB2W

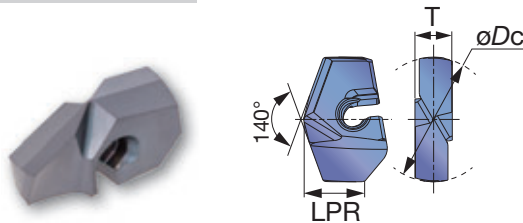
$\varnothing D_c$	Hole diameter tolerance*
$\varnothing 26.0 - \varnothing 29.9$	+0.08 / 0
$\varnothing 30.0 - \varnothing 41.0$	+0.09 / 0

\* Just for reference.



## DRILL HEAD

### SMP



Tool diameter	ø26.0 - ø29.9	ø30.0 - ø41.0
Head diameter tolerance	-0.006 / -0.026	-0.006 / -0.031

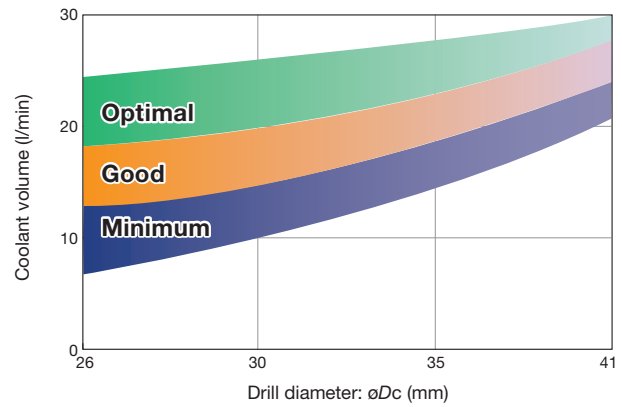
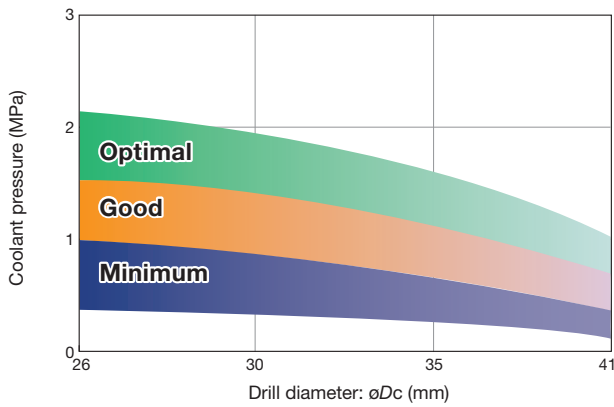
Designation	øDc	Grade AH725	T	LPR	Pocket size	Body	Designation	øDc	Grade AH725	T	LPR	Pocket size	Body
SMP260	26.0	●	7.5	11.6	26	TIS260F32-*	SMP360	36.0	●	10.0	16.1	36	TIS360F40-*
SMP261	26.1	●	7.5	11.6	26	TIS260F32-*	SMP361	36.1	●	10.0	16.1	36	TIS360F40-*
SMP265	26.5	●	7.5	11.6	26	TIS260F32-*	SMP365	36.5	●	10.0	16.1	36	TIS360F40-*
SMP267	26.7	●	7.5	11.6	26	TIS260F32-*	SMP366	36.6	●	10.0	16.1	36	TIS360F40-*
SMP270	27.0	●	7.5	11.1	27	TIS270F32-*	SMP370	37.0	●	10.0	15.7	37	TIS370F40-*
SMP271	27.1	●	7.5	11.1	27	TIS270F32-*	SMP371	37.1	●	10.0	15.7	37	TIS370F40-*
SMP272	27.2	●	7.5	11.1	27	TIS270F32-*	SMP375	37.5	●	10.0	15.7	37	TIS370F40-*
SMP275	27.5	●	7.5	11.1	27	TIS270F32-*	SMP380	38.0	●	10.5	17.0	38	TIS380F40-*
SMP280	28.0	●	8.0	11.7	28	TIS280F32-*	SMP381	38.1	●	10.5	17.0	38	TIS380F40-*
SMP281	28.1	●	8.0	11.7	28	TIS280F32-*	SMP385	38.5	●	10.5	17.0	38	TIS380F40-*
SMP285	28.5	●	8.0	11.7	28	TIS280F32-*	SMP388	38.8	●	10.5	17.0	38	TIS380F40-*
SMP286	28.6	●	8.0	11.7	28	TIS280F32-*	SMP390	39.0	●	10.5	16.6	39	TIS390F40-*
SMP290	29.0	●	8.0	11.3	29	TIS290F32-*	SMP391	39.1	●	10.5	16.6	39	TIS390F40-*
SMP291	29.1	●	8.0	11.3	29	TIS290F32-*	SMP395	39.5	●	10.5	16.6	39	TIS390F40-*
SMP295	29.5	●	8.0	11.3	29	TIS290F32-*	SMP397	39.7	●	10.5	16.6	39	TIS390F40-*
SMP296	29.6	●	8.0	11.3	29	TIS290F32-*	SMP398	39.8	●	10.5	16.6	39	TIS390F40-*
SMP300	30.0	●	8.5	14.1	30	TIS300F32-*	SMP400	40.0	●	10.5	16.2	40	TIS400F40-*
SMP301	30.1	●	8.5	14.1	30	TIS300F32-*	SMP401	40.1	●	10.5	16.2	40	TIS400F40-*
SMP302	30.2	●	8.5	14.1	30	TIS300F32-*	SMP405	40.5	●	10.5	16.2	40	TIS400F40-*
SMP303	30.3	●	8.5	14.1	30	TIS300F32-*	SMP410	41.0	●	10.5	16.2	40	TIS400F40-*
SMP305	30.5	●	8.5	14.1	30	TIS300F32-*							
SMP308	30.8	●	8.5	14.1	30	TIS300F32-*							
SMP310	31.0	●	8.5	13.7	31	TIS310F32-*							
SMP311	31.1	●	8.5	13.7	31	TIS310F32-*							
SMP315	31.5	●	8.5	13.7	31	TIS310F32-*							
SMP318	31.8	●	8.5	13.7	31	TIS310F32-*							
SMP320	32.0	●	9.0	14.5	32	TIS320F40-*							
SMP321	32.1	●	9.0	14.5	32	TIS320F40-*							
SMP325	32.5	●	9.0	14.5	32	TIS320F40-*							
SMP328	32.8	●	9.0	14.5	32	TIS320F40-*							
SMP330	33.0	●	9.0	14.1	33	TIS330F40-*							
SMP331	33.1	●	9.0	14.1	33	TIS330F40-*							
SMP333	33.3	●	9.0	14.1	33	TIS330F40-*							
SMP335	33.5	●	9.0	14.1	33	TIS330F40-*							
SMP340	34.0	●	9.0	13.7	34	TIS340F40-*							
SMP341	34.1	●	9.0	13.7	34	TIS340F40-*							
SMP345	34.5	●	9.0	13.7	34	TIS340F40-*							
SMP349	34.9	●	9.0	13.7	34	TIS340F40-*							
SMP350	35.0	●	10.0	16.6	35	TIS350F40-*							
SMP351	35.1	●	10.0	16.6	35	TIS350F40-*							
SMP355	35.5	●	10.0	16.6	35	TIS350F40-*							

Package quantity = 1 pc  
●: Line-up

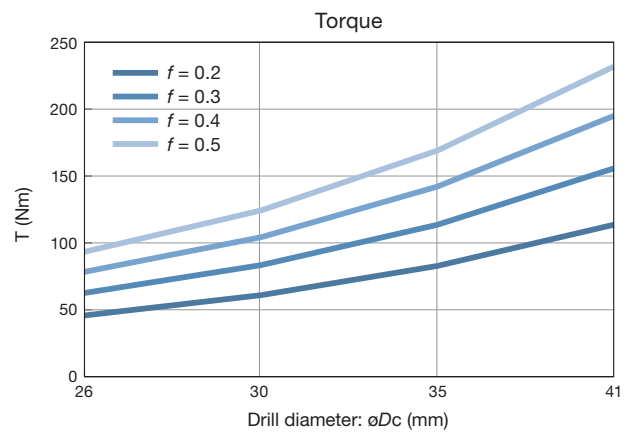
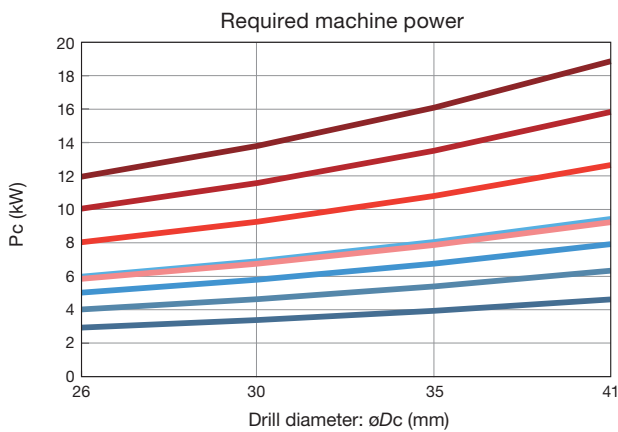
## STANDARD CUTTING CONDITIONS

ISO	Workpiece materials	Cutting speed Vc (m/min)	Feed: f (mm/rev)		
			øDc (mm)		
			26 - 29.9	30.0 - 35.9	36.0 - 41.0
<b>P</b>	Low carbon steel (C15, C20, etc.)	80 - 140	0.2 - 0.5	0.2 - 0.5	0.2 - 0.55
	Carbon steel and alloy steel (S55C / C55, SCM440 / 42CrMo4, etc.)	80 - 130	0.2 - 0.5	0.2 - 0.5	0.2 - 0.55
	Prehardend steel (NAK80, PX5, etc.)	50 - 100	0.2 - 0.5	0.2 - 0.5	0.2 - 0.55
<b>M</b>	Stainless steel (SUS304 / X5CrNi18-9, SUS316 / X5CrNiMo17-12-3, etc.)	40 - 80	0.15 - 0.3	0.15 - 0.3	0.2 - 0.35
<b>K</b>	Grey cast iron (FC250 / 250, FC300 / 300, etc.)	80 - 180	0.25 - 0.55	0.25 - 0.55	0.3 - 0.6
	Ductile cast iron (400-15, 600-3, etc.)	80 - 140	0.25 - 0.55	0.25 - 0.55	0.3 - 0.6
<b>N</b>	Non ferrous materials	100 - 200	0.4 - 0.6	0.4 - 0.6	0.5 - 0.7
<b>S</b>	Heat-resistant alloys (Inconel718, etc.)	30 - 60	0.1 - 0.2	0.1 - 0.2	0.1 - 0.25
	Titanium alloys (Ti-6Al-4V, etc.)	20 - 50	0.1 - 0.2	0.1 - 0.2	0.1 - 0.25
<b>H</b>	Hardened materials	20 - 60	0.1 - 0.2	0.1 - 0.2	0.1 - 0.25

## RECOMMENDED COOLANT PRESSURE AND VOLUME



## REQUIRED MACHINE POWER AND TORQUE



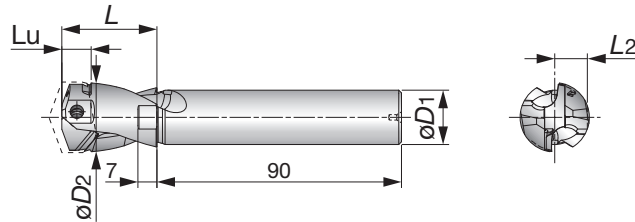
- $V_c = 50, f = 0.2$
- $V_c = 50, f = 0.3$
- $V_c = 50, f = 0.4$
- $V_c = 50, f = 0.5$
- $V_c = 100, f = 0.2$
- $V_c = 100, f = 0.3$
- $V_c = 100, f = 0.4$
- $V_c = 100, f = 0.5$

- Please access to "Tungaloy machining power" to calculate more detailed cutting forces.

<http://mpwr.imc-companies.com/machiningpwr/machiningpower.wgx?vwginstance=3d4bfb46110a456b8d375e68942cd0a3&Home=tungaloy>



## REGRINDING HOLDER



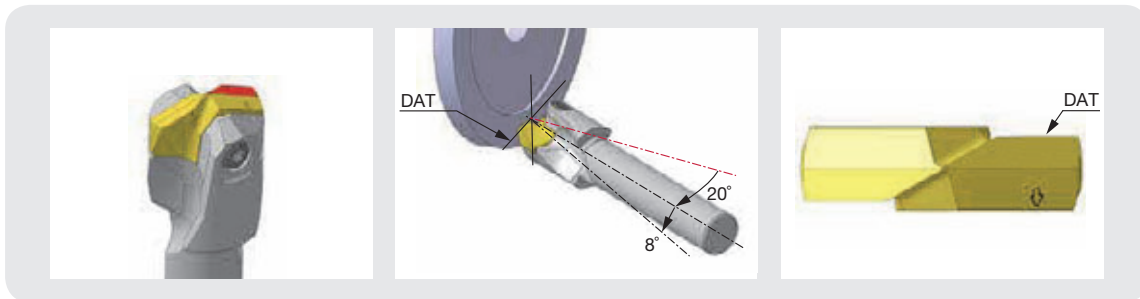
Designation	øD1	øD2	L	Lu	L2	Head
SMP260-279-GH	20	25.5	35	10.8	12	SMP260-SMP279
SMP280-299-GH	20	27.5	35	10.8	13	SMP280-SMP299
SMP300-319-GH	20	29.5	35	13	14	SMP300-SMP319
SMP320-349-GH	20	31.5	35	13	15	SMP320-SMP349
SMP350-379-GH	20	34.5	40	14.7	16.5	SMP350-SMP379
SMP380-410-GH	20	37.5	40	15.1	18	SMP380-SMP410

### ① Clamping

- Assemble the drill head on the regrinding holder or shortest standard holder (3xD)
- Set-up the drill head in the machine : Total run-out must be less than 0.02 mm

### ② Grinding the 1<sup>st</sup> clearance angle

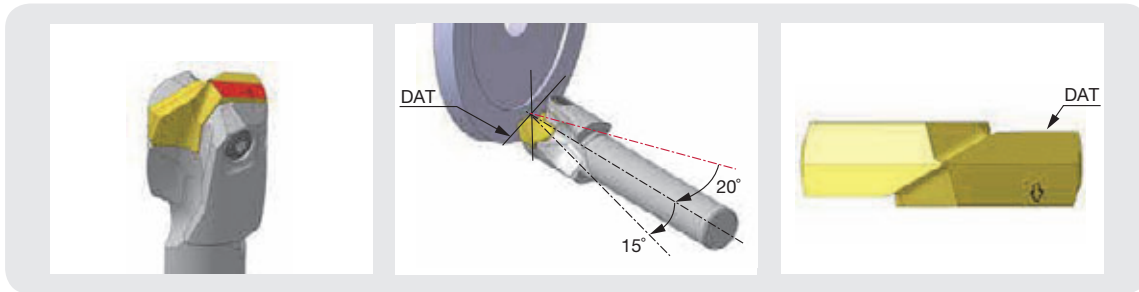
- Set the drill for point angle (140°) and 1<sup>st</sup> clearance angle (8°)
- Keep the cutting edge in the horizontal plane





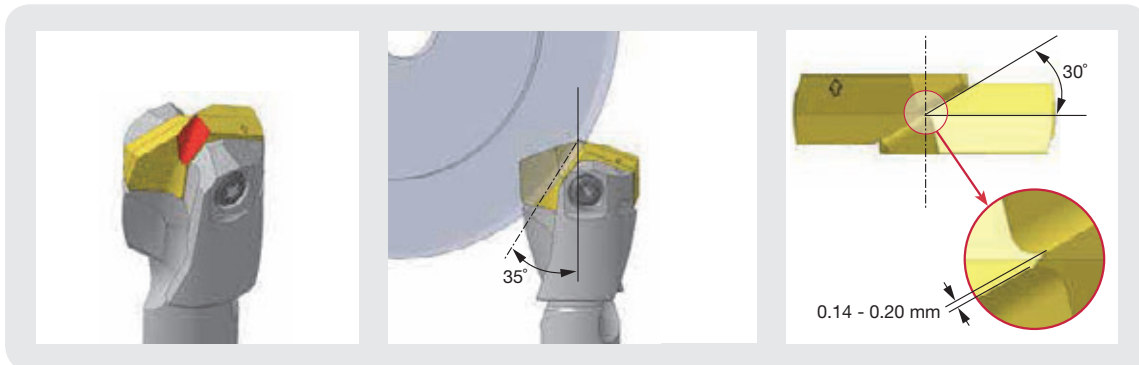
### ③ Grinding the 2<sup>nd</sup> clearance angle

- Set the drill for 2<sup>nd</sup> clearance angle (15°)



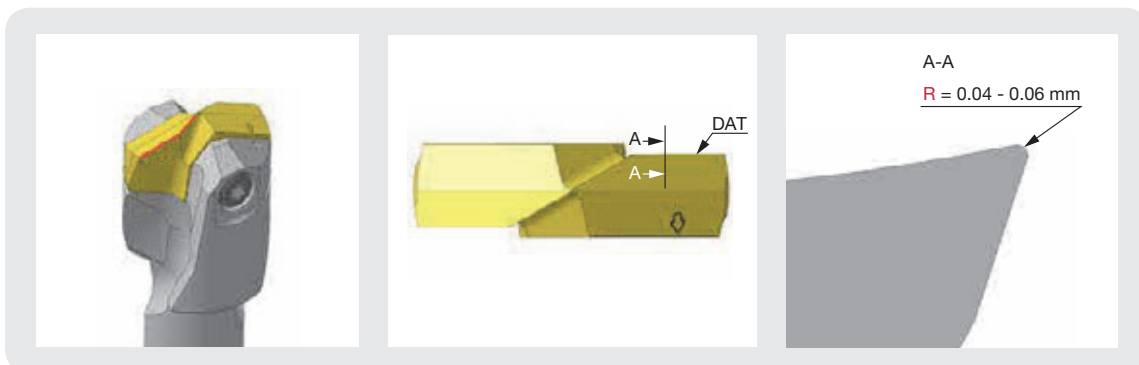
### ④ Grinding the chisel (Thinning)

- Set the drill for thinning angle (35°) with reference to drill axis and angle (30°) with reference to radial axis
- Keep the chisel thickness (0.14 - 0.20) and the thinning point must be over the center line



### ⑤ Edge preparation (Honing)

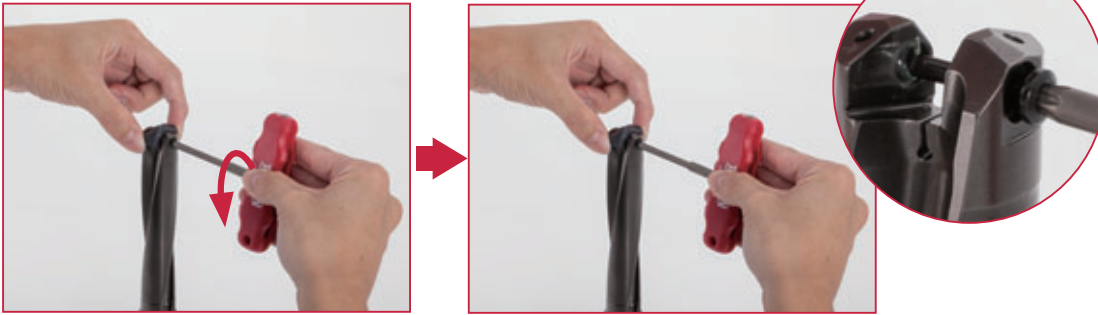
- Cutting edges should have honing by sand or brush (0.04 - 0.06 mm)
- Nega-land by diamond hand lapper is also available
- The width of honing must be uniform with good surface finish



## HOW TO CHANGE DRILL HEAD

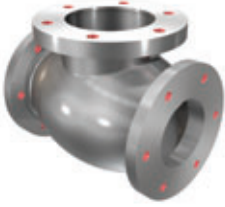
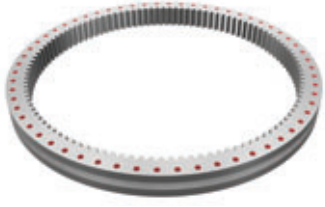
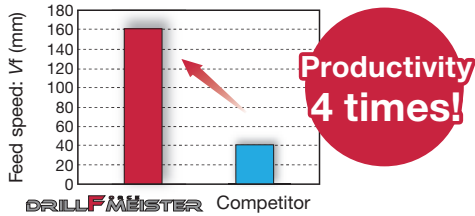
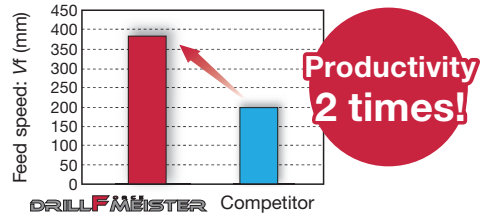
To unclamp rotate the screw 3-5 times counter-clockwise.

No need to remove the screw from the body.



- Please change the screw to new one when the screw does not rotate smoothly

## PRACTICAL EXAMPLES

Workpiece type	Gate valve	Slewing ring	
Drill	TIS300F40-5	TIS330F40-5	
Head	SMP300	SMP331	
Grade	AH725	AH725	
Workpiece material	SUS304 / X5CrNi18-9	SCM440 / 42CrMo4	
	 <b>M</b>	 <b>P</b>	
Cutting conditions	Cutting speed: $V_c$ (m/min)	60	100
	Feed : $f$ (mm/rev)	0.25	0.4
	Feed speed : $V_f$ (mm)	160	380
	Drilling depth : $H$ (mm)	120	150
Machine	Horizontal M/C	Vertical M/C	
Results	 <p><b>Productivity 4 times!</b></p> <p>DrillForce-Meister provides 4 times productivity than HSS drill.</p>	 <p><b>Productivity 2 times!</b></p> <p>DrillForce-Meister provides 2 times productivity and more stable hole diameter compare with indexable drill.</p>	



### **Tungaloy Corporation (Head office)**

11-1 Yoshima-Kogyodanchi  
Iwaki-city, Fukushima, 970-1144 Japan  
Phone: +81-246-36-8501  
Fax: +81-246-36-8542  
www.tungaloy.co.jp

### **Tungaloy America, Inc.**

3726 N Ventura Drive  
Arlington Heights, IL 60004, U.S.A.  
Phone: +1-888-554-8394  
Fax: +1-888-554-8392  
www.tungaloyamerica.com

### **Tungaloy Canada**

432 Elgin St. Unit 3  
Brantford, Ontario N3S 7P7, Canada  
Phone: +1-519-758-5779  
Fax: +1-519-758-5791  
www.tungaloy.co.jp/ca

### **Tungaloy de Mexico S.A.**

C Los Arellano 113,  
Parque Industrial Siglo XXI  
Aguascalientes, AGS, Mexico 20290  
Phone: +52-449-929-5410  
Fax: +52-449-929-5411  
www.tungaloy.co.jp/mx

### **Tungaloy do Brasil Ltda.**

Avd. Independencia N4158 Residencial Flora  
13280-000 Vinhedo, São Paulo, Brasil  
Phone: +55-19-38262757  
Fax: +55-19-38262757  
www.tungaloy.com/br

### **Tungaloy Germany GmbH**

An der Alten Ziegelei 1  
D-40789 Monheim, Germany  
Phone: +49-2173-90420-0  
Fax: +49-2173-90420-19  
www.tungaloy.de

### **Tungaloy France S.A.S.**

ZA Courtabœuf - Le Rio  
1 rue de la Terre de feu  
F-91952 Courtabœuf Cedex, France  
Phone: +33-1-6486-4300  
Fax: +33-1-6907-7817  
www.tungaloy.fr

### **Tungaloy Italia S.r.l.**

Via E. Andolfato 10  
I-20126 Milano, Italy  
Phone: +39-02-252012-1  
Fax: +39-02-252012-65  
www.tungaloy.it

### **Tungaloy Czech s.r.o.**

Turanka 115  
CZ-627 00 Brno, Czech Republic  
Phone: +420-532 123 391  
Fax: +420-532 123 392  
www.tungaloy.cz

### **Tungaloy Ibérica S.L.**

C/Miquel Servet, 43B, Nau 7  
Pol. Ind. Bufalvent  
ES-08243 Manresa (BCN), Spain  
Phone: +34 93 113 1360  
Fax: +34 93 876 2798  
www.tungaloy.es

### **Tungaloy Scandinavia AB**

Bultgatan 38  
442 40 Kungälv, Sweden  
Phone: +46-462119200  
www.tungaloy.se

### **Tungaloy Rus, LLC**

36-D Harkovsky Lane  
308009 Belgorod, Russia  
Phone: +7 4722 24 00 07  
Fax: +7 4722 24 00 08  
www.tungaloy.co.jp/ru

### **Tungaloy East LLC**

Stachek str., h.4, office 2, Ekaterinburg,  
620017, Russia  
Phone: +7-343-389-13-22  
Fax: +7-343-278-94-35  
www.tungaloy.co.jp/rue

### **Tungaloy Polska Sp. z o.o.**

ul. Genewska 24  
03-963 Warszawa, Poland  
Phone: +48-22-617-0890  
Fax: +48-22-617-0890  
www.tungaloy.co.jp/pl

### **Tungaloy U.K. Ltd**

The Technology Centre,  
Wolverhampton Science Park  
Glaisher Drive, Wolverhampton  
West Midlands WV10 9RU, UK  
Phone: +44 121 4000 231  
Fax: +44 121 270 9694  
www.tungaloy.co.jp/uk  
salesinfo@tungaloyuk.co.uk

### **Tungaloy Hungary Kft**

Erzsébet királyné útja 125  
H-1142 Budapest, Hungary  
Phone: +36 1 781-6846  
Fax: +36 1 781-6866  
www.tungaloy.co.jp/hu  
info@tungaloytools.hu

### **Tungaloy Turkey**

Dudullu, OSB 4. Cad No:4  
34776 Umranıye Istanbul, TURKEY  
Phone: +90 216 540 04 67  
Fax: +90 216 540 04 87  
www.tungaloy.com.tr  
info@tungaloy.com.tr

### **Tungaloy Benelux b.v.**

Tjalk 70  
NL-2411 NZ Bodegraven, Netherlands  
Phone: +31 172 630 420  
Fax: +31 172 630 429  
www.tungaloy-benelux.com

### **Tungaloy Croatia**

Josipa Kozarca 4  
10432 Bregana, Croatia  
Phone: +385 1 3326 604  
Fax: +385 1 3327 683  
www.tungaloy.hr

### **Tungaloy Cutting Tool (Shanghai) Co., Ltd.**

Rm No 401 No.88 Zhabei  
Jiangchang No.3 Rd  
Shanghai 200436, China  
Phone: +86-21-3632-1880  
Fax: +86-21-3621-1918  
www.tungaloy.co.jp/tcts

### **Tungaloy Cutting Tool (Thailand) Co., Ltd.**

Interlink tower 4th Fl.  
1858/5-7 Bangna-Trad Road  
km.5 Bangna, Bangna, Bangkok 10260  
Thailand  
Phone: +66-2-751-5711  
Fax: +66-2-751-5715  
www.tungaloy.co.th

### **Tungaloy Singapore (Pte.), Ltd.**

62 Ubi Road 1, #06-11 Oxley BizHub 2  
Singapore 408734  
Phone: +65-6391-1833  
Fax: +65-6299-4557  
www.tungaloy.co.jp/tspl

### **Tungaloy Vietnam**

Unit 18, 4th Fl. Saigon Centre Building  
65 Le Loi Blvd.  
Dist 1, Ho Chi Minh City, Vietnam  
Phone: +84-8-3827-0201  
Fax: +84-8-3827-0203  
www.tungaloy.co.jp/tspl

### **Tungaloy India Pvt. Ltd.**

Indiabulls Finance Centre,  
Unit # 902-A, 9th Floor,  
Tower 1, Senapati Bapat Marg,  
Elphinstone Road (West),  
Mumbai -400013, India  
Phone: +91-22-6124-8804  
Fax: +91-22-6124-8899  
www.tungaloy.co.jp/in

### **Tungaloy Korea Co., Ltd**

#1312, Byucksan Digital Valley 5-cha  
Beotkkot-ro 244, Geumcheon-gu  
153-788 Seoul, Korea  
Phone: +82-2-2621-6161  
Fax: +82-2-6393-8952  
www.tungaloy.co.jp/kr

### **Tungaloy Malaysia Sdn Bhd**

50 K-2, Kelana Mall, Jalan SS6/14  
Kelana Jaya, 47301  
Petaling Jaya, Selangor Darul Ehsan  
Malaysia  
Phone: +603-7805-3222  
Fax: +603-7804-8563  
www.tungaloy.co.jp/my

### **Tungaloy Australia Pty Ltd**

PO Box 2232, Rowville,  
Victoria 3178, Australia  
Phone: +61-3-9755-8147  
Fax: +61-3-9755-6070  
www.tungaloy.com.au

### **PT. Tungaloy Indonesia**

Kompleks Grand Wisata Block AA-10 No.3-5  
Cibitung  
Bekasi 17510, Indonesia  
Phone: +62-21-8261-5808  
Fax: +62-21-8261-5809  
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