

DATA SHEET

DMV 600 L

1 – Applications

DMV 600 L is the material of choice for a wide variety of applications, especially in aqueous liquids up to a temperature of approximately 450°C (842°F), for example in:

- Pressurized-water-reactors, steam generators
- Heat exchangers for sodium hydroxide
- Vinyl chloride production
- High chloride containing media

2 – Main Features

DMV 600 L is a stable, fully austenitic solid-solution nickel-iron-chromium alloy with low carbon content. The structure is characterized by an excellent resistance to intergranular corrosion. It offers immunity to chloride-ion stress corrosion cracking even at elevated temperatures, as well as very good resistance to high temperature resistance in dry chlorine and hydrogen chloride.

3 – Description

3.1 Specifications

- UNS N06600* acc. to ASTM B 163 and ASME SB 163
- UNS N06600* acc. to ASTM B 167 and ASME SB 167
- 2.4817 acc. to DIN 17751
- 2.4817 acc. to prDIN 59755

* The max. carbon content of 0.025% must be mentioned in the inquiry/order.

3.2 Chemical Composition

DMV 600 L contains:

	% min.	% max.
C		0.025
Si		0.50
Mn		1.00
P		0.020
S		0.015
Cr	14.00	17.00
Ni	72.00	
Al		0.30
Ti	0.20	0.30
Cu		0.50
Fe	6.0	10.0
Co		1.0

3.3 Mechanical Properties

3.3.1 Tensile Properties at 20°C (68°F), Annealed Condition

UNS N06600* acc. to ASTM B 167:
Hot worked annealed < 5" (127 mm)

	MPa	ksi
0.2% Y.S. min.	205	30
U.T.S. min.	550	80
E in 2" min.		35%

UNS N06600* acc. to ASTM B 167:
Cold worked annealed < 5" (127 mm):

	MPa	ksi
0.2% Y.S. min.	240	30
U.T.S. min.	550	80
E in 2" min.		35%

* no special mechanical values exist for the low carbon version

Grade 2.4817 (soft annealed) acc. to DIN 17751:

	MPa	ksi
0.2% Y.S. min.	180	(26.1)
1.0% Y.S. min.	210	(30.4)
U.T.S. min.	550	(79.7)
A		30%

1 MPa=1 N/mm²; 1 ksi=6.9 MPa
() = calculated values

3.3.2 Tensile Properties at Elevated Temperature

Grade 2.4817 (annealed) acc. to prDIN 59755:

Temperature °C (°F)	0.2% Y.S. min. MPa (ksi)	U.T.S. min. MPa (ksi)
100 (212)	150 (21.7)	530 (76.8)
200 (392)	140 (20.3)	500 (72.6)
300 (572)	130 (18.8)	485 (70.3)
400 (752)	125 (18.1)	480 (69.6)

() = calculated values

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3.3.3 Impact Resistance

The impact resistance at 20°C must be min. 200 J/cm² in longitudinal direction (average value of three samples with min. 140 J/cm² individual value).

3.3.4 Creep Rupture Strength

If high strength at elevated temperatures is of predominant interest, please select DMV 600 / DMV 600 H as first choice because it offers higher creep strength values.

3.4 Physical Properties

Coefficient of Thermal Expansion between 20°C (68°F) and ...		
Temperature °C (°F)	10 ⁻⁶ / K	10 ⁻⁶ / °F
100 (212)	13.7	(7.6)
200 (392)	14.1	(7.8)
300 (572)	14.4	(8.0)
400 (752)	14.8	(8.2)
500 (932)	15.1	(8.4)

() = calculated values

Thermal Conductivity		
Temperature °C (°F)	W / (m K)	Btu in / (ft h °F)
20 (68)	14.8	(8.55)
100 (212)	15.8	(9.13)
200 (392)	17.0	(9.83)
300 (572)	18.4	(10.6)
400 (752)	20.0	(11.6)
500 (932)	22.0	(12.7)

() = calculated values

Modulus of Elasticity			
Temperature °C (°F)	10 ³ MPa	10 ³ ksi	
20 (68)	214	(31.0)	
100 (212)	209	(30.3)	
200 (392)	205	(29.7)	
300 (572)	200	(29.0)	
400 (752)	194	(28.1)	
500 (932)	187	(27.1)	

() = calculated values

3.5 Corrosion Properties

DMV 600 L is mainly used as a material resistant to aqueous corrosion at temperature below 450°C (842°F). The chromium content of the alloy makes it superior to commercially pure nickel under oxidizing conditions, while its high nickel content enables it to retain considerable resistance under reducing conditions.

DMV 600 L has good resistance to corrosion by mineral acids at 20°C (68°F) up to a concentration of:

- 60% for sulphuric acid
- 100% for phosphoric acid
- 20% for nitric acid
- 2% for hydrochloric acid

Furthermore, this grade shows excellent resistance to organic acids at all temperatures.

Regarding to stress corrosion, DMV 600 L tubes and pipes are immune in chloride environments and can be used in concentrated magnesium chloride (note the risk of water line pitting in the presence of oxygen).

With higher nickel content, tubes and pipes in DMV 600 L are almost unaffected by corrosion in hot concentrated caustic soda up to about 150°C (302°F).

Additionally, they are less susceptible to sulphur and chlorate than pure nickel.

High temperature corrosion resistance is comparable to that of DMV 600 / DMV 600 H, which will be preferred for strength reasons.

4 – Supply

4.1 Dimensional Range

DMV 600 L is produced in form of seamless tubes and pipes in the range of Outside diameter:

6 mm – 219.1 mm (0.24" – 8.6")

Wall thickness:

1 mm – 30 mm (0.04" – 1.18")

4.2 Delivery Condition

Tubes and pipes are delivered in cold or hot finished condition depending on size and specification. Normally they will be supplied in annealed condition.

4.3 U-bent

Our tubes are also available in U-bent version in lengths of up to 30 m (straight); the high deformability of the material allows cold bending down to a very small bending radius.

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5 – Fabrication

5.1 Heat Treatment

“Annealing” should be carried out in the range of 920°C – 980°C (1688°F – 1796°F) followed by water quenching or rapid cooling. The treatment is essential to ensure maximum corrosion resistance.

High temperature “solution annealing” treatment is carried out at 1080°C – 1150°C (1976°F – 2102°F).

During any heating operations, strict precautions regarding cleanliness (especially contamination from grease) must be observed. The furnace atmosphere has to have very low sulphur content. When subsequently used in a moist environment, oxidation must be avoided by use of a highly reducing atmosphere (cracked ammonia, hydrogen, ...) or removed by pickling after heat treatment.

5.2 Bending

DMV 600 L is generally suitable for further cold or hot forming.

Cold bending of tubes and pipes can be carried out under similar conditions to those required for austenitic stainless steels. They have to be newly solution annealed if the forming degree is > 20% or the R/D ratio < or equal 2.5.

For corrosion reasons, it is sometimes recommended to perform a new solution annealing even following smaller forming degrees.

Hot bending should be carried out in the range of 900°C – 1200°C (1652°F – 2192°F). However the range of 650°C – 870°C (1202°F – 1598°F) must be avoided. Cooling after hot bending should be in water or as fast as possible. Annealing is recommended after hot bending to ensure maximum corrosion resistance and optimum metallographic structure.

5.3 Welding

Preheating and heat treatment after welding are not necessary.

To avoid hot cracks in the weld metal, processes suggested by the filler producers have to be observed. Only approved filler materials should be considered, that have been tested for the foreseen application temperature. The calculation values for the filler materials should be respected.

In all cases, the usual cleanliness precaution for welding stainless steels should be taken into account.

Where the subsequent application might be in moist environment, all oxidation must be avoided or eliminated.

6 – Standards and References

DMV 600 L may be delivered in accordance with the commonly used European, American and other national standards.

In other cases, our specialists are at your service for any guidance on drawing up your tube specifications.

Salzgitter Mannesmann Stainless Tubes has delivered DMV 600 L tubes and pipes to a wide range of worldwide customers in the chemical and petrochemical industry.

For any specific queries, please contact our sales offices.

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QUALITY IN ROUND TERMS.

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