Industeel

ArcelorMittal

Industeel®S420QLO

Industeel®S420QLO : a weldable quenched and tempered steel for large offshore structures with excellent toughness and weldability

Industeel®S420QLO is a quenched and tempered structural steel plate grade with a nominal minimum yield strength of 370MPa* dedicated to large offshore structures in the North Sea and similar environments.
Option 17 of EN 10225-1:2019 can be qualified with a documentary file that has been reviewed by DNV-GL and Lloyd's Register.
Its extreme purity with very low sulphur and phosphorus contents, as well as its adapted chemical analysis, makes **Industeel®S420QLO** easy to cut, shape and weld, and provides excellent impact toughness and CTOD properties in the very large sizes available.
Industeel®S420QLO is elaborated through Electric Arc Furnace (EAF) melting of selected scraps with fine grain practice, vacuum treatment and ingot casting to provide the necessary characteristics of the material.
The steel is rolled in plates with a quarto mill and finished using separate quenching and tempering heat treatments.

* 1MPa = 1N/mm^2 , for thickness above 150 mm

PROPERTIES

STANDARD

CLASSIFICATION SOCIETY AND STANDARD (MAX. THICKNESS TESTED)

EN 10225:2009 S420G2+QT (200 mm)

EN 10225-1:2019 S420QLO or 1.8666 (200 mm)

DNV-GL VL F40, VL E420 (200 mm)

ABS AB EQ43 Z35 (200 mm)

LR LR EH40 (400 mm), LR FH36 (200 mm on demand)

Industeel®S420QLO can be qualified to the following requirements of EN 10225-1:2019

Option 11 (strain-ageing testing)

Option 12 (through-thickness testing)

Option 17 (weldability testing)

This prequalification has been reviewed and approved by DNV-GL and Lloyd's Register.

The grade can be delivered according to **NORSOK M-120 Ed. 5 datasheet MDS-Y30 Rev.5** and at thicknesses above the maximum defined in the standard.

CHEMICAL ANALYSIS - WEIGHT %, MAXIMUM UNLESS A RANGE IS INDICATED

C	Si	Mn	P	S	Cr	Mo	Ni	Al	Cu
0,14	0,15 0,55	1,65	0,020	0,010	0,25	0,25	0,70	0,015 0,055	0,30

N	Nb	Ti	V	B	Nb+V	Nb+V+Ti	CEV	Pcm
0,010	0,050	0,025	0,080	0,0008	0,09	0,11	**0,42**	0,22

CEV = C + Mn/6 + (Cr+Mo+V)/5 + (Cu+Ni)/15

Pcm = C + Si/30 + (Mn+Cu+Cr)/20 + Ni/60 + Mo/15 + V/10 + 5 B

PROPERTIES

MECHANICAL PROPERTIES

Tensile

Thickness range (mm)	Yield Strength R_{eH} (MPa)	Tensile Strength R_m (MPa)	Yield to tensile strengths ratio	Elongation on base 5,65 $\sqrt{S_0}$ A (%)	Through thickness reduction of area Z (%)
80-150	Minimum 380	480-640	Maximum 0,93	Minimum 19	Minimum 35
150-200	Minimum 370	480-640	Maximum 0,93	Minimum 19	Minimum 35

$1N/mm^2$

Charpy Impact tests

Minimum values according to EN10225-1:2019 Table 11

Test temperature	Transverse direction impact test sub-surface	Transverse direction impact test mid-thickness
-40°C	Minimum 60 J	Minimum 60 J

DELIVERY CONDITIONS

The steel is manufactured through Electric Arc Furnace (EAF) melting of selected scraps with fine grain practice, vacuum treatment and ingot casting to provide the necessary characteristics of the material.

Sizes

Thickness range.....80mm to 200mm
Maximum unit weight.....60 tonnes
Maximum width.....4350mm
Maximum length.....19000mm

Heat treatment conditions

Heat treatment.....quenching of plates at 900°C and tempering at 600°C
Simulated PWHT.....on request on test coupon; nominal 580°C

Material condition

Edges.....oxycut
Surface condition.....EN10163-2 Class B Sub-class 3, ground
Internal soundness.....ultrasonic testing according to EN10160 S1/E2

Other delivery conditions can be agreed on request

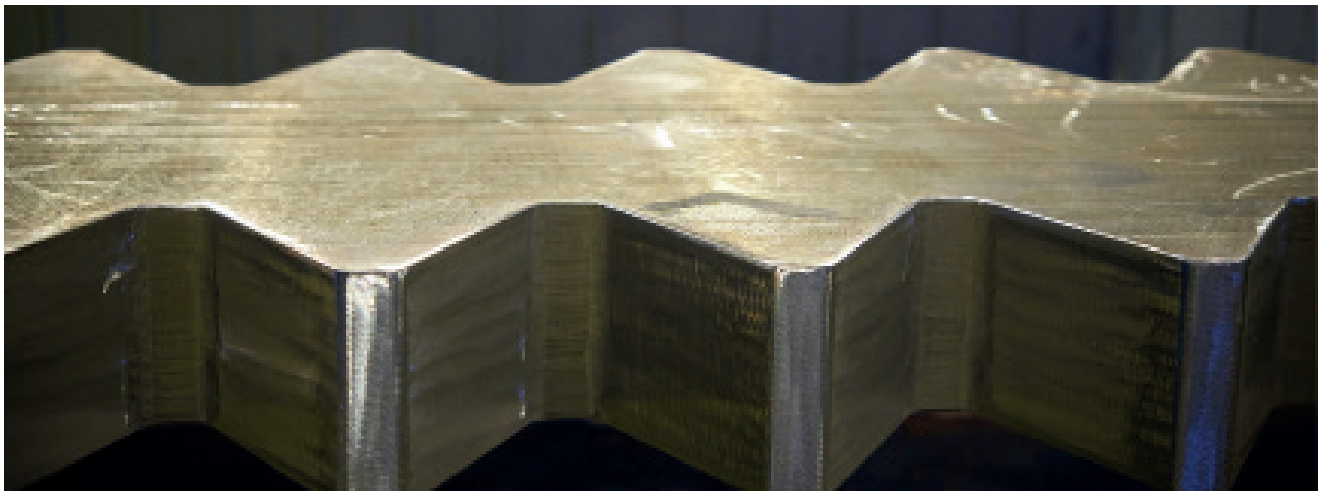

PLATE PROCESSING

FORMING, CUTTING & MACHINING

Industeel®S420QLO can be processed with the parameters generally applied for mild steels.
Please enquire for advice if requested.

WELDING

The weldability of **Industeel®S420QLO** is excellent thanks to its balanced chemical composition.
The weldability can be prequalified according to EN10225:2009 annexes E, F and G Option 18 as it has already been performed with Industeel®S355G10+N thanks to compatible chemical compositions.

Welding processes

Conventional fusion welding methods can be used, such as submerged arc welding (SAW), flux cored wire arc welding (FCAW), metal cored arc welding (MCAW), shielded metal arc welding (SMAW), GMAW and GTAW.
Preheating at 125°C is recommended and interpass temperature should be limited to a maximum of 250°C.
A maximum heat input of 3,5kJ/mm should be observed to achieve good properties in the weld metal.
A Post Weld Heat Treatment (PWHT) at 580°C +/-10°C for 1hour per 25mm thickness can be considered appropriate.

Welding consumables

Fluxes should be re-dried at 300-350°C for minimum 2 hours and stored at 150°C until used.

Standard	SMAW	GMAW	FCAW MCAW	SAW
AWS	AWS A5.1 E7018-G H4R AWS A5.5 E8018-C3 H4R	AWS 5.28 ER80S-Ni1	AWS A5.36 E71T5-M21P8-G-H4 E8xT1x-M21P8-Ni1-H4	AWS A5.17 F7A8-EH12K F7P8-EH12K
EN	EN ISO 2560-A E 42 4 B 3 2 H5 E46 6 1Ni B 4 2 H5	EN ISO 14341-A G 46 6 M21 3Ni1	EN ISO 17632-A T 42 6 Z B M 1 H5 T46 6 1Ni x M 1 H5	EN ISO 14171-A S46 6 FB S3Si

APPLICATIONS

Industeel®S420QLO is designed for use in thick and very thick parts of large offshore structures where there is an interest towards weight gain thanks to higher strength.

YOUR CONTACTS

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