

## CryElso™ 5

### CryElso™ 5: Steel plates for liquefied ethylene (LEG)

CryElso™ 5 is Industeel's high toughness quenched and tempered 5% nickel steel grade for cryogenic applications. The main application is gas storage and transportation at very low temperatures, down to  $-120^{\circ}\text{C}$ . A typical use is ethylene transportation in bilobe tanks (LEG carrier). CryElso™ 5 is available in plates 5 to 50 mm thick.

#### PROPERTIES

#### STANDARDS

> EN10028-4                      **X12Ni5 (1.5680)**  
(formely known as 12Ni19)

CryElso™ 5 is qualified as a naval grade according to several Class societies. Please enquire.

#### CHEMICAL ANALYSIS - WEIGHT %

A special feature of CryElso™ 5 is its chemical composition with low carbon, low phosphorus and low sulfur for improved enduse as well as fabrication properties.

*Typical composition, for information only*

C	Mn	P	S	Si	Ni	Al
0.05	0.5	< 0.010	< 0.002	0.20	5.0	> 0.020

#### MECHANICAL PROPERTIES

- > YS min 390 MPa (380 MPa above 30 mm thickness)
- > UTS 530-710 MPa
- > elongation min 20%
- > 40J transverse charpy impact toughness at  $-120^{\circ}\text{C}$

Supplementary heat treatments according to the standards may be considered by special agreement

## FORMING AND HEAT TREATING

Cold forming or medium temperature forming ( $t < 500^{\circ}\text{C}$ )

Heat Treatment	
Level of deformation below 2%	None
Level of deformation between 2% and 5%	Stress Relief (*)
Level of deformation higher than 5%	Quenching and Tempering (**)

Suggested post-forming heat treatment parameters

(\*) Stress Relief:

- > Heating: free
- > Soaking at temperature:  $590\text{--}630^{\circ}\text{C}$  (2 minutes per millimetre of thickness); still air cooling

(\*\*) Quenching & Tempering:

- > Quenching:
- > Heating: free; soaking at temperature:  $820^{\circ}\text{C}$  (1 minute per millimetre of thickness); water cooling

Tempering:

Heating: free ; soaking at temperature:  $590\text{--}630^{\circ}\text{C}$  (2 minutes per millimetre of thickness) ; still air cooling ; according to information on Material Test Certificate.

## WELDING CONDITIONS

CryElso™ 5 can be welded without preheating / postheating nor PWHT in a typical range of 1–3 kJ/mm heat input. Available classification of welding consumables is supplied herebelow for information. The list of brands is not limitative and specific availability of materials should be checked with the consumables supplier.

Classification of welding consumables	SMAW	GMAW	FCAW	Wire-Flux combination SAW
AWS	<b>SFA 5-11</b> E NiCrMo-3 (625) E NiCrMo-4 (276) E NiCrMo-6	<b>SFA 5-14</b> ER NiCrMo-3 (625) E NiCrMo-4 (276)		<b>SFA 5-14</b> ER NiCrMo-3 (625) E NiCrMo-4 (276)
EN	<b>ISO 14172</b> E Ni 6625 (625) E Ni 6276 (276) E Ni 6620	<b>ISO 18274</b> S Ni 6625 (625) S Ni 6276 (276) S Ni 6620	<b>ISO 14172</b> E Ni 6625 (625) E Ni 6276 (276) E Ni 6620	<b>ISO 18274</b> E Ni 6625 (625) E Ni 6276 (276) E Ni 6620
JIS	<b>Z3224</b> D NiCrMo-3 (625) <b>Z3225</b> D 9Ni-2	<b>Z 3332</b> Y GT 9Ni-2		<b>Z3333</b> Y S 9Ni + F S 9Ni-F YS 9Ni + F S 9Ni-H

CryElso™ 5 can also be welded with 316L type stainless steel consumables.



## PLATE PROCESSING

### FILLER MATERIALS

Consumables are available from the following suppliers (this list is not limitative):

Fillers metals in alloy type 625.

	SMAW	GMAW	FCAW	SAW	
				Wire	Flux
<b>ESAB</b>	OK 92.55 OK 92.45	OK Autrod 19.82		Autrod 19.82	FLUX 10.16
<b>LINCOLN</b>	NiCroMo 60/16	LNM NiCro 60/20		LNS NiCro 60/20	P2000
<b>LINCOLN- METRODE</b>	NIMROD 182	20.70.Nb		20.70.Nb	NiCr FLUX
<b>ALW</b>	FREEZAL ENi 9 DRY				
<b>BÖHLER-T-PUT</b>	Nicro 182 Thermanit 625	Thermanit 625		Thermanit 625	Marathon 104
<b>BÖHLER-UTP</b>	6222 Mo	A 6222 Mo	AF 6222 Mo	UP 6222 Mo	FX UP6222Mo

Fillers metals in alloy type C276.

	SMAW	GMAW	SAW	
			Wire	Flux
<b>BÖHLER- UTP</b>	776Kb	A776	UP776	FX UP776
<b>LINCOLN- METRODE</b>	NIMROD C276	HAS C276	HAS C276	NiCr FLUX

## APPLICATIONS

CryElso™ 5 is typically used for the construction of liquefied ethylene storage and transportation vessels (LEG carriers & storage), with a minimum design temperature down to -120°C.

## YOUR CONTACTS

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*Technical data and information are to the best of our knowledge at the time of printing. 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.*