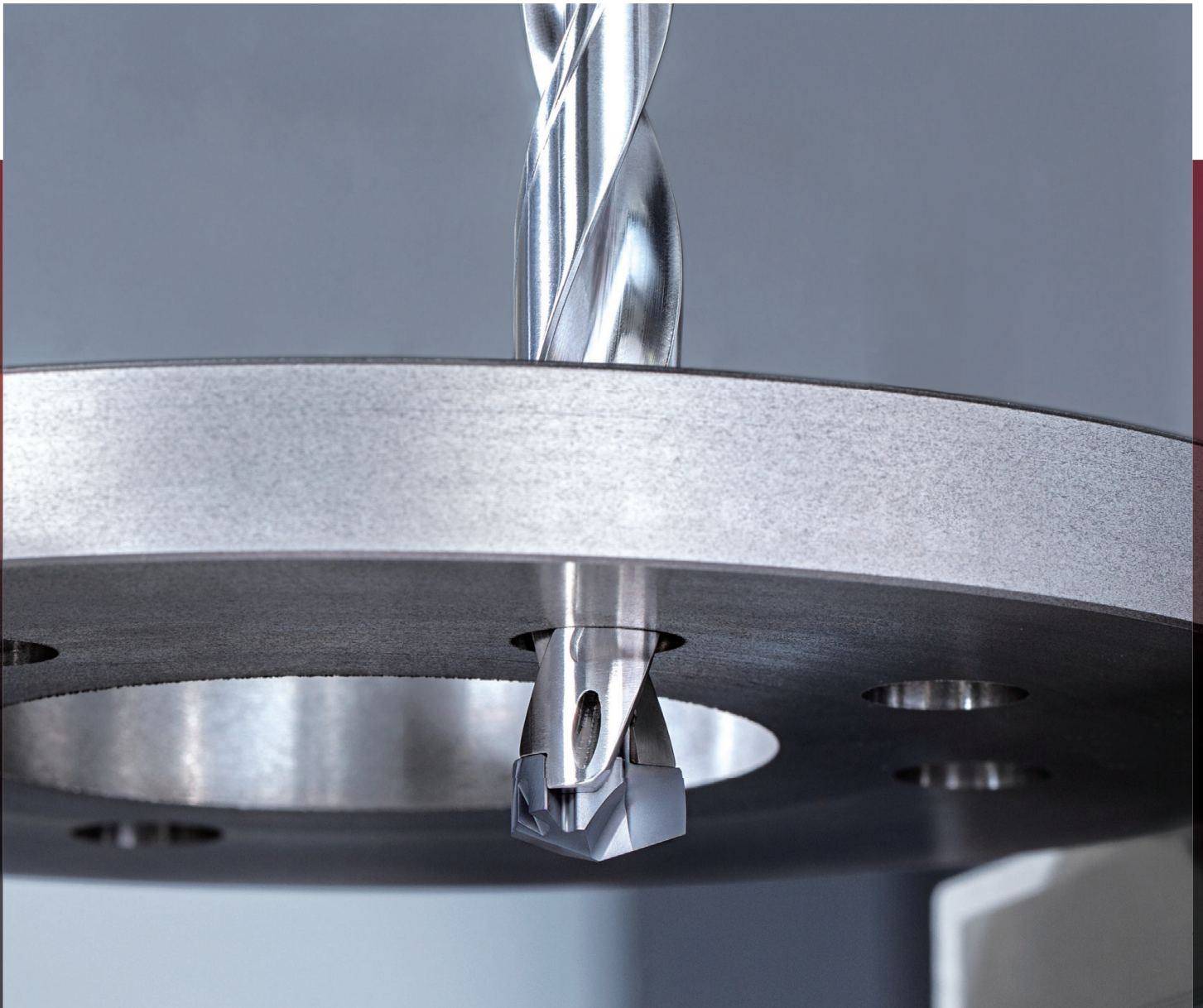


Exchangeable head drill

DRILLMEISTER

Tungaloy Report No. 412S9-G

Expansion of **DMH** drill heads with
new diameters



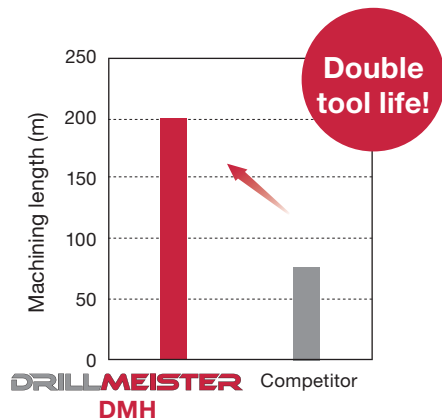


DMH - Fracture resistance head



- Counter measure solution for corner edge fracture
- Reinforced drill edge design protect the head's corners from both damaging impact of recoiling wall and weak part fixture
- The best solution for short depth through holes with multiple entry and exit
- Perfect solution for hardened steel drilling and especially high carbon steels ($C > 0.45\%$)
- Perfect combination with dedicated AH9130 grade for superb results

Longer tool life without edge fracture



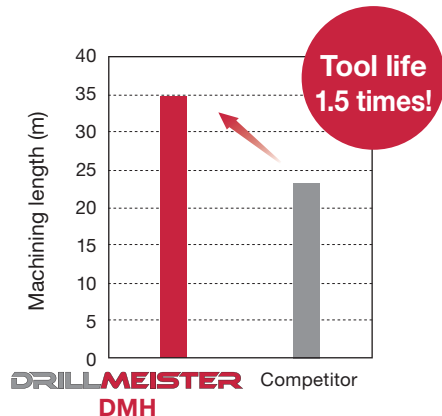
DRILLMEISTER DMH



Competitor



Tool	: $\phi 13.7$ mm, L/D = 3
Drill head	: DMH137
Grade	: AH9130
Workpiece material	: High carbon steel
Cutting speed	: $V_c = 90$ m/min
Feed	: $f = 0.3$ mm/rev
Hole depth	: $H = 20$ mm
Coolant	: Wet (External)



Tool	: $\phi 10.3$ mm, L/D = 3
Drill head	: DMH103
Grade	: AH9130
Workpiece material	: Tool steel (40HRC)
Cutting speed	: $V_c = 54.5$ m/min
Feed	: $f = 0.18$ mm/rev
Hole depth	: $H = 23$ mm
Coolant	: Wet (Internal)

Solution for improved tool life, especially for shallow through-holes



Hub



Knuckle

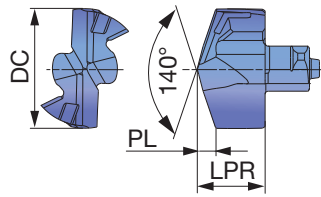
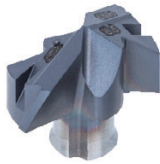


Diff. case



Brake disc

DMH High strength cutting edge



Tool diameter	Head diameter tolerance
ø6 - ø17.9	+0.018 / -0.005
ø18 - ø25.5	+0.021 / -0.005

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

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

★ : First choice

Designation	DC	LPR	Coated		PL	Body		Designation	DC	LPR	Coated		PL	Body
			AH9130								AH9130			
DMH060	6	3.85	●		1.09	TID*060...	New	DMH134	13.4	7.4	●		2.03	TID*130...
DMH068	6.8	4.15	●		1.33	TID*065...		DMH135	13.5	7.4	●		2.05	TID*135...
DMH070	7	4.45	●		1.03	TID*070...	New	DMH136	13.6	7.4	●		2.07	TID*135...
DMH075	7.5	4.45	●		1.12	TID*075...		DMH137	13.7	7.4	●		2.09	TID*135...
DMH080	8	5.25	●		1.2	TID*080...		DMH138	13.8	7.4	●		2.11	TID*135...
DMH085	8.5	5.25	●		1.29	TID*085...		DMH139	13.9	7.4	●		2.12	TID*135...
DMH086	8.6	5.25	●		1.31	TID*085...		DMH140	14	7.95	●		2.12	TID*140...
DMH087	8.7	5.25	●		1.33	TID*085...	New	DMH141	14.1	7.95	●		2.14	TID*140...
DMH088	8.8	5.25	●		1.35	TID*085...		DMH142	14.2	7.95	●		2.16	TID*140...
DMH090	9	5.65	●		1.37	TID*090...	New	DMH143	14.3	7.95	●		2.17	TID*140...
DMH095	9.5	5.65	●		1.46	TID*095...	New	DMH144	14.4	7.95	●		2.19	TID*140...
DMH097	9.7	5.65	●		1.5	TID*095...		DMH145	14.5	7.95	●		2.21	TID*145...
DMH100	10	6.05	●		1.47	TID*100...	New	DMH146	14.6	7.95	●		2.23	TID*145...
New DMH101	10.1	6.05	●		1.49	TID*100...	New	DMH147	14.7	7.95	●		2.25	TID*145...
DMH103	10.3	6.05	●		1.52	TID*100...		DMH150	15	8.53	●		2.27	TID*150...
New DMH104	10.4	6.05	●		1.54	TID*100...	New	DMH151	15.1	8.53	●		2.29	TID*150...
DMH105	10.5	6.05	●		1.56	TID*105...		DMH152	15.2	8.53	●		2.31	TID*150...
New DMH106	10.6	6.05	●		1.58	TID*105...	New	DMH153	15.3	8.53	●		2.32	TID*150...
New DMH107	10.7	6.05	●		1.6	TID*105...	New	DMH154	15.4	8.53	●		2.34	TID*150...
DMH108	10.8	6.05	●		1.62	TID*105...		DMH155	15.5	8.53	●		2.36	TID*150...
DMH110	11	6.45	●		1.67	TID*110...	New	DMH156	15.6	8.53	●		2.38	TID*150...
New DMH111	11.1	6.45	●		1.69	TID*110...	New	DMH157	15.7	8.53	●		2.40	TID*150...
New DMH112	11.2	6.45	●		1.71	TID*110...	New	DMH158	15.8	8.53	●		2.42	TID*150...
New DMH113	11.3	6.45	●		1.72	TID*110...		DMH160	16	9.1	●		2.42	TID*160...
New DMH114	11.4	6.45	●		1.74	TID*110...	New	DMH162	16.2	9.1	●		2.46	TID*160...
DMH115	11.5	6.45	●		1.76	TID*115...	New	DMH163	16.3	9.1	●		2.47	TID*160...
New DMH117	11.7	6.45	●		1.8	TID*115...		DMH165	16.5	9.1	●		2.51	TID*160...
New DMH118	11.8	6.45	●		1.82	TID*115...	New	DMH166	16.6	9.1	●		2.53	TID*160...
DMH119	11.9	6.45	●		1.83	TID*115...		DMH167	16.7	9.1	●		2.55	TID*160...
DMH120	12	6.8	●		1.82	TID*120...	New	DMH170	17	9.7	●		2.59	TID*170...
New DMH121	12.1	6.8	●		1.84	TID*120...	New	DMH171	17.1	9.7	●		2.61	TID*170...
New DMH122	12.2	6.8	●		1.86	TID*120...		DMH175	17.5	9.7	●		2.68	TID*170...
New DMH123	12.3	6.8	●		1.87	TID*120...	New	DMH177	17.7	9.7	●		2.72	TID*170...
New DMH124	12.4	6.8	●		1.89	TID*120...	New	DMH178	17.8	9.7	●		2.74	TID*170...
DMH125	12.5	6.8	●		1.91	TID*125...	New	DMH179	17.9	9.7	●		2.75	TID*170...
DMH126	12.6	6.8	●		1.93	TID*125...		DMH180	18	10.3	●		2.73	TID*180...
New DMH127	12.7	6.8	●		1.95	TID*125...	New	DMH181	18.1	10.3	●		2.75	TID*180...
New DMH128	12.8	6.8	●		1.97	TID*125...	New	DMH183	18.3	10.3	●		2.78	TID*180...
New DMH129	12.9	6.8	●		1.98	TID*125...		DMH185	18.5	10.3	●		2.82	TID*180...
DMH130	13	7.4	●		1.96	TID*130...	New	DMH187	18.7	10.3	●		2.86	TID*180...
New DMH131	13.1	7.4	●		1.98	TID*130...		DMH190	19	10.8	●		2.88	TID*190...
New DMH132	13.2	7.4	●		2	TID*130...		DMH191	19.1	10.8	●		2.90	TID*190...
DMH133	13.3	7.4	●		2.01	TID*130...	New	DMH192	19.2	10.8	●		2.92	TID*190...

ø6 - ø19.9 = 2 pieces per package
ø20 - ø25.5 = 1 piece per package

● : New product
● : Line up

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

★ : First choice

Designation	DC	LPR	Coated		PL	Body
			AH9130			
New DMH193	19.3	10.8	●		2.93	TID*190...
DMH194	19.4	10.8	●		2.95	TID*190...
DMH195	19.5	10.8	●		2.97	TID*190...
New DMH196	19.6	10.8	●		2.99	TID*190...
New DMH197	19.7	10.8	●		3.01	TID*190...
New DMH200	20	11.4	●		3.02	TID*200...
DMH205	20.5	11.4	●		3.11	TID*200...
DMH210	21	11.98	●		3.18	TID*210...
DMH215	21.5	11.98	●		3.27	TID*210...
DMH220	22	12.56	●		3.32	TID*220...
DMH225	22.5	12.56	●		3.41	TID*220...
DMH230	23	13.13	●		3.46	TID*230...
DMH235	23.5	13.13	●		3.55	TID*230...
DMH240	24	13.7	●		3.62	TID*240...
DMH245	24.5	13.7	●		3.71	TID*240...
DMH250	25	14.3	●		3.8	TID*250...
DMH255	25.5	14.3	●		3.89	TID*250...

ø6 - ø19.9 = 2 pieces per package
ø20 - ø25.5 = 1 piece per package

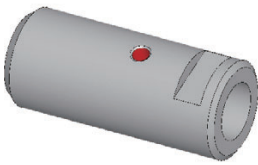
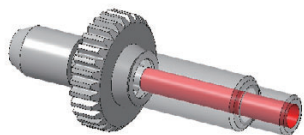
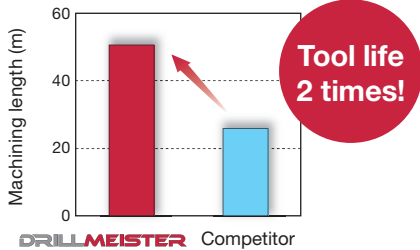
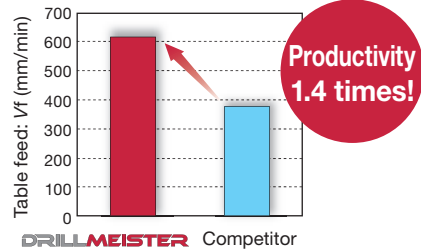
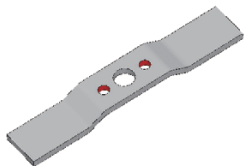
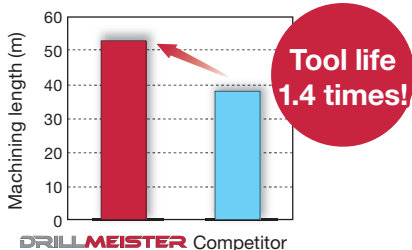
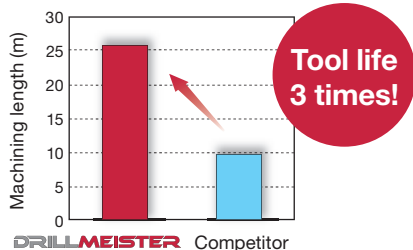
● : New product
● : Line up

STANDARD CUTTING CONDITIONS

ISO	Workpiece material	Cutting speed Vc (m/min)	Feed: f (mm/rev)						
			Tool diameter: DC (mm)						
			ø6 - 7.9	ø8 - 9.9	ø10 - ø11.9	ø12 - ø13.9	ø14 - ø15.9	ø16 - ø19.9	ø20 - ø25.9
P	Low carbon steels (C < 0.3) SS400, SM490, S25C, etc. C15E4, E275A, E355D, etc.	80 - 140	0.09 - 0.13	0.12 - 0.25	0.15 - 0.28	0.18 - 0.3	0.20 - 0.35	0.25 - 0.45	0.25 - 0.45
	High carbon steels (C > 0.3) S45C, S55C, etc. C45, C55, etc.	70 - 120	0.09 - 0.13	0.12 - 0.25	0.15 - 0.28	0.18 - 0.3	0.2 - 0.35	0.25 - 0.45	0.25 - 0.45
	Low alloy steels SCM415, etc. 18CrMo4, etc.	70 - 120	0.08 - 0.13	0.11 - 0.25	0.14 - 0.28	0.16 - 0.32	0.18 - 0.35	0.23 - 0.4	0.25 - 0.45
	Alloy steels SCM440, SCr420, etc. 42CrMo4, 20Cr4, etc.	40 - 90	0.08 - 0.13	0.11 - 0.25	0.14 - 0.28	0.16 - 0.32	0.18 - 0.35	0.23 - 0.4	0.25 - 0.45
M	Stainless steels SUS304, SUS316, etc. X5CrNi18-9, X5CrNiMo17-12-2, etc.	30 - 70	0.08 - 0.1	0.1 - 0.15	0.12 - 0.18	0.14 - 0.2	0.16 - 0.24	0.16 - 0.26	0.18 - 0.3
K	Grey cast irons FC250, etc. GG25, etc.	80 - 180	0.12 - 0.18	0.15 - 0.3	0.20 - 0.35	0.25 - 0.4	0.3 - 0.45	0.35 - 0.55	0.35 - 0.6
	Ductile cast irons FCD700, etc. GGG70, etc.	80 - 140	0.12 - 0.18	0.15 - 0.3	0.20 - 0.35	0.25 - 0.4	0.3 - 0.45	0.35 - 0.55	0.35 - 0.6
N	Aluminium alloys ADC12, etc. AlSi11Cu3, etc.	80 - 220	0.1 - 0.2	0.2 - 0.35	0.25 - 0.4	0.3 - 0.45	0.35 - 0.5	0.4 - 0.6	0.5 - 0.75
S	Titanium alloys Ti-6Al-4V, etc.	20 - 50	0.05 - 0.07	0.06 - 0.12	0.08 - 0.15	0.1 - 0.28	0.12 - 0.2	0.14 - 0.22	0.18 - 0.27
	Nickel-based alloys	20 - 50	0.05 - 0.07	0.06 - 0.11	0.08 - 0.13	0.1 - 0.15	0.12 - 0.18	0.12 - 0.22	0.14 - 0.22
H	Hardened steel	20 - 50	0.05 - 0.07	0.06 - 0.12	0.08 - 0.15	0.1 - 0.18	0.12 - 0.2	0.14 - 0.22	0.16 - 0.25

- Cutting conditions in the above table show standard cutting conditions
- Cutting conditions may change due to the rigidity and power of the machine and the workpiece material
- Machined hole diameter may change depending upon the rigidity of the machine tool or cutting conditions

PRACTICAL EXAMPLES

Workpiece type		Shaft pin	Input shaft
Drill body		TID085R10-8	TID170R18-6
Head		DMH088	DMH170
Grade		AH9130	AH9130
Workpiece material		S45C / C45	SCr420 / 20Cr4
		 P	 P
Cutting conditions	Cutting speed : V_c (m/min)	83	110
	Feed : f (mm/rev)	0.07	0.3
	Drill diameter: DC (mm)	8.8	17
	Hole depth : H (mm)	20	89
	Coolant	Wet (Internal coolant)	Wet (Internal and external coolant)
	Machine	Vertical M/C	CNC lathe
Results		 Existing products suffered from chipping during penetration, and had large deviation of tool life. The DMH head, which has excellent cutting edge strength, has achieved a stable tool life with reduced breakage.	 Existing products had fractured on the cutting edge and limited machining conditions. Cutting edge fracture is suppressed by using a DMH head. Furthermore, it became possible to improve the processing conditions.
Workpiece type		Gear case	Blade
Drill body		TID140F16-3	TID125F16-3
Head		DMH140	DMH125
Grade		AH9130	AH9130
Workpiece material		FCD700	HARDOX (450HB)
		 K	 H
Cutting conditions	Cutting speed : V_c (m/min)	100	70
	Feed : f (mm/rev)	0.28	0.2
	Drill diameter: DC (mm)	14	12.5
	Hole depth : H (mm)	30	32
	Coolant	Wet (Internal coolant)	Wet (Internal coolant)
	Machine	Vertical M/C	Horizontal M/C
Results		 Cutting edge fractures occurred frequently due to the impact when the drill penetrated, and the tool life was an issue, but by using the DMH head, fractures were suppressed and the tool life was 1.4 times.	 The tool life was short due to the high work height and chipping of the cutting edge, but by using the DMH head, chipping was suppressed and the tool life was tripled.

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