SAF™ 2507

Strip steel

Datasheet

SAF™ 2507 is a super-duplex (austenitic-ferritic) stainless steel for service in highly corrosive conditions. The grade is characterized by:

- Excellent resistance to stress corrosion cracking (SCC) in chloride-bearing environments
- Excellent resistance to pitting and crevice corrosion
- High resistance to general corrosion
- Very high mechanical strength
- Physical properties that offer design advantages
- High resistance to erosion corrosion and corrosion fatigue
- Good weldability

Standards

- UNS: S32750
- EN Number: 1.4410
- EN Name: X 2 CrNiMoN 25-7-4

Chemical composition (nominal)

Chemical composition (nominal) %

C	Si	Mn	P	S	Cr	Ni	Mo

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Chemical composition (nominal) %

C	Si	Mn	P	S	Cr	Ni	Mo
≤0.030	≤0.8	≤1.2	≤0.035	≤0.015	25	7	4

Others: N=0.3

Applications

SAF™ 2507 strip can be used in general strip applications where a good corrosion resistance is required. It is especially suitable for

- Seawater applications
- Chloride-containing bleaching environments in the pulp and paper industry
- Chemical industry

In the cold-rolled condition SAF™ 2507 is a very good spring material for corrosive environments.

In the annealed condition the combination of high yield strength and good corrosion resistance is inviting to a new design approach for a variety of applications. Especially allowing for non-corrosion protected light weight constructions with a low life cycle cost.

Corrosion resistance

General corrosion

SAF™ 2507 is highly resistant to corrosion by organic acids, e.g. formic and acetic acid. Also in chloride contaminated acid the grade remains resistant.
SAF™ 2507 in the annealed, cold-rolled as well as cold-rolled and aged condition has passed salt spray tests during 500 h according to ISO 9227:2006 without any attack.

Pitting corrosion

The pitting corrosion resistance was assessed electrochemically by the method ASTM G150. The Critical Pitting Temperature (CPT) was measured with results according to the below table.

Condition	Tensile strength, R_m, MPa	CPT, °C	CPT, °F
Annealed	900	>80	>176
Cold-rolled	1600	>80	>176
Cold-rolled and aged (480°C/3h)	2000	>80	>176

Bending

The values given below have been obtained by bending according to Swedish standard SS 11 26 26 method 3 (in a 90° V-block with a 25 mm die opening, a sample of 35 mm width, turned so that the burrs of the blanked edges face into the bend). They can be used as guidance for the smallest recommended bending radius.

Tensile strength		Thickness		Min bending radius, mm	
MPa	ksi	mm	in.	⊥	//
900	131	1.1	0.043	0.4t	0.4t

Tensile strength		Thickness		Min bending radius, mm	
1550	225	0.50	0.020	0.8t	13t
1650	239	0.28	0.011	1.4t	9t

// Parallel to the rolling direction
⊥ Transverse to the rolling direction
t is short for thickness

Forms of supply

The strip steel can be supplied in coils, bundles, on plastic spools or in lengths. The edges can be either slit, deburred or smoothly rounded.

Conditions and dimensions

SAF™ 2507 is supplied in the solution annealed (bright annealed or annealed and pickled) or cold rolled condition.

Width

2-300 mm (0.078-12 in.)

Thickness

0.015-3.5 mm (0.0006-0.14 in.)

Heat treatment

Solution annealing

The recommended annealing cycle is 1050-1125°C (1920-2060°F) for 1-5 minutes, followed by rapid cooling in air or water.

Aging

The strength of cold-rolled SAF™ 2507 can be increased by a heat treatment operation at 480°C (900°F) for 3 h. An increase in tensile strength of 200-300 MPa and in proof strength of 400-500 MPa can be expected. Aging also increases the modulus of elasticity.
Aging is normally carried out after forming. If the aging is performed in an open-air furnace, a brownish oxide is formed on the surface. To avoid discoloration, parts should be carefully cleaned before heat treatment.

Mechanical properties

Static strength, nominal values at 20°C (68°F)

Condition	Tensile strength, R_m		Proof strength, $R_{p0,2}$ [a)]		Elongation, $A_{11,3}$
	MPa	ksi	MPa	ksi	%
A	900	131	600	87	30
C	1150	167	1100	160	14
C	1350	196	1250	181	6
C	1550	225	1400	203	4

Static strength, nominal values at 20°C (68°F)

Condition	Tensile strength, R_m		Proof strength, $R_{p0,2}$ [a)]		Elongation, $A_{11,3}$
CT	1850	268	1800	261	3
C	1800	261	1550	225	3

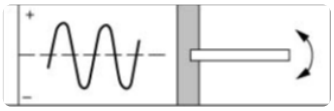
a) $R_{p0,2}$ corresponds to 0.2% offset yield strength.
1 MPa = N/mm^2
A = Annealed
C = Cold rolled
CT = Cold rolled and aged, 480°C (896°F)/3 h (see further under section "Heat treatment".)

Fatigue strength

Nominal values at 20°C (68°F) in a normal dry atmosphere. The fatigue limit is defined as the stress at which 50% of the specimens withstand a minimum of 2 million load cycles.

Reversed bending stress

Average stress = 0
Bending transversal to rolling direction.



Tensile strength, Rm	Fatigue limit, MPa	Tensile strength, Rm	Fatigue limit, ksi
	Thickness, mm		Thickness, inch
MPa	0,50	ksi	0.020
1850	± 540	268	± 78

Physical properties

The physical properties of a steel are related to a number of factors, including alloying elements, heat treatment and manufacturing process, but the following data can generally be used for rough calculations. The values refer to testing in the annealed condition at 20°C (68°F), where nothing else is mentioned.

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

Thermal conductivity

Temperature, °C	W/m °C	Temperature, °F	Btu/ft h°F
20	16	68	9
100	17	200	9.5
200	19	400	11
300	20	600	11.5
400	21	750	12.5

Metric units, W/(m °C)

Temperature, °C	20	100	200	300	400
SAF™ 2507	14	15	16	18	20
ASTM 316L	14	15	17	18	20

Imperial units, Btu/(ft h °F)

Temperature, °F	68	200	400	600	800
SAF™ 2507	8	9	9	10	12
ASTM 316L	8	9	10	10	12

Specific heat capacity

Temperature, °C	J/(Kg °C)	Temperature, °F	Btu/(lb °F)
20	480	68	0.12
100	500	200	0.12
200	530	400	0.13
300	550	600	0.13
400	580	800	0.14

Thermal expansion

SAF™ 2507 has a coefficient of thermal expansion close to that of carbon steel. This gives SAF™ 2507 definite design advantages over austenitic stainless steels in equipment comprising of both carbon steel and stainless steel. The values given below are average values in the temperature ranges.

Metric units [1)]

Temperature, °C	30-100	30-200	30-300	30-400
SAF™ 2507	13	13.5	14	14.5
Carbon steel (0.2%C)	12.5	13	13.5	14
ASTM 304L	16.5	17.5	18	18

1) ($x10^{-6}$/°C)

Imperial units [1)]

Temperature, °F	86-200	86-400	86-600	86-750
SAF™ 2507	7	7.5	7.8	8
Carbon steel (0.2%C)	7	7	7.5	7.5
ASTM 304L	9.5	9.5	10	10

1) ($x10^{-6}$/°F)

Modulus of elasticity, E [1)]

Condition	Tensile strength, R_m, MPa	E, MPa	Tensile strength, R_m, ksi	E, ksi
Cold rolled	1550	180	225	26.1
Cold rolled and aged	1850	210	268	30.5

1) ($x10^3$)

Welding

The weldability of SAF™ 2507 is good. Suitable welding methods are manual metal-arc welding with covered electrodes or gas shielded arc welding. Welding should be undertaken within the heat input range of 0.2-1.5 kJ/mm and with an interpass temperature of maximum 150°C (300°F).

Preheating or post-weld heat treatment is not necessary.

Matching filler metals are recommended in order to obtain a weld metal with optimum corrosion resistance and mechanical properties.

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