



## W 1.2312

## W 1.2312: A prehardened mold steel (300 HB/32 HRC) with improved machinability

### Material properties

Prehardened Cr-Mn-Mo steel designed for plastic mold industry, with a specific sulfur addition to improve machinability. Compared to 1.2311 grade, 30% increase in milling speed and 300% increase in drilling speed can be expected.

### For which tools, for which plastics

Plastic injection mould cores and cavities, extrusion dies for thermoplastics (PE, PP, PS), thermosetting plastics, transparent melts. Not suitable for polishing requirements.

## PROPERTIES

### STANDARD

> AFNOR	40 CMD8S
> DIN	40 CrMnMoS 8-6
> WERKSTOFF Nb	1.2312
> AISI	≈ P20+S

### CHEMICAL ANALYSIS

Typical values (weight%)

C	S	P max	Si	Mn	Cr	Mo
.4	.060	.012	.3	1.5	1.9	.2

### MECHANICAL PROPERTIES

1.2312 is delivered **quenched and tempered to 280 - 325 HB (29 - 33 HRC)**.

Hardness	Rp 0.2 Yield Strength		Rm Tensile strength		Elongation	Reduction of area	K <sub>C</sub> V 20°C	Elastic modulus	
	MPa	ksi	MPa	ksi				GPa	ksi
300	850	123	960	139	10	45	20	205	29733

### PHYSICAL PROPERTIES

Thermal conductivity W.m-1.K-1		Thermal expansion Coefficient (10-6.K-1)				Specific heat J/kg.°C
20°C		20-100°C	20-200°C	20-300°C	20-400°C	
34		11.5	11.6	12.5	12.8	470

Typical value

## PROPERTIES

### METALLURGICAL PROPERTIES

W1.2312 has an excellent hardenability resulting in good uniformity of hardness and microstructure.

#### Internal soundness

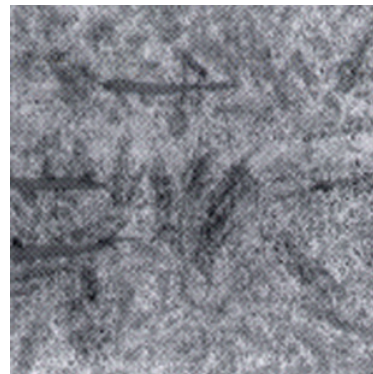
All plates are ultrasonically tested according to NFA 04305 Class C.

#### Grain size

Uniform 7/8 grain size according to ASTM E112.

#### Metallurgical transformation points

AC <sub>1</sub>	AC <sub>3</sub>	M <sub>s</sub>	V <sub>1</sub>	V <sub>2</sub>
733°C 1351°F	780°C 1436°F	320°C 608°F	1000°C/h 1830°F/h	300°C/h 540°F/h

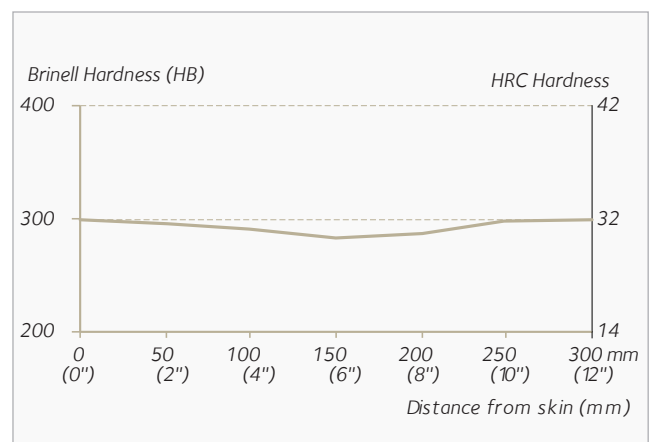


Homogeneous tempered bainite/martensite in prehardened condition (300 HB/32 HRC) Manganese sulfide inclusions (x 500).

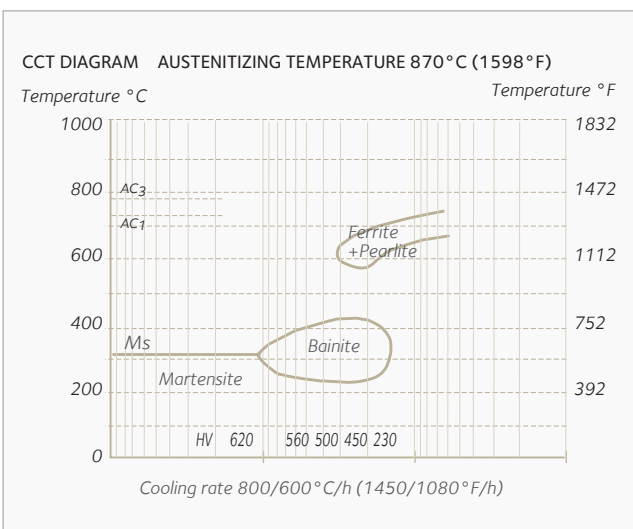
#### Heating conditions:

150°C/h up to 875°C, holding time 10 minutes,

270°F/h up to 1607°F, holding time 10 minutes.



Homogeneity of hardness through the thickness of the plate for  $th = 300$  mm (12").



## DELIVERY CONDITIONS

### DIMENSIONAL PROGRAM

Thickness	Width
7 - 120 mm (. 27" - 4.7")	1000 - 2500 mm (39 - 98.4")
120 - 610 mm (4.7" - 24")	1000 - 2100 mm (39" - 78.7")

## PLATE PROCESSING

### HEAT TREATMENT

For specific applications where mechanical properties higher than 300HB are required, hardening can be performed in the following way:

- > heating (about 850°C - 1562 °F) with a sufficient holding time (1 hour/inch)
- > water, oil or air quenching depending on thickness (see C.C.T diagram)
- > the tempering temperature controls the mechanical characteristics

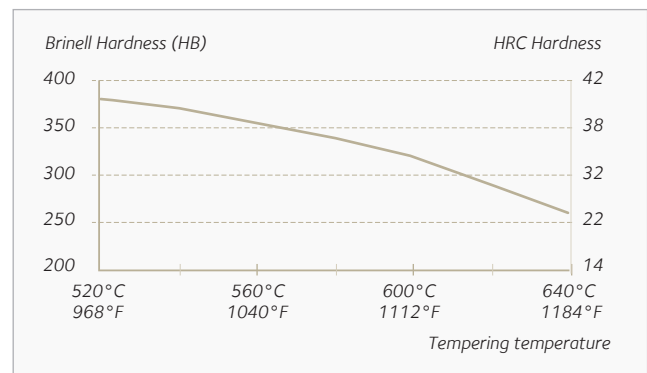
The following instructions must be followed to obtain an efficient tempering:

- > Uniform heating at the selected tempering temperature (see tempering curve)
- > Holding time of one hour per inch of total thickness
- > Double tempering with complete cooling to room temperature for each treatment

### Tempering curve

Test conditions:

- > austenitization 870°C (1598 °F)
- > tempering/holding time 1h
- > air cooling



Note that complicated shapes require accurate control of steel temperature uniformity and sufficient holding

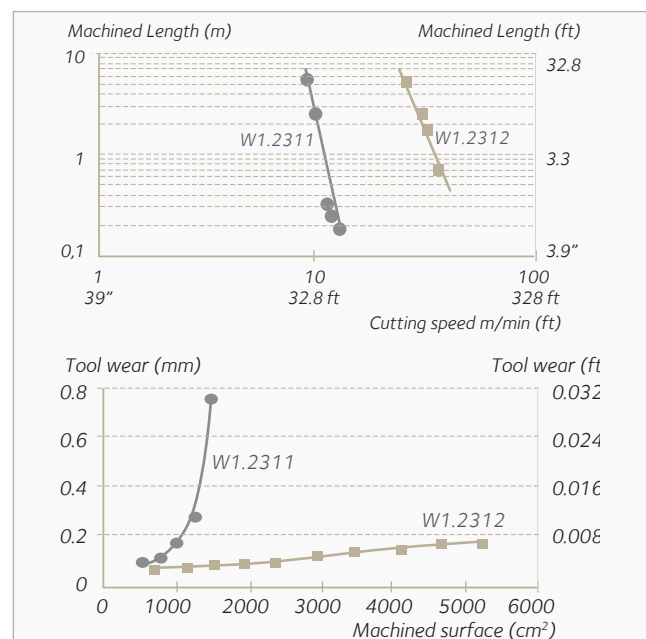
### MACHINING

W1.2312 grade shows high performance in drilling and in milling using high speed steel or carbide tools. The machinability of W1.2312 is increased (compared to W1.2311) by a controlled sulfur addition which aims at:

- > 500% increase in milling tool life (at constant cutting speed)
- > 300% increase in drilling speed
- > 30% increase in milling speed

Cutting conditions (cutting speed, feed rate...) depend on the tool, but those of 1.2311 could be applied taking into account:

- > 30% increase in milling speed with carbide inserts
- > 300% increase in drilling speed with high speed steel tools.



## POLISHING

W1.2312 can be roughly polished in the quenched and tempered condition. After grinding, polishing will be made with aluminium oxide or diamond paste.

## WELDING

Welding of W1.2312 requires exceptional care due to the high sulfur level. High pre/postheating temperature should be used (350°C – 660°F) to avoid cold cracking.

## YOUR CONTACTS

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*Technical data and information are to the best of our knowledge at the time of printing. However, they may be subject to some slight variations due to our ongoing research programme on steels. Therefore, we suggest that information be verified at time of enquiry or order. Furthermore, in service, real conditions are specific for each application. The data presented here are only for the purpose of description, and considered as guarantees when written formal approval has been delivered by our company. Further information may be obtained from the address opposite.*