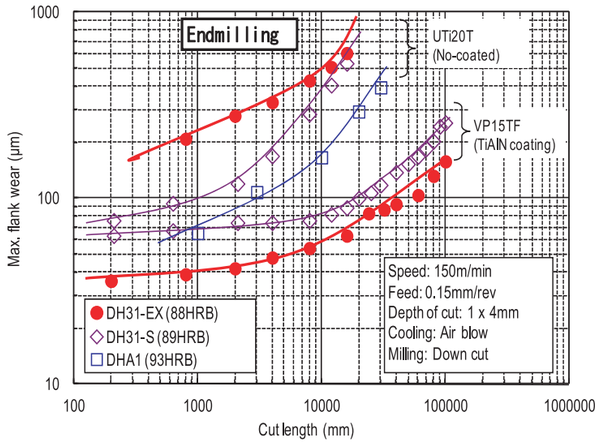
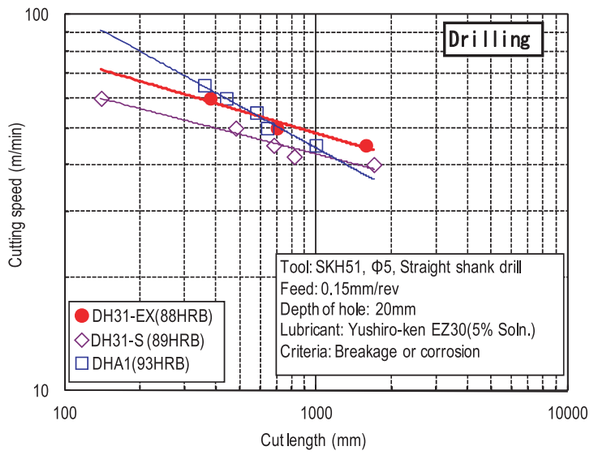
Machinability





Main applications

Applications	Hardness(HRC)
Al, Zn, Mg Diecasting molds	41～48
Hot extrusion dies	43～50
Hot shear blades	35～45
Hot forging dies	42～50

Physical properties

◆ Thermal expansion rate

Temp.	20～100℃	20～200℃	20～300℃	20～400℃	20～500℃	20～600℃	20～700℃
x10^{-6}/K	11.6	11.8	12.0	12.2	12.5	12.8	12.9

◆ Thermal conductivity

Temp.	100℃	200℃	300℃	400℃	500℃	600℃	700℃
W/m·K	26.7	27.9	29.0	29.4	29.7	30.0	29.5

◆ Specific heat

Temp.	100℃	200℃	300℃	400℃	500℃	600℃	700℃
J/kg·K [cal/g·℃]	487 [0.116]	527 [0.126]	572 [0.137]	626 [0.150]	703 [0.168]	802 [0.192]	985 [0.235]

※Heat treatment of specimens

Quenching : 1030℃, AC, Tempering : 610℃, AC, Twice

DAIDO STEEL

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www.daido.co.jp/

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SC1302 15.03.1,0 (DLS)

Daido's Hot Work Die Steel Series

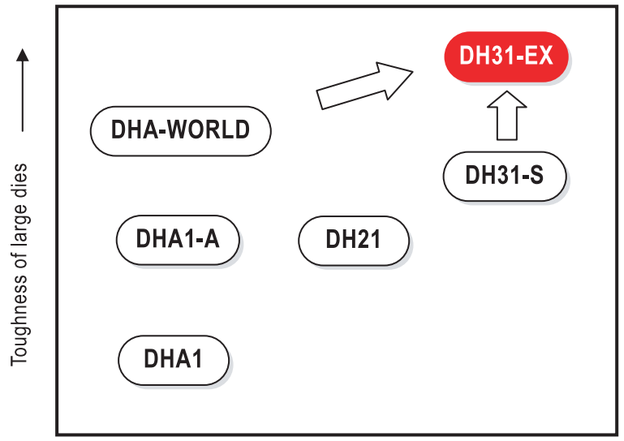
DH31-EX

High Performance Hot Work Die Steel

Features

High toughness throughout large Die Casting Dies and Forging Dies contributes to prevent from the risk of gross cracking in service

◆High hardenability・・・High toughness even in large sized Dies
◆High hot strength ・・・Great heat checking and wear resistance
◆Double melted ・・・Homogeneous and almost isotropic properties throughout Dies



Chemical composition

▪ Patent pending

Heat treating

Forging Temperature (℃)	Heat treatment(℃)			Hardness		Transformation Temp.(℃)	
	Annealing	Quenching	Tempering	Annealing	Quenching Tempering	Ac	Ms
900～1200	820～870 Slow cooling	1000～1050 Air cooling	550～650 Air cooling	≦235HB	35～53HRC	805～885	300 (Austenitized at 1030℃)

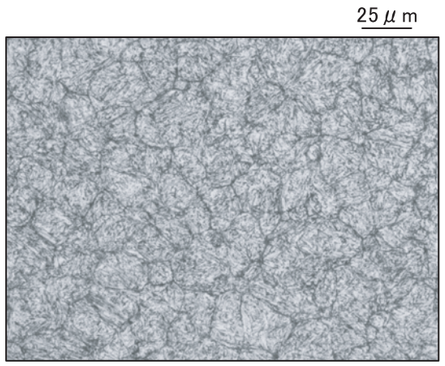
DAIDO STEEL

Properties

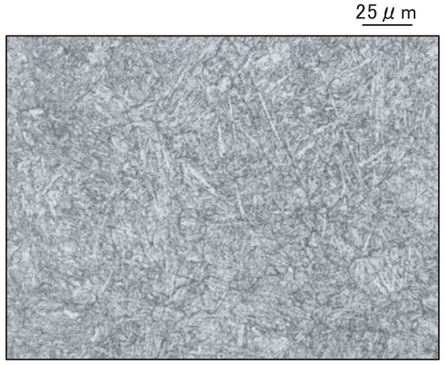
Material size : 200mm H × 800mm W

Microstructure (Quenched and Tempered)

Specimen : 200mmH × 600mmW × 300mmL (Center)
Quenching : 1030℃, Gas quenching with 6-9 bar in vacuum furnace



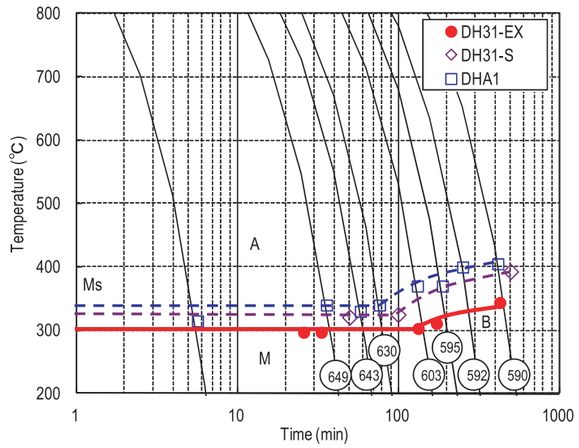
DH31−EX



DHA1

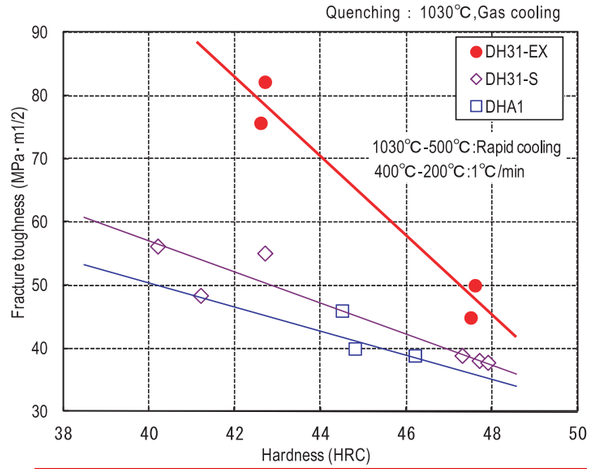
CCT curves

Austenitizing : 1030℃ × 15min



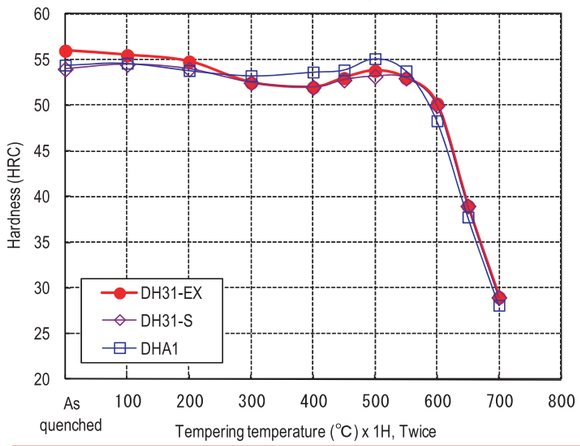
Fracture toughness

Specimen : 12.5mm × 61mm × 64mm
Quenching : 1030℃,Gas cooling



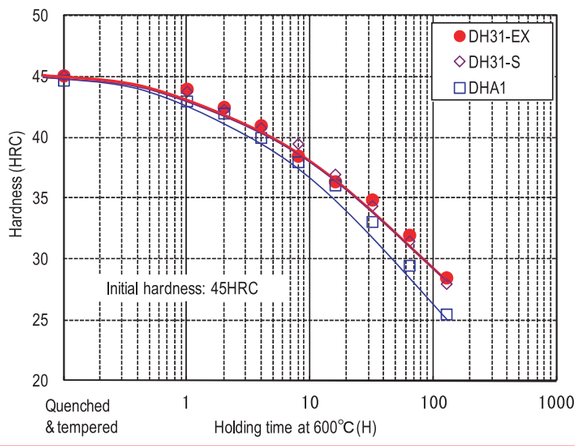
Tempering hardness

Specimen : 10mm × 15mm × 20mm
Quenching : 1030℃ × 15min, AC



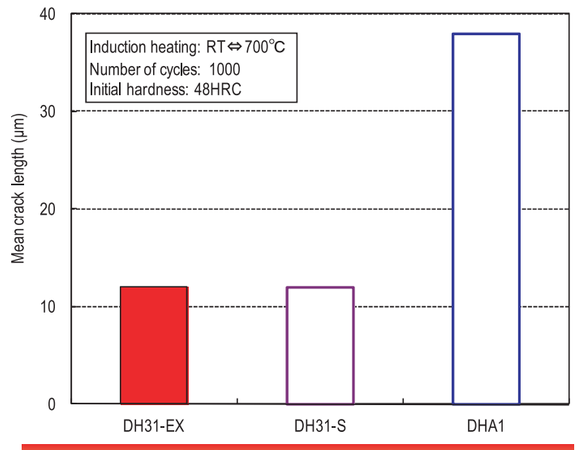
Softening resistance

Specimen : 200mmH × 600mmW × 300mmL(Center)
Quenching : 1030℃,Gas quenching with 6-9bar



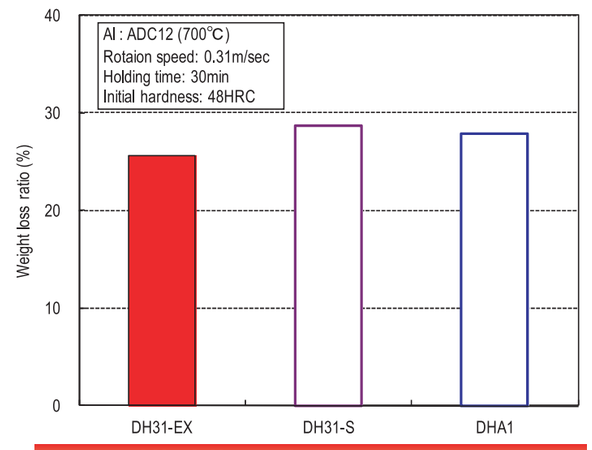
Heat checking resistance

Specimen : φ15mm, × 5mm
Quenching : 1030℃, Gas cooling



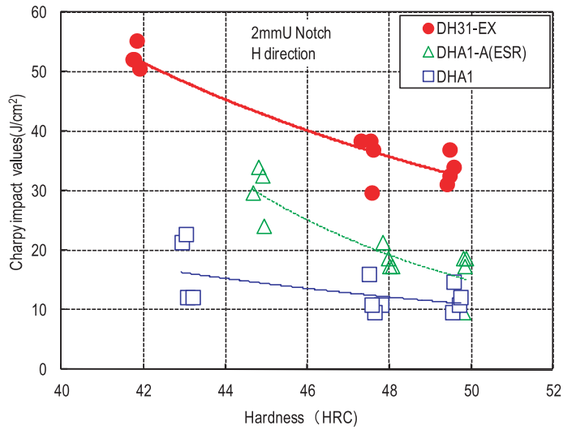
Al erosion resistance

Specimen : φ10 × 30mm
Quenching : 1030℃, Gas cooling

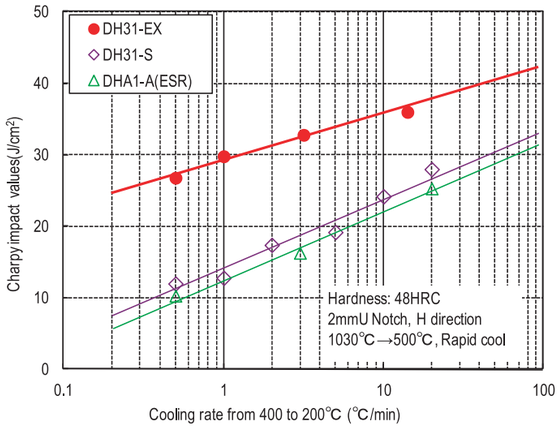


Toughness

Specimen : 200mmH × 600mmW × 300mmL (center)
Quenching : 1030℃, Gas quenching with 6-9bar

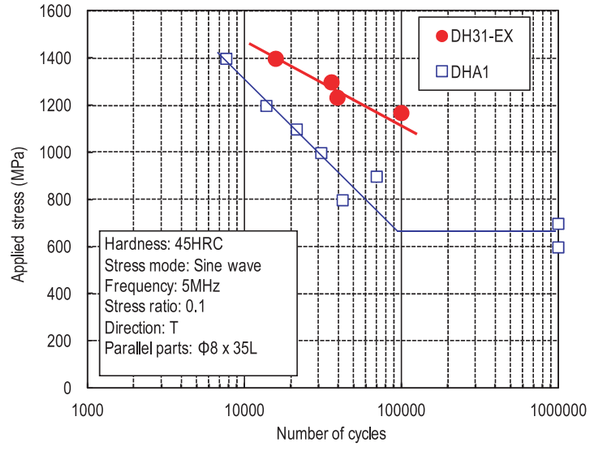


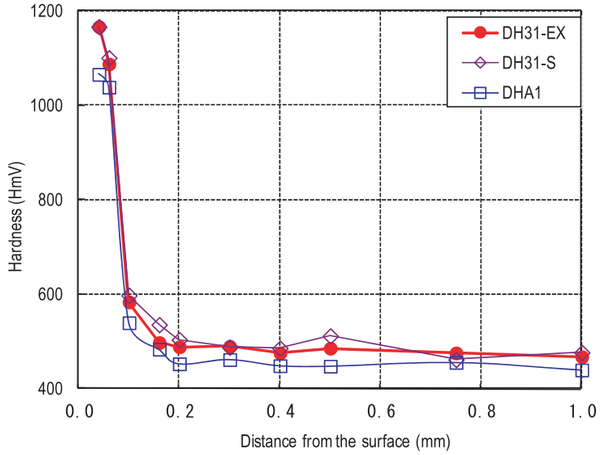
Specimen : 10mmSquare × 55mm
Quenching : 1030℃ × 1H, Gas cooling



Fatigue properties

Specimen : φ26 × 180mm
Quenching : 1030℃, Gas cooling



Nitriding characteristics

Nitriding : PS treatment
Initial hardness : 45HRC