

TUBACEX TX-22 Technical Datasheet

Introduction

TX-22 is a duplex stainless steel that has been specifically designed to work in aggressive environments of Oil Country Tubular Goods. The austenitic-ferritic matrix allows to obtain a high resistance to pitting in Chloride environments combined with an excellent resistance to Chloride induced stress corrosion cracking in presence of low contents of H2S and CO2.

General Characteristics

TX-22 is an austeno-ferritic stainless steel with a PREN between 30 and 40, a Molybdenum higher than 1,5%wt and a phase balance close to 50%/50%. The mechanical behaviour fulfils with the most exigent requirements of the standard ISO13680/API5CRA fro this grade of product.

A. Technical Specifications

- ISO 13680/API 5CRA
- ISO 15156/NACE MR0175

B. Chemical Composition

UNS number: S31803/S32205. Typical values are (in percentage of mass):

С	Mn	Si	Р	S	Cr	Ni	Мо	Ν	PREN
<0.02	< 2.0	<1.0	< 0.030	< 0.015	22	5.5	3.0	0.08 to 0,20	30-40

PREN = %Cr + 3.3 x %Mo + 16 x %N

C. Production Process

C.1 Steel Making Mill

Electric furnace process and Argon Oxygen Decarburization process (AOD) to refine the steel composition.

C.2 Pipe Production

The pipe production consists in a first hot working stage followed by a final cold working stage.

C.3 Heat Treatment

Depending on the final product requirements a heat treatment prior to the cold work could be applied. Minimum heat treatment temperature is 1020 $^{\circ}$ C (1870 $^{\circ}$ F) followed by a very rapid cooling to avoid the presence of any third phase in the microstructure.

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D. Mechanical Properties (Cold Worked Condition)

Different yield strength grades are available. The most typical one is grade 125 ksi PSL-2.

	MPa	862-1000
Rp0.2 (KSI)	Ksi	125-145
Due (kei)	MPa	>897
KM (KSI)	Ksi	>130
А	%	>10
HRC mean		<36
Ecv mean(*)	J	>50
Ecv indiv(*)	J	>40

1 ksi = 6,895 MPa - 1 MPa = 0,145 ksi (*) At -10 °C, transverse

Temperature yield derating factor at a given temperature:

Temperature °C (°F)	Yield Derating Factor
100 (212)	0.94
200 (392)	0.89

E. Physical Properties

E.1. Thermal Expansion Coefficient:

Mean coefficient between 20 °C and a given temperature:

E.2. Modulus of Elasticity

At 20 °C: 180 kN/ mm². At a given temperature:

Temperature °C (°F)	Coefficient (10 ⁻⁶ K ⁻¹)	Temperature °C (°F)	kN/ mm²
100 (212)	13,4	100 (212)	175
200 (392)	13,3	200 (392)	170

E.3. Poisson Ratio

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At 20 ºC: 0,32. At a given temperature:

Temperature °C (°F)	V
100 (212)	0.36
200 (392)	0.38

E.4. Other Physical Properties:

- Density at 20 °C: 7,83 g/cm³
- Thermal conductivity at 20 °C: 16 W/K·m
- Electrical resistivity at 20 °C: 0,80 $\Omega \cdot mm^2\!/m$
- Specific heat capacity at 20 °C: 500 J/kg °C

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F. Corrosion Properties

F.1. Intergranular Corrosion

TX-22 passes testing to ASTM A262 Practice E, ISO 3651-2 Method A without objections.

F.2. Stress Corrosion Cracking

F.2.1. Resistance to SSC, SCC and GHSC in H2S environment (NACE TM0136 4PB)

Condition	Grade	Applied Sress	NaCI (g/l)	рН	T ºC (ºF)	P H₂S kPa (psi)	P CO₂ kPa (psi)
1	125	90% AYS	50	3,5	170 (340)	10 (1,45)	90 (13)
2	125	90% AYS	50	3,5	80 (175)	20 (2,9)	90 (13)

F.2.2. Resistance to SCC in H2S environment (comparison with ISO 15156)

TX-22 grade 125 passes without objections the tests carried out within the ISO 15156 limits for this grade.



F.3. Pitting and Crevice Corrosion Resistance

According to ASTM G48, TX-22 has a critical pitting temperature of 45°C and a critical crevice temperature of 30°C.

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