

Designation	CoCr20W15Ni	DIN 2.4964	UNS (ASTM) R30605	AISI -	LMSA E500
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## Chemical composition

Co	Cr	Ni	W	Mn	C
Balance	19.0 - 21.0	9.0 - 11.0	14.0 - 16.0	1.0 - 2.0	0.05 - 0.15
Si	Fe	P	S	-	-
0.40 max.	3.0 max.	0.040 max.	0.030 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

L-605® is a cobalt-chromium-nickel-tungsten superalloy produced by vacuum induction melting (VIM) followed by electrolytic slag refining (ESR), resulting in very high inclusion cleanliness. This alloy (UNS R30605) features high mechanical strength, excellent resistance to high-temperature oxidation (up to 1093 °C) for long-term exposure, excellent fatigue strength and excellent wear resistance (galling and cavitation).

The presence of cobalt and chromium makes this alloy biocompatible and eligible for many applications in the medical industry. The presence of tungsten improves radiopacity. L-605® strength is essentially achieved by cold work hardening, although an ageing treatment combined with work hardening enables a slight increase in mechanical strength and hardness. Alloy L-605® is non-magnetic in all metallurgical tempers. L-605® alloy offers excellent resistance to corrosion, chloride and nitric acids, oxidizing agents and salt spray. This alloy can be welded by laser, plasma, resistance and arc welding (TIG). Alloy 605® (UNS R30605) complies with the following Standards: AMS5537, ASTM F90 and ISO 5832/7 (surgical implants).

## Typical uses

Medical: manufacture of welded tubes for the medical industry (stents, heart valves, electrodes, etc.)  
Others: aeronautical systems, combustion chambers, springs.

## Typical manufacturing range

	Thickness (mm)	Width (mm)	Length (mm)
<b>Rolled products</b> Strip in coils <sup>[1]</sup>	0.030 - 0.500	1.5 - 200.0	-
Strip as sheets <sup>[1]</sup>	0.030 - 0.500	10.0 - 200.0	300 - 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	R <sub>m</sub> (N/mm <sup>2</sup> )	R <sub>p0.2</sub> (N/mm <sup>2</sup> )	Hardness HV	A <sub>50mm</sub> (%)
annealed	900 - 1000	380 - 700	250 - 350	40
¼ hard	1080 - 1350	900 - 1200	330 - 420	10
½ hard	1300 - 1600	1200 - 1500	390 - 500	-
hard	1550 - 1900	1450 - 1850	480 - 590	-
extra hard	1900 min.	1850 min.	-	-

## Physical properties

Modulus of elasticity	kN/mm <sup>2</sup>	225
Density	g/cm <sup>3</sup>	9.27
Melting point	°C	1330 - 1410
Linear dilatation coefficient 21 to 816 °C	10 <sup>-6</sup> /°C	16.3
Specific heat capacity at 20 °C	J/(kg. K)	385
Thermal conductivity at 20 °C	W/m °K	10.5
Electrical resistivity at 20 °C	μΩcm	88.6
Magnetic properties at 200 Oersted		Nonmagnetic (1.002) for all tempers
Fatigue resistance (10 <sup>8</sup> cycles) at 980 °C	MPa	138

## Heat treatment

Solution annealing is carried out at 1175-1230 °C for a homogenization time of at least 15 minutes, followed by quenching with water or air. This treatment maintains the best properties of the L-605® alloy. Annealing at lower temperatures can lead to carbide precipitation, which is detrimental to the alloy's mechanical properties.

Annealing temperature (°C)	Quenching
1175 - 1230	Air or water

## Tolerances (strip and foil)

Thickness	Thickness (mm)		Lamineries MATTHEY			
	≥	<	LMSA Standard	LMSA Precision	LMSA Extreme	
<p>The table shown is an outline of our typical thickness tolerances available. They are tighter than industry standards.</p> <p>Our "LMSA Precision" and "LMSA Extreme" tolerances are available upon request.</p>	-	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	
<p>Our tolerance "LMSA Standard" respects the EN Standard 1654 (Length of measurement 1000 mm). Other tolerances upon request.</p>			≤ 0.5 mm	> 0.5 mm	≤ 0.5 mm	> 0.5 mm
	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					

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