

AISI 4140-W1.7225-EN 42CrMo4

4140-1.7225: A prehardened mold steel (260-310 HB)

4140 or 1.7225 are chromium-manganese-molybdenum grade designed for plastic mold industry. These grades are normally delivered in a prehardened condition at a hardness level of 260-310 HB. These grade have a fully homogeneous martensite-bainite microstructure. Toughness, high fatigue are the main characteristics of these family of tool steels.

Industeel is using a typical unique chemical analysis covering both 4140 and 1.7225 chemical specifications

This grade is typically used for:

- > Big mechanical parts
- > plastic injection molds for thermoplastics

PROPERTIES

CHEMICAL ANALYSIS - WEIGHT%

Analysis in %		C	Si	Mn	Ni	Cr	Mo	S	P
4140	Min	0.36	0.15	0.75	-	0.80	0.15	-	-
	Typ	0.41	0.275	0.85	< 0.06	1.05	0.20	<0.004	<0.020
	Max	0.44	0.35	1.00	< 0.28	1.10	0.25	<0.005	<0.020
1.7225 42 CrMo4	Min	0.38	0.10	0.60	-	0.90	0.15	-	-
	Typ	0.41	0.275	0.85	< 0.06	1.05	0.20	<0.004	<0.100
	Max	0.45	0.40	0.90	<0.28	1.20	0.30	<0.0035	<0.250

MECHANICAL PROPERTIES

Typical values for plates air quenched and tempered (thickness 45 mm - 1.8"). Density 7.85 g/cm³

	Hardness	YS 0.2		UTS		Elongation	Reduction of area	Charpy V (20 °C)	
	HB	MPa	KSI	MPa	KSI	%	Z%	J	Ft.Lbs
Longitudinal direction	260-310	875	127	1050	152	13	40	12	9

PHYSICAL PROPERTIES

Thermal conductivity W m ⁻¹ K ⁻¹	Thermal expansion coefficient 10 ⁻⁶ °C ⁻¹ /10 ⁻⁶ K ⁻¹		
20°C 68°F	20-100°C 68-212°F	20-200°C 68-392°F	20-300°C 68-572°F
42	11.1	12.1	12.9

METALLURGICAL PROPERTIES

4140 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.- ASTM A 578-59 2mm flat bottom hole

Grain size:

Uniform 7/8 grain size according to ASTM E112.

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 1800 °F/h	300 °C/h 540 °F/h



PLATE PROCESSING

HEAT TREATMENT

For specific applications where mechanical properties higher than 30 HRC 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 (see tempering curve)

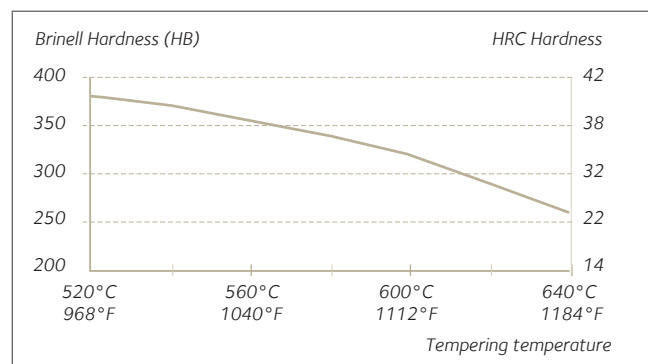
The following instructions must be followed to obtain an efficient tempering:

- > 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:

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 times to limit stresses and prevent cracking.

PLATE PROCESSING

POLISHING

4140 -1.7225 can be roughly polished in the quenched and tempered condition. After grinding, polishing will be made with aluminium oxide or diamond paste.

MICRO CLEANLINESS

Typical A (Sulfide) : 2,5 ; B (Aluminatess) : 0, ; C (Silicates) : 0 ; D (Globular oxydes) :1

WELDING

Welding of 4140 - 1.7225 requires special care . High pre/post-heating temperature should be used (350°C – 660°F) to avoid cold cracking.

DELIVERY CONDITIONS

DIMENSIONAL PROGRAM

Thickness	Width
20 - 120 mm (. 79" - 4.7")	1500 - 2500 mm (59 - 98.4")
120 - 500 mm (4.7" - 20")	2000 mm (82.7")

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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.