

CromElso™ 22 Enhanced Chromium-Molybdenum Steel

Special low alloy (2¼Cr1Mo) steel for high temperature hydrogen service

CromElso™ 22 Enhanced is a low alloyed Cr-Mo steel designed for pressure equipment such as hydrotreating reactors operating at elevated hydrogen pressure and temperature. **CromElso™ 22 Enhanced** is manufactured via the electric arc furnace with dephosphorisation, ladle refining and vacuum degassing to provide reproducible, clean and homogeneous steel. Special heat treatment is performed to get higher tensile properties than conventional 2¼Cr1Mo (**CromElso™ 22 – ASTM/ASME A/SA-387 gr22 cl2**).

The use of special steelmaking practice with extralow phosphorus levels gives **CromElso™ 22 Enhanced** improved resistance to temper embrittlement, as well as providing excellent low temperature impact toughness properties. **CromElso™ 22 Enhanced** is particularly suitable for pressure equipment in high temperature hydrogen service (e.g. hydrotreating reactors, exchangers). This steel is available in plate form in thickness up to 200 mm, and can also be provided in single- or multi-piece heads and cores.

Properties

Standards

CromElso™ 22 Enhanced is compliant with:

- ASTM/ASME A/SA-542 tpB cl4 (UNS K21590)
- EN 10028-2 12CrMo9-10 (1.7375)

*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 12CrMo9-10	Up to 250 mm	355	540-690	18
A/SA-542 tpB cl.4		380	585-760	20

Yield Strength (YS/Rp_{0.2}) guaranteed ≤ 620MPa.

Chemical composition

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

C	Mn	Si	Cr	Mo	Ni
≤ 0.15	0.30-0.60	≤ 0.50	2.0-2.5	0.90-1.10	≤ 0.30

Ultra clean steel : we guarantee J-factor ≤ 80, P ≤ 0.007 wt%, P+Sn ≤ 0.012 wt%

H₂ ≤ 2ppm or even ≤ 1ppm depending on production route, C ≤ 0.14 wt% possible for thickness ≤ 120mm

Specific guarantees

CromElso™ 22 Enhanced is delivered in heat treated condition with tempering done at 600°C minimum, with mechanical properties guaranteed for maximum PWHT 660°C – 22Hrs.

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) ≤ 240 in as-delivered condition (Q+T). BHN ≤ 220 following PWHT.

Welding

Consumables used for the welding of **CromElso™ 22 Enhanced** shall comply with the following standards.

	SMAW	GMAW	FCAW	SAW (Wire + Flux)
AWS	SFA5.5 E 9018 B3 H4 R	SFA 5.28 ER 90S-Si	SFA 5.29 E 91T1-B3M-H8	SFA5.23 F11AZ-EB3R-B3
EN	EN ISO 3590-A ECrMo2 B 4 2 H5	EN ISO 21952-A G CrMo2Si	EN ISO 17643-A T CrMo2 P M211 H8	EN ISO 24596-B S S CrMo2 AR + EN ISO 14174 S A AR 176 AC H5

Please contact your favorite filler materials supplier for corresponding references.

Delivery conditions

Plates

CromElso™ 22 Enhanced can be produced in thicknesses from 5 mm and up to 200 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™ 22 Enhanced** 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™ 22 Enhanced is suitable for pressure equipment such as reactors or exchangers operating under hot hydrogen service (within the limits of API RP 941):

- > Hydrodesulfuration (HDS) unit
- > Hydrotreatment (HDT) unit
- > Hydrocracking (HDC) unit

Industeel Belgium

Charleroi Plant

266, rue de Chatelet

B – 6030 Marchienne-au-Pont

industeel.arcelormittal.com



Your contact

Valéry NGOMO

Tel. +33 6 10 49 59 48

valery.ngomo@arcelormittal.com

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.