



DILLINGER HÜTTE GTS

DIMO P20

PREHARDENED CR MN MO-ALLOYED STEEL IN MOLD QUALITY FOR
THE CONSTRUCTION OF PLASTIC MOLDS

Specification DH-E68-B
Edition November 2006

DIMO P20 is a prehardened CrMnMo-alloyed tool steel for the construction of plastic molds with superior surface requirements on molds. It is characterized by excellent polishability, photoetchability, spark erosion behaviour and dimensional stability as well as good machinability. DIMO P20 is a typical toolsteel for the mold construction in North America and South East Asia.

Product description

Designation and range of application

DIMO P20 is a modified version of AISI P20 according to ASTM A681. Compared to DIMO 2311 and DIMO 2738, DIMO P20 has, as a result of its adjusted analysis resulting in a lower carbon equivalent, advantages at repair welding and at thermal-chemical surface layer treatment, as e.g. nitriding.

DIMO P20 is available as plate with sheared or flame cut edges in the following dimensions:

Thickness	> 12 ≤ 130 mm	> ½ ≤ 5 in	> 130 ≤ 165 mm	> 5 ≤ 6½ in
Width ¹⁾	≥ 1000 ≤ 2500 mm	≥ 40 ≤ 98¼ in	≥ 1000 ≤ 2050 mm	≥ 40 ≤ 80½ in
Length	≥ 4500 ≤ 6000 mm	≥ 177½ ≤ 236 in	≥ 4000 ≤ 6000 mm	≥ 157½ ≤ 236 in

¹⁾ Widths < 1250 mm (49 in) have to be ordered with an even number of plates

Other dimensions available upon request.

Production

The DIMO P20 production route is designed to achieve the excellent properties of this mold steel type with superior surface requirements. DIMO P20 is characterized by high dimensional stability. The DIMO P20 production route provides excellent polishability, photoetchability and spark erosion properties. Therefore DIMO P20 is particularly suitable for molds with superior surface requirements if suitable manufacturing processes are employed.

The good sulfidic and oxidic cleanliness and the modification of the few remaining inclusions by the calcium treatment lead to good machinability and minimize the tool wear.

These properties can only be achieved by the combination of the following DIMO P20-production steps:

- desulphurization to $S \leq 0.002$ % for high sulfidic cleanliness
- chemical analysis in dependence of dimensions
- vacuum degassing
- argon stirring for high sulfidic and oxidic cleanliness
- calcium treatment for inclusion shape control
- special casting conditions to assure the high cleanliness and homogeneity
- 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

Chemical composition

For the ladle analysis the following limiting values in % are applicable (¹⁾ alloyed depending on dimensions)

	C	Si	Mn	P	S	Cr	Mo	Ni	V
limiting values	0.28 - 0.40	≤ 0.40	0.80 - 1.40	≤ 0.025	≤ 0.002	1.00 - 2.00	0.20 - 0.50	¹⁾	¹⁾
auxiliary data for 100 mm plate thickness	0.38	0.36	0.92	0.015	0.001	1.90	0.42		

DIMO P20

Delivery condition

DIMO P20 is supplied in the prehardened (air hardened + tempered) condition.

Mechanical and technological properties in the delivery condition

Hardness

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

Physical properties (auxiliary data)

specific heat at 20 °C: 0,46 kJ/kg · K (at 68 °F: 0.11 Btu/lb · °F)							
thermal conductivity at W/m · K	20 °C	100 °C	200 °C	300 °C	400 °C		
	34	35	36	36	36		
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 ⁻⁶ m/m · K	20 °C and	100 °C	200 °C	300 °C	400 °C	500 °C	600 °C
	12.1	12.6	13.1	13.6	14.0	14.4	
10 ⁻⁶ in/in · °F	68 °F and	210 °F	390 °F	570 °F	750 °F	930 °F	1110 °F
	6.72	7.00	7.28	7.55	7.78	8.00	

Testing

- Heat analysis
- Dimension control
- Surface inspection
- Hardness

The hardness (HB) is tested on surface of each rolled mother plate.

- Ultrasonic testing

Unless otherwise agreed, 100 % ultrasonic testing is performed on each plate in the delivery condition in accordance with EN 10160. As admissible limit applies quality class 4 in table 5 of EN 10228-3.

Upon request, an ultrasonic testing in accordance with ASTM A 578, Level C, supplementary requirements S1 and S9 is possible. In this case the desired testing type 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 P20)
- heat number
- number of mother plate and individual plate
- the manufacturer's symbol
- inspector's sign

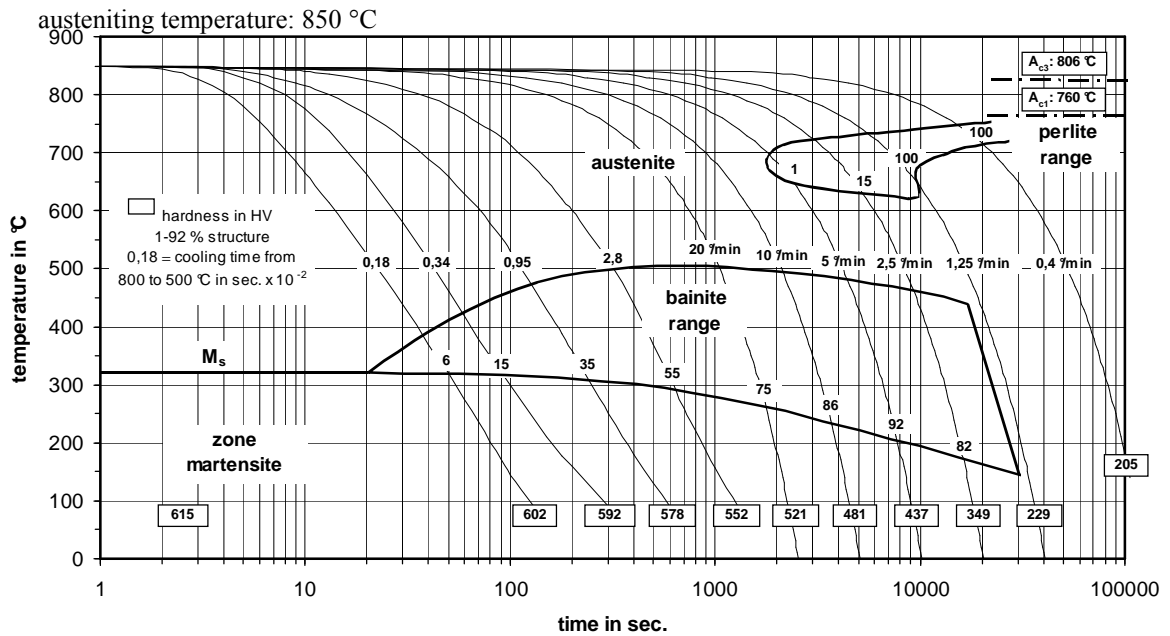
Processing

Heat treatment

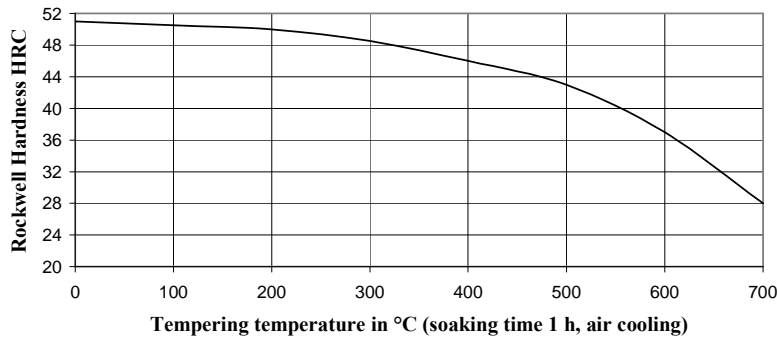
DIMO P20 is delivered in the prehardened condition; therefore further heat treatment is generally not necessary. This avoids the risks and costs involved by the hardening and tempering of a mold after processing. Should a heat treatment become necessary, the following data are recommended:

soft annealing	stress relieving	preheating before hardening	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	450 - 650 °C (840 - 1200 °F)	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 (min. 1 h/25 mm (1 in) wall thickness)

Time Temperature Transformation diagram



Tempering diagram



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 / ASTM A 6 with the following restrictions:

plate thickness:	in accordance with EN 10029, class C / ASTM A 6			
plate width:	≥ 1000 mm ≤ 1500 mm	± 25 mm	≥ 40 ≤ 59 in	± 1 in
	> 1500 mm ≤ 2050 mm	± 40 mm	> 59 ≤ 80½ in	± 1½ in
	> 2050 mm	± 50 mm	> 80½ in	± 2 in
plate length:		± 1000 mm		± 40 in
flatness:	≤ 3 mm/m (1/8 in/40 in)			

Unless otherwise agreed, short lengths ≥ 2 m (79 in) are part of the delivery.

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.

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