Alleima® HP 120
Tube and pipe, seamless
Datasheet

Alleima® HP 120 is an austenitic grade with a high level of Mn, a low level of Ni, and an addition of N. The grade is characterized by:

- High mechanical strength in the hard condition
- Excellent resistance against hydrogen embrittlement in gaseous and liquid hydrogen
- Very good impact toughness in temperatures down to -230°C (-382°F)
- Very good high temperature oxidation resistance

Standards

- S21900

Product standards

- ASME SA213
- ASTM A213

Customer specifications on request.

Chemical composition (nominal)

Chemical composition (nominal) %

C	Si	Mn	P	S	Cr	Ni	Mo	Cu	N
≤0.030	0.5	9	≤0.030	≤0.020	19.5	7	≤0.75	≤0.75	0.30

Applications

Alleima® HP 120 is a nitrogen-strengthened austenitic stainless steel that combines high mechanical strength with excellent toughness at cryogenic temperatures and good oxidation resistance at elevated temperatures. It maintains a fully austenitic, non-magnetic structure even after severe cold working and offers corrosion resistance comparable to AISI 304L, with enhanced resistance to stress corrosion cracking. The alloy also demonstrates good resistance to hydrogen embrittlement, making it suitable for applications involving gaseous or liquid hydrogen. These characteristics make it suitable for demanding applications in high-pressure, waterjet cutting, cryogenics, chemical processing, and high-temperature service.

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Forms of supply

Alleima® HP 120 seamless stainless steel tubes are supplied in the bright annealed condition or cold-worked (hard) condition.

Dimensions

Outside diameter mm (in.)	Wall Thickness mm (in.)
2 – 65 (0.079 – 2.56)	0.3 – 25 (0.012 – 1.0)

Tolerances

Outside diameter mm (in.)	Wall Thickness %
+/- 0.05, or 0.1 (+/- 0.002, or 0.004)	+/- 10

Mechanical properties

At 20°C (68°F), annealed condition

Proof strength, $R_{p0.2}$	Tensile strength, R_m	Elongation, 2" GL
MPa (ksi)	**MPa (ksi)**	**%**
≥330 (48)	≥655 (95)	≥35

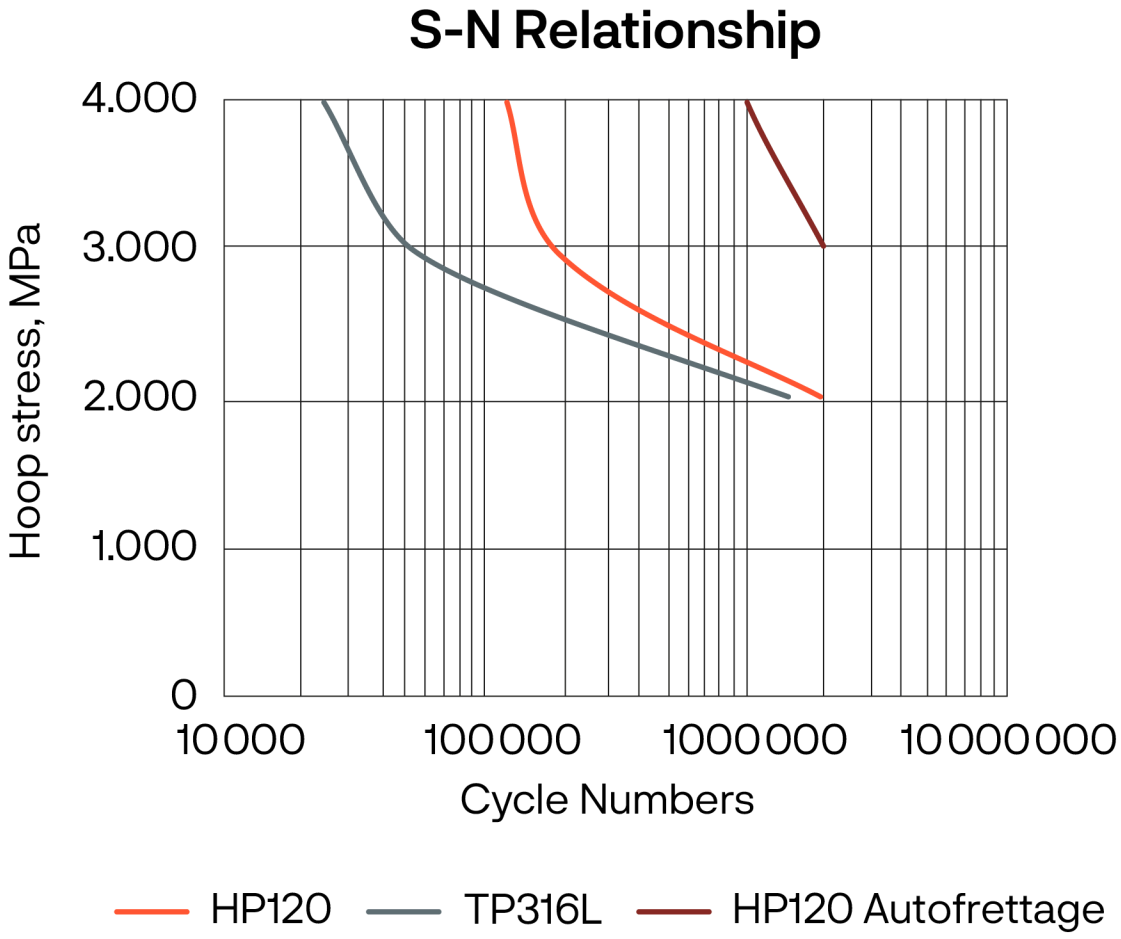
At 20°C (68°F), hard condition

Proof strength, $R_{p0.2}$	Tensile strength, R_m	Elongation, 2" GL
MPa (ksi)	**MPa (ksi)**	**%**
≥827 (120)	≥979 (142)	≥20

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Fatigue properties

Pulse pressure testing has been performed on Alleima HP 120 tubes and the results are presented as a Wöhler diagram. The tests were performed on 12.7x0.66 mm tubes in hard condition. The internal pressure was varied between 400, 550, 600, 700 and 900 bars from a minimum of 50 bars. The frequency of altering the pressure was varied between 10-15 Hz to maintain a stable ambient temperature during testing. The results were compared with standard TP316L tube with the same dimension and condition.



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Standard Dimensions and Working Pressure (Stat.)

Please note that the pressures in the table are only provided as guidance. The design must be approved according to regulations from domestic authorities.

OD mm	OD inch	ID mm	ID inch	Wall mm	Wall inch	4301/4404 bar (ksi)	HP 120 bar (ksi)	Calc. weight kg/m
6,00	0.236"	2,2	0.087"	1,90	0.075"	3 120 (45.25)	4 300 (62.37)	0,195
6,35	1/4"	2,39	3/32"	1,98	0.078"	3 045 (44.16)	4 180 (60.63)	0,217
6,35	1/4"	2,29	0.090"	2,03	0.080"	3 180 (46.12)	4 150 (60.19)	0,220
6,35	1/4"	1,59	1/16"	2,38	0.094"	4 300 (62.37)	5 920 (85.87)	0,237
9,52	3/8"	3,20	1/8"	3,16	0.124"	3 380 (49.02)	4 660 (67.59)	0,503
9,52	3/8"	1,60	1/16"	3,96	0.156"	5 530 (80.21)	7 630 (110.67)	0,551
14,30	9/16"	8,00	5/16"	3,15	0.124"	2 380 (34.52)	3 275 (47.50)	0,879
14,30	9/16"	4,76	3/16"	4,77	0.188"	3 390 (49.17)	4 700 (68.17)	1,138
19,05	3/4"	1,80	0.071"	8,63	0.340"	7 326 (106.25)	10 100 (146.49)	2,251
25,40	1"	17,45	0.687"	3,98	0.157"	1 219 (17.68)	2 520 (36.55)	2,133
30,00	1.18"	10,00	0.394"	10,00	0.394"	3 411 (49.47)	4 700 (68.17)	5,008

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Corrosion resistance

Alleima® HP 120 is a nitrogen alloyed austenitic stainless steel that offers corrosion resistance comparable to AISI 304L with enhanced resistance to stress corrosion cracking as a conservative estimation. In fact, it can be expected to be better than AISI 304L in many environments due to a slightly higher chromium content and nitrogen addition.

Alleima® HP 120 also offers good oxidation resistance at elevated temperatures.

Hydrogen embrittlement resistance

In-situ SSRT (Slow strain rate testing) hydrogen embrittlement test has been performed in 875 bar hydrogen gas at -40 °C. Tested material was Alleima® HP 120 with high cold reduction (hard condition).

In-situ hydrogen embrittlement test, average from three replicates.

Material	Average UTS H_2/Air (MPa)	Average Ra, H_2/Air (%)	Average El, H_2/Air (%)	UTS ratio	RA ratio	El ratio
Alleima® HP 120, hard condition	1101/1202	44.2/55.9	20.3/21.7	0.92	0.79	0.94

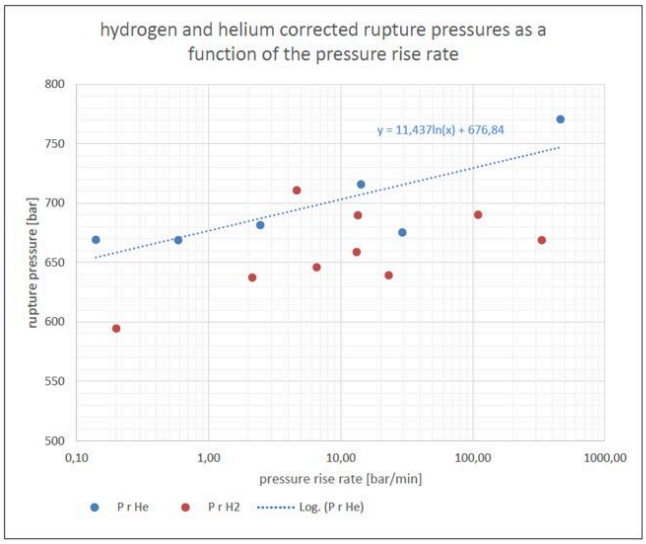
Hydrogen embrittlement testing has also been performed on Alleima® HP 120 in annealed condition using SSRT with thermal pre-charging. The pre-charging was performed in 139 bar hydrogen gas at 300 ± 5 °C. The autoclave was cooled down to room temperature and the H_2 gas removed before the opening. Samples were then stored in a freezer to avoid hydrogen effusion while waiting for being tested.

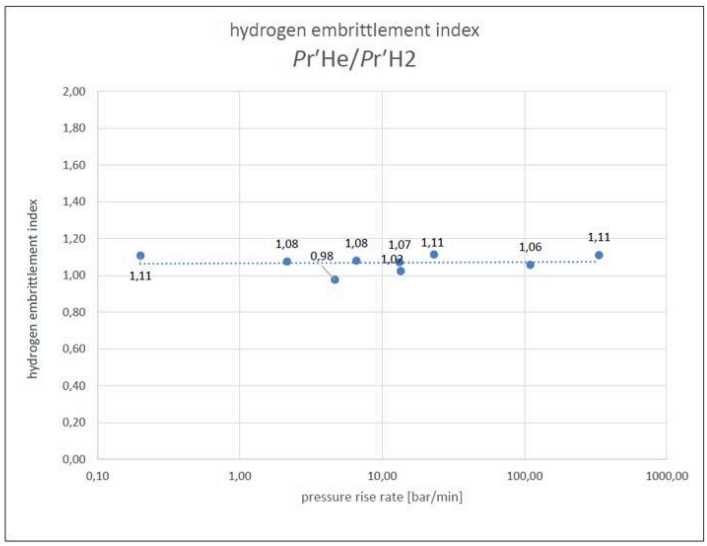
Hydrogen embrittlement test by pre-charging, average from two replicates.

Material	Average UTS H_2/Air (MPa)	Average RA, H_2/Air (%)	Average El, H_2/Air (%)	UTS ratio	Ra ratio	El ratio
Alleima® HP 120, annealed condition	852/862	62.5/60	69.5/79.5	0.99	1.04	0.87

Alleima® HP 120 has been tested in accordance with ISO 11114-4:2017, method A (disc test), for hydrogen compatibility. The tests were carried out at ambient temperature using hydrogen and helium (H_2O < 3 µl/l), with pressure rise rates ranging from 0.1 to 1,000 bar/min. For the applied pressure rise rates, the minimum rupture pressure was determined using graph method 2 according to ISO 11114-4. This value was subsequently used as the reference for the remaining tests. According to ISO 11114-4, the acceptance criterion requires the hydrogen embrittlement index ($Pr'He$ / $Pr'H_2$) to be less than 2.

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The measured value from the test was 1.11. This confirms that the material meets the specified requirement for hydrogen embrittlement resistance.

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Physical properties

Density: 7.8 g/cm^3, 0.28 lb/in^3

Specific heat capacity

Temperature, °C	J/(kg °C)	Temperature, °F	Btu/(lb °F)
0	480	32	0.12
100	480	212	0.12

Modulus of elasticity, x10^3

Temperature, °C	MPa	Temperature, °F	ksi
20	200	68	28.9

Poisson's ratio

0.285

Disclaimer:

Recommendations are for guidance only, and the suitability of a material for a specific application can be confirmed only when we know the actual service conditions. Continuous development may necessitate changes in technical data without notice. This datasheet is only valid for Alleima materials.

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