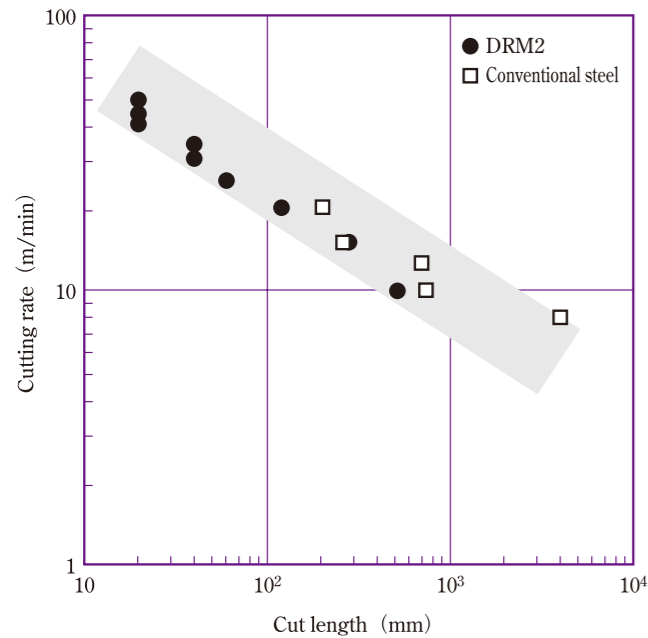


Drilling machinability



- Specimen : As annealed
- Tool : NACHI SD ϕ 5mm (non-coated)
- Test condition : Feed : 0.15mm/rev · Hole depth : 20mm
· Cutting fluid : none

Physical Properties

◆ Coefficient of expansion

	20~100°C	20~200°C	20~300°C	20~400°C	20~500°C	20~600°C	20~700°C	20~800°C
$\times 10^6 / K$	11.0	11.4	11.8	12.1	12.3	12.6	12.4	12.9

◆ Thermal conductivity

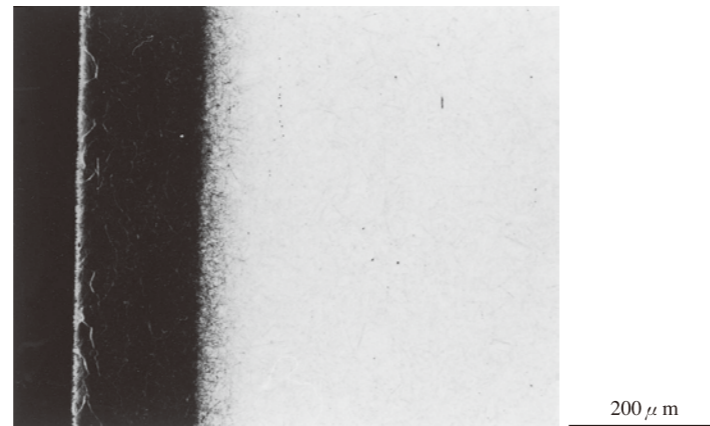
	25°C	200°C	300°C	400°C	500°C	600°C	700°C
W/m·K	23.2	26.9	27.9	29.0	28.8	29.2	29.6
[cal/cm·sec·°C]	[0.055]	[0.064]	[0.067]	[0.069]	[0.069]	[0.070]	[0.071]

◆ Specific heat

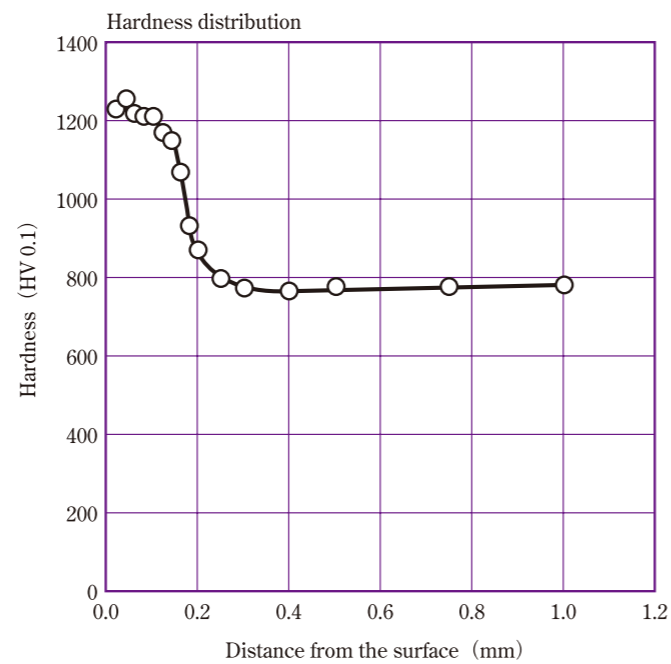
	25°C	200°C	300°C	400°C	500°C	600°C	700°C
J/kg·K	458	518	555	598	659	756	910
[cal/g·°C]	[0.109]	[0.124]	[0.133]	[0.143]	[0.158]	[0.181]	[0.217]

◆ Young's modulus 210 Gpa
· Specimen condition : H : 1120°C OQ T : 560°C AC twice

Nitriding



An example of micro structure nitrided by PS process
● PS process
· Daido Amistar's originally developed process featured by high scuffing and erosion resistance



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

Daido Steel (America) Inc. 1111 Plaza Drive, Suit 740, Schaumburg, Illinois 60173 U.S.A.
Phone: +1-847-517-7950 Fax: +1-847-517-7951

Bangkok Office Unit2-1, 22nd Fl., Silom Complex Bldg., 191, Silom Road, Silom, Bangrak, Bangkok 10500, Thailand
Phone: +66-02-231-3214 Fax: +66-2-231-3216

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

www.daido.co.jp

■ 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.

Copyright © 2018 Daido Steel Co., Ltd. All rights reserved.

SC1804
18.02.0.5(DLS)

Dream Series Daido's DRM2

Warm and Cold Forging Die Steel

High hard and tough matrix type high speed tool steel

Features

Matrix type high speed tool steel available for warm and cold forging tools where critical performance is required.
DRM2 prolongs service life due to its higher hardness and toughness than those of conventional grades.

- ① Applicable with the maximum hardness 62HRC
- ② Fine microstructure contributes to high toughness and fatigue strength
- ③ Greater hardenability results in high performance even in large dies and gas quenching in vacuum furnace.
- ④ Double melting realizes clean and homogeneous steel with less non-metallic inclusions

Applications

- Warm forging dies and punches
- Cold forging dies and punches

Heating treatment

Re-forging Temperature	Heat treatment conditions (°C)			Hardness	
	Annealing	Quenching	Tempering	Annealed	Hardening / Tempering
Requested to inquire	800~880 Slow cooling	1,050~1,120 OQ, GC, Salt bath	550~620 AC, \geq twice	\leq 235HBW	58~62HRC

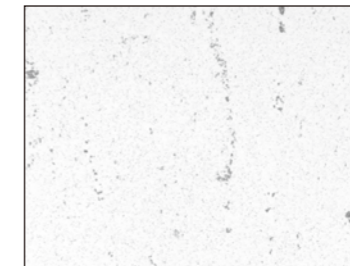
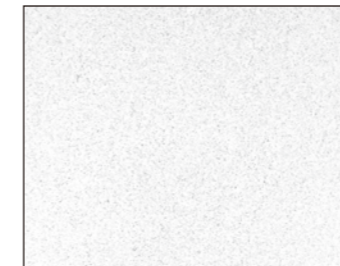
OQ : Oil quenching, GC : Gas quenching in vacuum furnace, AC : Air cooling

Microstructure (As annealed)

- Fine and uniform microstructure with less coarse carbides

DRM2 (Middle of 100 dia. bar)

Conventional steel (Daido)

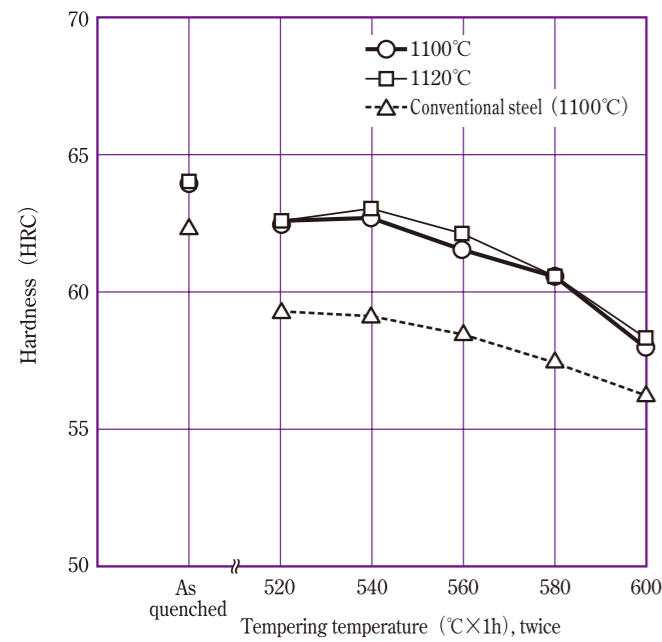


(Cr₂O₃ Electrically etching)



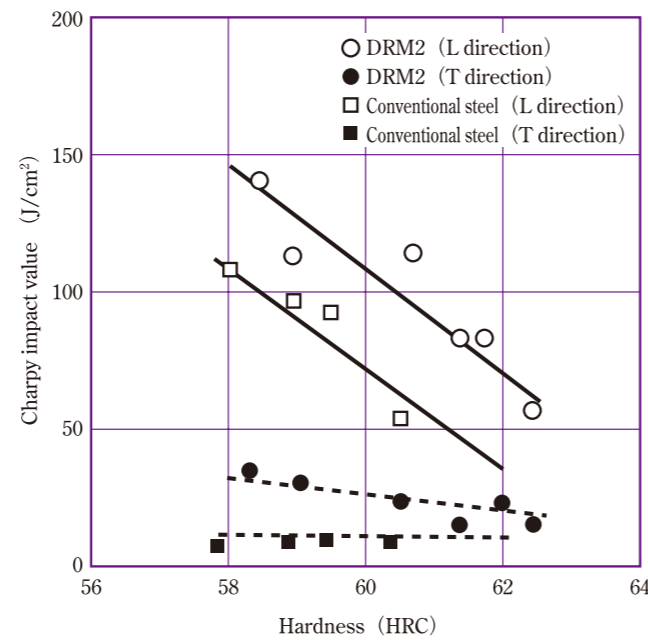
Characteristics

Tempering hardness



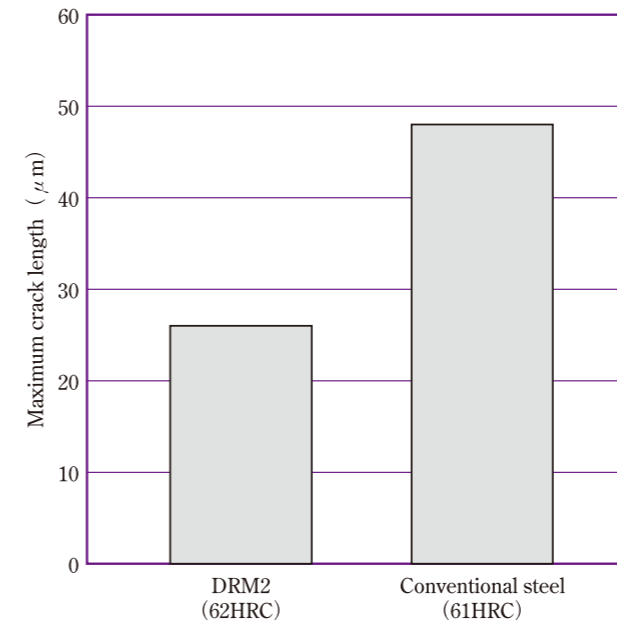
- Specimen : 15mm square
- Hardening : Oil quenching
- Tempering : Air cooling

Toughness : Charpy impact property



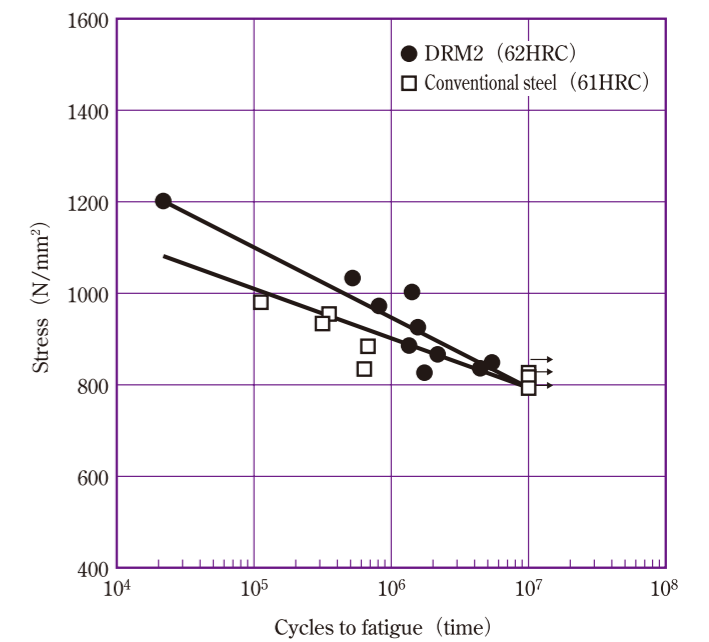
- Sampling : 100mm dia. Bar center
- Specimen : 10R notched
- Heat treatment : DRM2..... H : 1120°C OQ
T : 540~600°C AC, twice
- Heat treatment : Conventional Steel... H : 1120°C OQ
T : 540~600°C AC, twice

Heat checking resistance



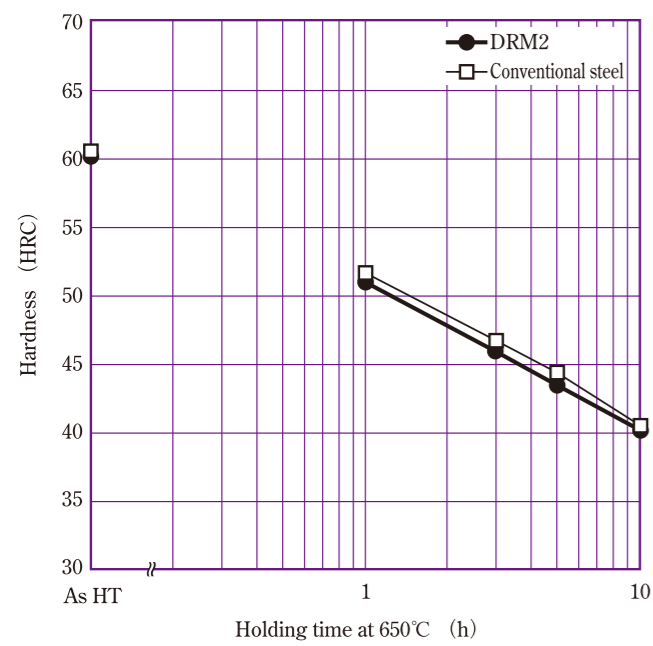
- Specimen : 15mm dia. 10mm thick
- Heat treatment : DRM2..... H : 1120°C OQ
T : 560°C AC, twice
- Heat treatment : Conventional Steel... H : 1140°C OQ
T : 560°C AC, twice
- Test method : Induction heating 20←→700°C (1000 times)

Fatigue strength



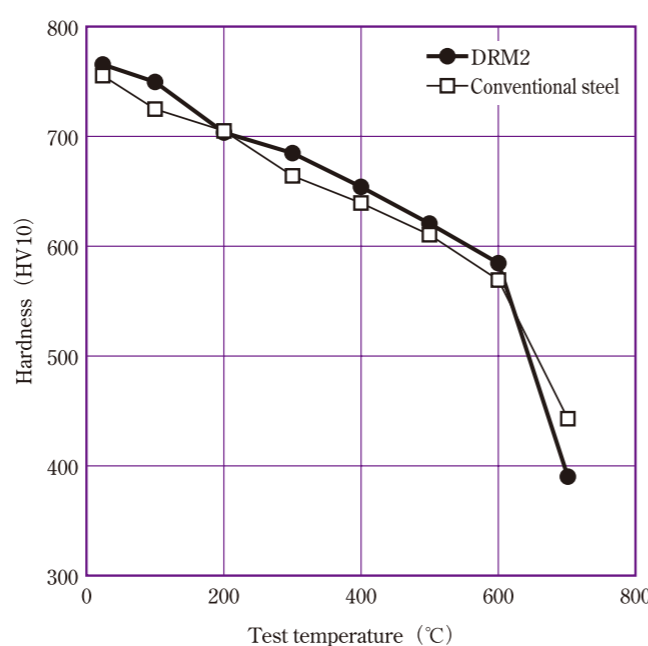
- Sampling : 100mm dia. Bar center
- Heat treatment : DRM2..... H : 1120°C OQ
T : 560°C AC, twice
- Heat treatment : Conventional Steel... H : 1140°C OQ
T : 560°C AC, twice
- Test method : Rotating bending fatigue test (20°C)

Temper softening resistance



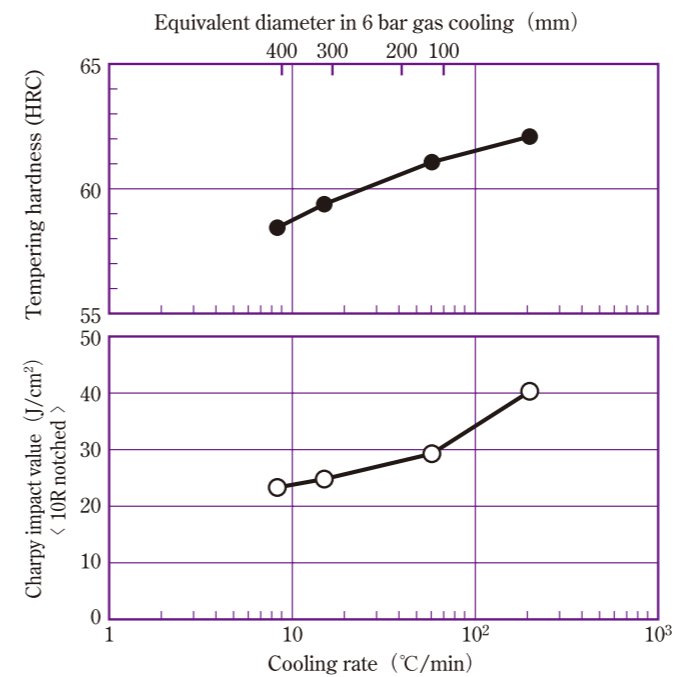
- Heat treatment : DRM2..... H : 1120°C OQ
T : 580°C AC, twice
- Heat treatment : Conventional Steel... H : 1120°C OQ
T : 610°C AC, twice

Hot hardness



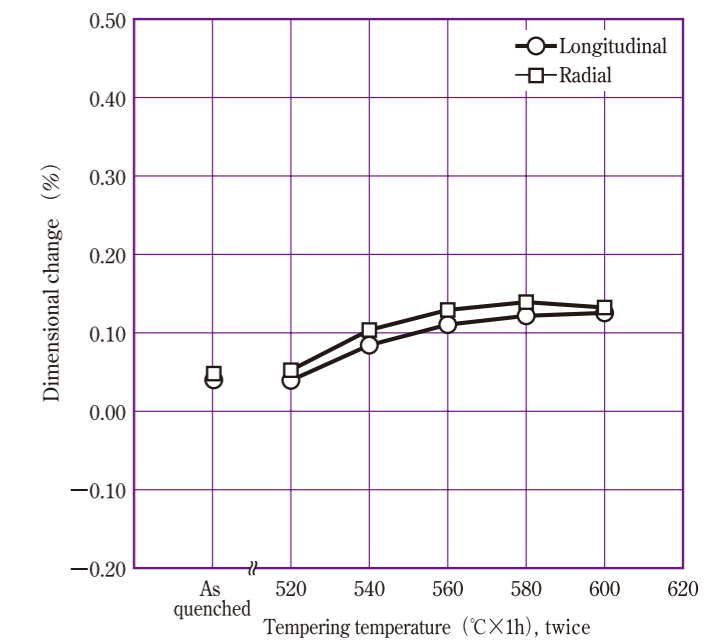
- Heat treatment : DRM2..... H : 1120°C OQ
T : 560°C AC, twice
- Heat treatment : Conventional Steel... H : 1120°C OQ
T : 560°C AC, twice

Hardenability



- Sampling : 100mm dia. Bar center
- Heat treatment : H : 1120°C (200°C / min → equal to OQ)
T : 560°C AC, twice

Dimensional changes in heat treatment



- Specimen : 36mm dia. x 60mm
- Hardening : 1120°C salt bath quenching