

DrillLine

DRILLFORCE MEISTER

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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



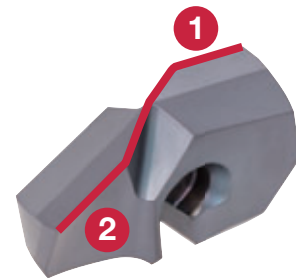
Unique clamping concept and two effective cutting edges on the drill head provide excellent hole quality and high productivity

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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

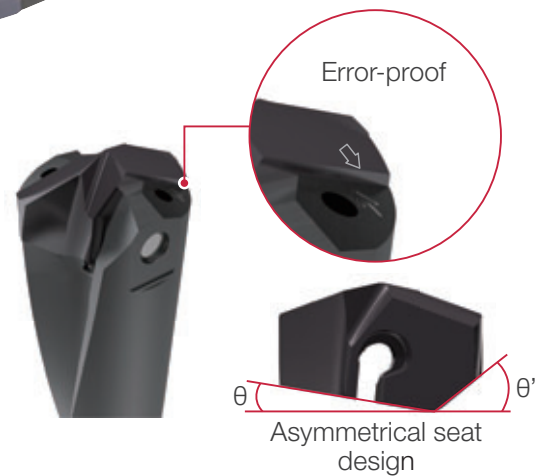
- The drill body has an optimized flute design for smooth chip evacuation and enhanced stiffness



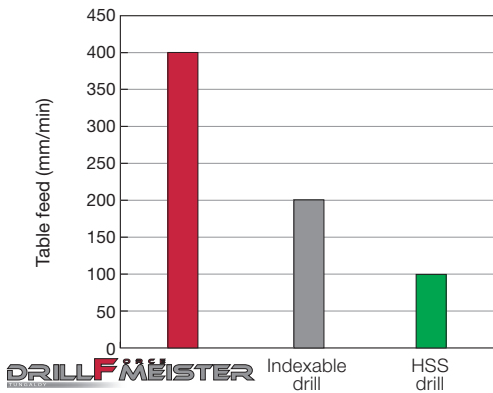
Unique clamping system

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



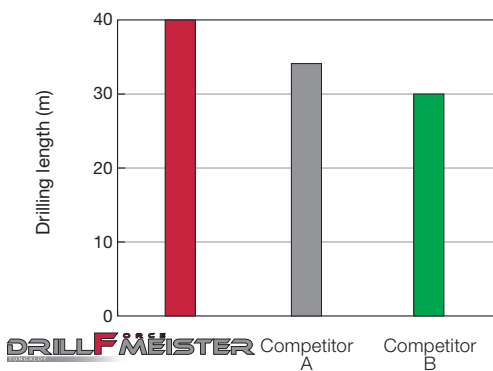
High productivity



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)
DRILLFMEISTER	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

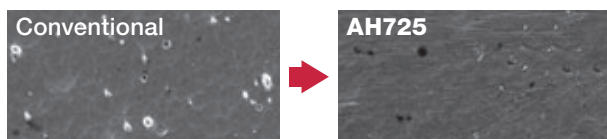
AH725, a highly reliable PVD grade

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



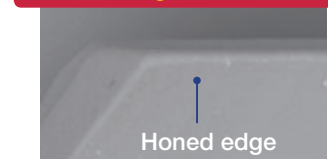
Optimized edge preparation

- Enlarged images of the edges before use



The cutting edge is honed to enhance coating adhesion

No coating delamination



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Coating is delaminated



CUTTING PERFORMANCE

Hole size

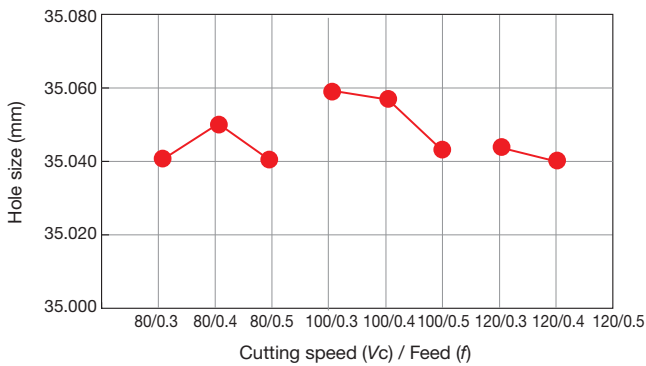


The hole size is stable in various cutting conditions and materials

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)

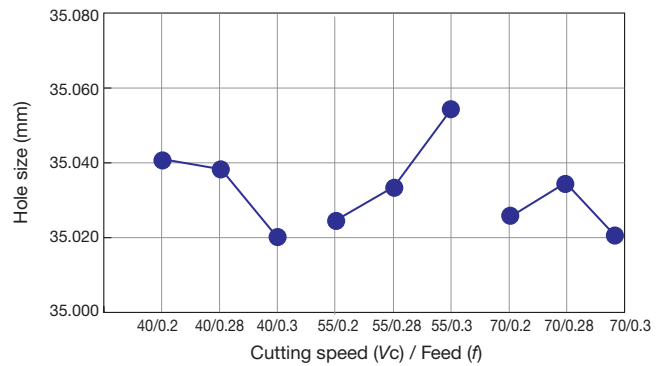
P

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

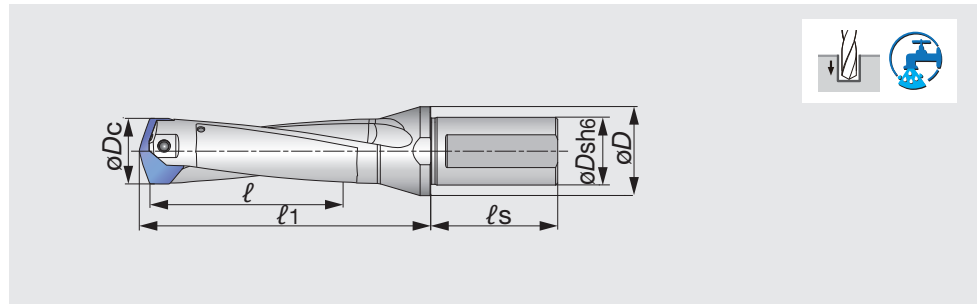
0.2			
0.3			
0.4			
Feed: f (mm/rev)	DRILLFORCE MEISTER	Competitor A	Competitor B

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	ϕD_c min	ϕD_c max	ϕD_s	ϕD	ℓ	ℓ_1	ℓ_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

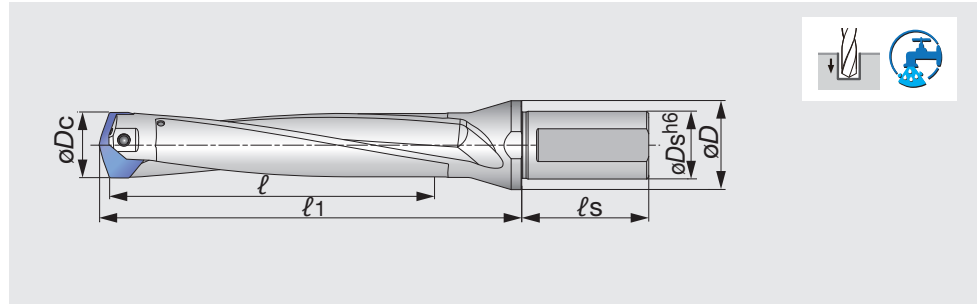
ϕD_c	Hole diameter tolerance*
$\phi 26.0 - \phi 29.9$	+0.05 / 0
$\phi 30.0 - \phi 41.0$	+0.06 / 0

* 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	$\varnothing D_s$	$\varnothing D$	ℓ	ℓ_1	ℓ_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



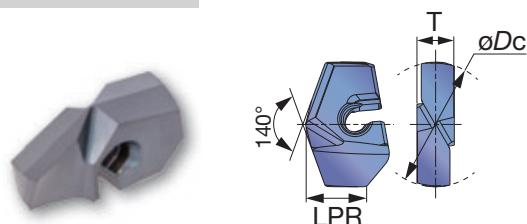
Designation	Clamping screw	Wrench	
		Torx Bit	Grip
TIS260F32-*	TS50230D3	BLDT20/S7	H-TB2W
TIS270F32-*	TS50230D3	BLDT20/S7	H-TB2W
TIS280F32-*	TS50230D35	BLDT25/S7	H-TB2W
TIS290F32-*	TS50230D35	BLDT25/S7	H-TB2W
TIS300F32-*	TS60265D4	BLDT25/S7	H-TB2W
TIS310F32-*	TS60265D4	BLDT25/S7	H-TB2W
TIS320F40-*	TS60285D42	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

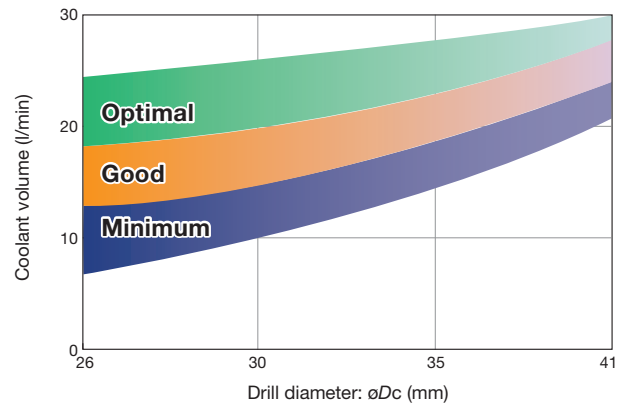
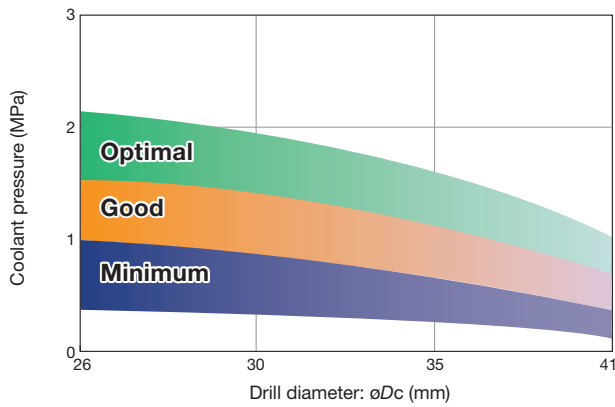
Designation	øDc	Grade AH725	T	LPR	Pocket size	Body	Designation	øDc	Grade AH725	T	LPR	Pocket size	Body
SMP260	26.0	●	7.5	11.6	26	TIS260F32-*	SMP360	36.0	●	10.0	16.1	36	TIS360F40-*
SMP261	26.1	●	7.5	11.6	26	TIS260F32-*	SMP361	36.1	●	10.0	16.1	36	TIS360F40-*
SMP265	26.5	●	7.5	11.6	26	TIS260F32-*	SMP365	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

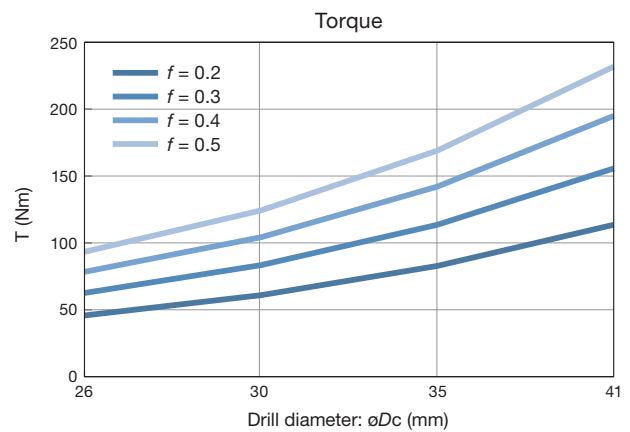
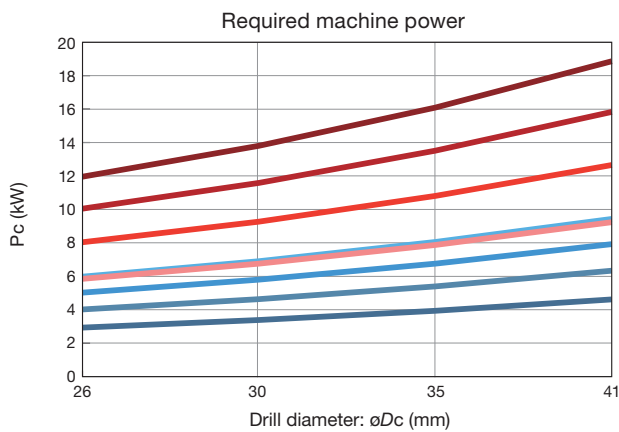
STANDARD CUTTING CONDITIONS

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
P	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
M	Stainless steel (SUS304 / X5CrNi18-9, SUS316 / X5CrNiMo17-12-3, etc.)	40 - 80	0.15 - 0.3	0.15 - 0.3	0.2 - 0.35
K	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
N	Non ferrous materials	100 - 200	0.4 - 0.6	0.4 - 0.6	0.5 - 0.7
S	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
H	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



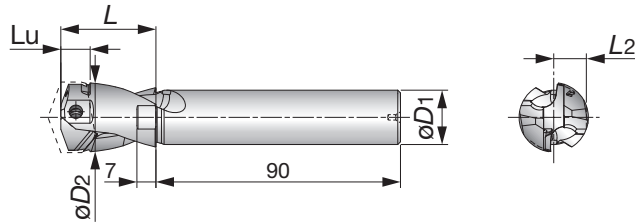
- $V_c = 50, f = 0.2$
- $V_c = 50, f = 0.3$
- $V_c = 50, f = 0.4$
- $V_c = 50, f = 0.5$
- $V_c = 100, f = 0.2$
- $V_c = 100, f = 0.3$
- $V_c = 100, f = 0.4$
- $V_c = 100, f = 0.5$

- 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



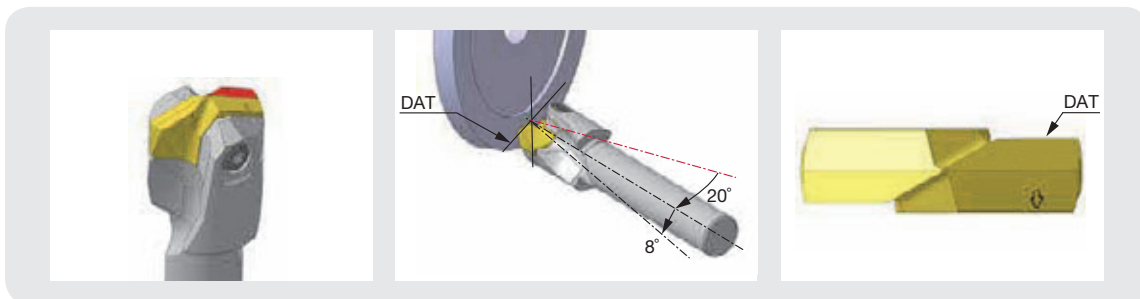
Designation	øD1	øD2	L	Lu	L2	Head
SMP260-279-GH	20	25.5	35	10.8	12	SMP260-SMP279
SMP280-299-GH	20	27.5	35	10.8	13	SMP280-SMP299
SMP300-319-GH	20	29.5	35	13	14	SMP300-SMP319
SMP320-349-GH	20	31.5	35	13	15	SMP320-SMP349
SMP350-379-GH	20	34.5	40	14.7	16.5	SMP350-SMP379
SMP380-410-GH	20	37.5	40	15.1	18	SMP380-SMP410

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

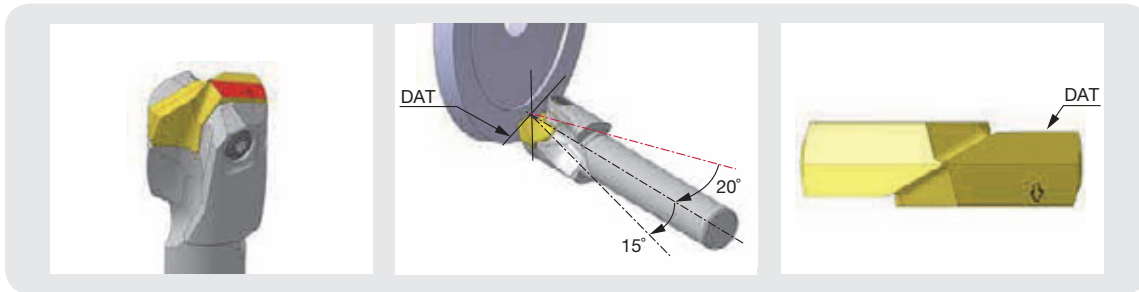
② Grinding the 1st clearance angle

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



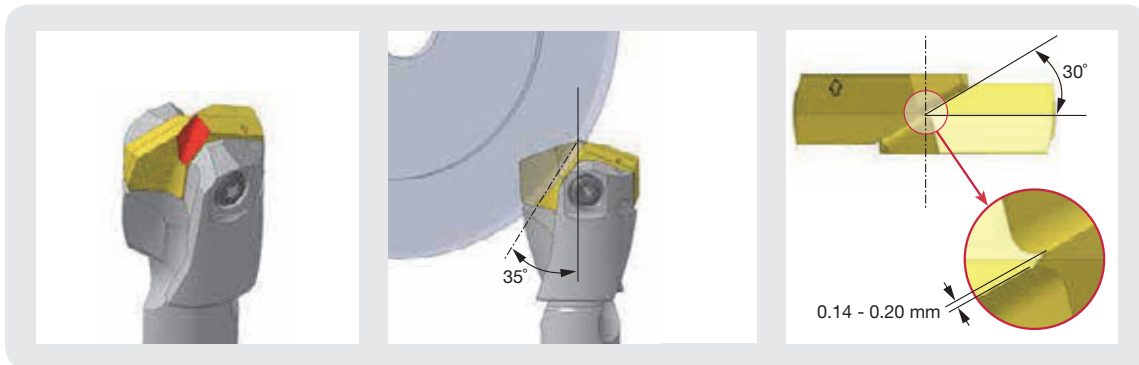
③ Grinding the 2nd clearance angle

- Set the drill for 2nd clearance angle (15°)



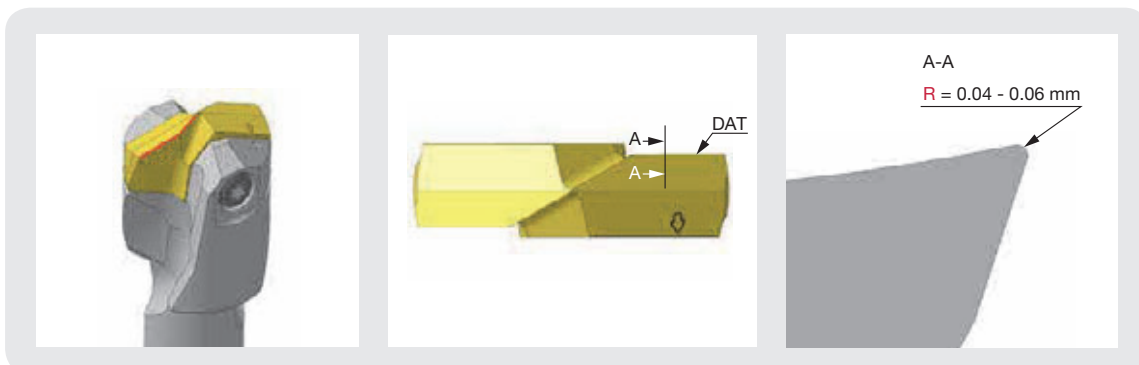
④ Grinding the chisel (Thinning)

- 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

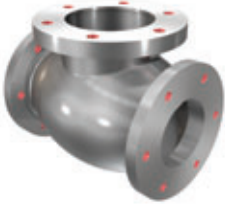
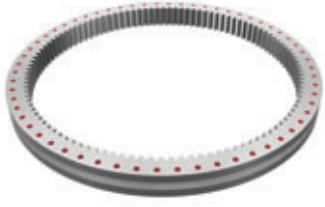
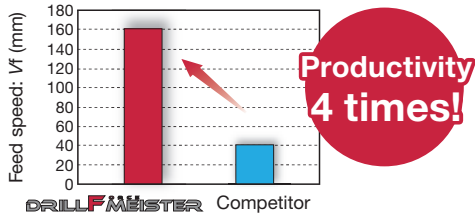
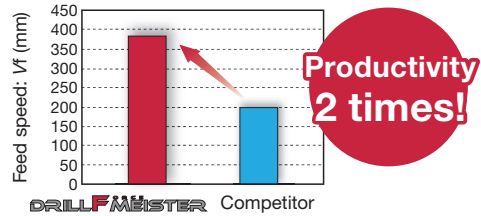
To unclamp rotate the screw 3-5 times counter-clockwise.

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	
	 M	 P	
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>DrillForce-Meister provides 4 times productivity than HSS drill.</p>	 <p>DrillForce-Meister provides 2 times productivity and more stable hole diameter compare with indexable drill.</p>	

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