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. (℃)	Treating temperature (℃)				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℃ for longer than 1h	≦ 235HB	56～62HRC

DAIDO STEEL

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

INTERNATIONAL MOLD STEEL, INC.

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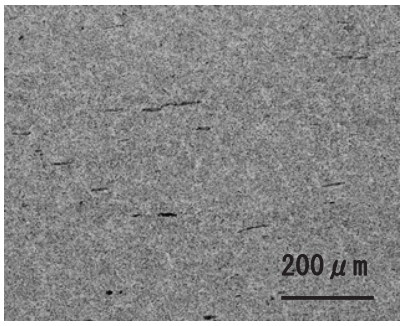
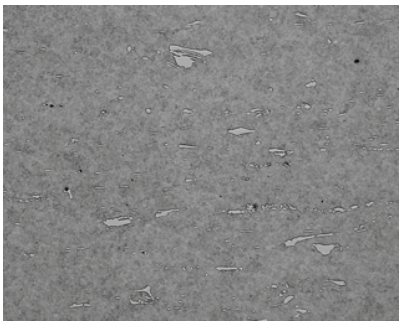
Properties

Optical micrographs （As annealed）

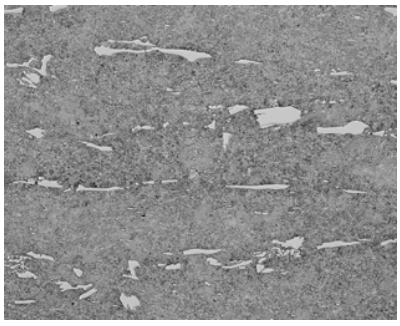
● DCMX shows fine microstructure almost free from coarse carbides



DCMX

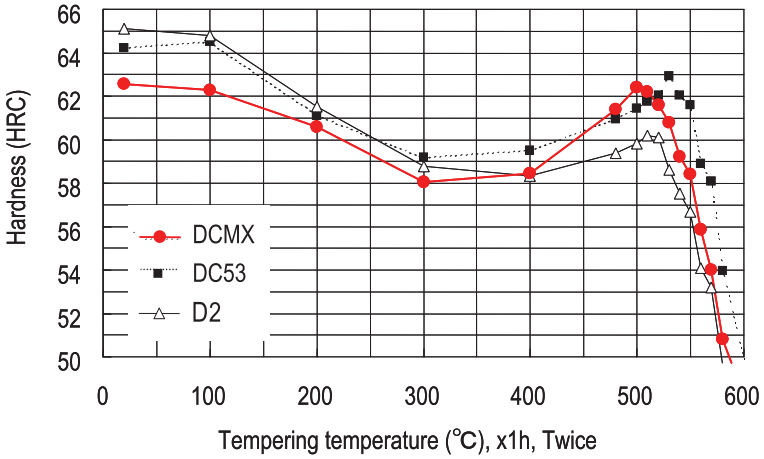


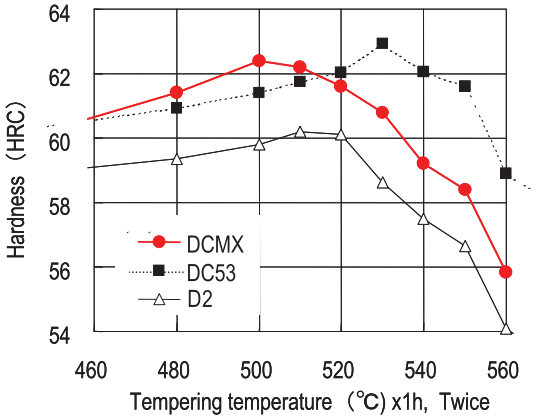
DC53



D2

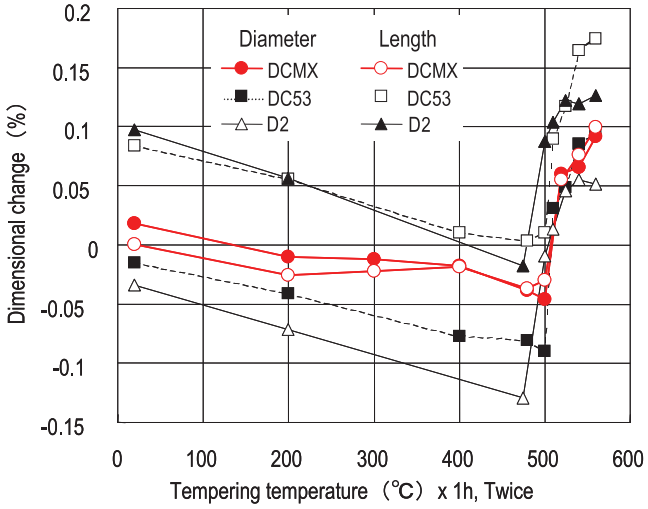
Tempering hardness



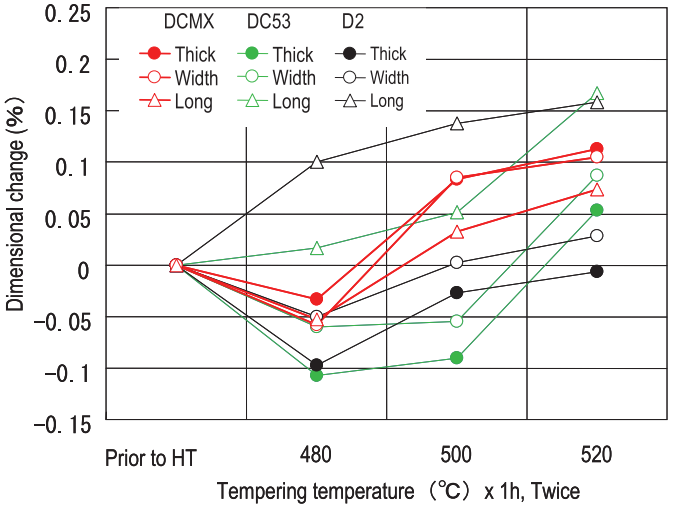


Specimen: 15mm Cubic, Quenching: 1030℃, AC

Dimensional stability



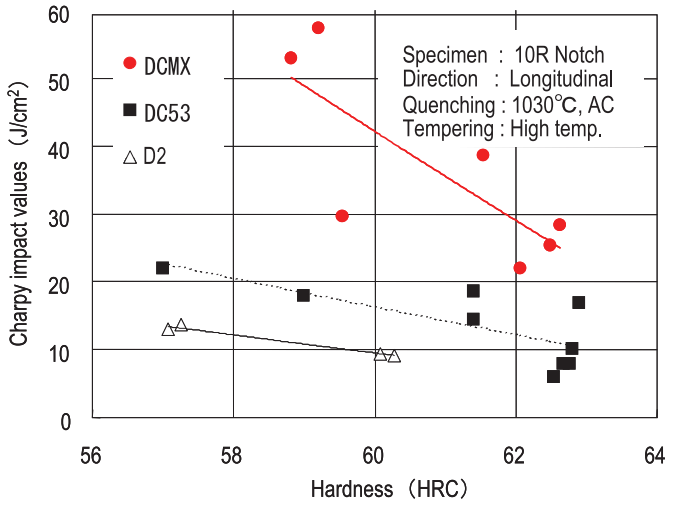
Specimen: 10mm dia. x 50mm Long
Quenching: 1030℃, AC



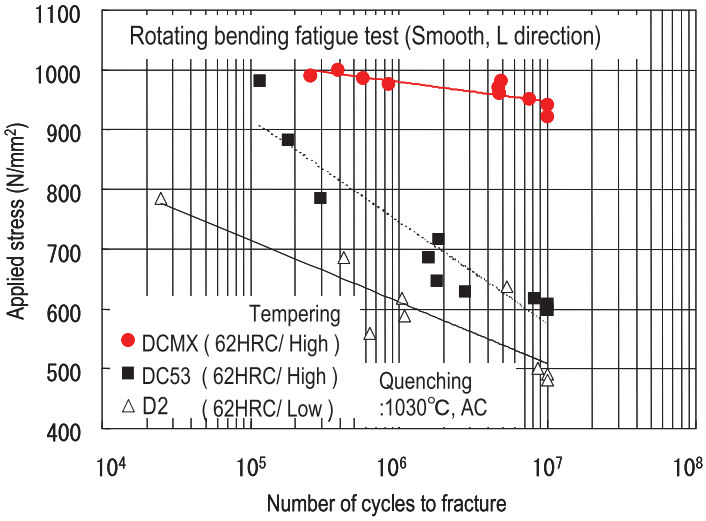
Specimen: 50mm Thick x 100mm Width x150mm Long
Quenching: Atmosphere furnace, 1030℃, Fan AC

Properties

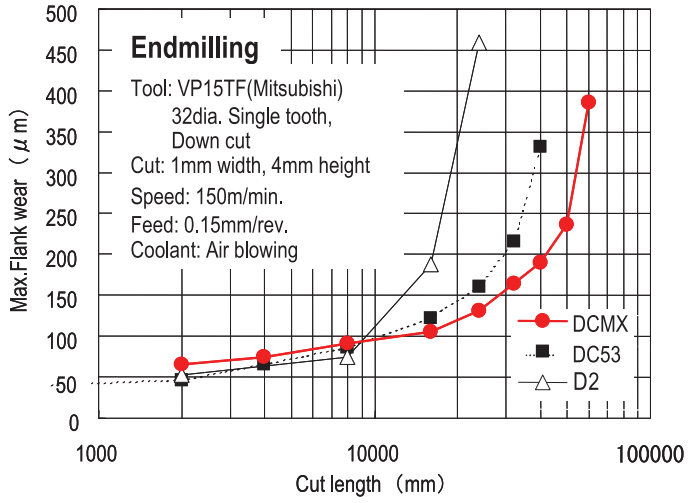
Toughness

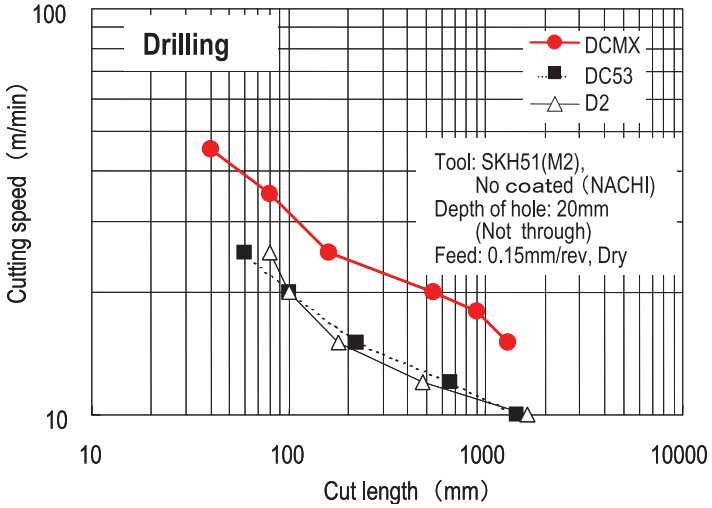


Fatigue properties

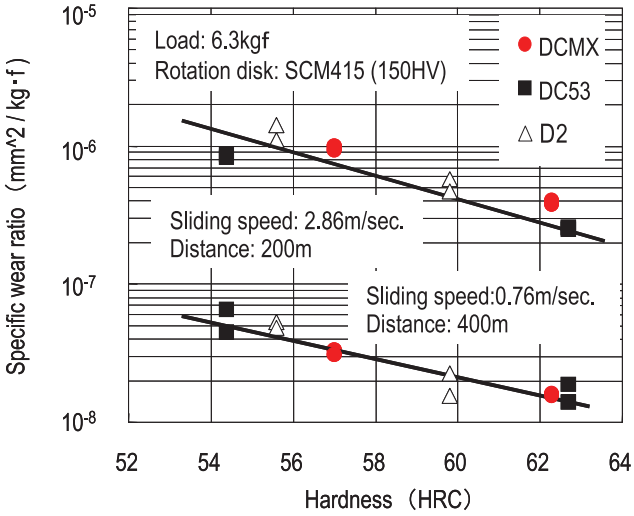


Machinability (Annealed)

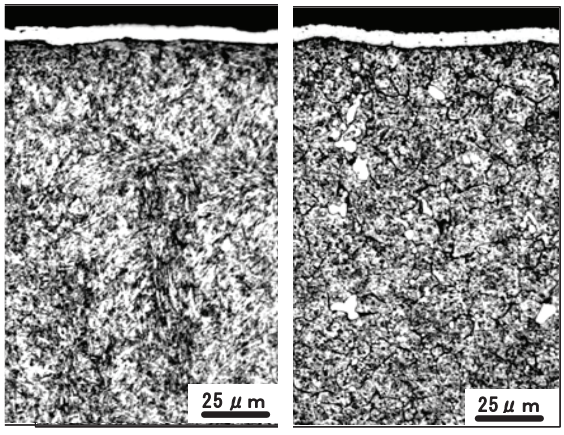




Wear resistance (Ohkoshi-test)

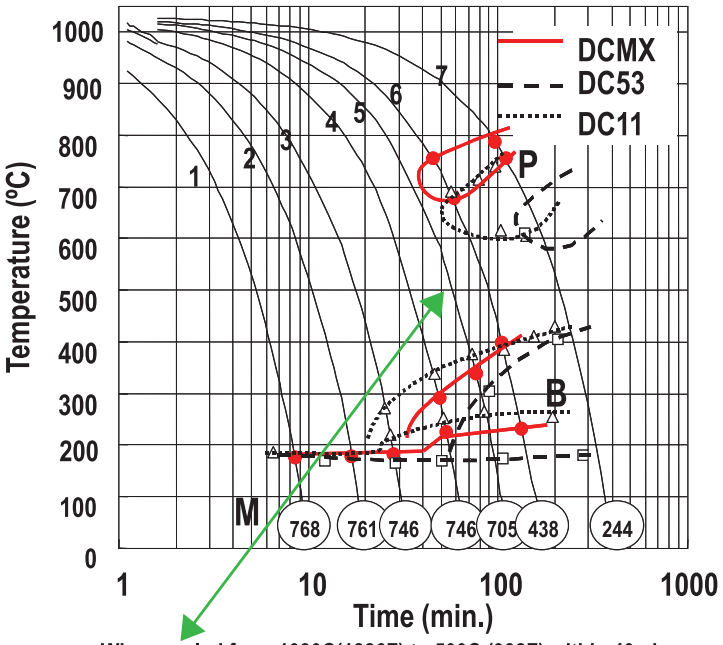


TD coating



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.

To obtain high enough hardness as quenched, cool down to the Ms temperature (180°C) within 60 min.

Physical properties

◆Thermal expansion rate （x10^{-6}/K, Ave.value from 20℃）

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

◆Thermal conductivity （W/m・K [cal/cm・sec・℃]）

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

◆Specific heat （J/kg・K）

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

◆Young modulus＝202 GPa

◆Specific weight＝7.67 g/cm^3

※ Heat treating of specimens

Quenching: 1030℃, AC, Tempering: 500℃, Twice

Comparison of properties among Daido cold work die steels

Properties		DCMX	DC53	D2
Tempering hardness	Low temp.(200℃)	61 HRC	61 HRC	61 HRC
	High temp.(500℃)	62 HRC	60 HRC	58 HRC
	Hightemp.(520℃)	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℃ for wire EDM and PVD coating

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