

APPROVAL OF MANUFACTURER CERTIFICATE

Certificate No:
AMMM000000A
Revision No:
6

This is to certify:

That

SIDENOR ACEROS ESPECIALES , S.L.
Basauri, Reinosa and Azkoitia plants
Basauri, Vizcaya, Spain

is an approved manufacturer of
Steelmaking and Rolled Steel Products

in accordance with
DNV GL rules for classification – Ships
Offshore Standard DNV-OS-B101
DNVGL-OS-E302 – Offshore mooring chain, Edition July 2018

and the following particulars:

Product	Round bars for chain cables, Rolled round bars intended to be machined into components, Semi-finished products; ingots, blooms and billets for forging and rolling stock
Grades	See pages 2 and 3
Steelmaking	See pages 2 and 3
Deoxidation	Killed
Fine grain elements	See pages 2 and 3
Delivery conditions	See page 2
Max. diameter	See page 2
Remarks	See pages 2 to 4

Manufacturer approved by this certificate is accepted to deliver according to DNV GL, DNV and GL rules. Materials to be applied to DNV GL classed object shall fulfill the material requirements in the applicable DNV GL class rules.

Issued at **Høvik** on **2019-03-21**

for **DNV GL**

This Certificate is valid until **2021-11-15**.

DNV GL local station: **Bilbao**

Approval Engineer: **Dechun Lou**

Hanne Anita Hjerpetjønn
Head of Section



Job Id: **263.11-009763-1**
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Particulars of the approval

Rolled round bars ¹⁾²⁾⁶⁾ intended to be machined into components (as a substitute for forged bars), Semi-finished products for forging or rolling stock				
Steel types	Steelmaking ³⁾	Fine grain elements	Delivery conditions ⁴⁾	Max. diameter (mm)
Carbon and carbon-manganese	EAF, IC or CC	Al or Al+V	N ⁵⁾	220 ⁵⁾
Alloy ⁶⁾	EAF, IC or CC	Al or Al+V	QT ⁵⁾	220 ⁵⁾

Remarks:

- 1) Minimum rolling reduction ratio 6:1
- 2) Sampling, inspection and testing requirements shall be according RU-SHIP Pt.2 Ch.2 Sec. 6
- 3) EAF: Electric Arc Furnace; IC: Ingot Casting; CC: Continuous Casting.
- 4) N: Normalised; QT: Quenched and Tempered.
- 5) Not applicable for semi-finished products.
- 6) Including clean steel of grade 18CrNiMo7-6 according to EN 10084, DNVGL RU-SHIP Pt.2 Sec.6 and DNVGL-CP-0247 Sec.3 [2.1].

Round bars for chain cables				
Grade ⁵⁾	Max. diameter (mm)	Steelmaking ¹⁾	Fine grain elements	Delivery condition ²⁾
R3	185	EAF, VD, IC	Al+V	AR
	78	EAF, VD, CC ³⁾		
	150	EAF, VD, CC ⁵⁾		
	203	EAF, VD, CC ⁵⁾		
R3S	185	EAF, VD, IC	Al+V	AR
	78	EAF, VD, CC ³⁾		
	150	EAF, VD, CC ⁵⁾		
	186.5	EAF, VD, CC ⁵⁾		
R4	175	EAF, VD, CC ⁵⁾	Al	HA
R4 ⁶⁾	185	EAF, VD, IC	Al+V	AR
	78	EAF, VD, CC ³⁾		
	88	EAF, VD, CC ⁴⁾		
	191	EAF, VD, CC ⁵⁾		
R4S ⁶⁾	185	EAF, VD, IC	Al+V	AR
	78	EAF, VD, CC ³⁾		
	88	EAF, VD, CC ⁴⁾		
	174	EAF, VD, CC ⁵⁾		
R5 ⁶⁾	230	EAF, VD, IC	Al+V	AR
	78	EAF, VD, CC ³⁾		
	88	EAF, VD, CC ⁴⁾		
	174	EAF, VD, CC ⁵⁾		

Remarks:

- 1) EAF: Electric Arc Furnace; VD: Vacuum Degassing; IC: Ingot Casting; CC: Continuous Casting.
- 2) AR: As Rolled; HA: Annealed for Hydrogen diffusion.
- 3) Dimensions of billet: 185 x 185 mm
- 4) Dimensions of billet: 240 x 240 mm
- 5) Dimensions of bloom: 300 x 400 mm or 350 x 470 mm.
- 6) Minimum tempering temperature shall be 610°C.
- 7) Specification for chemical composition according to table S1

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Ingots, blooms and billets for chain cables		
Grade ²⁾	Steelmaking ¹⁾	Fine grain elements
R4	EAF, VD, CC	Al
R3, R3S R4, R4S R5	EAF, IC or CC	Al+V

Remarks:

¹⁾ EAF: Electric Arc Furnace; VD: Vacuum Degassing; IC: Ingot Casting; CC: Continuous Casting.

²⁾ Specification for chemical composition according to table S2

Table S1 - Specification for chemical composition - Round bars for chain cables														
Grade, dia. (mm)			C	Si	Mn	P	S	Cr	Ni	Mo	Cu	Al	V	N
R3	203	Min. Max.												
R3S	185	Min. Max.												
	186.5	Min. Max.												
R4 ²⁾	175	Min. Max.												
R4	185	Min. Max.												
R4S	185	Min. Max.												
R5	185	Min. Max.												
R5	230	Min. Max.												