

DHA-WORLD

High hardenability and high tough General use Hot Work Die Steel

Features

- Improved H13 applicable wide variety uses
- High toughness even in large dies due higher hardenability than that H13

Applications and proper hardness

Applications	Hardness HRC)
Al, Zn, Mg die casting molds	41~48HRC
Die casting parts (Plunger sleeve, Chip, etc.)	45~50HRC
Hot extrusion dies	43~50HRC
Hot shear blades	35~45HRC
Hot forging dies	42~50HRC

Chemistries

Patent pending

Heat treatment

Forging Temp. : C	Treating temperature : C			Hardness		Transformation point : C	
	Annealing	Quenching	Tempering	Annealed	Quenched & tempered	Ac	Ms
1200-900	820 – 870 Slow cooling	1000 – 1050 Air cooling	550 ~ 650 Air cooling	≤229HB	≤53HRC	815 ~ 875	300 Austenite temp : 1030 C



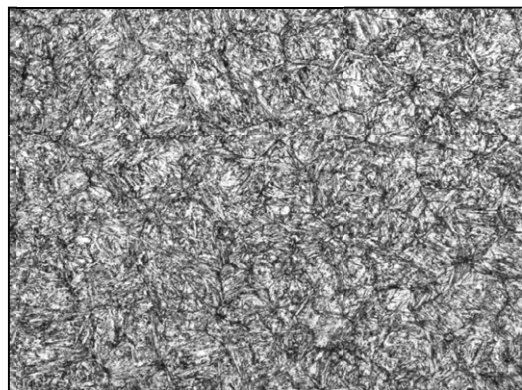
INTERNATIONAL MOLD STEEL, INC.

1-800-625-6653
www.imsteel.com

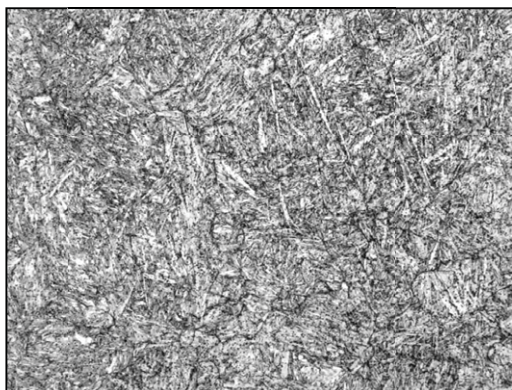
Microstructure (Quenched and tempered)

Specimen 200H x 600W x300L(Center)
Vacuum quenched and tempered

25 μ m

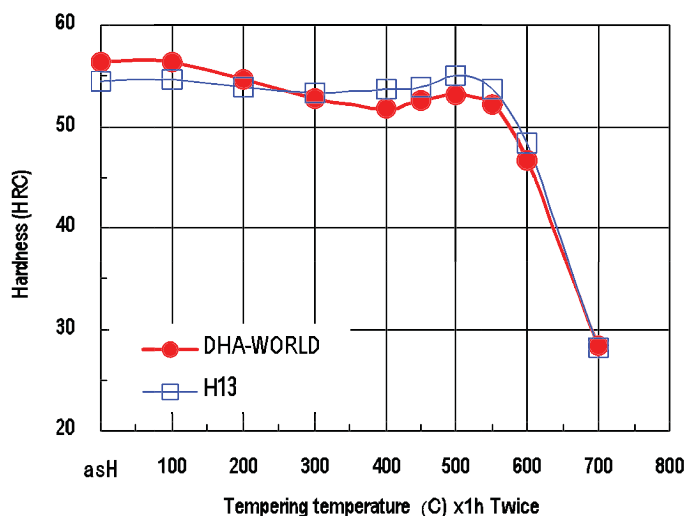


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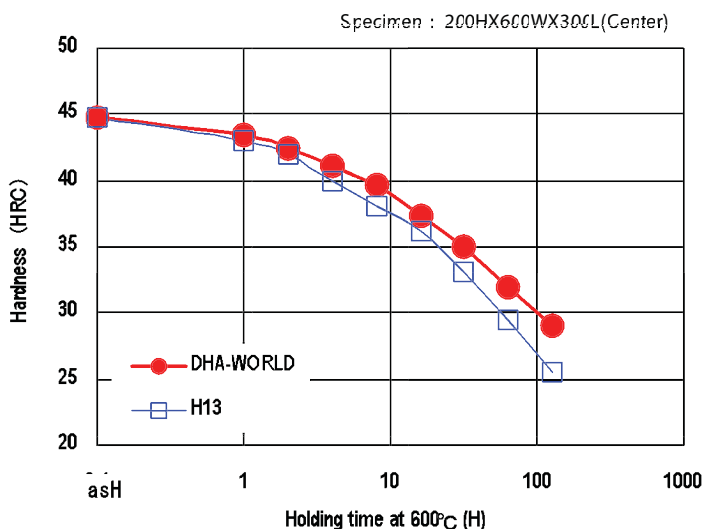


H13

Tempering hardness

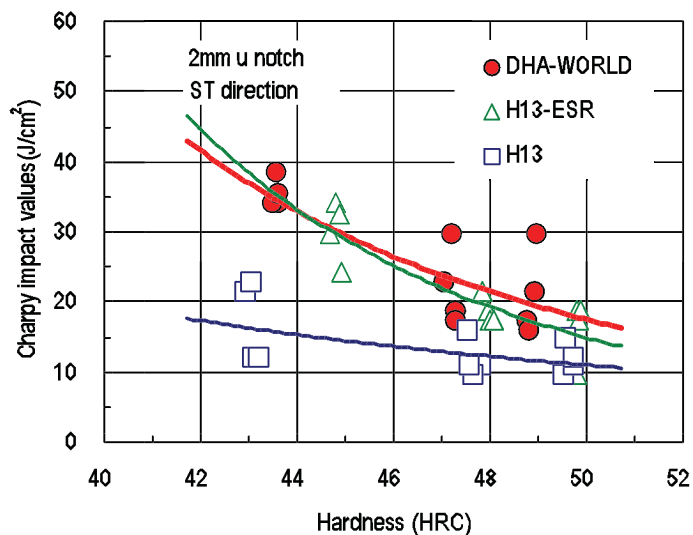


Softening resistance



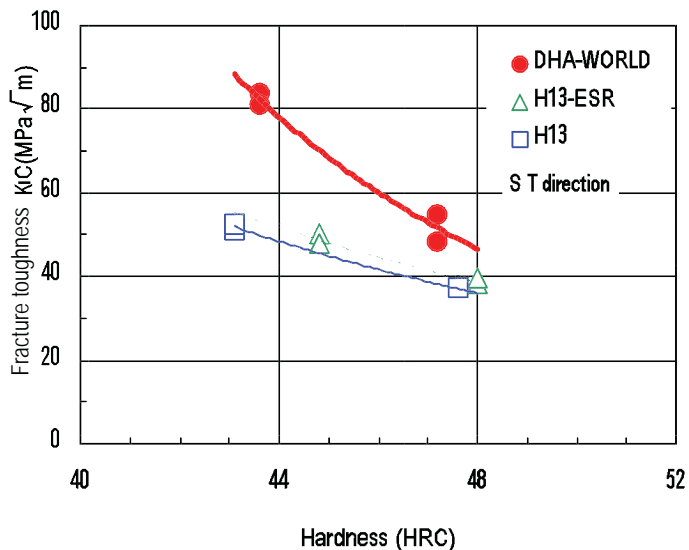
Toughness

Specimen : 200HX600WX300L(Center)

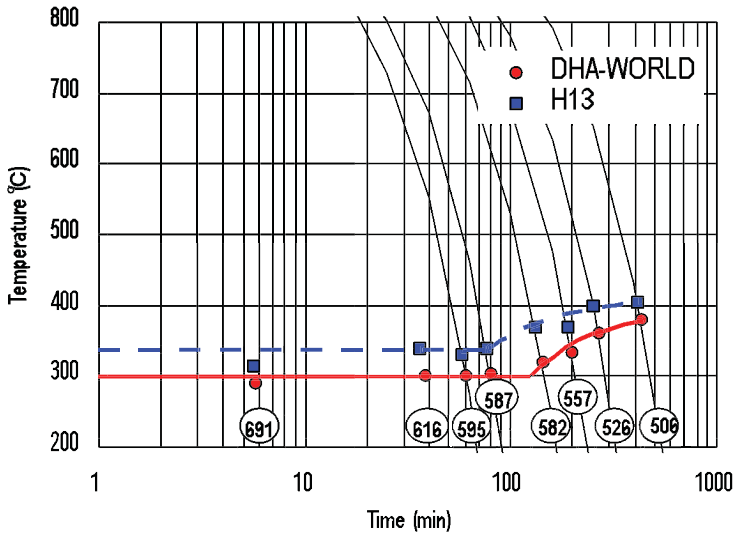


Fracture toughness

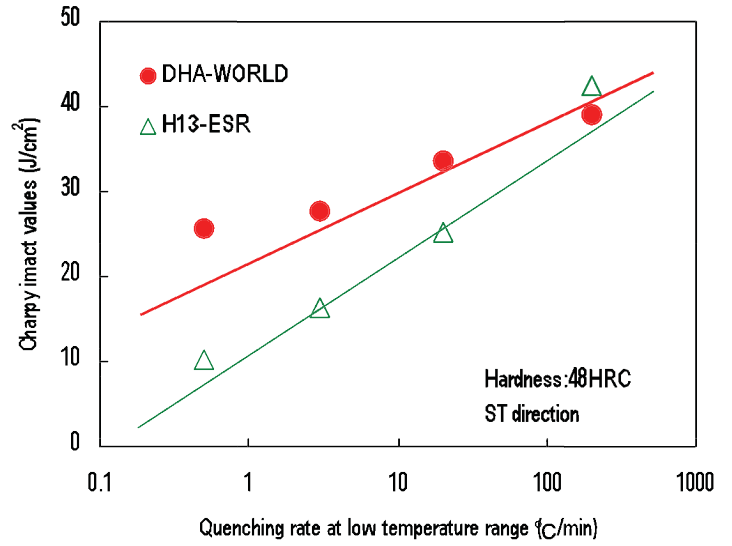
Specimen : 200HX600WX300L(1/4 H)



CCT curves

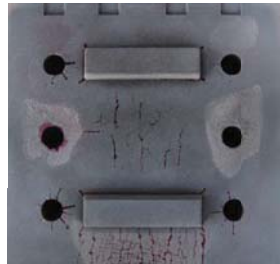
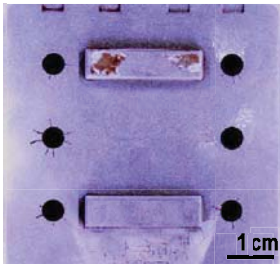


Quenching rate vs. Toughness



Heat checking resistance

135t Die casting test machine

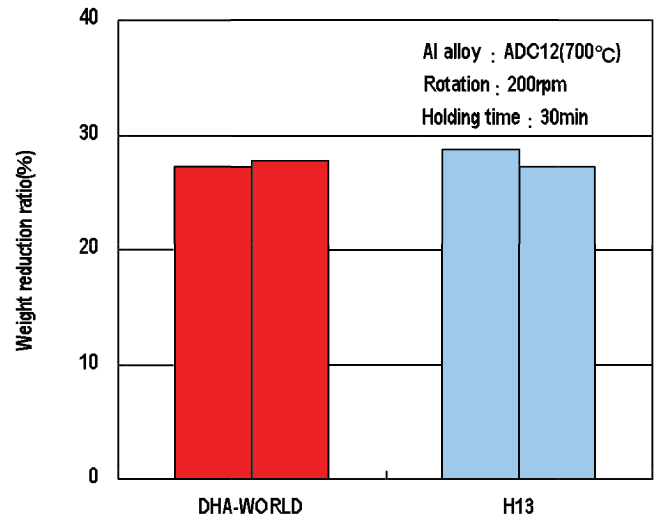


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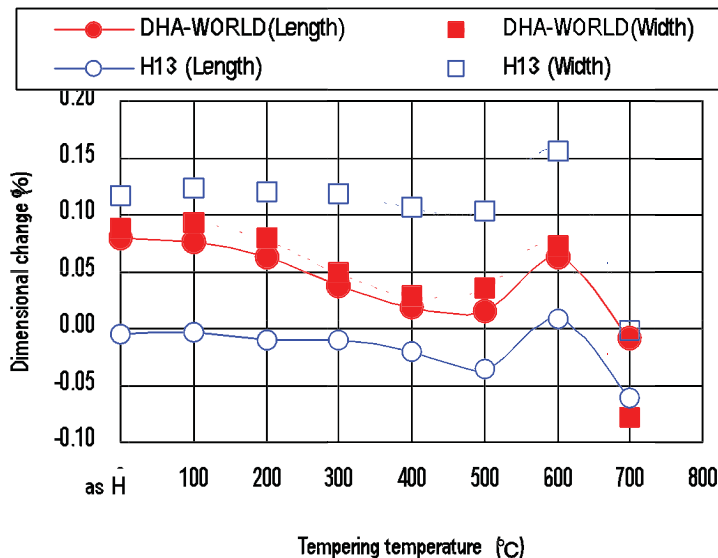
H13

Hardness: 43HRC
Number of run: 10,000
Al alloy: ADC12(700°C)
Cycle time: 30sec

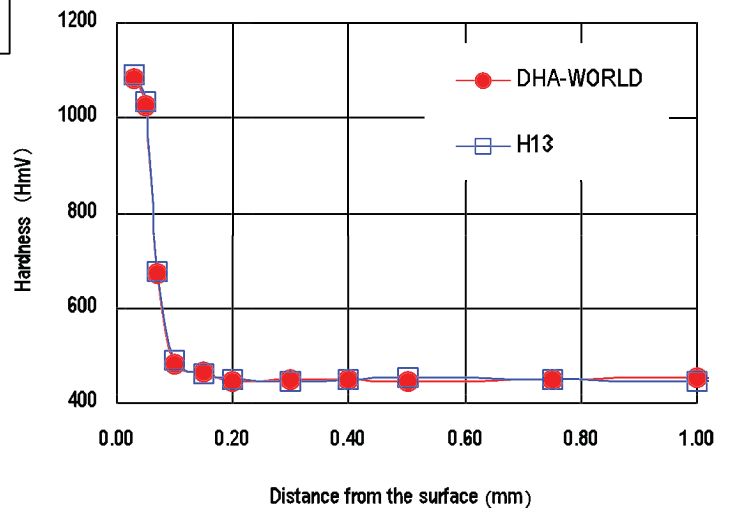
Al erosion resistance



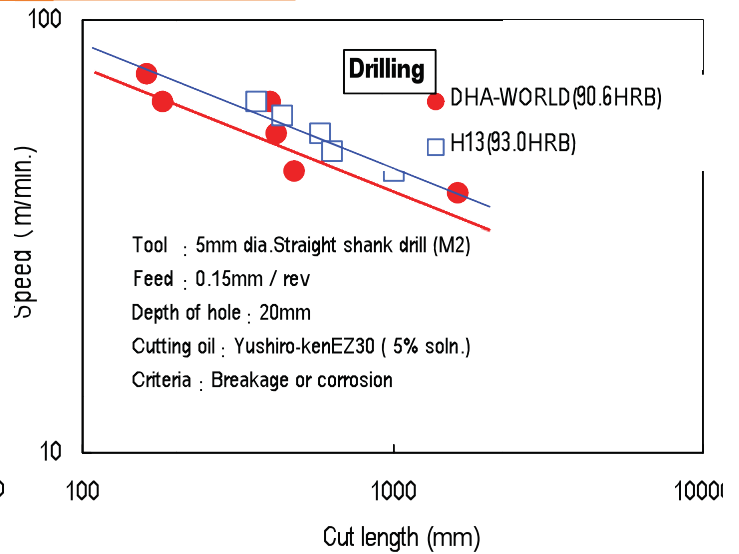
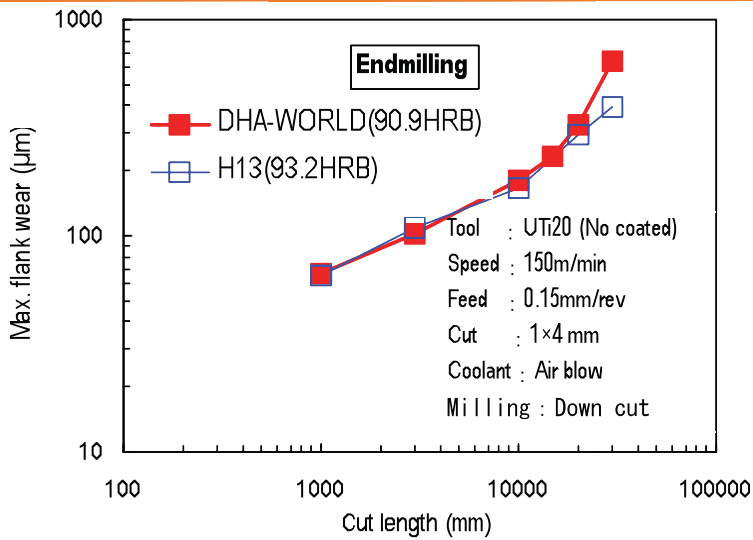
Dimensional change



Nitriding characteristics



Machinability



Thermal expansion rate

Temperature	20~100°C	20~200°C	20~300°C	20~400°C	20~500°C	20~600°C	20~700°C
$\times 10^{-6}/\text{K}$	11.3	11.7	12.1	12.5	12.8	13.1	13.2

Thermal conductivity

Temperature	100°C	200°C	300°C	400°C	500°C	600°C	700°C
W/m·K	25.2	26.6	27.9	28.5	28.7	28.3	27.6

Specific heat

Temperature	100°C	200°C	300°C	400°C	500°C	600°C	700°C
J/kg·K	473	509	558	604	667	760	934
[cal/g·°C]	[0.113]	[0.122]	[0.133]	[0.144]	[0.159]	[0.182]	[0.223]

Specific weight

Temperature	20°C
kg/m ³	7800.0
[g/cm ³]	[7.80]



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