OSTP

High Performance Austenitic Welded Stainless Tubular Products 904L -1.4539 - N08904

Characteristic

Grade 904L is a Molybdenum and Copper alloyed Cr-Ni austenitic stainless steel with low Carbon content. The high performance austenitic stainless steels such as 904L have a fully austenitic microstructure in the quench annealed condition.

Characteristic properties:

- Very good resistance to uniform corrosion
- Good to exceptionally good resistance to pitting and crevice corrosion
- · Very good resistance to stress corrosion cracking
- Very good formability

Dimensions

Tubular products in grade 904L 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.

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

Corrosion resistance



Product Standards

Europe

EN 10217-7: Welded steel tubes for pressure purposes —Technical delivery conditions Part 7: Stainless steel tubes
EN 10296-2: Welded circular steel tubes for mechanical and general engineering purposes —Technical delivery conditions Part 2: Stainless steel
EN 10253-3: Butt-welding pipe fittings Part 3: Wrought austenitic and austenitic-ferritic (Duplex) stainless steels without specific inspection requirements.

• EN 10253-4: Butt-welding pipe fittings

Part 4: Wrought austenitic and austenitic-ferritic

(Duplex) stainless steels with specific inspection requirements.

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USA

- ASTM A 249: Welded Austenitic steel boiler, superheater, heat-exchanger and condenser tubes.
- ASTM A 269: Seamless and Welded Austenitic
- Stainless Steel Tubing for General Service
- ASTM A 312: Seamless, Welded, and Heavily
- Cold Worked Austenitic Stainless Steel Pipes
- ASTM A 358: Electric-Fusion-Welded Austenitic
- Cr-Ni Stainless Steel Pipe for High-Temperature
- Service and General Applications
- ASTM A 774: As-welded wrought austenitic
- stainless steel fittings for general corrosive service
- at low and moderate temperatures
- ASTM A 403: Wrought austenitic stainless steel

piping fittings

Pressure vessel requirements

Europe

The Pressure Equipment Directive (PED) regulates the use of stainless steel pipe and fittings in most European countries. OSTP fulfils the Directive and is an approved manufacturer of welded stainless tubular products.

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 and SA-312 respectively. ASME B31.1 Power Piping and ASMEB31.3 Process Piping prescribes design and design stress values for approved pipe materials.

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)
- SAW (Submerged Arc Weiding

The general recommendation for shield and plasma gas is pure Argon (TIG/PAW). Additions of 2–3% hydrogen H2 and 2-3% nitrogen N2 will improve the penetration and corrosion resistance. As backing/ purging gas the general recommendation is pure Argon or Formier gas (90% N2 and 10% H2). When material thickness requires more than one run, the interpass temperature has to be below 100°C. General filler recommendation for steel grade 904L can be found in the table below. Welding without filler metal not followed by post heat treatment will reduce the corrosion resistance and is therefore not recommended

Cold forming

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

Hot forming

Grade 904L is slightly harder at higher temperatures than austenitic standard grades. Hot forming temperature range is 1150 - 850°C. If the hot forming is discontinued at a temperature above 1100°C and the material is quenched directly thereafter the material may be used without subsequent heat treatment. It is important that the entire workpiece has been quenched from temperatures above 1100°C. In the case of partial heating or partial cooling below 1100°C or if the cooling has been too slow, hot working should always be followed by solution annealing and quenching

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BUTT WELDED FITTINGS Örnsköldsvik, Sweden Jakobstad, Finland PCM Technology, Finland PROCESS EQUIPMENT ÖMV, Örnsköldsvik, Sweden

OSTP

Heat treatment

The normal solution annealing temperature is $1060-1140^{\circ}$ C followed by rapid cooling to at least 700°C. At temperatures between 800–900°C, inter metallic phases that impair the properties will form within a few minutes.

Applications

- Process equipment in chemical industry
- Bleaching equipment in the pulp and paper industry
- Flue-gas cleaning
- Desalination
- Seawater handling
- Heat exchangers

Design

The allowable design values are similar to those for standard austenitic steels. Please use our Pressure Calculation Tool on www.ostp.biz for design purposes.

Mechanical Properties (at room temperature)														
			acc. To EN 10088-2:14				14 in (U)				Acc to ASTM A240:20			
			Rp 0.2	Rm	A	Rp 0.2	Rm Rm	р (п) А	Rp 0.2	Rm	e (P) A	Rp 0.2	Rm	A50
Grade	EN Grade	ASME/UNS	Мра	Мра	%	Мра	Мра	%	Мра	Мра	%	Мра	Мра	%
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
Ultra 254 SMO	1.4547	S31254	> 320	650 - 850	> 35	> 300	650 - 850	> 35	> 300	650 - 850	> 40	> 310	> 655	> 35
Ultra 904L	1.4539	N08904	> 240	530 - 730	> 35	> 220	530 - 730	> 35	> 220	520 - 720	> 35	> 220	> 490	> 35
654SMO	1.4652	S32654	> 430	750 - 1000]> 40	> 430	750 - 1000	(> 40	> 430	750 - 1000	> 40	> 430	> 750	> 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 Pro	perties								
Grade	EN Grade	ASME/UNS	Density	Modulus of elasticity	Poissons's ratio	Coefficient of thermal expansion 20 -100°C			
			kg/dm ³	Gpa	μ = −εt/εl	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			
Ultra 254 SMO	1.4547	S31254	8,0	195	0,3	16,5			
Ultra 904L	1.4539	N08904	8,0	195	0,3	15,8			
654SMO	1.4652	S32654	8,0	190	0,3	15,0			

Chemical Co	mpositi	on, % (Typica	al values)						
Grade	EN Grad	e ASME/UNS	С	Cr	Ni	Мо	Ν	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
Ultra 254 SMO	1.4547	S31254	0,01	20	18,0	6,1	0,2	Cu	43
Ultra 904L	1.4539	N08904	0,01	19,8	24,2	4,3	-	Cu	34
654SMO	1.4652	S32654	0,01	0,5	24	22	7,3	Cu Mn	56

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

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