LAMINERIES MATTHEY
NOTZ group advanced metal solutions

Stainless Steel 1.4435

		EN	UNS (ASTM)	AISI	LMSA
Designation	**X2CrNiMo18-14-3**	1.4435	-	316L	D310

Chemical composition

Fe	C	Cr	Ni	Mo	Mn	Si	P	S	N
Balance	≤ 0.03	17.0 - 19.0	12.5 - 15.0	2.5 - 3.0	≤ 2.0	≤ 1.0	≤ 0.045	≤ 0.015	≤ 0.11

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

Upon request we can guarantee chemical composition and the residual delta ferrite content compliance with the chemical industry standard "Basler Norm 2, BN2".

Main technical properties and features

Austenitic stainless steels are the most well-known and commonly used of stainless-steel grades. In addition to the chromium content of around 17 %, austenitic stainless steel contains additions of molybdenum, titanium and niobium. The addition of nickel allows to obtain an austenitic structure that increases corrosion resistance. The absence of a second phase, such as cold rolled induced martensite or ferrite, is beneficial to enhance corrosion resistance. Stainless steel 1.4435, also known as UREA 316L, is an important steel grade for the chemical industry and is often offered with the label "BN2" and the corresponding specifications.
The significant presence of molybdenum in this steel is intended to increase the corrosion resistance to chloride, sulfuric acid and organic acids. For these reasons, 1.4435, UREA 316L stainless steel grade is often the best choice for applications requiring high corrosion resistance, e.g. in urea and carbon production units (pipes, fittings, etc.). By increasing the austenitizing elements content such as nickel, the formation of delta (δ) ferrite in the structure is reduced and even completely eliminated. The absence of δ ferrite makes the steel to be non-magnetic in the soft temper, but a high work hardening can make it magnetizable. Thanks to its higher molybdenum content, the pitting resistance is improved compared to the 1.4404 grade. The 1.4435 grade can be easily welded by all standard welding processes, except by oxyacetylene torch. Depending on the welding conditions, a small amount of magnetizable residual ferrite can be present along the welding line. A post-weld treatment is not necessary if the alloy is welded in soft temper.

Typical uses

Frequently used to manufacture pressure gauges, various watch components, and membranes for the chemical industry. Used for parts requiring prolonged skin contact, and for parts that need to resist pitting corrosion. UREA 316L steel is used in particular in urea and carbonate production units (interior linings of urea units, pipes, fittings, etc.).

Typical manufacturing range

		Thickness (mm)	Width (mm)	Length (mm)
Rolled products	Strip in coils [1]	0.010 - 0.500	1.5 - 200.0	-
	Strip as sheets [1]	0.015 - 0.500	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		$Rp_{0.2}$ (N/mm^2)	R_m (N/mm^2)	A_{50mm} (%)	Hardness HV
C650 [1]	soft	220 min.	650 - 850	30 min.	190 - 250
C550 [1], [2]	soft	220 min.	550 - 700	30 min.	150 - 200
C680 [1]	¼ hard	-	680 - 1000	-	200 - 300
C950 [1]	½ hard	-	950 - 1150	-	250 - 390
C1100 [1]	hard	-	1100 - 1300	-	310 - 420
C1250 [1]	extra hard	-	1250 - 1550	-	380 - 500

[1] These tempers do not exactly correspond to the EN 10151 and EN 10088 and are only indicative

[2] The temper C550 is only possible for thicknesses superior or equal to 0.1mm. For thickness < 0.1mm, the corresponding temper is C650.

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Physical properties

Modulus of elasticity	kN/mm^2	200
Poisson ratio		0.33
Density	g/cm^3	8.0
Melting point	°C	1410
Linear dilatation coefficient	10^{-6}·/ °C	18.5
Thermal conductivity at 20°C	W/m.K	15
Electrical resistivity	μΩcm	75
Electrical conductivity	MS/m	1.35
Specific heat at 20°C	J/(kg. K)	500
Magnetic properties		Non-magnetic soft temper (μ = 1.005)

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

Our tolerance "LMSA Standard" respects the EN Standard 1654 (Length of measurement 1000 mm).
Other tolerances upon request.

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
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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