Industeel

ArcelorMittal

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, extursion dies for thermoplastics (PE, PP, PS), thermosetting plastics, transparent melts. Not suitable for polishing requirements.

PROPERTIES

ACCORDING TO STANDARD

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

CHEMICAL ANALYSIS

Typical values (weight%)

C	S	P max	Si	Mn	Cr	Mo
0.4	0.060	0.012	0.3	1.5	1.9	0.2

MECHANICAL PROPERTIES

1.2312 is delivered **quenched and double tempered to 280 - 325 HB (29 - 34 HRC).**

Hardness	Rp 0.2 Yield Strength		Rm Tensile strength		Elongation	Reduction of area	KCV 20°C	Elastic modulus	
HB	MPa	ksi	MPa	ksi	%	Z%	J	GPa	ksi
300	850	123	960	139	10	45	20	205	29733

Typical values

PHYSICAL PROPERTIES

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

Typical values

METALLURGICAL PROPERTIES

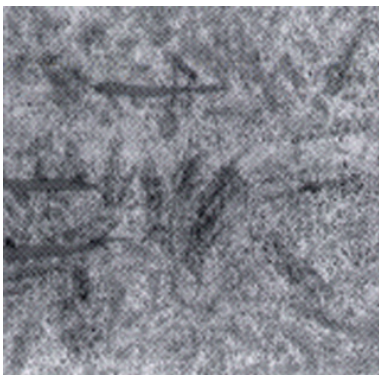
W1.2312 has an excellent hardenability resulting in good uniformity of hardness and microstructure.

Internal soundness

All plates are ultrasonically tested according to EN 10160 S3 E4.

Grain size

Uniform 7/8 grain size according to ASTM E112.



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

Metallurgical transformation points

AC_1	AC_3	M_S	V_1	V_2
733°C 1351°F	780°C 1436°F	320°C 608°F	1000°C/h 1830°F/h	300°C/h 540°F/h

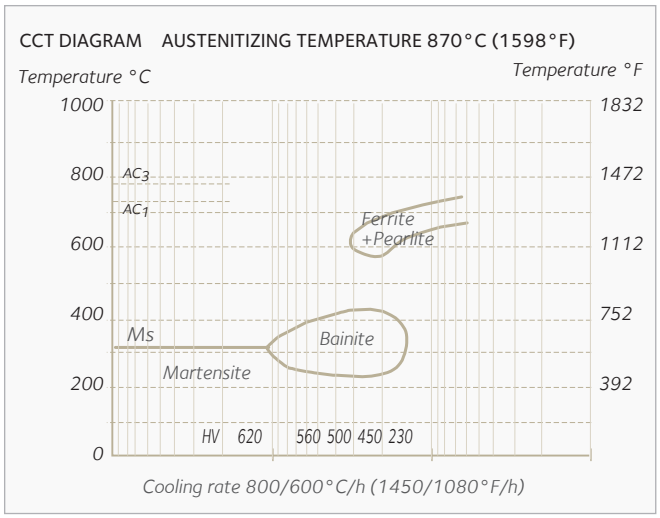


PLATE PROCESSING

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**

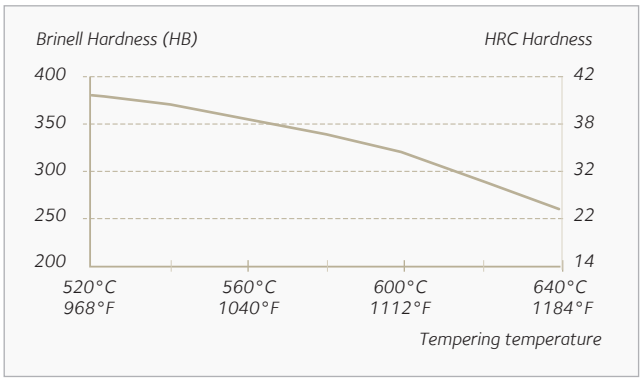
The following instructions must be followed to obtain an efficient tempering:

- **> 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)

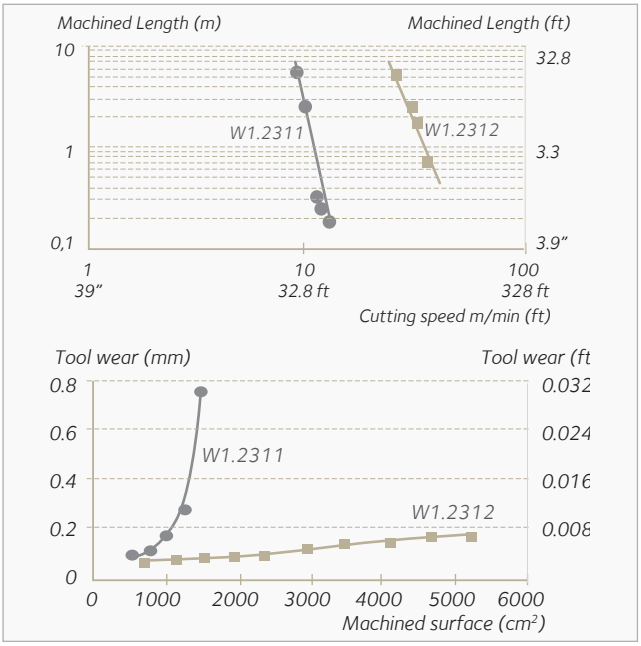
> 300% increase in drilling speed

> 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.



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.

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")

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