SALZGITTER MANNESMANN STAINLESS TUBES
A Member of the Salzgitter Group

D A T A S H E E T
DMV 800 H

1 – Applications

DMV 800 H is the material of choice for a wide range of applications like:

- Heating element sheathing because of good mechanical strength
- Ethylene pyrolysis tubing due to resistance to carburization and good mechanical properties
- Steam super-heater tubing owing to good mechanical strength and resistance to steam
- Furnace components

2 – Main Features

DMV 800 H is an austenitic solid-solution grade containing small amounts of precipitated titanium nitrides and carbides, carbon nitrides and chromium carbides. During long term exposure below 700°C (1292°F) γ´-phase may be formed, lowering the ductility. Therefore, please check carefully the standards regulation and chemical composition for the intended application.

3 – Description

3.1 Specifications

- UNS N08800* a. N08810* acc. to ASTM B 163 and ASME SB 163
- UNS N08800* a. N08810* acc. to ASTM B 407 and ASME SB 407
- 1.4876 according to VdTÜV material data sheets 412 / 434*
- 1.4558 a. 1.4959 according to EN 10216-5

* Please check the responding chemical analysis modification with our technical department. [UNS N08811 is available on special request.]

3.2 Chemical Composition

DMV 800 H contains:

	% min.	% max.
C	0.05	0.10
Si	0.20	0.60
Mn		1.50
P		0.015
S		0.015
Cr	19.00	22.00
Ni	30.00	34.00
Al	0.20	0.60
Ti	0.20	0.60
Cu		0.50
Fe	39.5	

3.3 Mechanical Properties

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

UNS N08800* acc. to ASTM B 407: Cold worked annealed:

	MPa	ksi
0.2% Y.S. min.	205	30
U.T.S. min.	520	75
E in 2" min.	30%	

UNS N08800* acc. to ASTM B 407 and UNS N08810* acc. to ASTM B 407: Hot-finished annealed:

	MPa	ksi
0.2% Y.S. min.	170	25
U.T.S. min	450	65
E in 2" min.	30%	

Grade 1.4958 / 1.4959 according to EN 10216-5:

	MPa	ksi
0.2% Y.S. min.	170	(25)
1.0% Y.S. min.	200	(29)
U.T.S. min.	500	(72)
A	30%	

1 MPa=1 N/mm^2; 1 ksi=6.9 MPa
( ) = calculated values

3.3.2 Tensile Properties at Elevated Temperature

Grade 1.4958 and 1.4959 acc. to EN 10216-5:

Temperature °C (°F)	0.2% Y.S. min. MPa (ksi)	1.0% Y.S. min. MPa (ksi)
100 (212)	140 (20.3)	160 (23.2)
150 (302)	127 (18.4)	147 (21.3)
200 (392)	115 (16.7)	135 (19.6)
250 (482)	105 (15.2)	125 (18.1)
300 (572)	95 (13.8)	115 (16.7)
350 (662)	90 (13.0)	110 (15.9)
400 (752)	85 (12.3)	105 (15.2)
450 (842)	82 (11.9)	102 (14.8)
500 (932)	80 (11,6)	100 (14.5)
550 (1022)	75 (10.9)	95 (13.8)

( ) = calculated values

DATASHEET
DMV 800 H

3.3.3 Impact Resistance

Acc. to EN 10216-5 the notch impact energy at 20°C must be minimal 100 J in longitudinal and 60 J in transversal direction (average value of three samples with min. 70 J/cm^2, longitudinal and 40 J/cm^2 transversal individual value).

3.3.4 Creep Rupture Strength

For grade 1.4958 and 1.4959 the following creep rupture strength values for 10,000 h and 100,000 h are listed in EN 10216-5:

Grade 1.4958

Temperature °C	(°F)	10,000 h min. MPa (ksi)	100,000 h min. MPa (ksi)
500	**(932)**	290 (42.0)	215 (31.2)
550	**(1022)**	225 (32.6)	160 (23.1)
600	**(1112)**	140 (20.3)	95 (13.8)
650	**(1202)**	97 (14.1)	63 (9.1)
700	**(1292)**	69 (10.0)	44 (6.4)

( ) = calculated values

Grade 1.4959

Temperature °C	(°F)	0.2% Y.S. min. MPa (ksi)	1.0% Y.S. min. MPa (ksi)
700	**(1292)**	74 (10.7)	50 (7.3)
750	**(1382)**	47 (6.8)	31 (4.5)
800	**(1472)**	32 (4.6)	21 (3.0)
850	**(1562)**	23 (3.3)	14 (2.1)
900	**(1652)**	15 (2.2)	9.4 (1.4)
950	**(1742)**	10 (1.4)	5.8 (0.8)
1000	**(1832)**	6.4 (0.9)	3.7 (0.5)

( ) = calculated 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)**	14.4	(8.0)
200	**(392)**	15.2	(8.4)
400	**(752)**	16.2	(9.0)
600	**(1112)**	17.0	(9.4)
800	**(1472)**	17.2	(9.9)
1000	**(1832)**	18.8	(10.6)

( ) = calculated values

Thermal Conductivity			
Temperature °C	(°F)	W / (m K)	Btu in / (ft h °F)
20	**(68)**	11.6	(6.71)
100	**(212)**	13.0	(7.51)
200	**(392)**	15.0	(8.67)
400	**(752)**	17.8	(10.3)
600	**(1112)**	21.0	(12.1)
800	**(1472)**	24.5	(14.2)
1000	**(1832)**	29.0	(16.8)

( ) = calculated values

Modulus of Elasticity			
Temperature °C	(°F)	10^3 MPa	10^3 ksi
20	**(68)**	198	(28.7)
100	**(212)**	193	(28.0)
200	**(392)**	187	(27.1)
400	**(752)**	173	(25.1)
600	**(1112)**	158	(22.9)
800	**(1472)**	144	(20.9)
1000	**(1832)**	127	(18.4)

( ) = calculated values

3.5 Corrosion Properties

For applications reinforcing high temperature oxidation the high chromium and nickel contents of DMV 800 H make it eminently suitable for use in non sulphurous, oxidizing atmospheres up to 1000°C (1832°F) even under non isothermal conditions.

Since DMV 800 H contains iron, it has a high resistance to internal oxidation, which normally affects Nickel–Chromium alloys.

In other atmospheres, like carburization due to the high Nickel and Chromium content, DMV 800 H has a very good resistance: higher than that of 25% Cr-20% Ni steels. The protective oxide layer which is formed is adherent in both, static and cyclic conditions of heating and cooling. Resistance to carburization is enhanced as soon as a thin layer of oxide is formed on the surface.

Resistivity to hydrogen is excellent, so that DMV 800 H is the preferred material used in the production of hydrogen in steam / hydrocarbon reforming processes.

DMV 800 H also shows a good resistance in the presence of hydrogen sulphide up to about 400°C (752°F).

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DATASHEET
DMV 800 H

4 – Supply

4.1 Dimensional Range

DMV 800 H 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.

5 – Fabrication

5.1 Heat Treatment

To ensure complete recrystallization and a homogeneous chromium distribution, solution annealing should be carried out in a temperature range of 1150°C – 1200°C (2102°F – 2192°F). DMV 800 H is susceptible to relaxation cracking if solution annealed materials are exposed to service temperatures within the range of 550°C – 750°C (1020°F – 1380°F).

During subsequent service a high degree of cold deformation and welding during fabrication enhances the susceptibility to relaxation cracking.

A stabilizing heat treatment at about 980°C (1800°F) for 3 hours has been shown to alleviate susceptibility to relaxation cracking. This has been proved for new material prior to fabrication and for material which has already been in service prior to repair welding.

As for all austenitic stainless steels, the cleanliness requirements (especially contamination from greases) must be strictly observed.

The furnace atmosphere must have very low sulphur content.

When subsequently used in a moist environment, oxidation must be avoided by use of highly reducing atmosphere (cracked armonia, hydrogen, …) or removed by pickling after heat treatment.

5.2 Bending

DMV 800 H is generally suitable for further cold or hot forming.

Cold bending of tubes can be carried out under similar conditions to those required for austenitic stainless steels.

Cold formed tubes and pipes 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.

5.3 Welding

Preheating and heat treatment after welding are not necessary.

To avoid hot cracks in the weld metal, processes recommended 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.

To eliminate the risk of relaxation cracking, material exposed to service temperature above 550°C (1022°F) should obey strictly the mentioned instructions in chapter "5.1 Heat Treatment" of this datasheet.

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 800 H 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 800 H tubes and pipes to a wide range of world-wide 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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