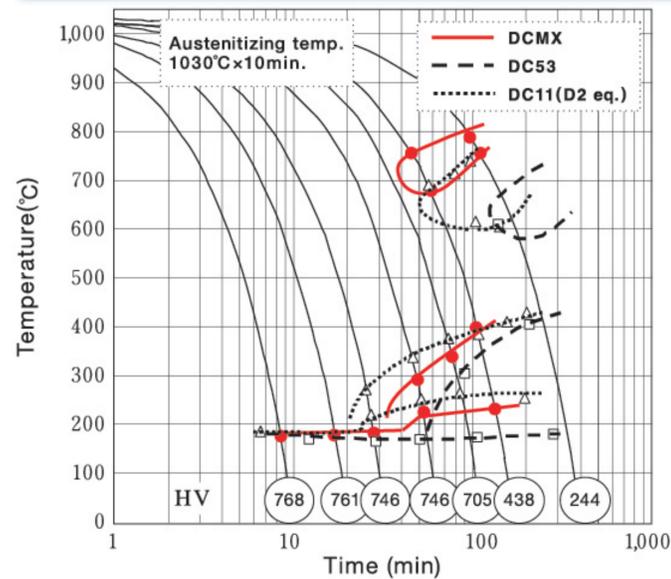


## CCT diagrams



## Physical properties

Quenching: 1030°Cx1h, Gas cooling  
Tempering: 520°Cx1h, Twice  
Hardness: 61HRC

◆ Thermal expansion rate

| Temp.                | 20~100°C | 20~200°C | 20~300°C | 20~400°C | 20~500°C | 20~600°C |
|----------------------|----------|----------|----------|----------|----------|----------|
| x10 <sup>-6</sup> /K | 10.7     | 11.4     | 12.0     | 12.0     | 13.0     | 13.3     |

◆ Thermal conductivity

| Temp. | 25°C | 100°C | 200°C | 300°C | 400°C | 500°C | 600°C |
|-------|------|-------|-------|-------|-------|-------|-------|
| W/m·K | 16.0 | 17.1  | 18.0  | 19.8  | 21.7  | 22.4  | 24.5  |

\*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 | 450  | 456   | 474   | 524   | 587   | 636   | 740   |

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

| Young's modulus | Rigidity modulus | Poisson's ratio |
|-----------------|------------------|-----------------|
| 204GPa          | 78GPa            | 0.30            |

## Comparison of properties among Daido cold work die steels

| Properties                     |                   | DCMX  | DC53  | DC11(D2 eq.) |
|--------------------------------|-------------------|-------|-------|--------------|
| Tempering hardness             | Low temp.(200°C)  | 61HRC | 61HRC | 61HRC        |
|                                | High temp.(500°C) | 62HRC | 60HRC | 58HRC        |
|                                | High temp.(520°C) | 60HRC | 63HRC | 58HRC        |
| Isotropy                       |                   | ◎     | ○     | △            |
| Dimensional change with time*1 |                   | ○(○)  | △(○)  | ○(○)         |
| Hardenability                  |                   | ○     | ◎     | ○            |
| 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 is especially featured properties  
\*2 Comparison by the decrease in hardness when tempered at 520°C for wire EDM and PVD coating



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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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## Daido's Matrix type Tool Steel Series

# DCMX<sup>TM</sup>

## Matrix type Cold Work Die Steel

### Features

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.  
DC-Matrix shows high performance in service and ease in mold making as well.

#### <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>

- ◆ **Isotropic** dimensional change works easy geometry control in heat treating.
- ◆ **Machinability** is improved by free machining additives and finely dispersed carbides.

### Main applications

- ◆ **Punches, dies and working tools for cold pressing and cold forging, especially for cold stamping dies for high strength steels where galling and peel off of coated layer, TD and CVD, are main failure modes**  
Insert blocks for composite stamping dies where good dimensional stability is required in dies alignment  
Blanking punches and trimming edges where main failures are cracking and chipping.

### Heat treatment

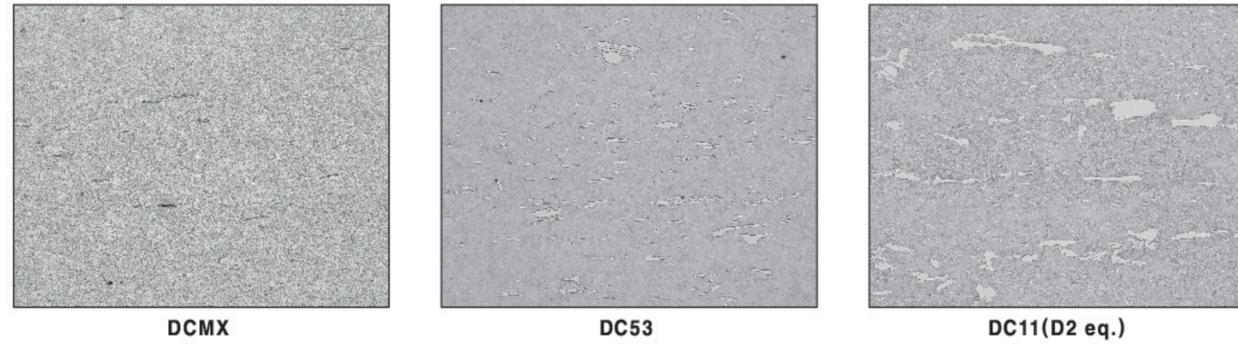
| Re-forging Temperature (°C) | Heat treatment (°C)     |                          |  |                             | Hardness |                     |
|-----------------------------|-------------------------|--------------------------|--|-----------------------------|----------|---------------------|
|                             | Annealing               | Quenching                | Tempering  | Stabilizing treatment       | Annealed | Quenched & Tempered |
| 900~1160                    | 920~980<br>Slow cooling | 1000~1050<br>Air cooling | Low :150~200<br>High:480~560<br>Air cooling<br>More than twice | 400°C<br>for longer than 1h | ≤235HBW  | 56~62HRC            |



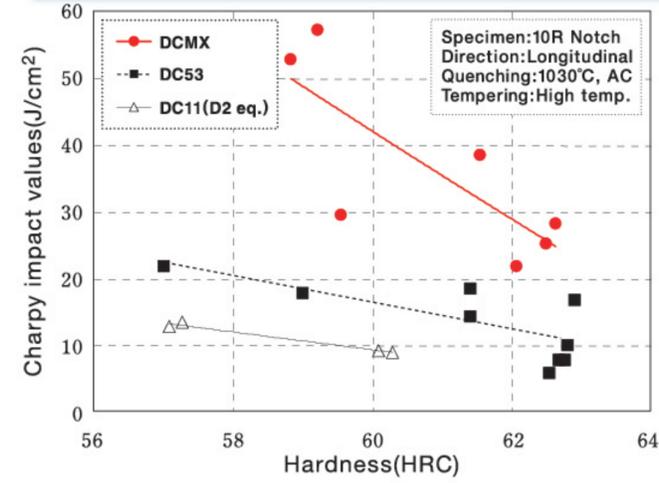
# Properties

## Optical micrographs(as annealed)

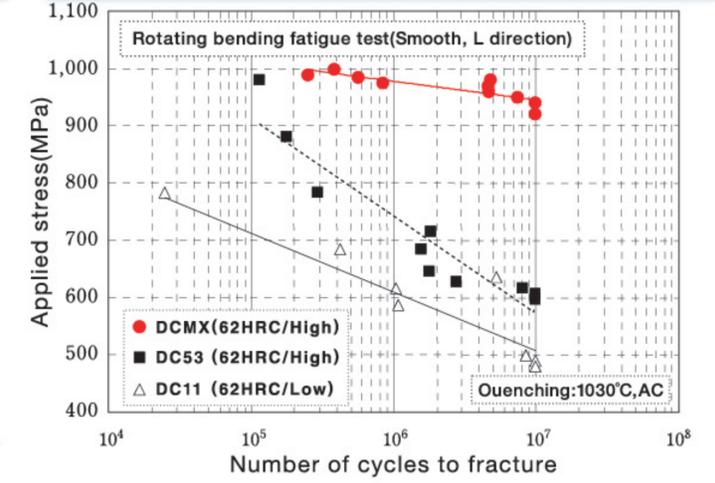
● DCMX shows fine microstructure almost free from coarse carbides



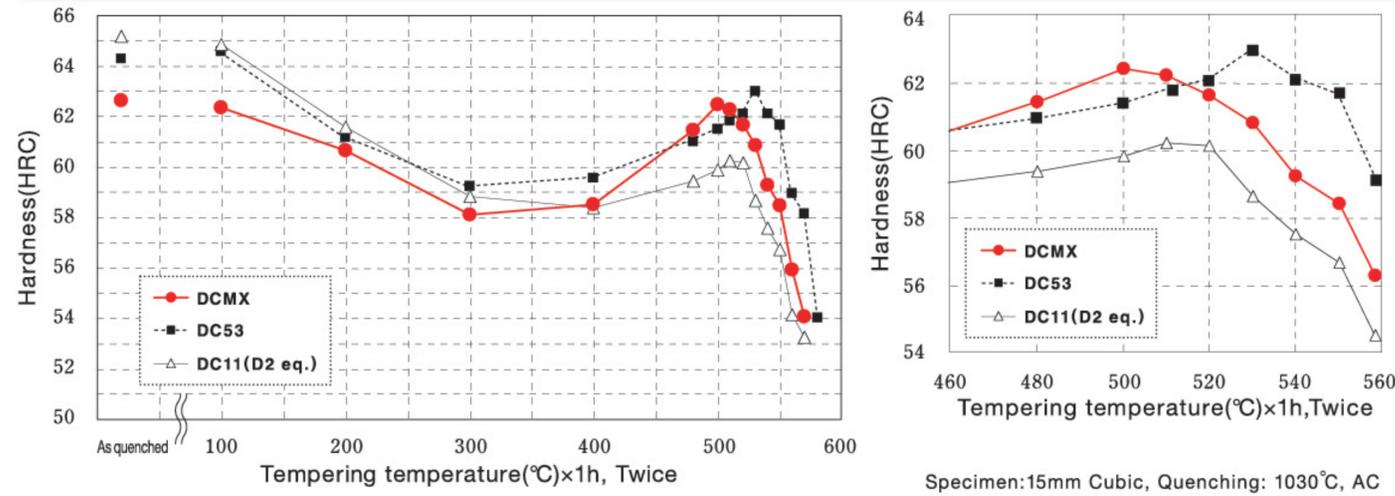
## Toughness



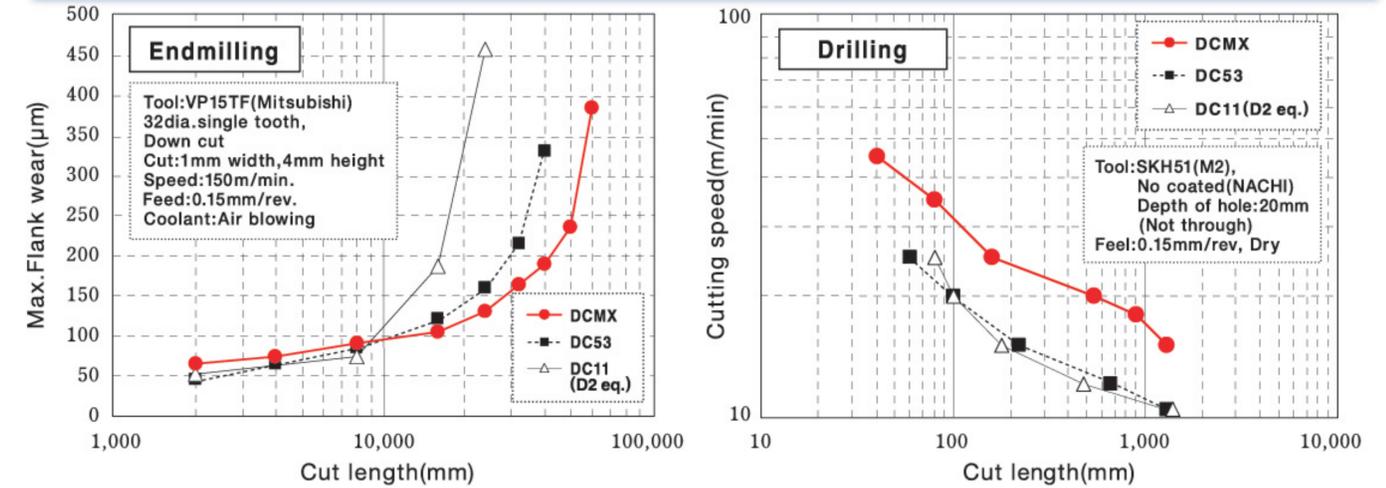
## Fatigue properties



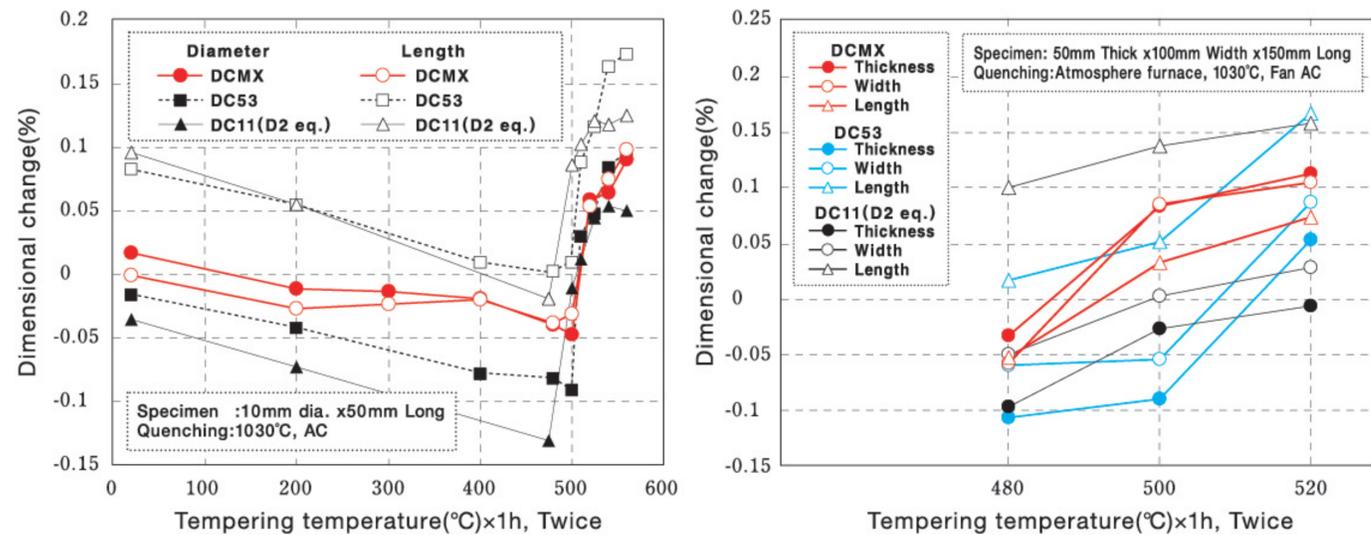
## Tempered hardness



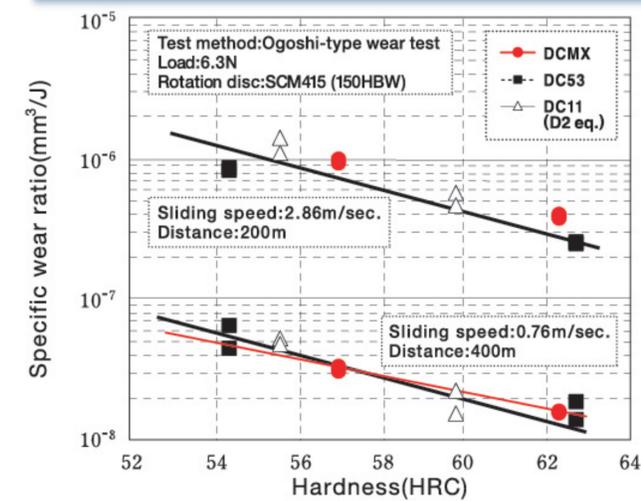
## Machinability (annealed)



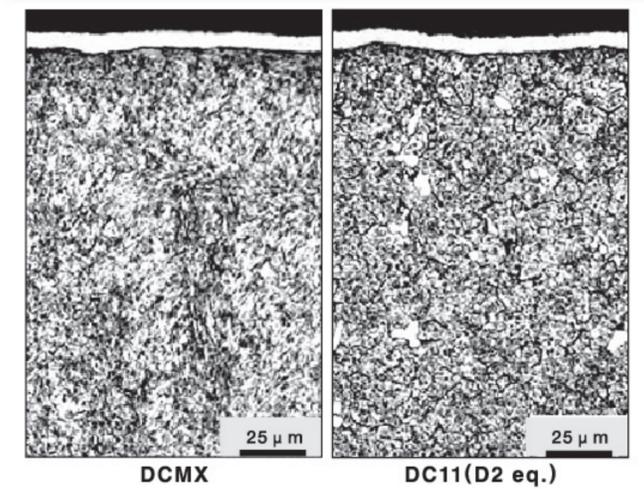
## Dimensional stability



## Wear resistance



## TD coating



TD coating: By courtesy of DOWA Thermo Engineering.