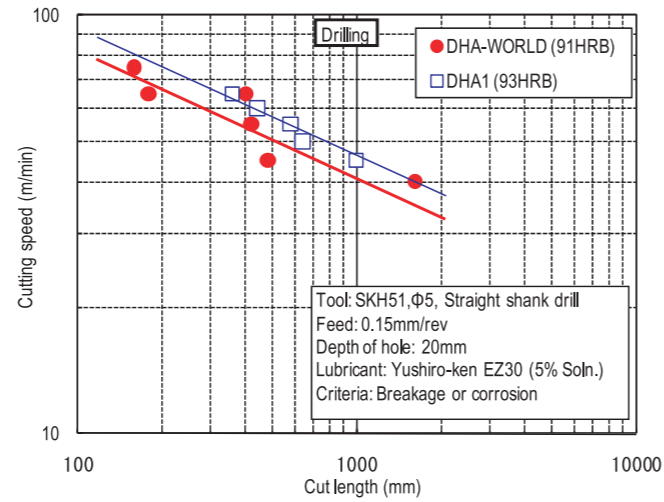
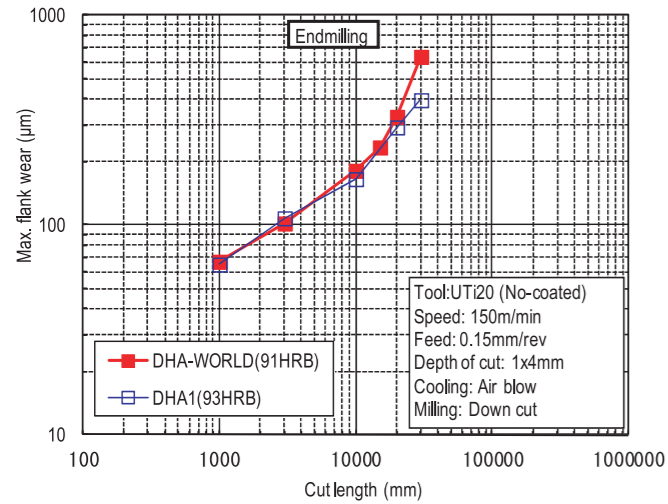


Machinability



Main applications

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

Physical properties

Thermal expansion rate

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

Thermal conductivity

Temp.	100°C	200°C	300°C	400°C	500°C	600°C
W/m·K	28.3	29.1	29.8	30.2	30.0	29.5

Specific heat

Temp.	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]

※ Heat treatment of specimens

Quenching : 1030°C, AC, Tempering : 610°C, AC, Twice

Daido's Hot Work Die Steel Series

DHA-WORLD

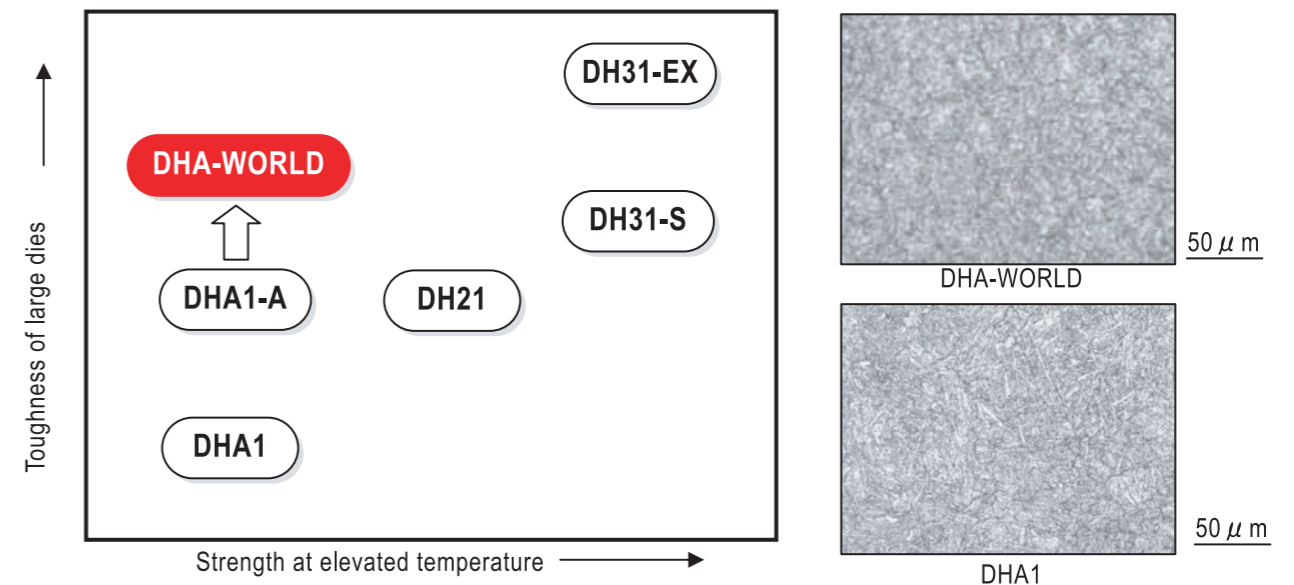


High hardenability and high tough Hot Work Die steel available for large Die Casting Dies as improved SKD61

Features

1. High hardenability : High toughness even in large sized dies due to optimum alloy designing
2. Single melt steel : Almost the same quality as double melt steels due to state of the art production technologies

Specimen: 200mm H×600mm W×300mm L (Center)
Quenching: 1030°C, gas quenching with 6bar



Chemical composition

▪ Patent pending

Heat treatment

Forging Temperature (°C)	Heat treatment (°C)			Hardness		Transformation Temp. (°C)	
	Annealing	Quenching	Tempering	Annealing	Quenching Tempering	Ac	Ms
900~1200	820~870 Slow cooling	1000~1050 Air cooling	550~650 Air cooling	≤ 229HB	35~53HRC	815~875	300(Austenitized at 1030°C)

IMPORTANT NOTE

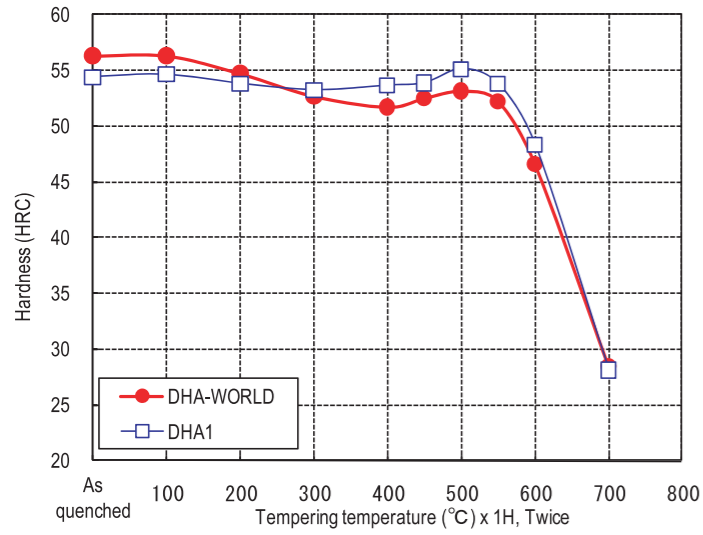
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Properties

Material size : 200mm H × 800mm W

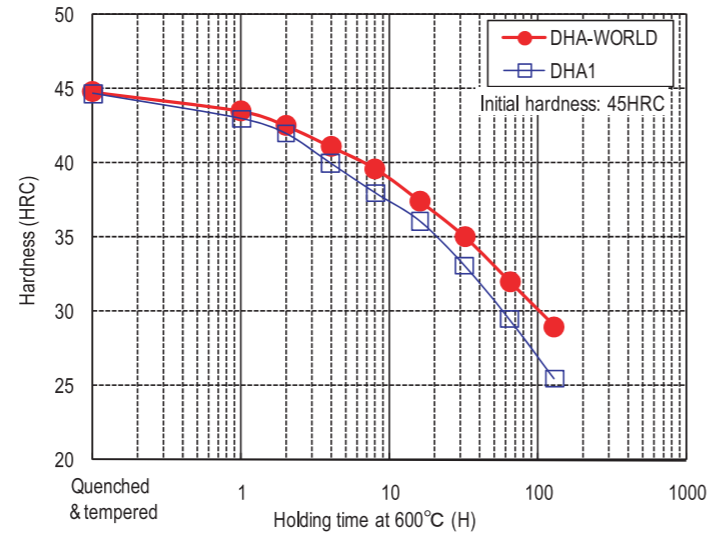
Tempering hardness

Specimen : 10mm x 15mm x 20mm
Quenching : 1030°C x 15min, AC



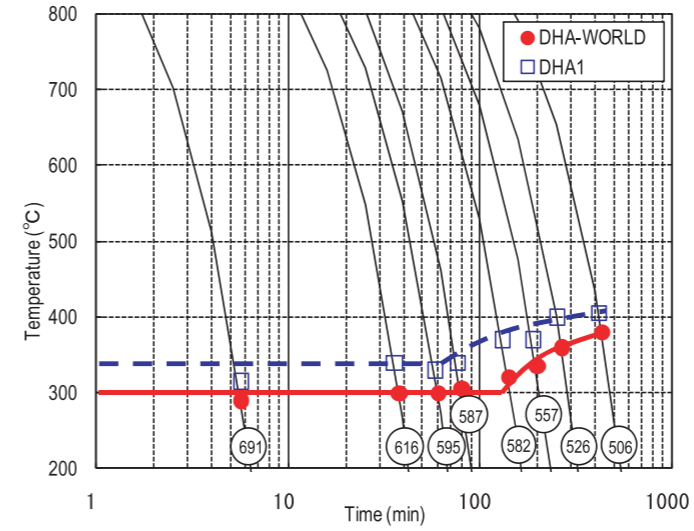
Softening resistance

Specimen : 200mm H x 600mm W x 300mm L(Center)
Quenching : 1030°C, Gas cooling (6-9bar)

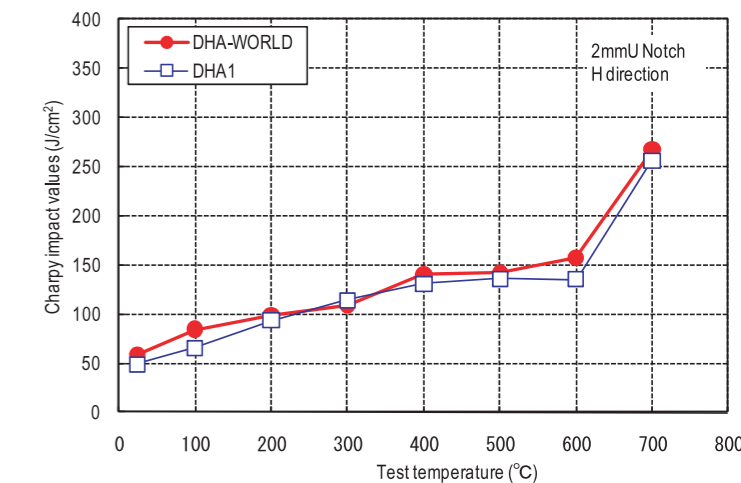
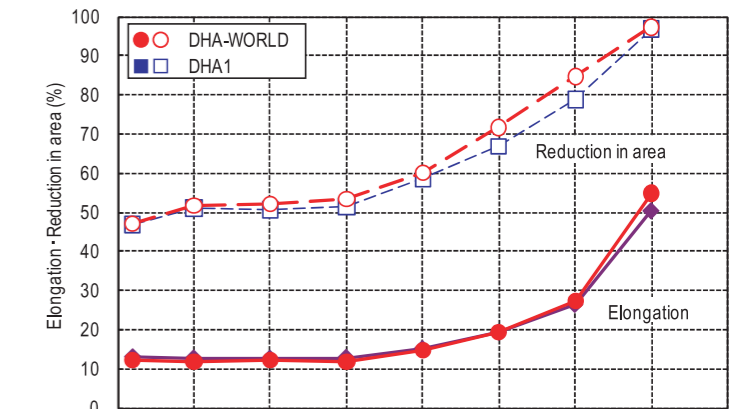
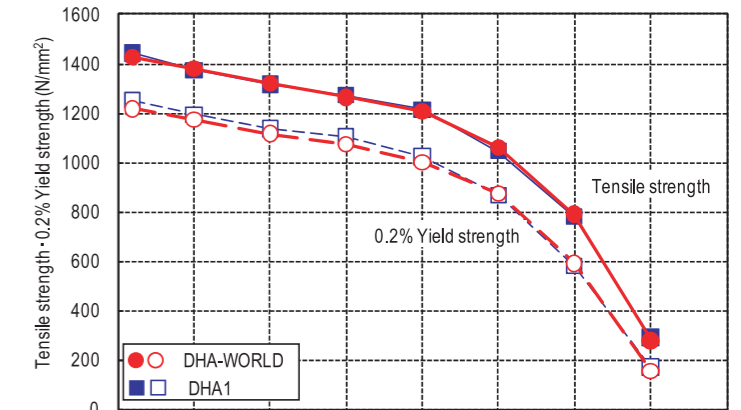
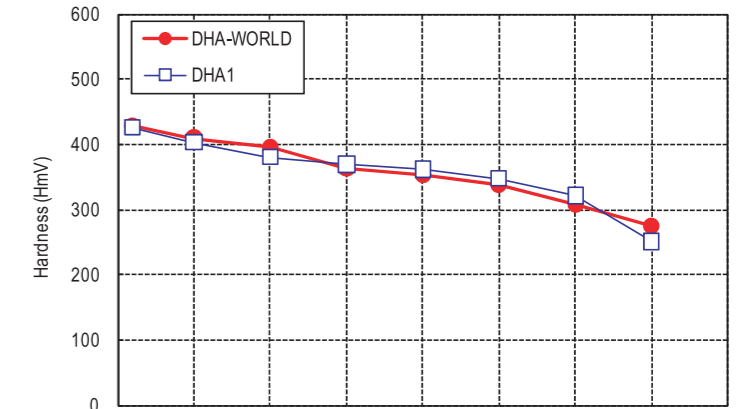


CCT curves

(Austenitizing temp. 1030°C x 15min)

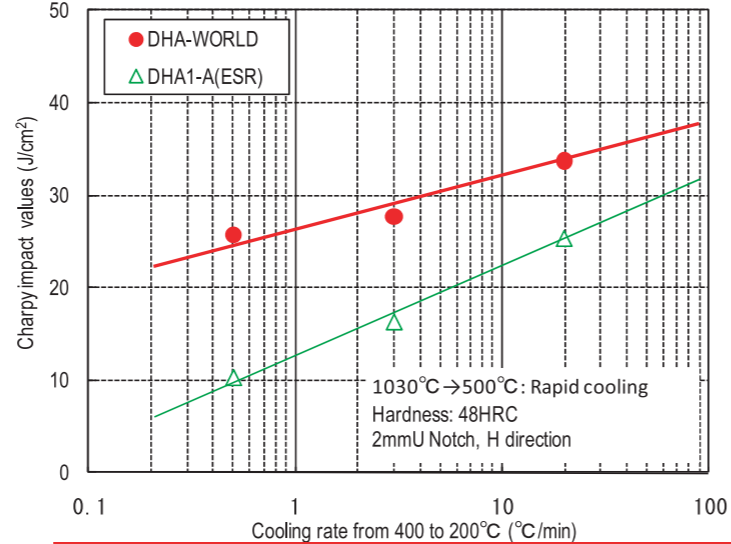
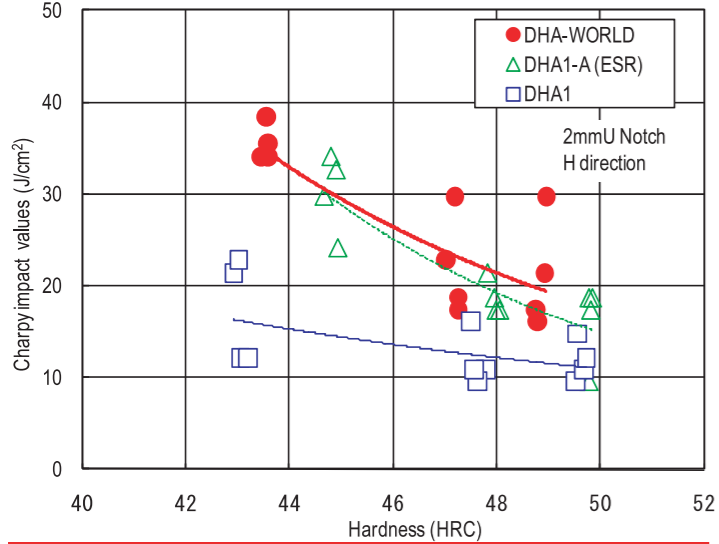


Mechanical properties



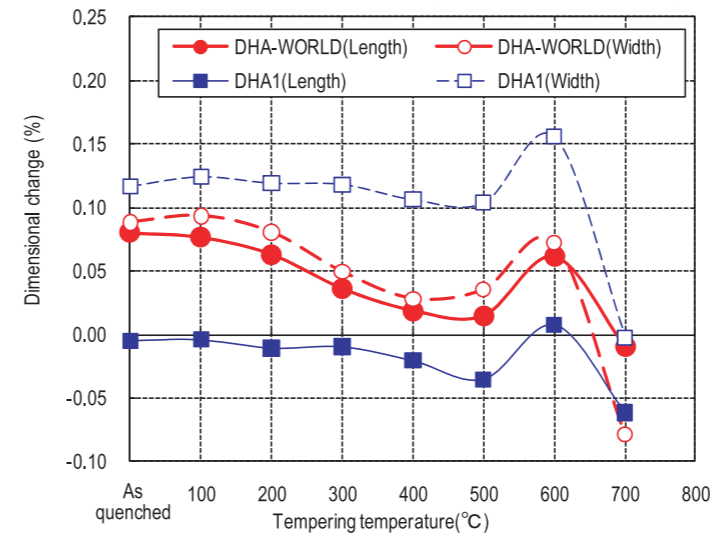
Toughness

Specimen: 200mm H x 600mm W x 300mm L(Center)
Quenching: 1030°C, Gas cooling (6-9bar)



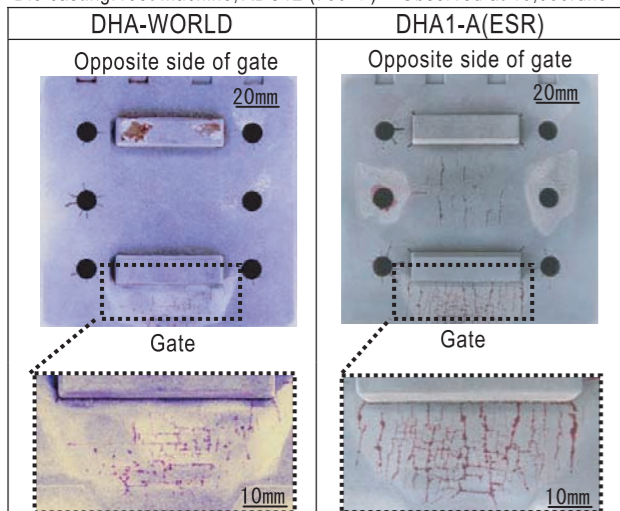
Dimensional change

Specimen: φ 30 x 45mm
Quenching: 1030°C x 1H, Gas cooling



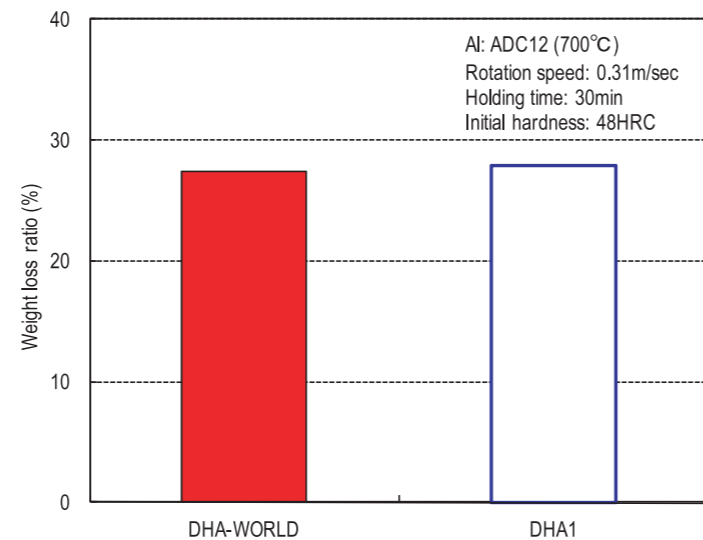
Heat checking resistance

Mold size: 62mm x 200mm x 205mm (42HRC)
Quenching: 1030°C, Gas cooling (6bar)
Die casting: 135t machine, ADC12 (700°C) Observed at 10,000runs



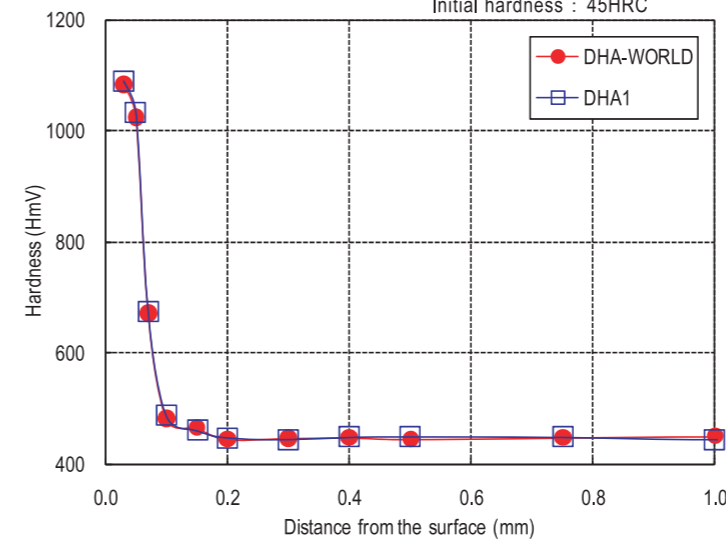
Al erosion resistance

Specimen: φ 10 x 30mm
Quenching: 1030°C, Gas cooling



Nitriding characteristics

Nitriding : PS treatment
Initial hardness : 45HRC



Quenching : 1030°C, AC, Initial hardness : 45HRC
Dimension : Tensile specimen : φ 8 × 90mm
Charpy specimen : 10mm × 55mm