

Designation	CoCr20Ni16Mo7	DIN	UNS	AISI	LMSA
		-	R30003/R30008	-	E300

Chemical composition (weight %)

Fe	Co	Cr	Ni	Mo	Mn	Si	C	P	S	Be
Balance	39-41	19-21	15-16	6.5-7.5	1.5-2.0	≤ 1.2	≤ 0.15	≤ 0.015	≤ 0.015	≤ 0.001

In order to achieve maximum homogeneity and consistent quality, the actual tolerances on both alloy components and impurities are significantly tighter and more precisely defined than the standard composition indicated.

Main technical properties and features

Phynox (Elgiloy) is an austenitic cobalt-based alloy (40%Co, 20%Cr, 16%Ni et 7%Mo) strengthened by cold work and capable of additional hardening by aging. Its ultimate tensile strength (UTS) can reach more than 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 (rolling). Additional strengthening can be obtained by age hardening at 520°C (3h), for example. The influence of aging is negligible in the annealed condition, but increases significantly with the degree 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. Furthermore, Phynox presents an excellent passivity in contact with human tissues (bio-compatibility). Phynox has the ability to be used over a very wide range of temperatures, from 4.2K (liquid helium) to about 500°C. Thanks to its high Young modulus (210kN/mm²), its very high yield strength, (sometimes > 2200 N/mm²), and its good fatigue strength, Phynox has exceptional spring properties. Lamineries MATTHEY SA delivers Phynox strips according 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 manufacturing range

		Thickness (mm)	Width (mm)	Length (mm)
Rolled products	Strip in coil ¹⁾	0.030 - 1.000	1.5 - 200.0	-
	Foil cut to length ¹⁾	0.030 - 1.000	10.0 - 200.0	100 - 3000

1) Not all our production possibilities are presented here. Other dimensions or other product forms available upon request. Certain combinations of thicknesses and widths are not possible.

Mechanical properties of strips

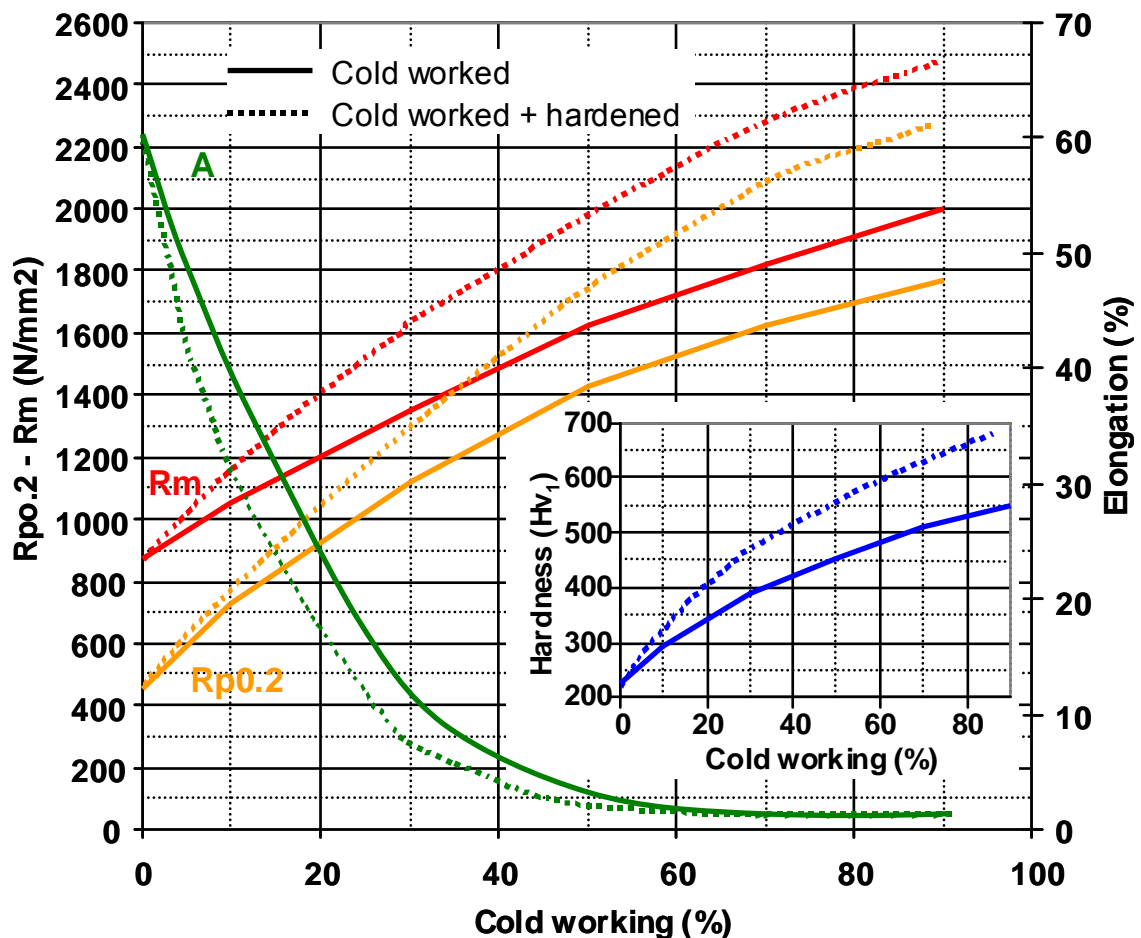
Temper			Heat Treatment	R _{p0.2} (N/mm ²)	R _m (N/mm ²)	A _{50mm} (%)	HV
R850	H200	soft annealed	-/-	350-650	850-1050	≥ 30	200-270
R1000	H260	¼ hard	-/-	650-1150	1000-1300	≥ 15	260-420
R1200	H340	½ hard	-/-	900-1350	1200-1500	-/-	340-460
R1500	H440	¾ hard	-/-	1150-1600	1500-1800	-/-	440-560
R1600	H480	hard	-/-	1300-1850	1600-1900	-/-	480-600
R1800	H560	extra hard	-/-	≥ 1650	≥ 1800	-/-	≥ 560
After heat treatment (by the customer)							
R850	H200	soft + hardened	3h / 520°C	350-650	850-1050	≥ 30	200-270
R1000	H260	¼ hard+ hardened	3h / 520°C	650-1200	1050-1450	≥ 10	300-450
R1200	H340	½ hard + hardened	3h / 520°C	1050-1500	1400-1800	-/-	400-520
R1500	H440	¾ hard + hardened	3h / 520°C	1500-1900	1800-2300	-/-	500-650
R1600	H480	hard + hardened	3h / 520°C	1750-220	2000-2400	-/-	600-750
R1800	H560	extra hard +hardened	3h / 520°C	≥ 2050	≥ 2200	-/-	≥ 680

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Physical properties

Modulus of elasticity	kN/mm ²	215 (soft), 190 (hard), 225 (soft+hardened), 210 (hard+hardened)
Poisson ratio		0.3
Melting point / Melting range	kg/dm ³	1450-1460
Density	°C	8.3
Linear dilatation coefficient (x10 ⁻⁶)	/°C	12.5
Thermal conductivity at 20°C	W/m °K	12.5
Specific heat at 20°C	J/kg K	450
Electrical resistivity	μΩcm	95
Electrical conductivity	MS/m	1.1
Magnetic properties		Nonmagnetic For all practical purposes, Phynox is nonmagnetic through all temperature range.

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





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Typical uses

Watch industry : springs, wrist-watch strap parts, etc.; Medical : orthodontics, pacemaker electrodes, stents, needles, etc ; Other : weapon parts, spring energized seals, nonmagnetic parts, etc.

Tolerances

Thickness	Thickness (mm)		Lamineries MATTHEY SA		
	≥	<	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	± 0.0012
	1.200	1.250	± 0.030	± 0.020	± 0.0012
	1.250	1.500	± 0.035	± 0.025	± 0.0014

The table shown is an outline of our typical thickness tolerances available, which are tighter than industry standards.

Upon request: our "Precision" and "Extreme" tolerances are also available.

Width Our width tolerance is + 0.2 -0.0 mm (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
Our tolerance "standard" respects the EN Standard 1654 (Length of measurement 1000 mm). Other tolerances upon request.	3	6	12	-	6	-
	6	10	8	10	4	5
	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