Physical Properties

Specific gravity (g / cm^3)	7.87					
Coefficient of expansion (x 10^{-6} / °C)	-150°C	-200°C	-300°C	Retained austenite 14%		
	13.0	13.5	14.2			
Thermal conductivity (cal / cm • sec • °C)	Room temperature	100°C	200°C	300°C	400°C	500°C
	0.057	0.060	0.064	0.064	0.065	0.062
Young's modulus (E)	21,700 (kgf / mm^2)					
Modulus of rigidity (G)	8,480 (kgf / mm^2)					
Poisson's ration (v)	0.28					

Stabilization Treatment

It is possible to control dimensional change with time by additional stabilization treatment (250°C~400°C) after high-temperature tempering.
The best temperature of stabilization treatment is 400°C.

Heat Treatment vs. Properties

	Heat Treatment	Dimensional change with time	Dimensional change in HT	Dimensional change in W-EDM	Hardness (HRC)	Toughness
1	H : 1030°C T : 180 - 200°C TWICE	◎	Small	△	60-61	◎
2	H : 1030°C T : 500°C TWICE	△	Small	○	60-61	○
3	H : 1030°C T : 500 - 540°C TWICE	△	Large	◎	61-63	◎
4	H : 1030°C T : 500 - 540°C TWICE + 400°C	◎	Large	◎	60-63	◎

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06/2012

DC53

High Hardness & Toughness New General-Purpose Cold Die Steel

Features

1 **Higher hardness after heat treatment than SKD11**
A Hardness of HRC 62-63 is secured after tempering at high temperatures (520-530°C).
Therefore, DC53 exceeds SKD11 in strength and wear resistance.

2 **Double the toughness of SKD11**
DC53 has relatively well-performing toughness among all cold die steels. Therefore, tools and dies made of DC53 are less faced with the problems such as cracking and chipping, which often seriously affect conventional tools and dies, and enjoy greater durability.

3 **Less residual stress after wire electro-discharge machining**
Residual stress is lessened by means of high-temperature tempering. Therefore, problems such as cracking and distortion are prevented during and after wire electro-discharge machining.

4 **Excellent machinability and grindability**
DC53 is superior to SKD11 in machinability and grindability. Therefore, the use of DC53 is expected to provide relatively longer tool life and reduces the number of processes in die making.

Applications

1 **Precision press dies**
Wire discharge processed press dies for fine blanking, composite processing, etc.

2 **Plastic forming tools for hard-to-work materials**
Dies for cold forging, deep drawing, and thread rolling

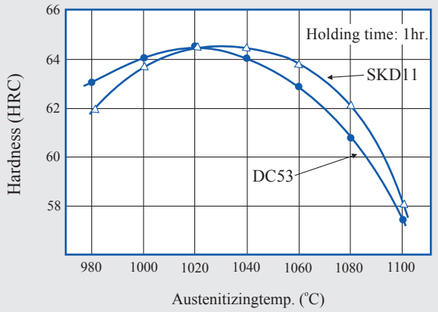
3 **Other**
High-speed blanking punches, stainless steel sheet punches

DAIDO STEEL

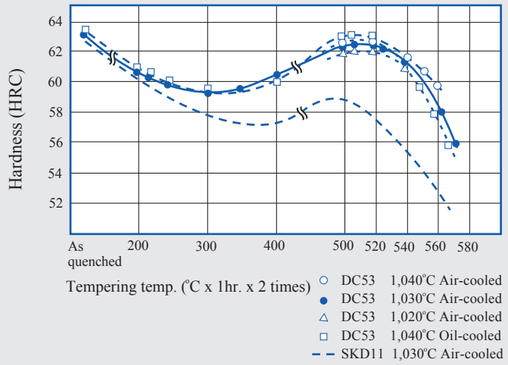
Heat Treatment

Our newly developed cold die steel, DC53, is an improvement over the alloy tool steel SKD11 specified in Japanese Industrial Standard (JIS) G4404. It eliminates the disadvantage of insufficient hardness and toughness, resulting from high-temperature tempering found with SKD11, and is intended to replace SKD11 in use for general purposes and precision dies.

Quenching hardness curve



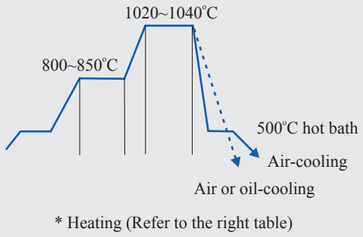
Quenching & tempering hardness curve



[Standard Heat Treatment Conditions]

Usual quenching

Quenching



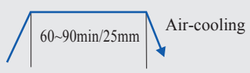
* Heating (Refer to the right table)

Standard heating time (salt bath)

Dia. thickness (mm)	Immersing time (min)
5	5-8
10	8-10
20	10-15
30	15-20
50	20-25
100	30-40

Tempering

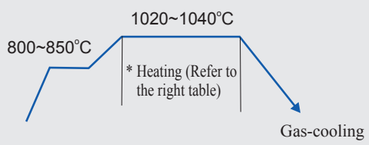
- Low-Temperature: 180~200°C
- High-Temperature: 500~550°C



Repeated twice

Vacuum quenching

Quenching

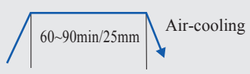


Standard heating time

Thickness (mm)	Heating time
100mm and under	20-30min/25mm
Over 100mm	10-20min/25mm

Tempering

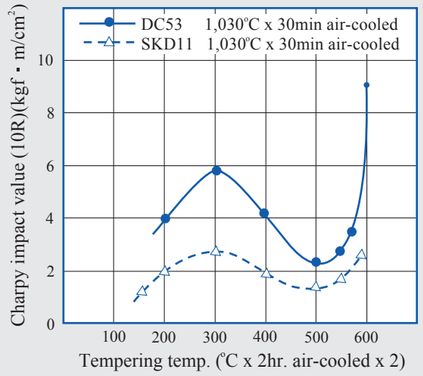
- Low-Temperature: 180~200°C
- High-Temperature: 500~550°C



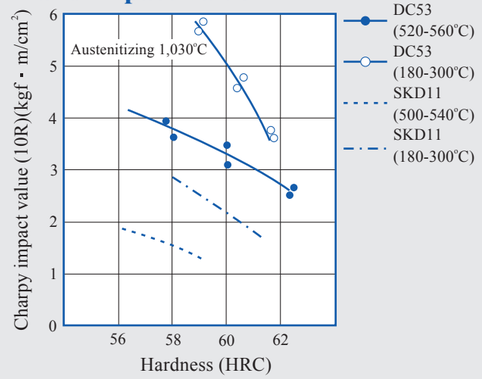
Repeated twice

Quality Characteristics

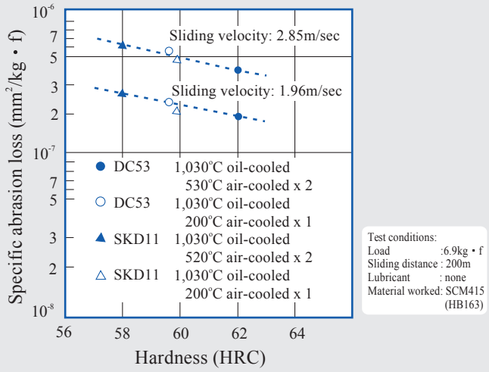
Relationship Between Tempering Temperature and Impact Value



Relationship Between Hardness and Impact Value

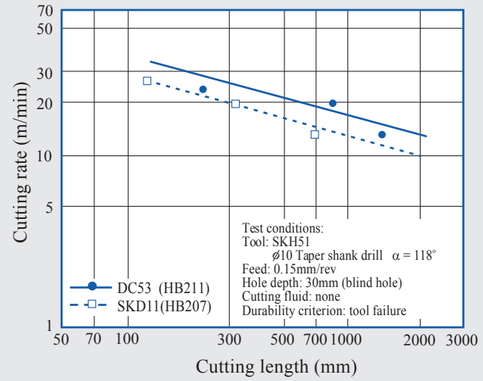


Abrasion Test (Ohgoshi Method)

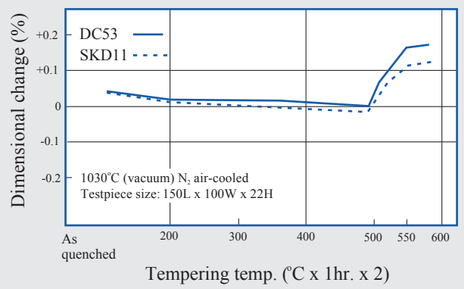


Test conditions:
Load :6.9kg • f
Sliding distance : 200m
Lubricant : none
Material worked: SCM415 (HB163)

Durability of Drilling Tool



Dimensional Changes due to Heat Treatment



Relationship Between Tempering Temperature and amount of Retained Austenite