

<b>Désignation</b>	<b>X2NiCrMoTi10-10-5</b>	DIN 1.6908	UNS (ASTM) -	AISI -	LMSA <b>E200</b>
--------------------	--------------------------	---------------	-----------------	-----------	---------------------

### Chemical composition

Fe	C	Cr	Ni	Mo	Ti	Mn	Si	P	S
Balance	≤ 0.03	8.5 - 10.5	8.5 - 11.0	4.5 - 5.5	0.5 - 1.0	≤ 0.30	≤ 0.30	≤ 0.025	≤ 0.015

Values (Weight %). In order to achieve maximum homogeneity and consistent quality, the actual manufacturing tolerances are tighter and more precisely than the composition indicated.

### Main technical properties and features

Durinox® is a low carbon martensitic hardenable (maraging steel) and presents a very high tensile strength. In the delivered tempers, Durinox® can be hardened in order to reach a tensile strength of approximately 2000 N/mm<sup>2</sup>. This high performance steel allows an easy cold working of parts; Durinox® has a very high fatigue strength limit and the cutting edges, often critical in mechanical clock industry, for example, remain smooth. The hardening of parts (typically at 480 °C 3h under vacuum or under inert atmosphere) results in a high degree of hardening without perceptible dimensional change.

After a heat treatment at high temperature (typically 800-1000 °C) and a rapid cooling carried out during the production process, the face centered cubic austenitic phase is transformed into soft martensite. In contrast to carbon steels, there is no distortion of the lattice by interstitial carbon atoms and the martensitic structure can be easily cold deformed. Hardening is due to the appearance of very stable Ni<sub>3</sub>Ti or Ni<sub>3</sub>Mo intermetallics, this practically without deformation (distortion) of the treated parts. As a result of the Ni-rich particle precipitation hardening mechanism, austenite-forming nickel is removed from the matrix. This shifts the austenite retransformation to even higher temperatures, allowing Durinox® to be used at relatively high temperatures.

Lamineries MATTHEY produces two different Maraging steels: Durnico®, X2NiCoMo18-9-5, 1.6358 (Durimphy, NiMark 300) and Durinox®, X2CrNiMo10-10-5, 1.6908 (Ultrafort). A slightly higher mechanical strength can be achieved with Durnico®. Corrosion resistance of Durinox® exceeds that of Durnico®, though is slightly lower than that of stainless steel 1.4435, 316L.

### Typical uses

Springs, pallet forks, wheels, bridges, connectors, various parts subjected to high stresses, etc.

### Typical manufacturing range

	Thickness (mm)	Width (mm)	Length (mm)
<b>Rolled products</b> Strip in coils <sup>[1]</sup>	0.030 - 1.000	1.5 - 200.0	-
Strip as sheets <sup>[1]</sup>	0.030 - 1.000	10.0 - 200.0	100 - 3000

<sup>[1]</sup> Not all our production possibilities are presented here. Other dimensions or product forms available upon request. Some combinations of thicknesses and widths are not possible.

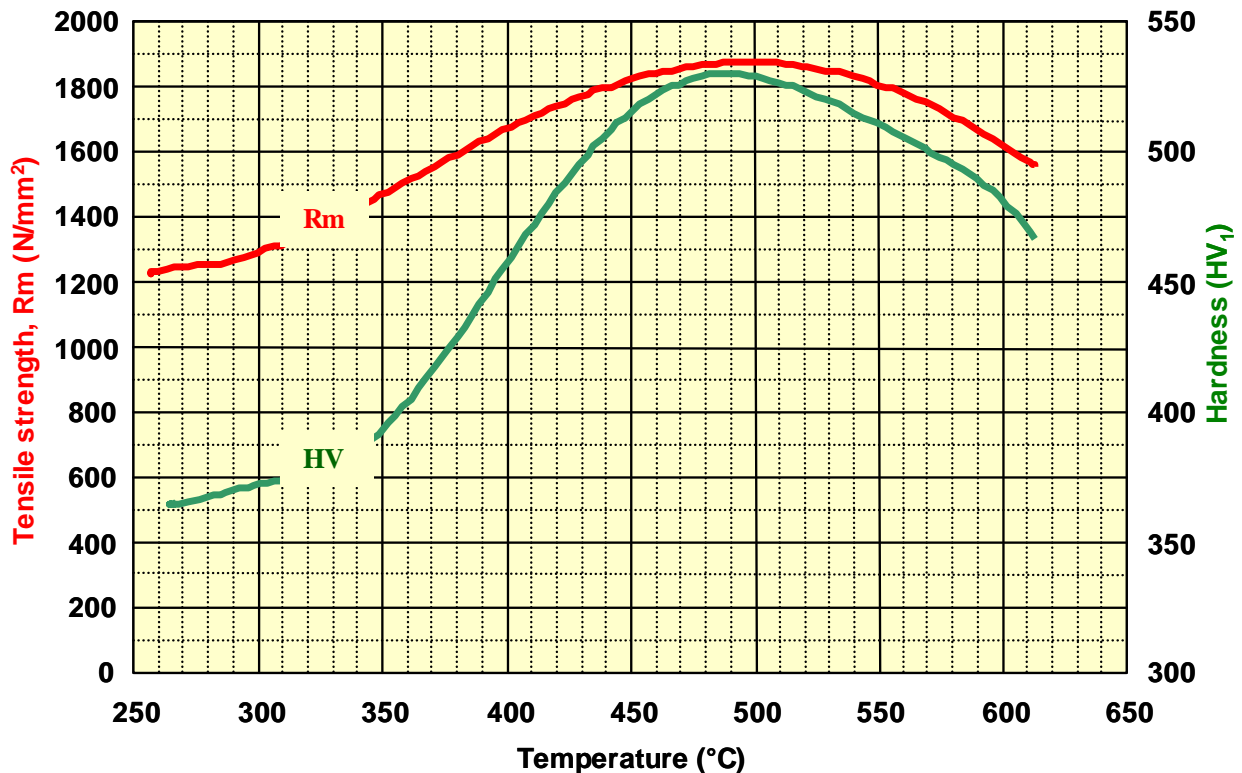
**Mechanical properties of strips**

Temper			Heat Treatment	R <sub>m</sub> (N/mm <sup>2</sup> )	Hardness HV
R1000	H310	soft annealed	-	1000 - 1200	310 - 360
R1050	H310	skin pass	-	1050 - 1250	320 - 380
R1200	H360	hard	-	1200 min.	360 min.

After hardening (by the customer)

R1600	H450	soft + hardened	3h at 480 °C	1600 - 1900	450 - 550
R1700	H480	skin pass + hardened	3h at 480 °C	1700 - 1900	480 - 550
R800	H530	hard + hardened	3h at 480 °C	1800 min.	530 min.

**Typical aged hardening curve at different temperatures of Durinox®  
Initial temper: soft - 3h heat treatment.**



### Physical properties

Modulus of elasticity	kN/mm <sup>2</sup>	203 at 20 °C, 195 at 200 °C and 181 at 400 °C
Poisson ratio		0.3
Density	g/cm <sup>3</sup>	8.1
Melting point	°C	approx. 1450
Linear dilatation coefficient	10 <sup>-6</sup> /°C	Soft annealed: 9.9 (20 - 100 °C), 10.7 (20 - 200 °C) 11.1 (20 - 300 °C), 11.2 (20 - 400 °C) Hardened <sup>[1]</sup> : 10.3 (20 - 100 °C), 11.0 (20 - 200 °C) 11.2 (20 - 300 °C), 11.5 (20 - 400 °C)
Thermal conductivity at 20°C	W/m °K	Hardened <sup>[1]</sup> : 23.6
Electrical resistivity	μΩcm	Hardened <sup>[1]</sup> : 47
Electrical conductivity	MS/m	Hardened <sup>[1]</sup> : 2.13
Specific heat at 20°C	J/(kg. K)	Hardened <sup>[1]</sup> : 440
Curie temperature	°C	approx. 400

[1] These values are given for standard tempering at 480 °C on soft annealed metal. They can vary slightly with the tempering temperature.

### Tolerances (strip and foil)

Thickness	Thickness (mm)		Lamineries MATTHEY		
	≥	<	LMSA Standard	LMSA Precision	LMSA Extreme
	-	0.025	-	-	± 0.001
	0.025	0.050	± 0.003	± 0.002	± 0.0015
	0.050	0.065	± 0.004	± 0.003	± 0.002
	0.065	0.100	± 0.006	± 0.004	± 0.003
	0.100	0.125	± 0.008	± 0.006	± 0.003
	0.125	0.150	± 0.008	± 0.006	± 0.004
	0.150	0.250	± 0.010	± 0.008	± 0.004
	0.250	0.300	± 0.012	± 0.008	± 0.005
	0.300	0.400	± 0.012	± 0.009	± 0.005
	0.400	0.500	± 0.015	± 0.010	± 0.006
	0.500	0.600	± 0.020	± 0.012	± 0.007
	0.600	0.800	± 0.020	± 0.014	± 0.007
	0.800	1.000	± 0.025	± 0.015	± 0.009
	1.000	1.200	± 0.025	± 0.018	± 0.012
	1.200	1.250	± 0.030	± 0.020	± 0.012
	1.250	1.500	± 0.035	± 0.025	± 0.014
<b>Width</b>	Our width tolerances "Standard" is +0.2, -0.0 (or ± 0.1 mm upon request). They are available for slit widths < 125 mm and thicknesses < 1.00 mm. Special tolerances upon request.				
<b>Camber</b>	Width (mm)		Camber max. (mm/m)		
	>	≤	LMSA standard		LMSA extreme
			≤ 0.5 mm	> 0.5 mm	≤ 0.5 mm
					> 0.5 mm
	3	6	12	-	6
	6	10	8	10	4
	10	20	4	6	2
	20	250	2	3	1
					5
					3
					1.5
<b>Surface</b>	Special surface qualities upon request				
<b>Flatness</b>	Special requirement on the longitudinal or transversal flatness upon request				

The information in this document is informative only. Information provided does not constitute any contractual commitment or warranty of any kind.