



cryofit offshore heavy plates

Cost efficient and sustainable steel for offshore LNG tank manufacturing

cryofit heavy plates are excellently suited to applications exposed to extremely low temperatures. The traditional materials for LNG tanks are e.g. a 9% nickel steel or austenitic stainless steel.

Based on the IGC/IGF code it is also possible to use a specially heat-treated 5.5% nickel steel for the construction of fuel or cargo tanks. This material thus contains roughly 1/3rd less nickel.

Depending on your required dimensions and the actual alloying prices, voestalpine is ready to offer the highly advanced cryofit offshore heavy plates at an approx. 20% lower price compared to the 9% Ni material but providing the same mechanical properties and comparable thermal expansion behavior.

By substantially saving resources, you can expect lower costs and a reduced CO₂-footprint in the construction of your LNG fuel or cargo tank. Furthermore, your project is less depending on the volatile nickel price.

When compared to high manganese steel grades, cryofit offshore shows its advantages in regard

to health, safety and environmental issues during flame cutting and welding.

Choosing voestalpine BöhlerWelding Group's most advanced welding process and the appropriate welding consumables you can realize a remarkable cost reduction for welding consumables, when manufacturing tanks out of cryofit offshore heavy plates instead of conventional 9% Ni.

Convincing advantages

- » Essential cost reduction
- » Sustainable use of Ni-resources
- » No health threat
- » Reduced CO₂ footprint of your application
- » High level of strength in combination with excellent toughness at low temperature

Processing

- » Same workability like cutting, bending and edge preparation as for traditional material
- » Böhler Welding Group will offer you a complete range of consumables for all welding processes and will support you in optimizing your onsite welding operations

Chemical composition

Heat analysis in mass % acc. standard

Steel grade	Plate thickness [mm]	C max.	Si max.	Mn max.	P max.	S max.	Al max.	Cr max.	Mo max.	Ni max.	N max.
A 645 Gr. B cryofit offshore	> 5 ≤ 50	0.13	0.30	1.50	0.020	0.010	0.050	1.00	0.30	6.00	0.01

Differing from the normative definitions and based on our state of the art production process, voestalpine is able to offer lowest phosphorus and sulfur contents ($P_{\max}=0.008\%$, $S_{\max}=0.001\%$).

Mechanical properties: Notch impact energy ¹⁾

Values in as-delivered condition acc. standard

Steel grade	Test temperature [°C]	Size of specimen [mm]	Notch impact energy Testing direction longitudinal		Notch impact energy Testing direction transversal	
			A _v min. [J]	A min. [J]	A _v min. [J]	A min. [J]
A 645 Gr. B cryofit offshore	-196	10 x 10	34	27	27	22
		10 x 7.5	26	22	20	16
		10 x 6.67	23	18	18	14
		10 x 5.0	18	14	14	11

¹⁾ Each specimen shall have a lateral expansion opposite the notch of not less than 0,38 mm
Notch impact bending test in accordance with ASTM A 20M

Mechanical properties: Tensile test ²⁾

Values in as-delivered condition acc. standard

Steel grade	Yield strength $R_{p0.2}$ [MPa] min.	Tensile strength R_m [MPa]	Fracture elongation A5 $L_0 = 5.65 \sqrt{S_0}$ [%]
A 645 Gr. B cryofit offshore	590	690 – 830	20

²⁾ Tensile test in accordance with ASTM A 20M
On request, additional or more restrictive requirements (e.g. a higher minimum tensile strength) can be offered, which can be beneficial for a variety of applications.

Available dimensions

Steel grade	Plate thickness [mm]	Max. width [mm]	Max. length [mm]	As-delivered condition ³⁾
A 645 Gr. B cryofit offshore	5 – 50	3,800	12,700	Q + I + T

³⁾ I ... Intermediate heat treatment

Additional dimensions upon request.

Welding Consumables

Welding process	Product name	AWS classification	EN ISO classification	Notch impact energy [J] / -196 °C	UTS [MPa]	YS [MPa]
SMAW	Böhler Thermanit 620	ENiCrMo-6	E Ni 6620	80	700	430
FCAW	Böhler FOXcore 625-T1	ENiCrMo3T1-4	Ni 6625 P M21 2	72	750	475
SAW wire	Böhler NiMo C276	ERNiCrMo-4	SNi6276	110	720	450
SAW flux	Böhler Marathon 104	-	SA FB 2 AC	-	-	-

The information and product properties contained in this printed material are non-binding and serve the sole purpose of technical orientation. They do not replace individual advisory services provided by our sales and customer service teams. The product information and characteristics set forth herein shall not be considered as guaranteed properties unless explicitly stipulated in a separate contractual agreement. For this reason, voestalpine shall not grant any warranty nor be held liable for properties and/or specifications other than those subject to explicit agreement. This also applies to the suitability and applicability of products for certain applications as well as to the further processing of materials into final products. All application risks and suitability risks shall be borne by the customer. The General Terms of Sale for Goods and Services of the voestalpine Steel Division shall apply to all materials supplied by the voestalpine Steel Division and can be accessed using the following link: www.voestalpine.com/stahl/en/The-Steel-Division/General-Terms-of-Sale

Technical changes are reserved. Errors and misprints are excepted. No part of this publication may be reprinted without explicit written permission by voestalpine Stahl GmbH.