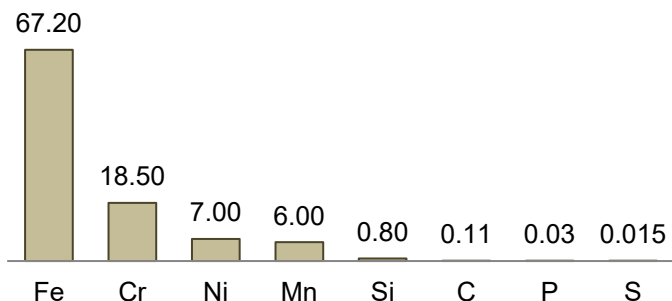


ROBAMAG

Austenitic stainless steel

Chemical composition



Alloy denomination

N° Robert Laminage SA: 976
 EN Number: 1.4369
 EN Designation : X 11 CrNiMn 19-8-6
 UNS*:
 *Unified Numbering System (USA)

Properties and main applications

ROBAMAG is a stainless spring steel combining high mechanical strength with a non-magnetic structure. This combination of properties has previously been found mainly in expensive Co-Ni-base or Cu-Be alloys. Corrosion resistance is comparable to ASTM 301.

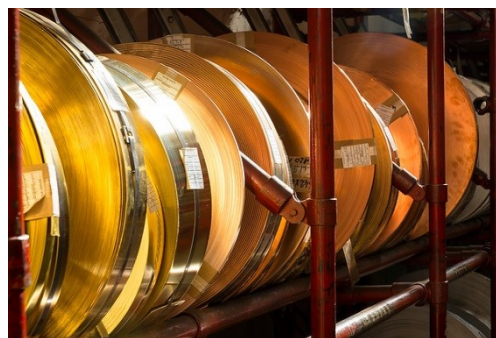
ROBAMAG also possesses good fatigue properties and excellent ductility, which makes it a most suitable choice for springs and other high-strength applications where ferromagnetic materials cannot be used.

ROBAMAG main characteristics:

- Non-magnetic structure in all conditions
- High mechanical strength in the cold rolled condition. Strength can be further increased by tempering, without any effect on the non-magnetic structure.
- High elastic limit and energy storing capacity in the cold rolled and tempered condition which is important for spring applications.

Physical properties

		Units
Density 20° C	7.9	Kg/dm ³
Melting point	1400-1450	°C
Modulus of elasticity, longitudinal	190	GPa/mm ²
Thermal Conductivity	15	W/m•K
Electrical Conductivity	1.4	M/Ω•mm ²
Electrical resistivity	70	μΩ•cm
Coefficient of linear expansion	18	10 ⁻⁶ •K ⁻¹
Magnetic property (annealed – cold rolled)	1.002 – 1.20	μ
Poisson's ratio	0.29	



Workability

	Note
Corosion resistant	+++
Hotworking	-
Coldworking	+++
Plating	+++
Diamond cutting	-
Surface Nitration	-
Polishing	+++
Soldering	+++
Brazing	+++
Machining	++

+ bad
 ++ medium
 +++ good
 ++++ excellent
 - no information(s)
 N/A not-applicable for this alloy

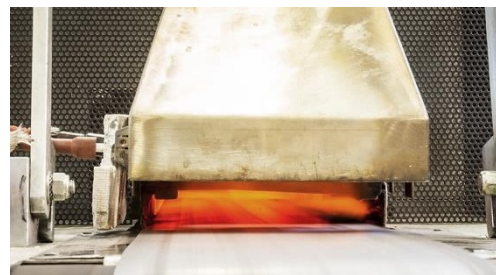


Thermal treatment / Hardening

Annealing temperature	1050°C
Stress relieving heat treatment temperature	480°C
Mill hardened as delivered	-°C
Age hardened by customer	2 heure(s)

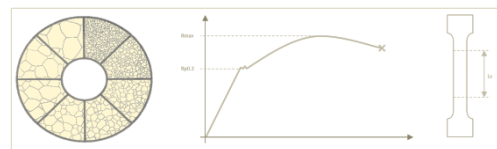
Comments / thermal treatment:

The strength of cold rolled steel can be increased by a tempering operation at 480°C for 2 hours. For cold rolled ROBAMAG with a tensile strength above about 1400 MPa, an increase in tensile strength of about 100-200 MPa can be expected. This heat treatment is also beneficial for relaxation and fatigue resistance. Tempering is normally carried out by the customer after forming. To avoid discolouration, parts should be carefully cleaned before heat treatment.



Mechanical Properties:

ROBAMAG

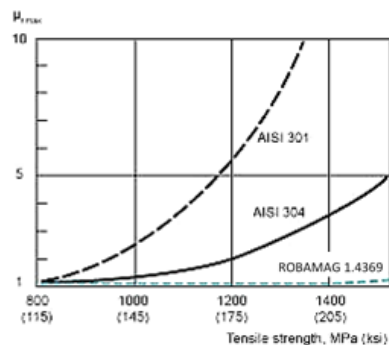


Possible hardness range [HV] :
170 - 480

Possible ultimate tensile strength range [MPa] :
750 - 1600

Temper	State	Hardness (HV : Vickers)		Rm (MPa)		Rp 0.2 (MPa)		Elongation (%) avec Lo = 50mm	Grain size (µm)	
		min	max	min	max	min	max		min	max
According to technical specification from the supplier										
C750	Annealed	170	290	750	950	300	600	>= 40	-	-
C1000	¼ hard	250	375	1000	1200	800	1100	>= 10	-	-
C1200	½ hard	310	440	1200	1400	900	1200	>= 7	-	-
C1300	Hard	410	500	1300	1600	1050	1350	>= 2	-	-
C1600	Spring	>= 480		>= 1600		>= 1300		-	-	-

The following diagram shows typical values for the maximum relative magnetic permeability for ROBAMAG, compared to ASTM 301 and 304.



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