

# DCMX

## Matrix type Cold Work Die Steel

DC-Matrix is a matrix type cold work tool steel. Only fine carbides are distributed in matrix due to optimum alloy design and production process.

### Features

#### DIE PERFORMANCE

- **High hardness** such as 62HRC is available by high temperature tempering with good dimensional stability, resulting in high wear resistance.
- **High toughness** contributes to prevent cracking and chipping.

#### EASE IN DIE MAKING

- **Minimal Dimensional** change when tempered at 500 degrees C.
- **Machinability** is improved by free machining additives and finely dispersed carbides.

### Main applications

**PUNCHES, DIES AND WORKING TOOLS FOR COLD PRESSING AND COLD FORGING  
COLD STAMPING DIES FOR HIGH STRENGTH STEELS.**

- Cold stamping dies for high strength steels
- Insert blocks for composite stamping dies
- Blanking punches and trimming edges

### Chemistry

**PATENT PENDING**

### Heat treatment

Forging Temp. (°C)	Treating temperature (°C)				Hardness	
	Annealing	Quenching	Tempering	Stabilizing treatment	Annealed	Quenched & tempered
900 — 1160	870 — 930 Slow cooling	1000-1050 Air cooling	Low : 150 - 200 High: 480 - 560 Air cooling More than twice	400°C for longer than 1h	≤ 235HB	56~62HRC



DCMX is distributed by  
International Mold Steel, Inc.,  
A Daido partner company

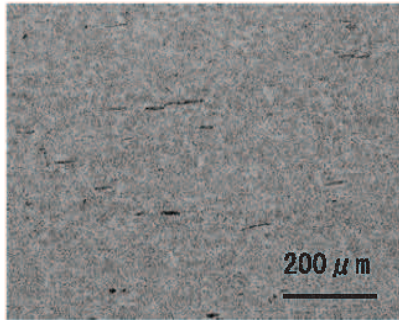


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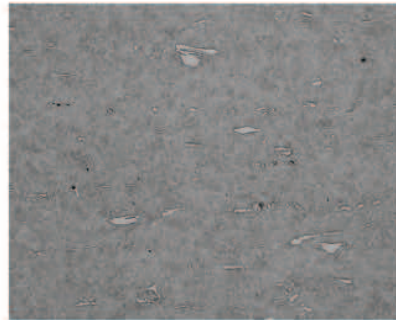
# Properties

## Optical micrographs (As annealed)

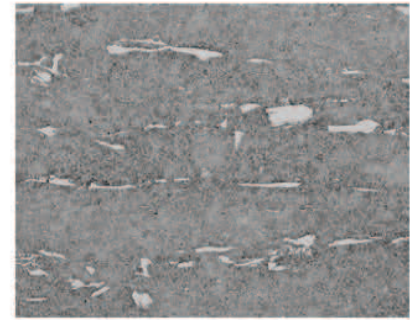
- DCMX shows fine microstructure almost free from coarse carbides



DCMX

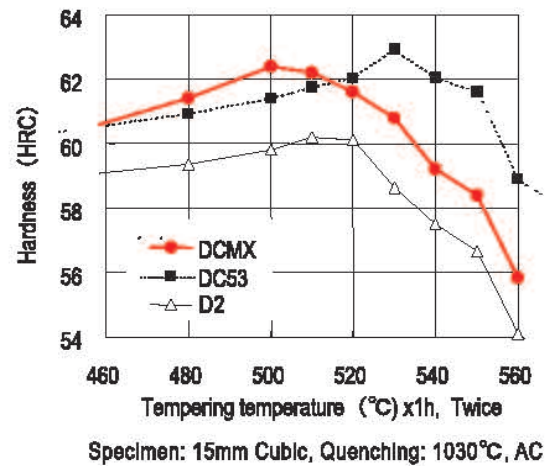
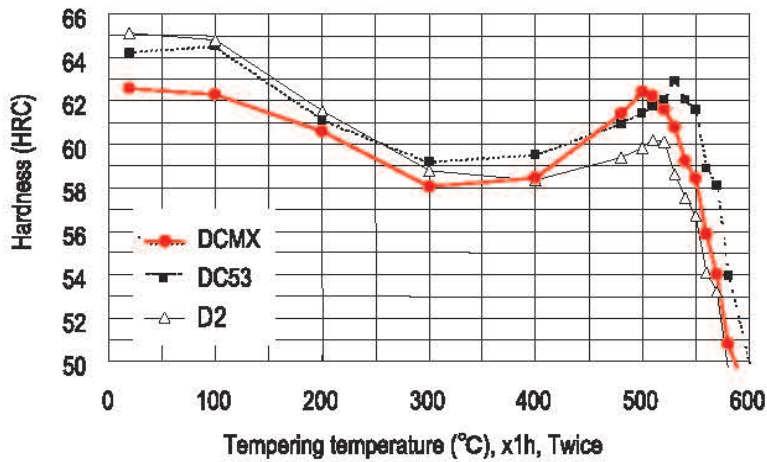


DC53

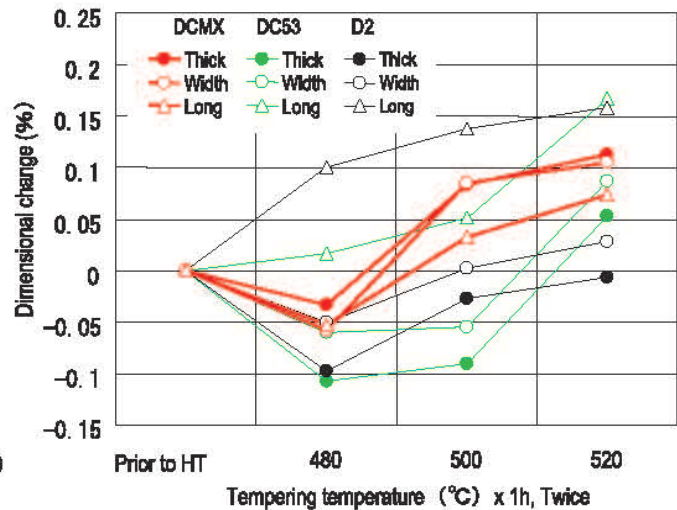
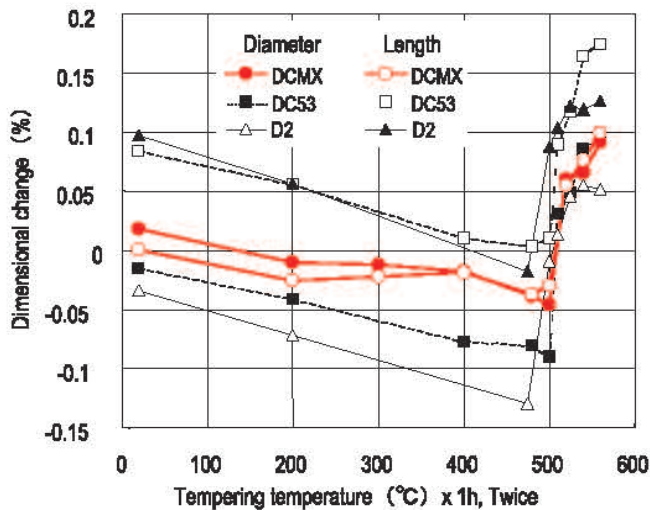


D2

## Tempering hardness



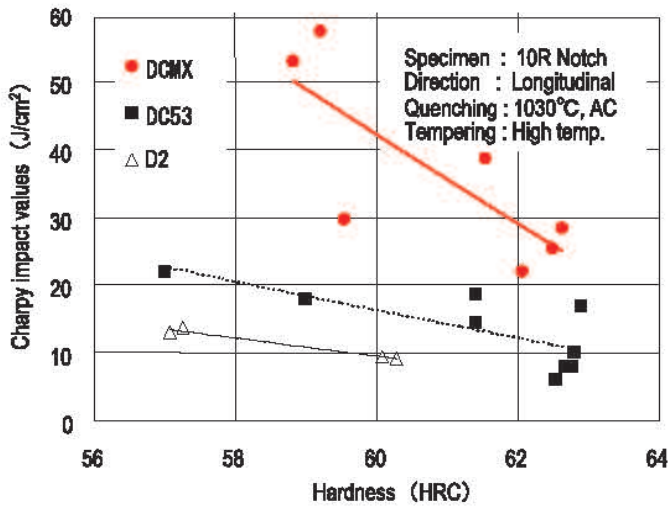
## Dimensional stability



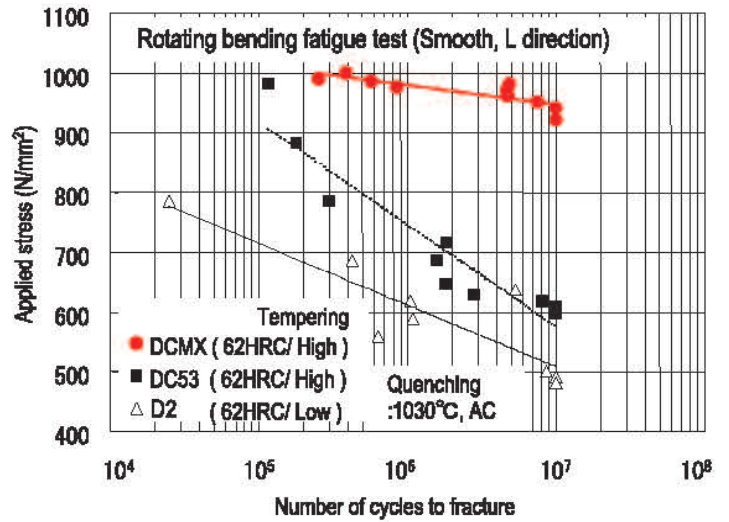


# Properties

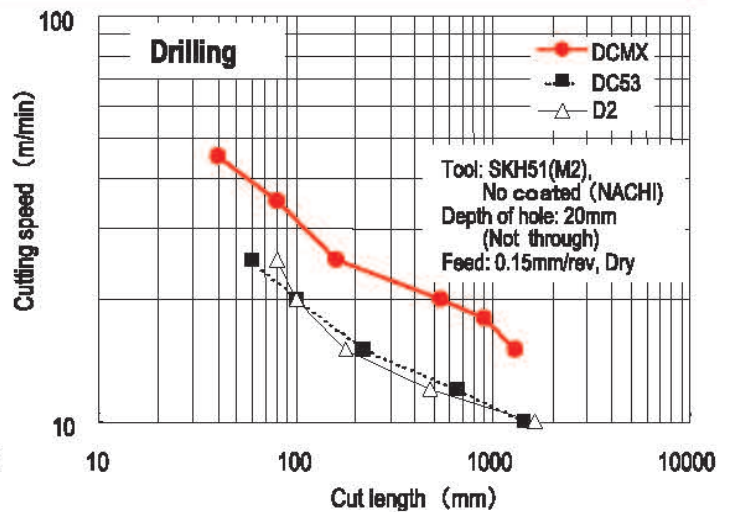
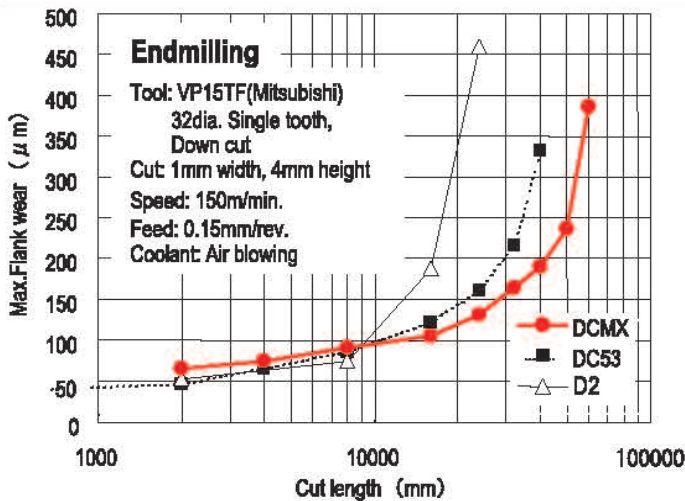
## Toughness



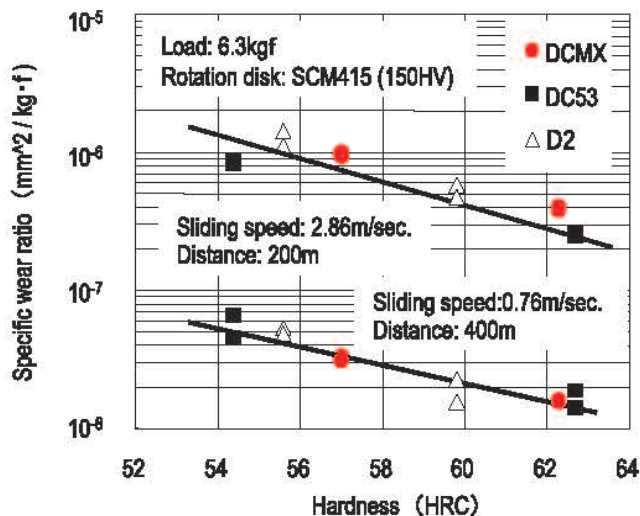
## Fatigue properties



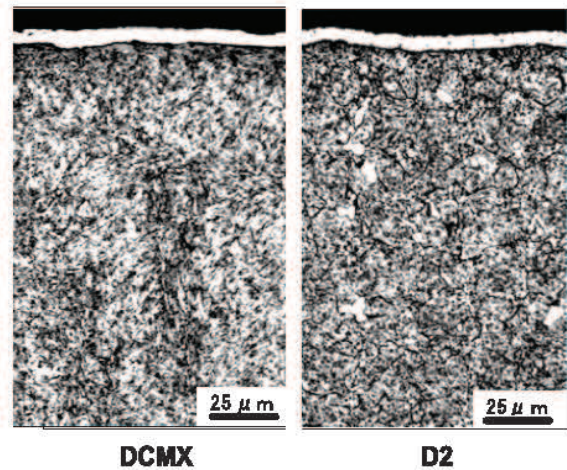
## Machinability (Annealed)



## Wear resistance (Ohkoshi-test)

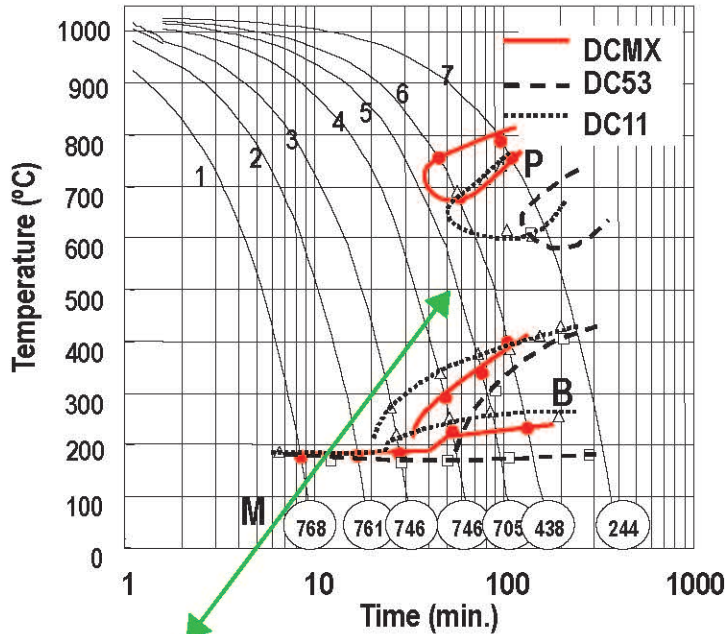


## TD coating



TD coating: By courtesy of DOWA Thermo Engineering.

## CCT diagrams



When cooled from 1030C(1886F) to 500C (932F) within 40min.,  
A Martensitic matrix is obtained free from pearlite structure.

13C/min. (23F/min.) form 1886F to 932F.

## Physical properties

◆ Thermal expansion rate ( $\times 10^{-6}/K$ , Ave.value from 20°C)

100°C	200°C	300°C	400°C	500°C	600°C	700°C
13.3	13.7	14.0	14.4	14.7	14.9	14.9

◆ Thermal conductivity (W/m·K [cal/cm·sec·°C])

RT	100°C	200°C	300°C	400°C	500°C
17.1	18.8	20.9	22.6	24.0	25.7
[0.0409]	[0.0449]	[0.0499]	[0.0540]	[0.0573]	[0.0614]

◆ Specific heat (J/kg·K)

RT	100°C	200°C	300°C	400°C	500°C
507	535	570	611	654	719

◆ Young modulus = 202 GPa

◆ Specific weight = 7.67 g/cm<sup>3</sup>

※ Heat treating of specimens

Quenching: 1030°C, AC, Tempering: 500°C, Twice

## Comparison of properties among Daido cold work die steels

Properties		DCMX	DC53	D2
Tempering hardness	Low temp.(200°C)	61 HRC	61 HRC	61 HRC
	High temp.(500°C)	62 HRC	60 HRC	58 HRC
	Hightemp.(520°C)	60 HRC	62 HRC	58 HRC
Isotropy		◎	○	△
Dimensional change with time*1		○(○)	△(○)	○(○)
Hardneability		○	◎	○
Toughness		◎	○	△
Fatigue properties		◎	○	△
Machinability		◎	○	△
Wear resistance		◎	◎	○
Wear resistance to sand		△	○	◎
Wire EDM *2		○	◎	○
Low temp. coating *2		○	◎	○

\*1 Comparison by dimensional change when stabilizing treated △: Average, ○: Good ◎: Excellent

Highlighted are especially featured properties

\*2 Comparison by the decrease in hardness when tempered at 520°C for wire EDM and PVD coating

