



# DIMO 2312

## HARDENED CrMnMoS-ALLOYED STEEL IN MOLD QUALITY FOR THE CONSTRUCTION OF PLASTIC MOLDS

Material data sheet, edition February 2015<sup>1)</sup>

DIMO 2312 is a hardened CrMnMoS-alloyed tool steel for the construction of plastic molds with lower surface requirements referring to e.g. polishability and photoetchability. DIMO 2312 is characterized by excellent machinability and high dimensional stability. Moreover, it is used by the customers for accessories with holderblock requirements as e.g. ejector plates, supports, clamping plates and housings for diecasting dies.

### Product description

#### Designation and range of application

DIMO 2312 is a modified version of 1.2312 according to Stahl-Eisen-Liste, respectively 40CMD8+S according to NF A 35590, 40CrMnNiMo8-6-4 according to DIN EN ISO 4957 and a modified version of P20 according to ASTM A681.

DIMO 2311 is available as plate with cut edges (sheared, flame cut or water jet cut) in the following dimensions:

<b>Thickness</b>	≥ 12 ≤ 130 mm	≥ ½ ≤ 5 in	> 130 ≤ 215 mm	> 5 ≤ 8½ in
<b>Width <sup>a)</sup></b>	≥ 1000 ≤ 2500 mm	≥ 40 ≤ 98¼ in	≥ 1000 ≤ 2050 mm	≥ 40 ≤ 80½ in
<b>Length</b>	≥ 3000 ≤ 6000 mm	≥ 119 ≤ 236 in	≥ 3000 ≤ 6000 mm	≥ 119 ≤ 236 in

<sup>a)</sup> Widths < 1250 mm (49 in) have to be ordered with an even number of plates  
Other dimensions available upon request.

#### Production

The DIMO 2312 production route is designed to achieve the excellent machinability and dimensional stability of this holderblock steel type. The high oxidic cleanliness and the large number of sulfides provide excellent machinability and low tool wear. On flame cut edges, a surplus of 10 mm for the machining has to be scheduled. DIMO 2312 should only be applied for molds if the surface requirements referring to e.g. polishability and photoetchability are less ambitious. DIMO 2312 should not be applied for spark erosion.

The above mentioned properties can only be achieved by the combination of the following DIMO 2312-production steps:

- chemical composition in dependence of thickness
- vacuum degassing
- argon stirring for high oxidic cleanliness
- sulphur alloying
- special casting conditions to assure the high oxidic cleanliness
- High Shape Factor Rolling (high thickness reduction) to realize a closely packed structure
- appropriate heat treatment parameters according to analysis and dimensions to assure homogeneous hardness distribution over the plate and to minimize residual stresses

<sup>1)</sup> The latest edition of this material data sheet is available at <http://www.dillinger.de/>.



## Chemical composition

For the ladle analysis the following limiting values in % are applicable

	C	Si	Mn	P	S	Cr	Mo	Ni	V
limiting values	0.35 - 0.45	0.30 - 0.50	1.40 - 1.60	≤ 0.030	0,050 – 0,100	1.80 - 2.00	0.15 - 0.25	a)	a)
auxiliary data for 100 mm plate thickness	0.40	0.35	1.50	0.022	0.060	1.90	0.20	0.15	0.05

a) alloyed depending on dimensions

## Delivery condition

DIMO 2312 is supplied in the hardened (air hardened + tempered) condition.

## Mechanical and physical properties in the delivery condition

### Hardness

Unless otherwise agreed the hardness at the surface in the delivery condition is 280 - 325 HBW. According to EN ISO 18265, table B2, this corresponds to a tensile strength of approximately 890 - 1030 MPa (128 - 148 ksi).

### Physical properties (auxiliary data)

specific heat at [kJ/(kg K)]	20°C						
	0,46						
specific heat at [Btu/(lb°F)]	68 °F						
	0,11						
thermal conductivity at [W/(m K)]	20 °C	100 °C	200 °C	300 °C	400 °C		
	34	35	36	36	36		
thermal conductivity at [Btu/(ft h°F)]	68 °F	210 °F	390 °F	570 °F	750 °F		
	19.6	20.2	20.8	20.8	20.8		
coefficient of thermal expansion between 10 <sup>-6</sup> [m/(mK)]	20 °C and	100 °C	200 °C	300 °C	400 °C	500 °C	600 °C
		12.1	12.7	13.2	13.8	14.2	14.3
coefficient of thermal expansion between 10 <sup>-6</sup> [in/(in°F)]	68 °F and	210°F	390°F	570°F	750°F	930°F	1110°F
		6.72	7.05	7.33	7.66	7.88	7.94

## Testing

- Heat analysis
- Dimension control
- Surface inspection
- Hardness  
The hardness (HBW) is tested on surface of each rolled mother plate.
- Ultrasonic testing  
Unless otherwise agreed, 100 % ultrasonic testing is performed on each plate in accordance with EN 10160. As admissible limit applies for thickness ≤ 150 mm quality class 3 and for thickness > 150 mm quality class 2 in table 5 of EN 10228-3. Upon request, an ultrasonic testing in accordance with ASTM A 578, Level C supplementary requirements S1 is possible. In this case the desired testing standard has to be indicated on the order.



Unless otherwise agreed, the results are documented in an inspection certificate 3.1 in accordance with EN 10204.

### Identification of plates

Unless otherwise agreed the marking is carried out via steel stamps with at least the following information:

- steel grade (DIMO 2312)
- heat number
- number of mother plate and individual plate
- the manufacturer's symbol
- inspector's sign

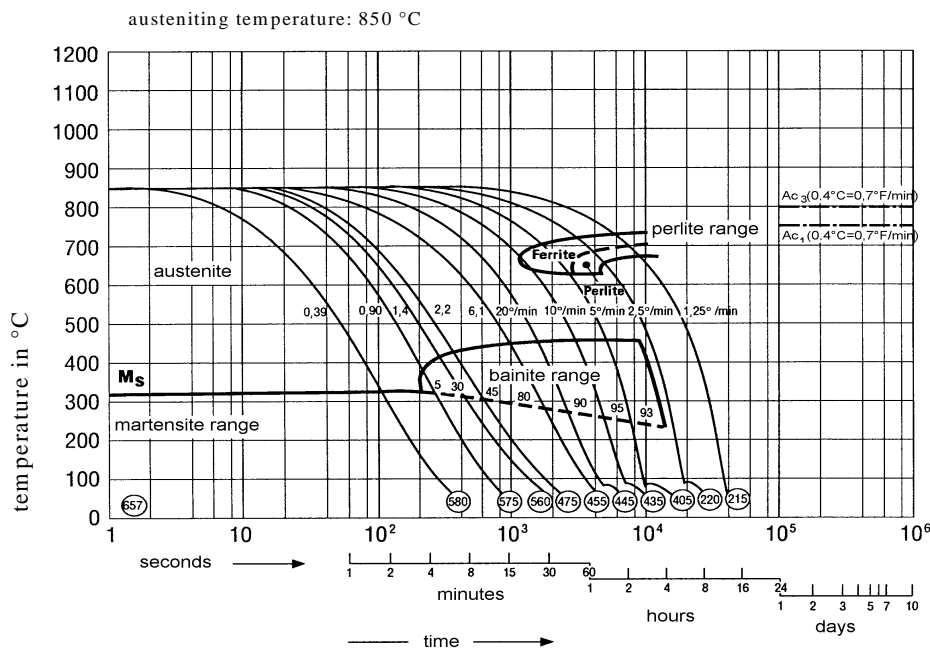
### Processing

#### Heat treatment

DIMO 2311 is delivered in the hardened condition; therefore further heat treatment is generally not necessary. This avoids the risks and costs involved by the hardening and tempering of a mold after processing. Should a heat treatment become necessary, the following data are recommended:

soft annealing	stress relieving	hardening	tempering
720 - 740 °C (1330 - 1360 °F) 2 - 4 h, furnace cooling hardness about 230 HB	in the delivery condition max. 580 °C (1080 °F) 1 - 2 h, furnace cooling	840 - 860 °C (1540 - 1580 °F)/oil; for low wall thicknesses air cooling or warm bath hardening at 200 - 230 °C (390 - 450 °F) are possible	in accordance with tempering diagram to required hardness

#### Time Temperature Transformation diagram



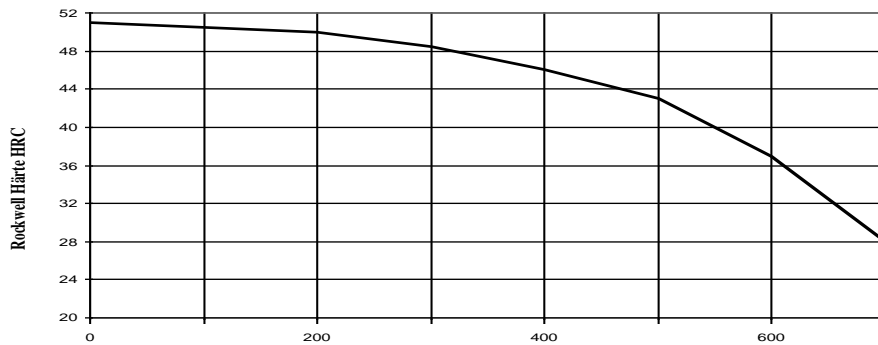
0.39 - 6.1 = cooling parameters  
(t<sup>8</sup>/<sub>5</sub> – time in sec./100)

5 - 95 = % structure

657 = hardness in HV



### Tempering diagram



**Tempering temperature [°C]** (valid for soaking time 1 h, air cooling)

Remark: the values in the diagram are mean values on samples, diameter 25 mm (1 in), length 50 mm (2 in), hardened at 850 °C (1560 °F) in oil

### General technical delivery requirements

Unless otherwise agreed, the general technical delivery requirements in accordance with EN 10021 apply.

#### Tolerances

Unless otherwise agreed, tolerances are in accordance with EN 10029 with the following restrictions:

<b>plate thickness</b>	in accordance with EN 10029, class C			
<b>plate width</b>	≥ 1000 mm ≤ 1500 mm	-0/+40 mm	≥ 40 ≤ 59 in	-0/+1,6 in
	> 1500 mm ≤ 2050 mm	-0/+50 mm	> 59 ≤ 80½ in	-0/+2 in
	> 2050 mm	-0/+100 mm	> 80½ in	-0/+4 in
<b>plate length</b>		± 500 mm		± 20 in
<b>flatness</b>	≤ 3 mm/m, ≤ 6 mm/2 m (1/8 in/40 in, 2/8 in/80 in)			

#### Surface quality

Unless otherwise agreed, the specifications will be in accordance with EN 10163-2 class A, subclass 3. Shot blasting of upper and lower surface of the plate and shop priming are possible on request.

#### General note

If special requirements, which are not listed in this specification, are to be met by the steel due to its intended use or processing, these requirements are to be agreed before placing the order. The information in this specification is a product description. This specification is updated if necessary. The latest version is available from the mill or as download at [www.dillinger.de](http://www.dillinger.de).



DILLINGER HÜTTE

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