

## CromElso™ 11 Chromium-Molybdenum Steel

### Special low alloy (1¼Cr½MoSi) steel for high temperature and/or high pressure hydrogen service

**CromElso™ 11** is a low-alloyed Cr-Mo steel designed for pressure equipment such as hydrotreating reactors, catalytic reforming reactors, ammonia converters or coke drums. **CromElso™ 11** is manufactured via the electric arc furnace route with dephosphorisation, ladle refining and vacuum degassing to provide reproducible, clean and homogeneous steel.

The use of special steelmaking practice with ultra-low phosphorus aims at providing an improved resistance to creep cracking to **CromElso™ 11**, as well as low excellent temperature impact toughness.

**CromElso™ 11** is particularly suitable for pressure equipment in both refinery and gas treatment applications with high temperature hydrogen service.

### Properties

#### Standards

**CromElso™ 11** is compliant with:

- ASTM/ASME A/SA-387 gr11
- EN 10028-2 13CrMoSi5-5 (1.7336)

*For other standard compliancy, please consult.  
Multiple certifications are possible on request.*

#### Tensile properties

Guaranteed transverse tensile properties at room temperature. (Measured on every plates):

Standard	Plate thickness (mm)	Yield Strength (MPa)	Ultimate Tensile Strength (MPa)	Minimum Elongation (%)
EN 10028-2 13CrMoSi5-5 (Q+T)	≤ 60	400	510-690	20
	60-100	390	500-680	
	100-250	380	490-670	
A/SA-387 gr11 cl.2		275	515-690	18

Yield Strength (YS/Rp<sub>0.2</sub>) guaranteed ≤ 620MPa.

#### Chemical composition

**Ladle analysis** – Expressed in weight percent (wt%) as per above standards

C	Mn	Si	Cr	Mo	Ni
≤ 0.15	0.45-0.60	0.50-0.80	1.0-1.5	0.4-0.6	≤ 0.30

**Ultra clean steel** : we guarantee J-factor ≤ 150, P ≤ 0.007 wt%, P+Sn ≤ 0.012 wt%

H<sub>2</sub> ≤ 2ppm or even ≤ 1ppm depending on production route, C ≤ 0.14wt% possible for thickness ≤ 120mm

## Specific guarantees

**CromElso™ 11** is delivered in heat treated condition with tempering done at 710°C minimum, with mechanical properties guaranteed for maximum PWHT 690°C – 28Hrs.

We guarantee actual tensile properties as per ASME II Part D: 90% UTS (Table U) and 100% YS (Table Y).

Tensile test done at design temperature (min and max PWHT).

Brinell hardness (BHN) ≤ 220 in as-delivered condition (Q+T). BHN ≤ 210 following PWHT.

## Welding

Consumables used for the welding of **CromElso™ 11** shall comply with the following standards.

	SMAW	GMAW	FCAW	SAW (Wire + Flux)
AWS	SFA5.5 E 8018 B2 H4	SFA 5.28 ER 80S-G	SFA 5.29 E 81T1-B2M-H4	SFA5.23 F10AZ-EB2R-B2
EN	EN 3590-A ECrMo1 B 4 2 H5	EN ISO 21952-A G CrMo1 Si	EN ISO 17643-A T CrMo1 B M21 3 H5	EN ISO 24598-B S S CrMo1 AR + EN ISO 14174 S A AR 176 AC H5

Please contact your favorite filler materials supplier for corresponding references.

## Delivery conditions

### Plates

**CromElso™ 11** can be produced in thicknesses from 5 mm and up to 250 mm (3/16" up to 10").

Maximum plate weight: 20 tons per unit for continuous casting route and up to 80+ tons for ingot route.

### Prefabrication

By special agreement, prefabricated pieces can be delivered according to drawings. The following operations can be performed: beveling, bending, rolling of shell to radius, cutting to shape, fabrication of stiffeners and annular plates, pre-welding. *(Non exhaustive list, please consult)*

### XCarb®

On request, **CromElso™ 11** plates can be delivered with **XCarb®** certificate that guarantees steels with a low carbon footprint, made through the electric arc furnace using recycled scrap and renewable electricity. Product carbon footprint is third-party verified.

## Applications

This material may be used in all applications requiring service conditions under high temperature and or high pressure of hydrogen.

**CromElso™ 11** is suitable for pressure equipment such as reactors or exchangers operating under hot hydrogen service (within the limits of API RP 941 and/or API RP 934-C/E). The following applications successfully use **CromElso™ 11** for decades:

- > Coke Drums units
- > Ammonia Converters units
- > FCC units

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*Technical data and information are to the best of our knowledge at the time of editing. However, they may be subject to some slight variations due to our ongoing research programme on steels. Therefore, we suggest that information be verified at time of enquiry or order. Furthermore, in service, real conditions are specific for each application. The data presented here are only for the purpose of description, and considered as guarantees when written formal approval has been delivered by our company. Further information may be obtained from the address opposite.*