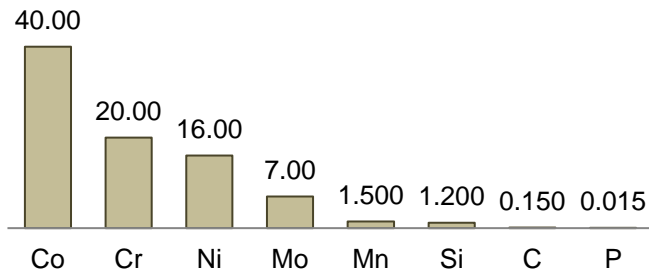


PHYNOX

High tensile strength alloy

Chemical composition



Alloy denomination

N° Robert Laminage SA: 974

EN :
EN designation : CoCr20Ni16Mo7
UNS* : R30003 / R30008
*Unified Numbering System (USA)

Properties and main applications

Phynox is an austenitic alloy strengthened by cold work. It is possible to increase its hardness through a soft heat treatment at 500 °C. After the hardening process, its modulus of elasticity (Young modulus) can reach 210 GPa and its ultimate tensile strength 2500 MPa, which creates outstanding spring properties. In addition to that, Phynox has many other properties that makes it a premium solution for many applications :

Main carasteristics :

- Extremely resistant to corrosion, stress-corrosion cracking and to hydrogen embrittlement
- Non magnetic, high fatigue strength and absence of aging
- Can be used over a wide range of temperature (from -269°C to500°C)
- Bio compatible and implantable
- Possibility of increasing the mechanical properties after forming
- High operating temperature
- Absence of brittleness at low temperature

Physical properties

		Units
Density 20° C	8.3	Kg/dm ³
Melting point	1450-1460	°C
Modulus of elasticity, longitudinal	215 (soft)	GPa/mm ²
Thermal Conductivity	12.5	W/m•K
Electrical Conductivity	1.1	M/Ω•mm ²
Electrical resistivity	95	μΩ•cm
Coefficient of linear expansion	12.5	10 ⁻⁶ •K ⁻¹
Magnetic properties	non-magnetic	μ
Poisson ratio	0.30	



Workability

	Grade
Corrosion resistance	++++
Hot working	-
Cold working	+++
Plating	+++
Diamond cutting	-
Surface Nitration	-
Polishing	+++
Welding	+++
Brazing	+++
Machining	++



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

Thermal treatment / Hardening

Annealing temperature	1050°C
Stress relieving heat treatment temperature	520°C
Mill hardened as delivered	-°C
Age hardened by customer	3 hour (s)

Comments / Thermal treatment :

The strength of cold rolled steel can be increased by a tempering operation at 520°C for 3 hours. The heat treatment in air does not change the mechanical properties, but can influence the surface aspect (pale yellow tint). We would recommend treatments under a vacuum (10^{-5} Torr) or with a neutral atmosphere such as argon gaz.

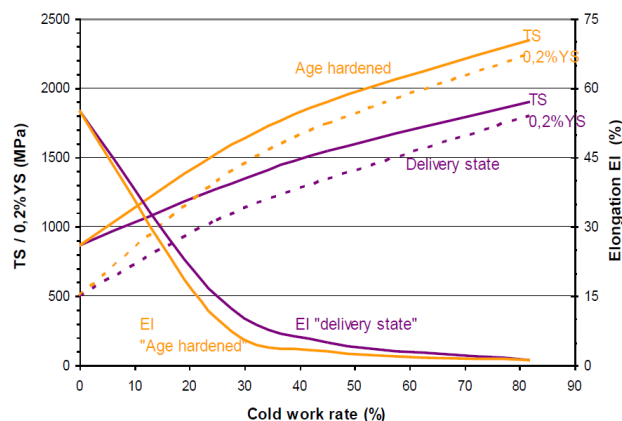


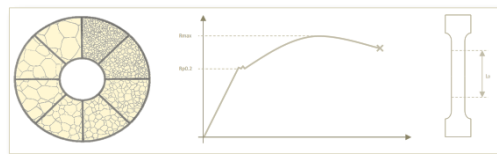
Figure 1: Influence of cold work on 0.2% YS, UTS and elongation

Mechanical Properties:

PHYNOX R30003 R30008

Hardness Range [HV] :
200 - 680

Tensile Strength Range [MPa] :
850 - 2200



	State	Hardness (HV : Vickers)		Rm (MPa)		Rp 0.2 (MPa)		Elongation (%) avec L ₀ = 50mm	Gain size (µm)	
		min	max	min	max	min	max		min	max
According to the technical data from the melter										
R850	Annealed	200	270	850	1050	350	650	>= 30	-	-
R1200	½ Hard	340	460	1200	1500	900	1350	-	-	-
R1600	Hard	480	600	1600	1900	1300	1850	-	-	-
R1800	Extra Hard	>= 560		>= 1800		>= 1650		-		
According to the technical data from the melter										
TM00	Annealed + hardened	200	270	850	1050	350	650	>= 30	-	-
TM04	½ hard + hardened	400	520	1400	1800	1050	1500	-	-	-
TM10	Hard + hardened	600	750	2000	2400	1750	2200	-	-	-
TM14	Extra Hard + hardened	>= 680		>= 2200		>= 2050		-		

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