

Designation	CoCr20Ni16Mo7	DIN	UNS (ASTM)	AISI	LMSA
		-	R30003/R30008	-	E300

Chemical composition

Fe	Co	Cr	Ni	Mo	Mn
Balance	39.0 - 41.0	19.0 - 21.0	15.0 - 16.0	6.5 - 7.5	1.5 - 2.0
Si	C	P	S	Be	-
1.2 max.	0.15 max.	0.015 max.	0.015 max.	0.001 max.	-

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

Main technical properties and features

Phynox® (Elgiloy) is an austenitic cobalt-based alloy (40 % Co, 20 % Cr, 16 % Ni et 7 % Mo) produced by vacuum induction melting (VIM) process, followed by electroslag remelting (ESR). Phynox® can be strengthened by cold work and additionally hardened by aging. Its ultimate tensile strength (UTS) can reach 2500 N/mm². Soft annealed temper is achieved by annealing at high temperature (1000 - 1200 °C) followed by rapid cooling. In this temper, its UTS is only approximately 900 N/mm² but the mechanical strength of Phynox® increases significantly with cold rolling and its UTS can reach more than 1900 N/mm² only by cold working (cold rolling). Additional strengthening can be obtained by age hardening at 520 °C for 3h. The influence of aging is negligible in the annealed condition but increases significantly with the percentage of cold working. Phynox® is non-magnetic, extremely resistant to corrosion (not sensitive to corrosion by organic acids), and its behavior in inorganic acids is greatly superior to that of the best stainless steels grade. Phynox® is also insensitive to hydrogen embrittlement. Furthermore, Phynox® alloy presents an excellent passivity in contact with human tissues (biocompatibility). Phynox® has the ability to be used over a very wide range of temperatures, from -269 °C (liquid helium) to about 500 °C. Thanks to a combination of high Young modulus (210 kN/mm²), a very high yield strength (up to 2200 N/mm²), and a good fatigue strength, Phynox® presents an exceptional spring property.

Lamineries MATTHEY delivers Phynox® strips according to the following standards: ASTM F-1058 (surgical implants), ISO 5832/7 (surgical implants), AFNOR NF S 90-403 (surgical implants), AMS 5875, AMS 5876 and NACE MR0175.

Typical uses

Watch industry: springs, wrist-watch strap parts, etc.;

Medical: orthodontics, pacemaker electrodes, stents, needles, etc.;

Others: weapon parts, spring energized seals, nonmagnetic parts, etc.

Typical manufacturing range

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

^[1] 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.

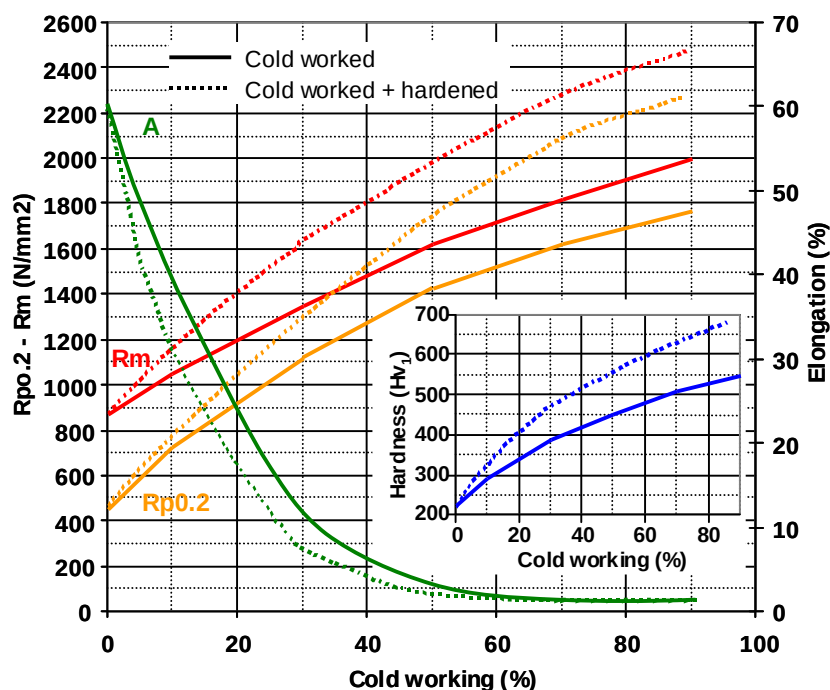
Mechanical properties of strips

Temper			Heat Treatment	Rp0.2 (N/mm ²)	Rm (N/mm ²)	A _{50mm} (%)	Hardness HV
R850	H200	soft annealed	-	350 - 650	850 - 1050	30 min.	200 - 270
R1000	H260	¼ hard	-	650 - 1150	1000 - 1300	15 min.	260 - 410
R1200	H340	½ hard	-	900 - 1350	1200 - 1500	-	320 - 440
R1500	H440	¾ hard	-	1150 - 1600	1500 - 1800	-	420 - 530
R1600	H480	hard	-	1300 - 1850	1600 - 1900	-	450 - 560
R1800	H560	extra hard	-	1650 min.	1800 min.	-	560 min.

After heat treatment (by the customer)

R850	H200	soft + hardened	3h to 520 °C	350 - 650	850 - 1050	30 min.	200 - 270
R1000	H260	¼ hard + hardened	3h to 520 °C	650 - 1200	1050 - 1450	10 min.	300 - 450
R1200	H340	½ hard + hardened	3h to 520 °C	1050 - 1500	1400 - 1800	-	400 - 520
R1500	H440	¾ hard + hardened	3h to 520 °C	1500 - 1900	1800 - 2300	-	500 - 650
R1600	H480	hard + hardened	3h to 520 °C	1750 - 2200	2000 - 2400	-	600 - 750
R1800	H560	extra hard + hardened	3h to 520 °C	2050 min.	2200 min.	-	680 min.

Typical cold working curve of Phynox.
 Values of Rm, Rp0.2, A, et HV₁ before and after hardening at (520 °C 3h).



Physical properties

Modulus of elasticity	kN/mm ²	215 (soft), 190 (hard), 225 (soft+hardened), 210 (hard+hardened)
Poisson ratio		0.3
Density	g/cm ³	8.3
Melting point	°C	1450 - 1460
Linear dilatation coefficient	10 ⁻⁶ /°C	12.5
Thermal conductivity at 20°C	W/m °K	12.5
Electrical resistivity	μΩcm	95
Electrical conductivity	MS/m	1.1
Specific heat at 20°C	J/(kg. K)	450
Magnetic properties		Nonmagnetic (For all practical purposes, Phynox is nonmagnetic through all temperature range.)

Tolerances (strip and foil)

Thickness The table shown is an outline of our typical thickness tolerances available. They are tighter than industry standards. Our "LMSA Precision" and "LMSA Extreme" tolerances are available upon request.	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			
Width	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.						
Camber	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	5
Our tolerance "LMSA Standard" respects the EN Standard 1654 (Length of measurement 1000 mm). Other tolerances upon request.	10	20	4	6	2	3	
	20	250	2	3	1	1.5	
	Surface	Special surface qualities upon request					
Flatness	Special requirement on the longitudinal or transversal flatness upon request						

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