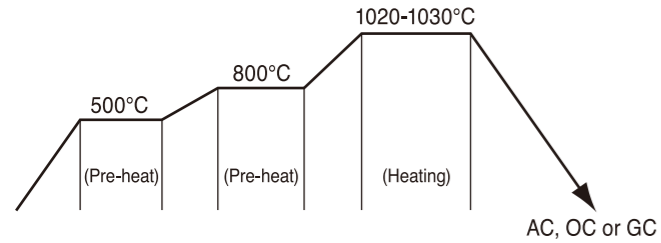


## Heat Treatment

### ◆ Hardening

- PD613 has good hardenability, thus cooling after hardening can be either Air-cool, oil-cool or gas-cooling

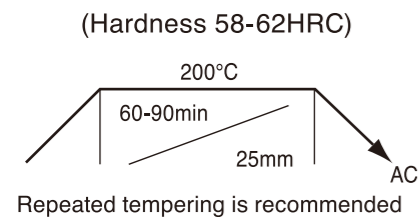


### Standard heating time

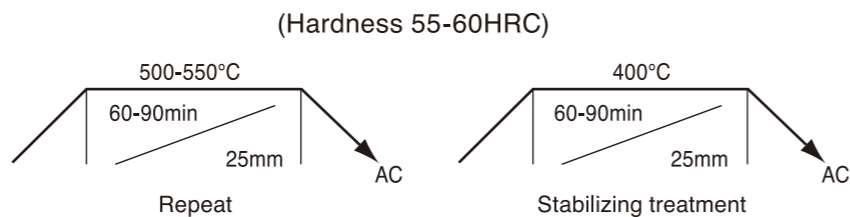
Heating method	Standard heating time	
	Thickness (mm)	Hold time (min/25mm)
Vacuum furnace Electric furnace Gas atmosphere furnace	<100 >100	20 - 30 10 - 20
Salt bath	Dia./Thickness (mm)	Immersion time (min)
	5	5 - 8
	10	8 - 10
	20	10 - 15
	30	15 - 20
	50 100	20 - 25 30 - 40

### ◆ Tempering

- When wear resistance and durability as well as secular change are important



- When EDMs are applied and secular change is important



## Physical Properties

Quenching: 1030°Cx1h, Air-cooling  
Tempering: 500°Cx1h, Twice  
Hardness: 60HRC

### ◆ 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	10.9	11.5	12.2	12.8	13.3	13.5

### ◆ Thermal conductivity

Temp.	25°C	100°C	200°C	300°C	400°C	500°C	600°C
W/m·K	19.0	20.8	20.7	22.0	23.4	23.7	25.8

\*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	420	447	450	491	549	593	678

### ◆ Young's modulus / Rigidity modulus / Poisson's ratio (25°C)

Young's modulus	Rigidity modulus	Poisson's ratio
209GPa	80GPa	0.31

## Daido's Plastic Mold Steel Series

# PD613™



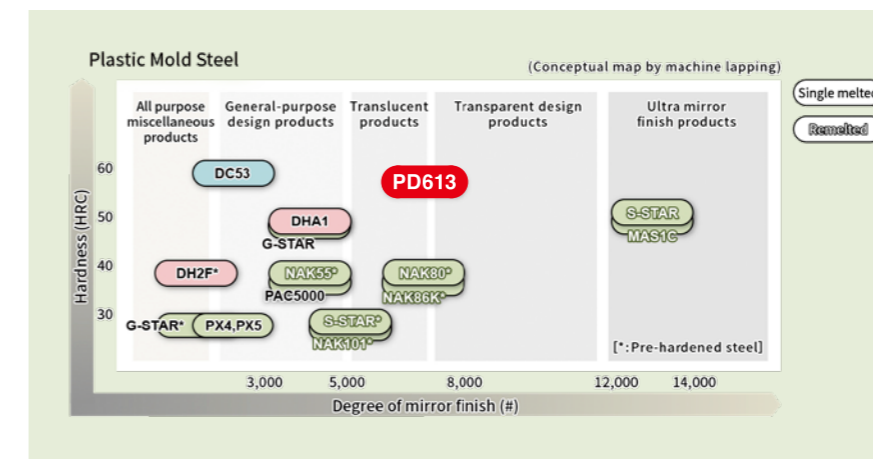
## High Hardness, Super Mirror Polishable Plastic Mold Steel

### Features

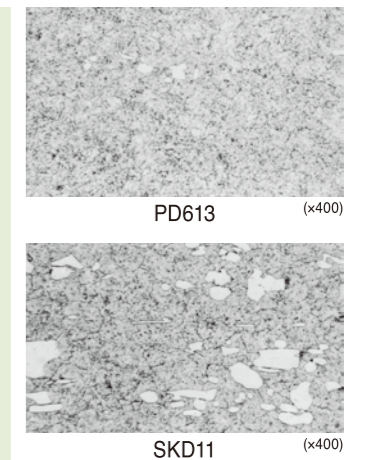
PD613 is remelted steel with high reliable quality.

- ◆ Excellent wear resistance due to high hardness of 56-61HRC
- ◆ High mirror polishability
- ◆ Small dimensional change after heat treatment
- ◆ Excellent toughness
- ◆ Excellent nitriding characteristics
- ◆ Excellent texturing characteristics

### Conceptual diagram



### Microstructure (as quenched & tempered)



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PD613 is a Registered trademark or Trademark of Daido Steel Co., Ltd.

■ 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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No. SC2303 24.07.0.0 (ZZZ)

## Main Application

- High hardness, super mirror polished plastic molds
  - Cold press dies
- Precision mold for engineering plastics, IC substrate      Dies requiring high toughness and high fatigue strength

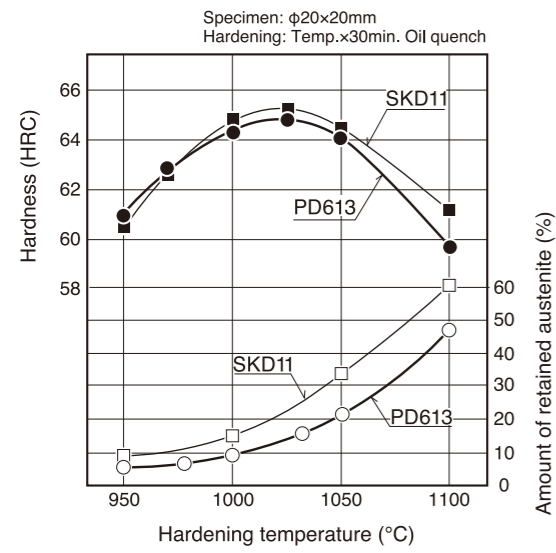
## Chemical Composition

Daido Brand	Supplied Condition (Hardness)	Chemical Composition (%)						
		C	Si	Mn	Ni	Cr	Mo	V
PD613	<248HBW	JIS SKD11 mod. (AISI D2 mod.)						



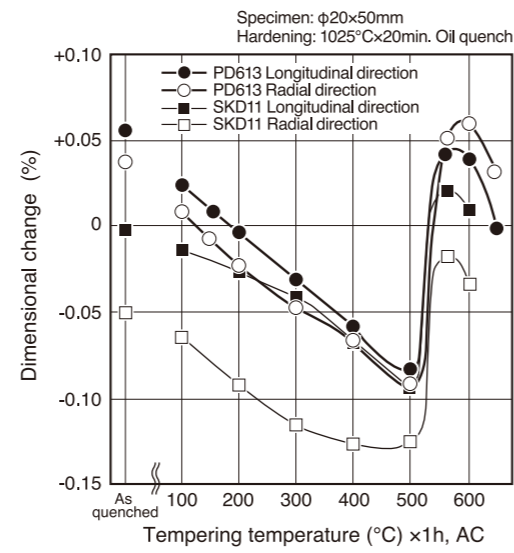
# Properties

## Quenched Hardness

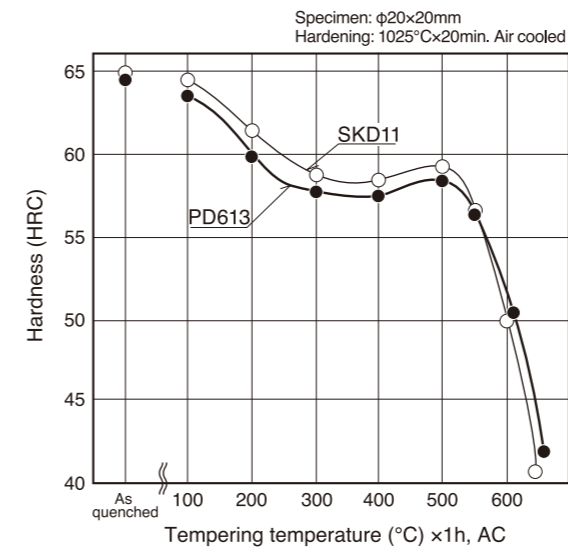


## Dimensional Change

◆ Dimensional change and its directional dependence is smaller than SKD11.

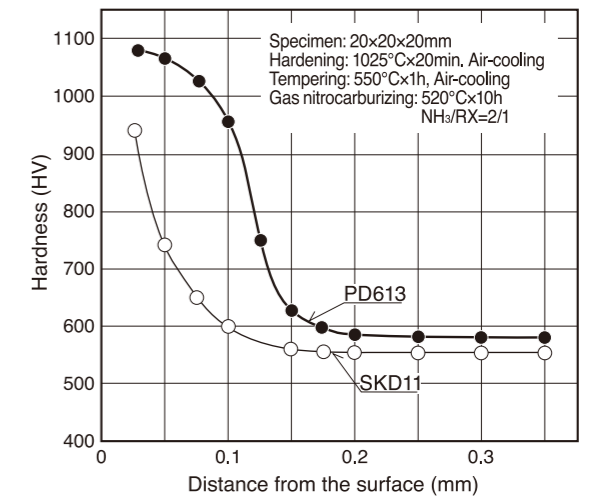


## Tempered Hardness

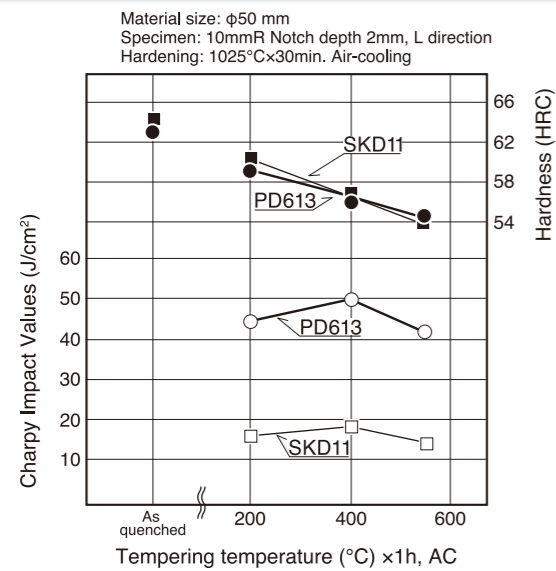


## Nitriding Characteristics

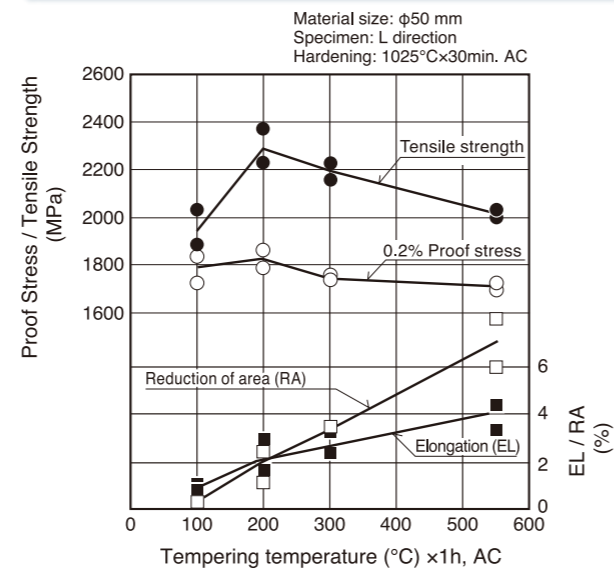
◆ Surface hardness is higher and case depth is deeper than SKD11.



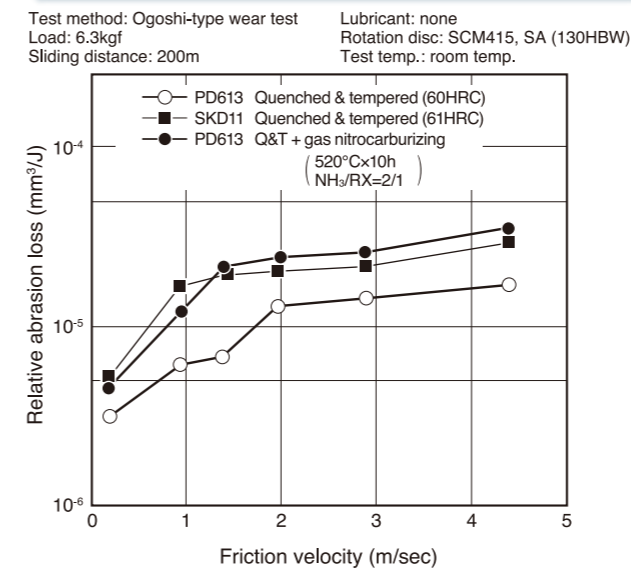
## Toughness



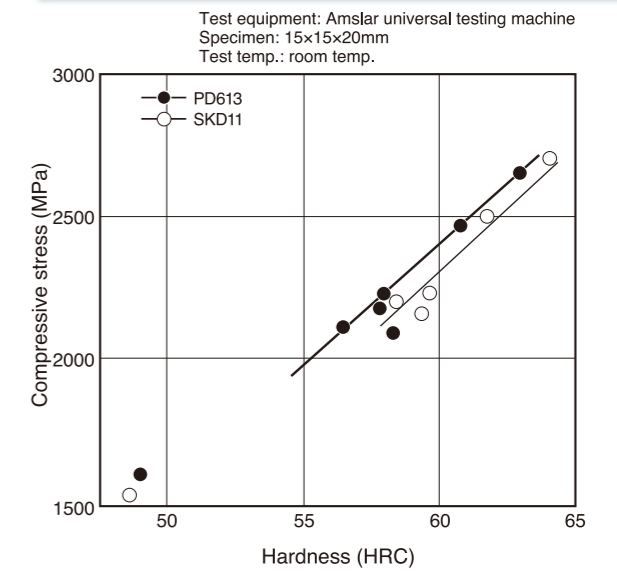
## Mechanical Characteristics



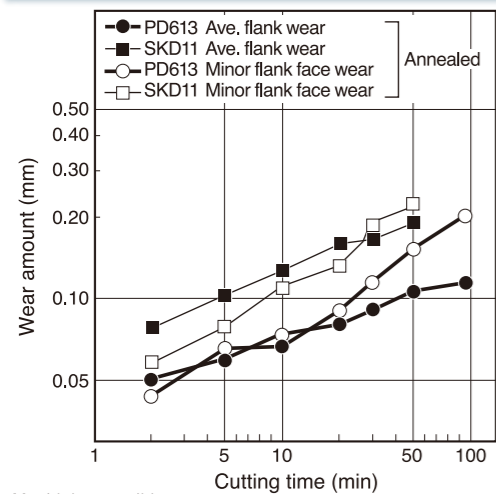
## Wear Resistance



## Compressive Characteristics



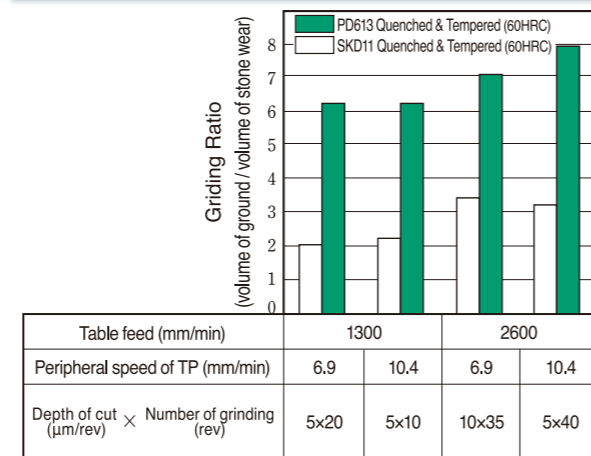
## Machinability (Turning)



Machining condition

Tool: P20 (STi20)    Cutting speed: 80m/min    Feed: 0.2mm/rev  
Tool shape: 0-5-6.6-15-15-0.4R    Depth of cut: 1.5mm    Lubricant: none (dry)

## Grindability (Cylindrical)

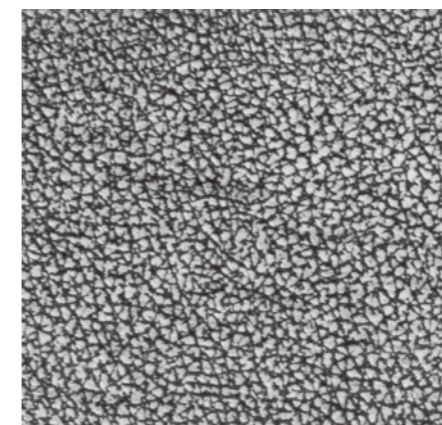


Grinding condition

Grind wheel: WA120 ( $\phi 405 \times 30$ t)    Lubricant: Water-soluble grinding oil  
Wheel peripheral speed: 2700mm/min (2120rpm)    Specimen size:  $\phi 22 \times 200$ mm

## Texturability

◆ Texturability is excellent without uneven texture.



Leather Texture (x1.5)  
As etched



Leather Texture (x1.5)  
Sand blasted