High Temperature Welded Stainless Tubular Products
253 MA® - 1.4835 - S30815

Characteristics

Grade 253 MA® combines excellent service properties at high temperatures with ease of fabrication. It provides superior service to Grade 310. The inclusion of high silicon, nitrogen and cerium contents gives the steel good oxide stability, high elevated temperature strength and excellent resistance to sigma phase precipitation. Optimal performance is achieved at 850–1100°C, and the scaling temperature is 1150°C.

Its specific characteristics are:
- Austenitic micro structure
- High mechanical strength at elevated temperatures
- Low sensitivity to form sigma phase
- High resistance to:
  - oxidation
  - high temperature corrosion
  - creep
- Good ductility and weldability

Dimensions

Tubular products in grade 253 MA® are not stock standard but can be generally manufactured in most common standard sizes within OSTP's product range and to client tailored needs by agreement. Minimum order quantities applicable.

Executions

Tubes, Pipes and Butt Weld Fittings
- Welded with- or without filler metal
- Unannealed, pickled
- Solution annealed and pickled
- With – or Without BCW (Bead Cold Work) – Tubes Only
- Bevelled ends according to standards

Heat and corrosion resistance

A common feature of high temperature steels is that they are designed primarily for use at temperatures exceeding ~550°C, i.e. in the temperature range where creep strength as a rule is the dimensioning factor and where HT corrosion occurs. Optimizing steels for high temperatures has meant that their resistance to wet corrosion has been limited.

Product Standards

Europe
- EN 10296-2 Welded SS tubes for general purposes

USA
- ASTM A 249 Welded Austenitic SS Heat Exchanger Tubes
- ASTM A 312 Welded and seamless Austenitic SS Pipes
- ASTM A 358 EF Welded Austenitic Pipe with filler metal
- ASTM A 409 Large Diameter Welded Pipe

Pressure vessel approvals

Europe
No approvals for welded tubes as present.
Outside Europe
Pressure vessel regulations are authorized to ASME. ASME Section VIII, Division 1, Table UHA-23, shows design values for tube and pipe manufactured and tested according to ASME SA-249, SA-312 and SA-358 respectively. Creep strength values for 253 MA® are shown in the table on next page.

Fabrication

Welding
Common welding methods for tubular products are:
- MMA, SMAW (Shielded Metal Arc Welding)
- TIG, GTAW (Gas Tungsten Arc Welding)
- MIG, MAG, GMAW (Gas Metal Arc Welding)
- FCAW (Flux-Cored Arc Welding)
- PAW (Plasma Arc Welding)
- SAW (Submerged Arc Welding)

General filler recommendation for steel grade 253 MA® can be found in the table below. Welding without filler metal not followed by post weld heat treatment, will reduce the corrosion resistance of the weld, and is therefore not recommended. The base of the shielding and welding gases should consist of pure Ar with additions of 2–3% Hydrogen, in order to get optimal penetration and corrosion resistance.

Cold forming
Excellent cold forming properties. The same properties as for other standard austenitic stainless steels.

Heat treatment
Normal annealing temperature is 1020–1100°C followed by rapid cooling.

Applications

Heat exchanger tubes and pipes in processes for:
- Exhaust system
- Furnace rolls
- Furnaces for drying
- Heat recovery, carbon black
- Hydrocarbon gases, painting
- Flue gas and synthetic graphite
- Production of Aluminium Sulphate
- Production of mineral wool
- Pyrometer
- Recuperators
- Waste combustion
- Waste incineration

Design

The creep strength is much higher than those for similar high temperature austenitic steels. This means that the possibility of designing thinner walls can save costs in material, transport, welding and maintenance.

OSTP

Mechanical Properties (at room temperature)

Grade	EN Grade	ASME/UNS	acc. To EN 10028-7:16 Cold Rolled Strip (C) Rp 0.2 Mpa	Rm Mpa	A %	Hot Rolled Strip (H) Rp 0.2 Mpa	Rm Mpa	A %	Hot rolled Plate (P) Rp 0.2 Mpa	Rm Mpa	A %	Acc to ASTM A240:20 Rp 0.2 Mpa	Rm Mpa	A50 %
304L/4307	1.4307	304L	> 220	520 - 700	> 45	> 200	520 - 700	> 45	> 200	500 - 700	> 45	> 170	> 485	> 40
316L/4404	1.4404	316L	> 240	530 - 680	> 40	> 220	530 - 680	> 40	> 220	520 - 670	> 45	> 170	> 485	> 40
316L/4432	1.4432	316L	> 240	550 - 700	> 40	> 220	550 - 700	> 40	> 220	520 - 670	> 45	> 170	> 485	> 40
253MA	1.4835	S30815	> 310	650 - 850	> 40	> 310	650 - 850	> 40	> 310	650 - 850	> 40	> 310	> 600	> 40

1)Elongation according to EN standard:A80 for thickness below 3 mm.A for thickness ≥3 mm.Elongation according to ASTM standard A2" or A50

Physical Properties

Grade	EN Grade	ASME/UNS	Density kg/dm³	Modulus of elasticity Gpa	Poissons´s ratio μ = −εt/εl	Coefficient of thermal expansion 20 -100°C $10^{-6}/K$
304L/4307	1.4307	304L	7,9	200	0,3	16,0
316L/4404	1.4404	316	8,0	200	0,3	16,0
316L/4432	1.4432	316L	8,0	200	0,3	16,0
253MA	1.4835	S30815	7,8	200	0,3	17,0

Chemical Composition, % (Typical values)

Grade	EN Grade	ASME/UNS	C	Cr	Ni	Mo	N	Others	PRE*
304L/4307	1.4307	304L	0,02	18,1	8,1	–	–	–	18
316L/4404	1.4404	316	0,02	17,2	10,1	2,1	–	–	24
316L/4432	1.4432	316L	0,02	16,9	10,7	2,6	–	–	25
253MA	1.4835	S30815	0,09	21	11,0	–	0,17	Si Ce	23

* PRE = % Cr + 3.3% Mo + 16% N (The formula is used as a ranking tool to estimate pitting corrosion resistance in the materia

OSTP is a joint venture between Agave Srl and Outokumpu Group. manufactures the broadest range of stainless steel tubular products:

PROCESS PIPES
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