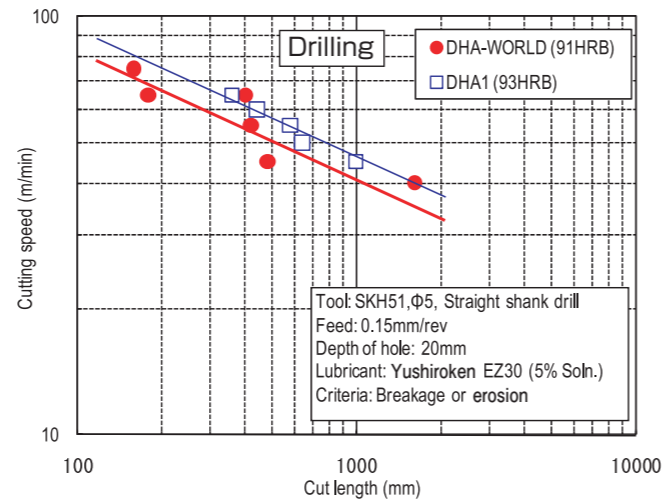
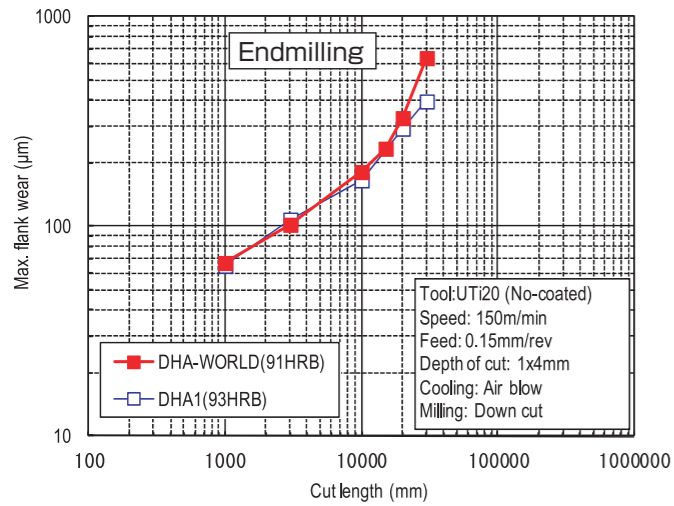


## Machinability



## Main applications

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

## Physical properties

Quenching : 1030°C × 1h, Air cooling  
Tempering : 610°C × 1h, Twice  
Hardness : 45HRC

### ◆ Thermal expansion rate

Temp.	20~100°C	20~200°C	20~300°C	20~400°C	20~500°C	20~600°C
× 10 <sup>-6</sup> /K	11.2	11.6	11.9	12.3	12.8	13.1

### ◆ Thermal conductivity

Temp.	25°C	100°C	200°C	300°C	400°C	500°C	600°C
W/m·K	27.0	28.4	29.1	30.0	30.3	30.1	29.5

\*Accuracy of repeated measurements is about ± 10%.

### ◆ Specific heat

Temp.	25°C	100°C	200°C	300°C	400°C	500°C	600°C
J/kg·K	465	510	538	562	628	688	789

## Daido's Hot Work Die Steel Series

# DHA-WORLD™

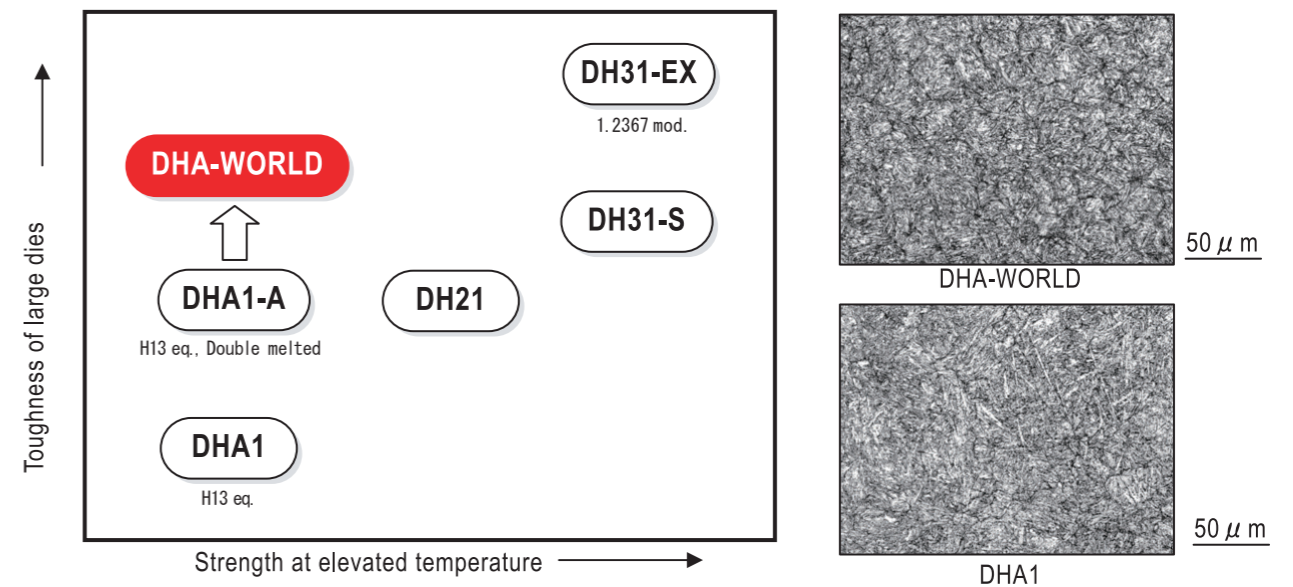
## High hardenability & toughness Hot Work Die Steel

### Features

General use hot work die steel with high hardenability and excellent toughness available for large die casting dies as improved substitute for DHA1 (H13 eq.)

- ◆ High hardenability : High toughness even in large sized dies due to optimum alloy designing
- ◆ Single melt steel : Excellent quality similar to 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



## Heat treatment

Re-forging Temperature (°C)	Heat treatment (°C)			Hardness		Transformation Temp. (°C)	
	Annealing	Quenching	Tempering	Annealed	Quenched & Tempered	Ac	Ms
900~1200	820~870 Slow cooling	1000~1050 Air cooling	550~650 Air cooling	≤ 229HBW	35~53HRC	815~875	300(Austenitized at 1030°C)



**Tokyo Head Office**  
(Tool Steel Div. Tool Steel Marketing & Sales Dept. Overseas Sect.)

Daido Shinagawa Building, 6-35, 1-Chome, Konan, Minato-ku, Tokyo, Japan  
Phone: +81-3-5495-1270 Fax: +81-3-5495-6739

**Bangkok Office**

Unit2-1, 22nd Fl., Silom Complex Bldg., 191, Silom Road, Silom, Bangrak, Bangkok 10500, Thailand  
Phone: +66-2-231-3214 Fax: +66-2-231-3216

**Daido Steel Group Europe GmbH**

Insterburger Strasse 16, 60487 Frankfurt am Main, Germany  
Phone: +49-69-29802867-0 Fax: +49-69-29802867-40

**Daido Steel (America) Inc.**

1051 Perimeter Drive, Suite 1175, Schaumburg, Illinois 60173, U.S.A.  
Phone: +1-847-517-7950 Fax: +1-847-517-7951

**Daido Steel (Shanghai) Co., Ltd**

Room 1402, Ruijin Building, 205 Mao Ming Nan Road, Shanghai, 200020, China  
Phone: +86-21-5466-2020 Fax: +86-21-5466-0279

**Daido Steel (Shanghai) Co., Ltd  
Guangzhou Subsidiary Company**

Room 2601, No.8, Linhezhoug Road, Tianhe District, Guangzhou, 510610, China  
Phone: +86-20-3877-1632 Fax: +86-20-8550-1126

[www.daido.co.jp](http://www.daido.co.jp)

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### Document Disclaimer

The product characteristics included in this brochure are the representative values based on the result of our measurements, and do not guarantee the performance in use of the products. Please inquire the latest information to our department in charge as the information of this brochure is updated without previous notice as needed.

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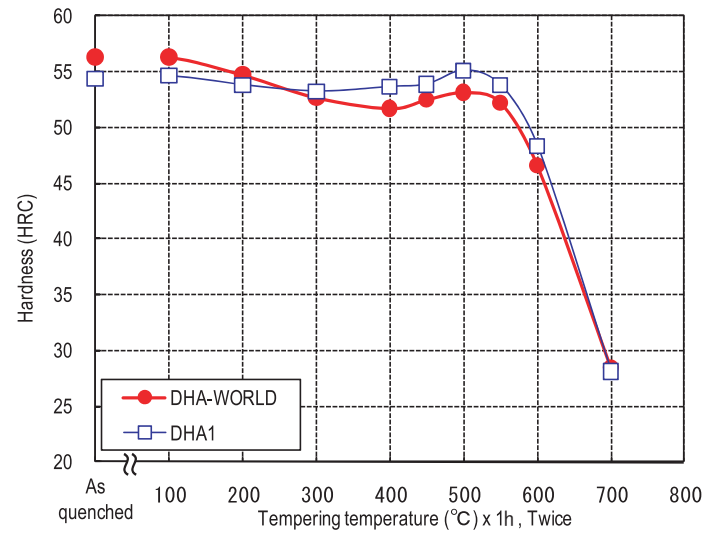


# Properties

Material size : 200mm H × 800mm W

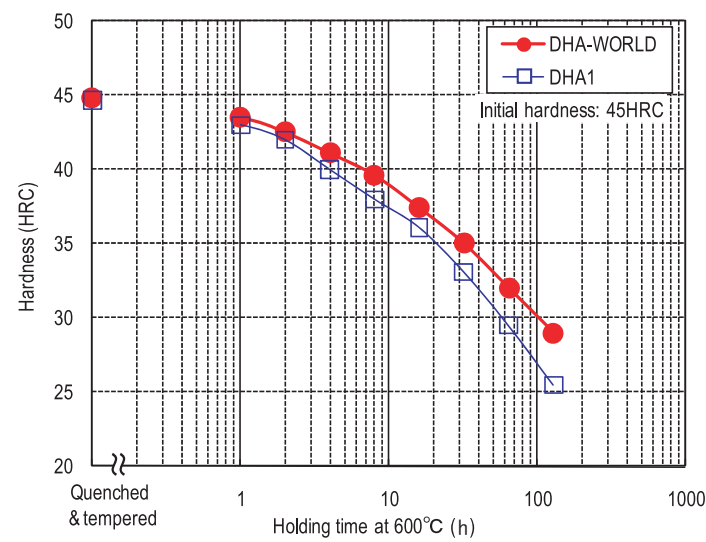
## Tempered hardness

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



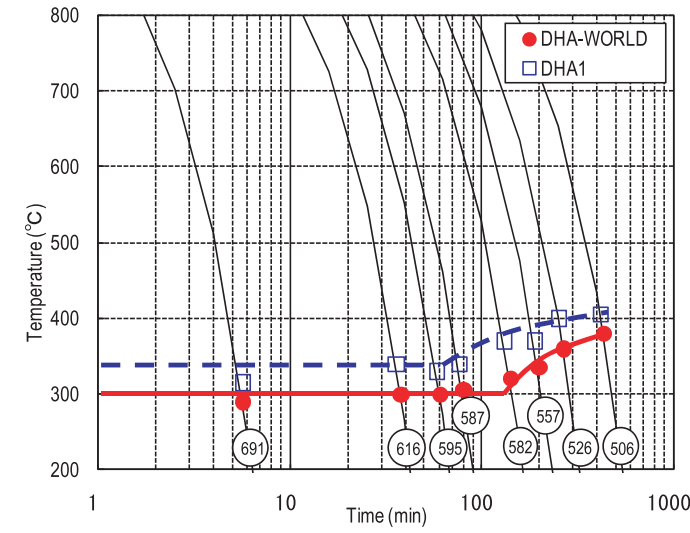
## Softening resistance

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

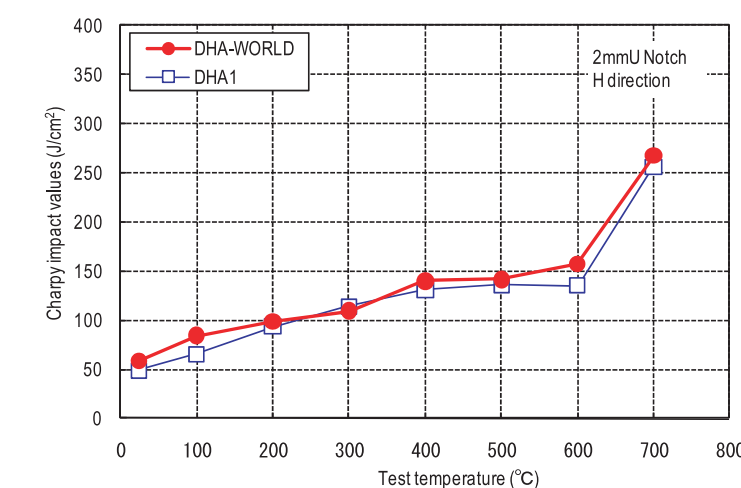
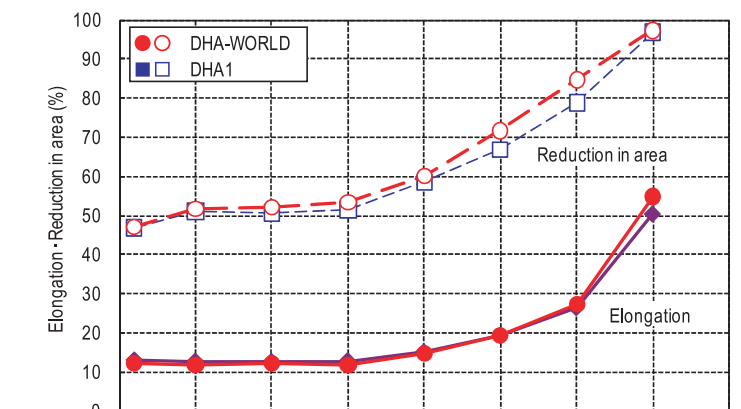
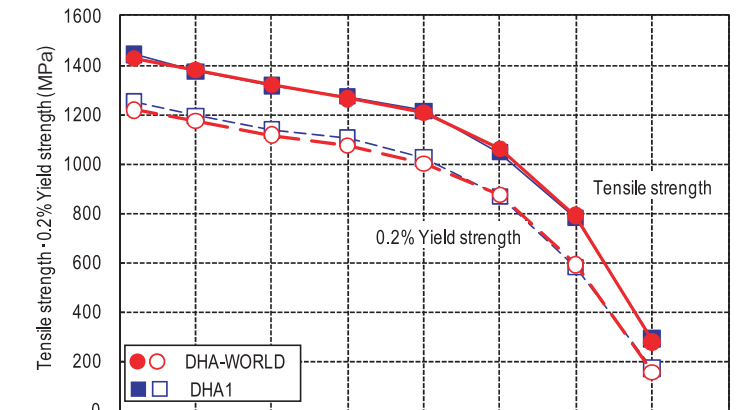
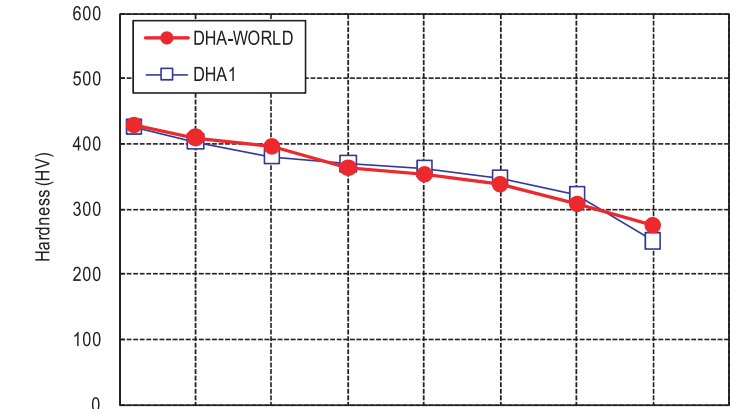


## CCT diagram

(Austenitizing temp. 1030°C x 15min)

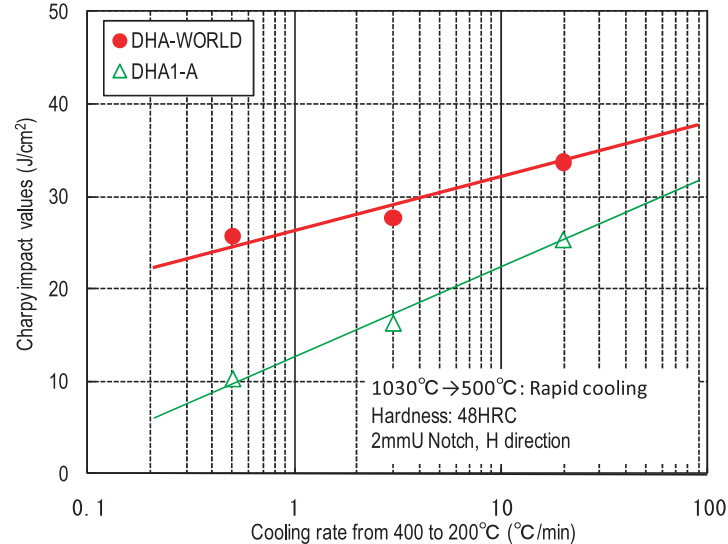
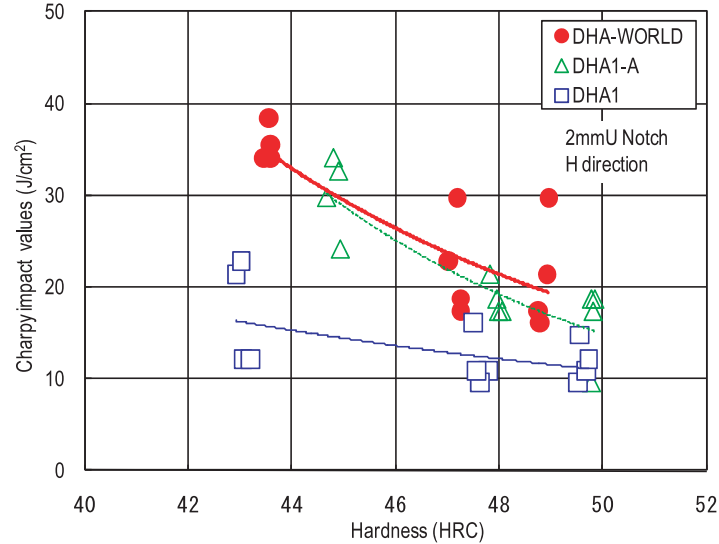


## Mechanical properties



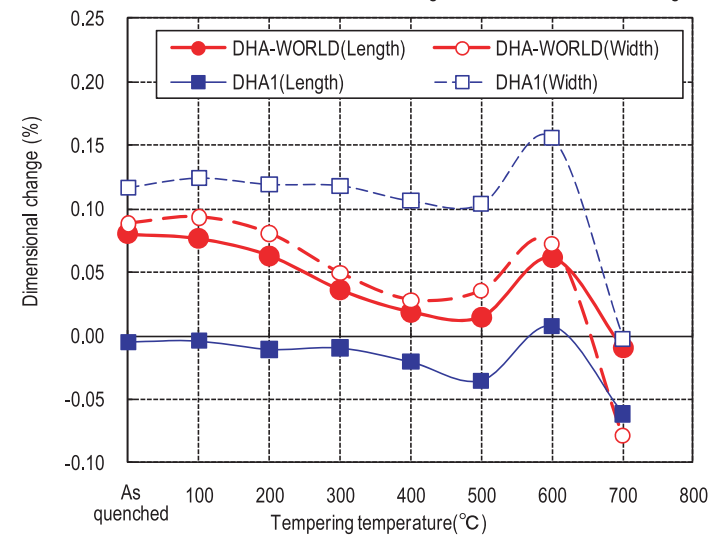
## Toughness

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



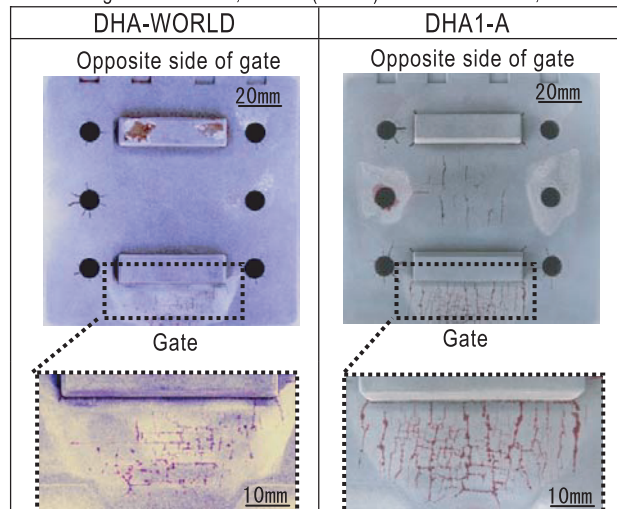
## Dimensional change

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



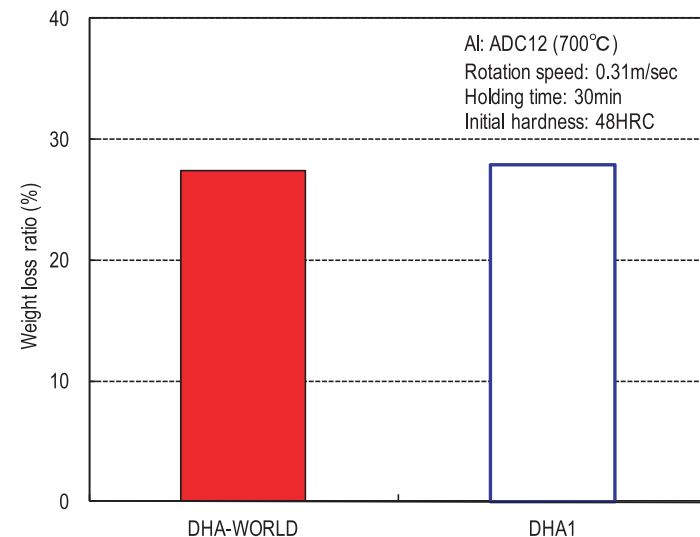
## Heat checking resistance

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



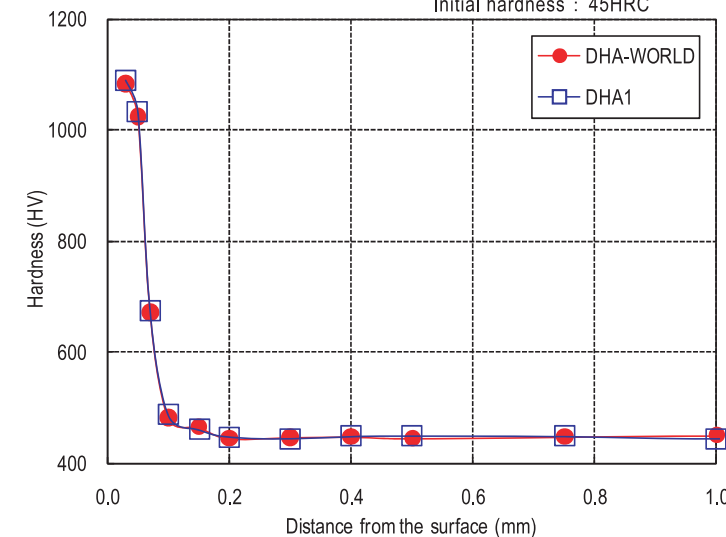
## Al erosion resistance

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 : 10 × 10 × 55mm