

LDC-i

General

LDC-i is a hot-work die steel developed for super-large integrated die-casting molds, classified under the NADCA category as a H11 modified grade, it is characterised by:

- Excellent toughness and ductility
- Very good high-temperature strength
- Outstanding quenchability even for 800mm thickness
- Excellent heat treatment dimensional stability and hardness uniformity
- Suitable for nitriding and oxidation

Chemical composition

Grade	C	Mn	Si	S	P	Cr	Mo	V
LDC-i (wt%)	0.36	0.62	0.26	0.001	0.007	5.40	1.55	0.76
Standard specification	AISI H11 Modified, W-Nr. 1.2343 Modified							
Delivery condition	Soft annealed hardness $\leq 210\text{HB}$							

Microcleanliness

The permissible limits of microcleanliness (severity levels of nonmetallic inclusion content) be determined by ASTM E45,

A		B		C		D	
thin	heavy	thin	heavy	thin	heavy	thin	heavy
0.5	0	0.5	0.5	0	0	0.5	0

Applications

Preferred for manufacturing the large die-casting molds with high demands on toughness and high-temperature strength, such as automobile integrated Aluminum die-casting molds, longitudinal beam molds and shock tower molds so on. Also for large hot forging dies, large aluminum extrusion dies, and plastic molds with strict requirements for high polish and texture.

Physical Properties

Temp	200°C	400°C	600°C
Density Kg/m ³	7790	7750	7630
Young's Modulus MPa	2.05 X 10 ⁵	1.90 X 10 ⁵	1.50 X 10 ⁵
Thermal expansion coefficient °C ⁻¹	11.7 X 10 ⁻⁶	12.2 X 10 ⁻⁶	12.8 X 10 ⁻⁶
Thermal conductivity. W/m°C	28.3	32.1	33.2

Room temperature mechanical properties:

Hardness	44HRC	46HRC	48HRC
Tensile strength MPa	1510	1600	1690
0.2% Yield strength MPa	1200	1320	1450
elongation %	13	12.8	12.5
Reduction of area %	59	58	55

Heat treatment

Quenching

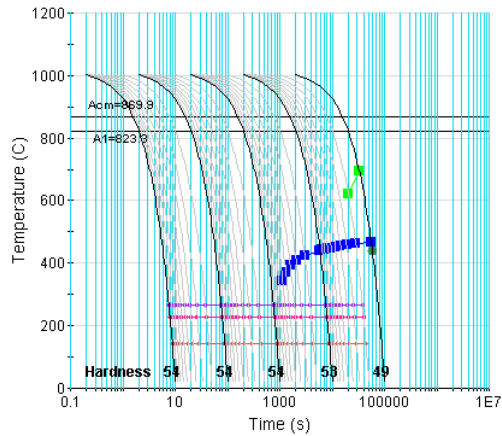
For super-large molds, it is recommended to use vacuum graded quenching process with the following parameters: preheating temperature: 600 – 850°C (usually in two stages), austenitizing temperature: 1010°C to 1030°C (the austenitizing temperature for forging dies can be increased to 1030°C to 1050°C). After holding at the core temperature for 30 to 45 minutes, rapid cooling should be applied to achieve a desirable martensitic structure. Once the mold is quenched and the core temperature reaches around 80°C, immediate tempering is required. During the quenching process, precautions should be taken to avoid oxidation and decarburization of the mold.

Tempering

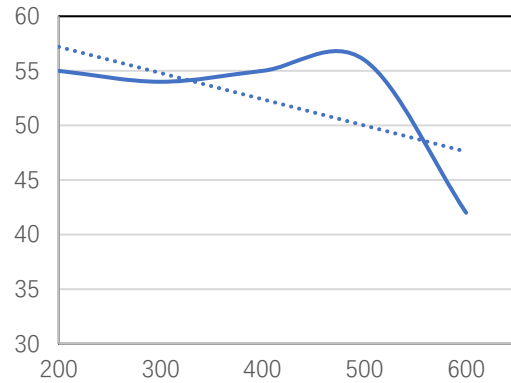
Refer to the tempering curve chart to select the desired hardness based on the mold's

working conditions. It is recommended to temper medium to large molds three times and super-large molds four times. Tempering temperature settings should avoid the range of 520°C to 550°C, as this can lead to a reduction in impact toughness.

CCT Graph

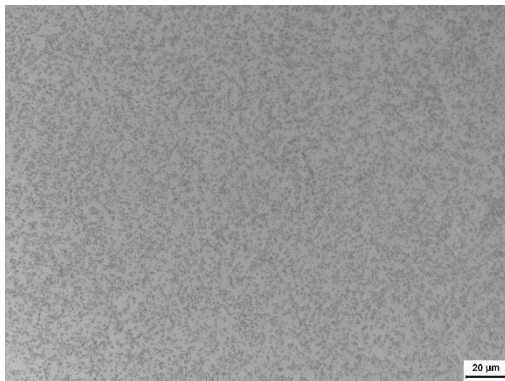


Tempering Graph

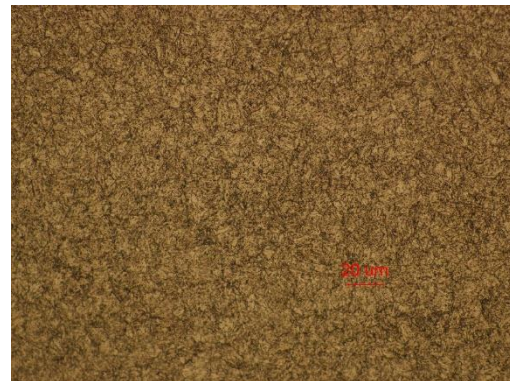


The tempering samples size 15x15x40mm and are obtained through oil quenching followed by air cooling. In actual production, please adjust the tempering parameters based on factors such as mold weight and dimensions.

Spheroidizing Annealing Microstructure



Tempered Martensite Microstructure



Impact toughness value at room temperature KV2 (J)	42HRC	44HRC	46HRC	48HRC
	28	25	20	17

Impact Toughness

Nitriding and Nitrocarburizing:

Through nitriding or nitrocarburizing surface treatment, compressive stress is generated on the surface of the mold. The surface hardness after nitriding is approximately 950 – 1100 HV0.2, providing excellent wear resistance and anti-adhesive properties. When combined with oxidation treatment after nitriding, it can significantly extend the service life of the mold.

Note: LDC-i composite surface treatment has even better effects, such as nitriding + oxidation, nitriding + PVD, etc., which have a significant impact on improving erosion and early cracking failure.

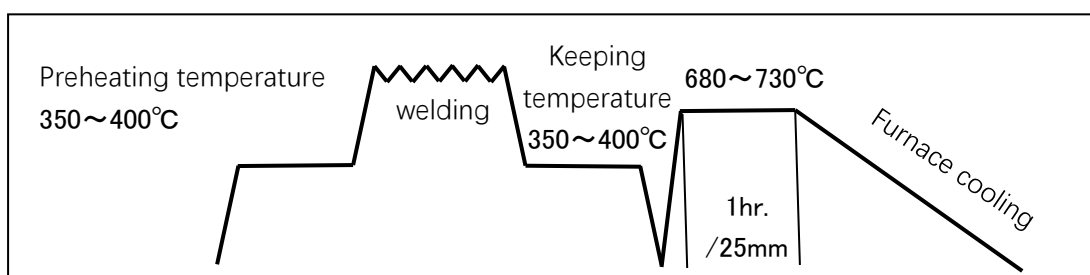
Cutting Data Recommendations:

The cutting data below should be considered as guidelines only. These guidelines must be adapted to local machining conditions. LDC-i cutting characters are similar to H13. Please refer to H13 cutting data.

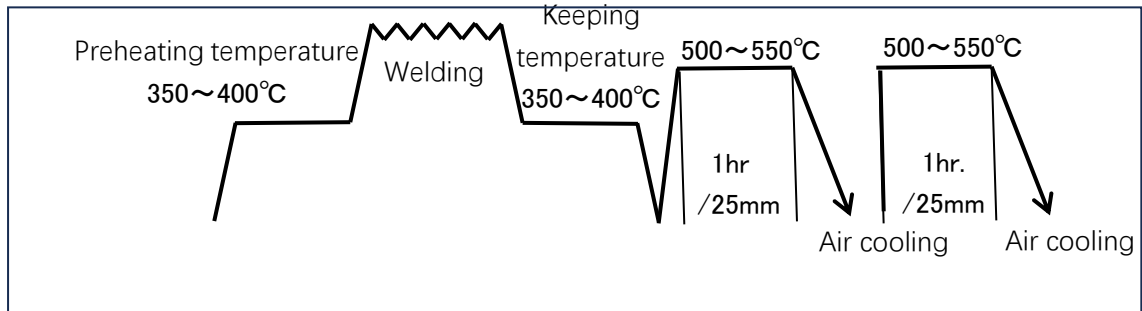
Welding

For welding annealed and quenched state molds, please refer to the following welding process. Preheating should be done by overall heating in a furnace. During welding, ensure that the mold surface is properly insulated, and the post-welding area should not fall below the preheating temperature.

Material at anneal condition welding process



Material at harden condition welding process



Technical Support information

For more detailed product information, please contact your local martensitic new materials technical person.

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