



**BUREAU
VERITAS**

**Marine & Offshore
Division**

Certificate number: 37273/A4 BV

File number: MAT 2395-2013

Product code: 9019I

This certificate is not valid when presented without the full attached schedule composed of 7 sections

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APPROVAL CERTIFICATE for MATERIALS

This certificate is issued to

SIDENOR ACEROS ESPECIALES, S.L.

Reinosa (Cantabria) - SPAIN

for the type of product

ROUND BARS FOR OFFSHORE MOORING CHAIN CABLE

Round bars for offshore mooring chain cables in steel grades QR3, QR3S, QR4/R4S and QR5

Requirements:

Bureau Veritas Rules on Materials and Welding for the Classification of Marine Units

This certificate is issued to attest that BUREAU VERITAS did undertake the relevant approval procedures for the product identified above which was found to comply with the relevant requirements mentioned above.

This certificate will expire on: 10 Jan 2019

For BUREAU VERITAS,

At BV MADRID, on 10 Apr 2017,

Montserrat Espin



This certificate remains valid until the date stated above, unless cancelled or revoked, provided the conditions indicated in the subsequent page(s) are complied with and the product remains satisfactory in service. This certificate will not be valid if the applicant makes any changes or modifications to the approved product, which have not been notified to, and agreed in writing with BUREAU VERITAS. Should the specified regulations or standards be amended during the validity of this certificate, the product(s) is/are to be re-approved prior to it/they being placed on board vessels to which the amended regulations or standards apply. This certificate is issued within the scope of the General Conditions of BUREAU VERITAS Marine & Offshore Division available on the internet site www.veristar.com. Any Person not a party to the contract pursuant to which this document is delivered may not assert a claim against BUREAU VERITAS for any liability arising out of errors or omissions which may be contained in said document, or for errors of judgement, fault or negligence committed by personnel of the Society or of its Agents in establishment or issuance of this document, and in connection with any activities for which it may provide.

THE SCHEDULE OF APPROVAL

1. PRODUCT DESCRIPTION :

Hot rolled round bars for offshore mooring chain cables.

Steel grade	Delivery condition - Round bar diameter
QR3; QR3S; QR4; QR4S (1)	As rolled with thickness up to 185mm
QR3(2)	As rolled with thickness up to 203mm
QR3S (3)	As rolled with thickness up to 186,5mm
QR4 (4)	As rolled with thickness up to 183mm
QR5 (5)	As rolled with thickness up to 175mm
QR5 (6)	As rolled with thickness up to 230mm

(1) Steelmaking in Electric Arc Furnace, Ingot casting by bottom pouring. Reduction ratio is above 7.0 for steel grades QR3, QR3S, QR4, QR4S.

(2) QR3 chemical composition as per specification Ref.MPSR3 Rev.02 dated 28/03/2015. Steelmaking in Electric Arc Furnace, LF Refining and Vacuum Degassing, Continuous Casting. Blooms size 470 × 350mm are manufactured by Sidenor Basauri. Minimum Reduction ratio is 5.1;

(3) QR3S alternative chemical composition as per specification Ref.MPSR3S Rev.02 dated 05/12/2014. Steelmaking in Electric Arc Furnace, LF Refining, Continuous Casting. Blooms size 470 × 350mm are manufactured by Sidenor Basauri. Minimum Reduction ratio is 6.0;

(4) Steelmaking in Electric Arc Furnace, LF Refining, Continuous Casting. Blooms size 470 × 350mm are manufactured by Sidenor Basauri. Minimum Reduction ratio is 6.0;

(5) Steelmaking in Electric Arc Furnace, LF Refining and Vacuum Degassing, Continuous Casting. Blooms size 470 × 350mm are manufactured by Sidenor Basauri. Minimum Reduction ratio is 5.05.

(6) Steelmaking in Electric Arc Furnace, Ingot casting by bottom pouring. Reduction ratio is above 8 for round bar up to 185mm and above 5 for round bar 180mm/230mm ;

2. DOCUMENTS AND DRAWINGS :

Chemical composition (%) specification (Ref.MPSR3 Rev.01 & Ref.MPR3 Rev.13) on ladle of steel grade QR3 for chains diameter 180mm max.:

Element	C	Mn	Si	P	S	Ni (1)	Mo (2)	Cr	Al	Cu
min	0.23	1.60	0.20	-	-	-	-	-	0.010	-
max	0.27	1.90	0.35	0.020	0.020	0.40	0.08	0.35	0.040	0.25
Element	Sn	V	Ti	As	Sb	B	N2(ppm)	O2 (ppm)	H2(ppm)	Others
min	n.s.*	0.05	-	n.s.*	n.s.*	-	-	-	-	-
max	n.s.*	0.10	0.015	n.s.*	n.s.*	0.002(3)	150	25(4)	1.1	n.s.*

(1) Ni content up to 0.55% as per Ref.MPR3 Rev.13 for chains made at Vicinay Deusto site only; (2) Mo content up to 0.13% for diameter above 140mm; (3) B content up to 0.002% for diameter above 140mm; (4) O2 content up to 25ppm as per Ref.MPR3 Rev.13 for chains made at Vicinay Deusto site only; * n.s. means not specified.

Chemical composition (%) specification (Ref.MPSR3 Rev.02) on ladle of steel grade QR3 for chains diameter 195mm max.:

Element	C	Mn	Si	P	S	Ni	Mo (1)	Cr	Al	Cu
min	0.23	1.60	0.20	-	-	-	-	-	0.010	-
max	0.27	1.90	0.35	0.020	0.020	0.55	0.13	0.35	0.040	0.25
Element	Sn	V	Ti	As	Sb	B (2)	N2(ppm)	O2 (ppm)	H2(ppm)	Others
min	n.s.*	0.05	-	n.s.*	n.s.*	-	-	-	-	-
max	n.s.*	0.10	0.015	n.s.*	n.s.*	0.0015	150	25	1.1	n.s.*

(1) Mo content: 0.08max. for $\varnothing < 140\text{mm}$, 0.13max. for $\varnothing > 140\text{mm}$; (2) B content: 0.0015max. only for $\varnothing > 140\text{mm}$; * n.s. means not specified.

Chemical composition (%) specification (Ref.MPSR3S Rev.01&Ref.MPR3S Rev.13) on ladle of steel grade QR3S for chains diameter 180mm max.:

Element	C	Mn	Si	P	S	Ni	Mo	Cr	Al	Cu
min	0.23	1.60	0.20	-	-	0.40	0.08	0.20	0.010	-
max	0.27	1.90	0.35	0.020	0.020	0.55	0.13	0.35	0.040	0.25
Element	Sn	V	Ti	As	Sb	B (1)	N2(ppm)	O2 (ppm)	H2(ppm)	Others
min	n.s.*	0.08	-	n.s.*	n.s.*	-	-	-	-	-
max	n.s.*	0.10	0.015	n.s.*	n.s.*	0.0015	150	25(2)	1.1	n.s.*

(1) B content up to 0.0015% as per Ref.MPR3S Rev.13 for chains made at Vicinay Deusto site only; (2) O2 content up to 25ppm as per Ref.MPR3S Rev.13 for chains made at Vicinay Deusto site only;* n.s. means not specified.

Alternative chemical composition(%) specification (Ref.MPSR3S Rev.02) on ladle of steel grade QR3S for chain diameter 180mm max.:

Element	C	Mn	Si	P	S	Ni	Mo	Cr	Al	Cu
min	0.22	1.00	0.20	-	-	0.40	0.08	0.20	0.010	-
max	0.27	1.90	0.35	0.020	0.020	0.60	0.20	1.20	0.040	0.25
Element	Sn	V	Ti	As	Sb	B	N2(ppm)	O2 (ppm)	H2(ppm)	Others
min	n.s.*	0.08	-	n.s.*	n.s.*	n.s.*	-	-	-	-
max	n.s.*	0.10	0.015	n.s.*	n.s.*	n.s.*	150	25	1.1	n.s.*

* n.s. means not specified.

Chemical composition (%) specification (Ref.MPSR4 Rev.01 & Ref.MPR4 Rev.15) on ladle of steel grade QR4 for chains diameter 180mm max.:

Element	C (1), (2)	Mn (3)	Si	P	S	Ni	Mo	Cr	Al	Cu
min	0.18	0.85	0.15	-	-	0.50	0.20	0.90	0.015	-
max	0.24	1.20	0.35	0.020	0.015	0.80	0.40	1.25	0.040	0.25
Element	Sn	V	Ti	As	Sb	B	N2(ppm)	O2 (ppm)	H2(ppm)	Others
min	-	0.04	-	-	-	-	-	-	-	-
max	0.030	0.10	0.015	0.025	0.005	0.0015	150	25	1.1	n.s.*

(1) C content as per Ref.MPSR4 Rev.01 for chains made at Vicinay Sestao site only: 0.18-0.21% for $\varnothing < 80\text{mm}$, 0.21-0.24 for $80\text{mm} < \varnothing < 120\text{mm}$, 0.22-0.24 for $\varnothing > 119\text{mm}$; (2) C content as per Ref.MPR4 Rev.15 for chains made at Vicinay Deusto site only: 0.18-0.21% for $\varnothing < 81\text{mm}$, 0.21-0.24% for $\varnothing > 80\text{mm}$; (3) Mn content: 0.85-0.95% for $\varnothing < 80\text{mm}$, 0.95-1.10 for $80\text{mm} < \varnothing < 120\text{mm}$, 1.10-1.20 for $\varnothing > 119\text{mm}$;* n.s. means not specified.

Chemical composition(%) specification (Ref.MPSR4S Rev.01 & Ref.MPR4S Rev.10) on ladle of steel grade QR4S for chains diameter 173mm max.:

Element	C (1)	Mn	Si	P	S	Ni	Mo(2)	Cr	Al	Cu
min	0.21	1.20	0.20	-	-	0.95	0.40	1.00	0.015	-
max	0.24	1.40	0.35	0.020	0.008	1.15	0.55	1.10	0.040	0.25
Element	Sn	V	Ti	As	Sb	B	N2(ppm)	O2 (ppm)	H2(ppm)	Others
min	-	0.09	-	-	-	-	-	-	-	-
max	0.030	0.12	0.015	0.025	0.005	0.0015	150	25	1.1	n.s.*

(1) C content: 0.18-0.24% for $\varnothing < 120\text{mm}$; (2) Mo content: 0.50-0.65% for $\varnothing > 150\text{mm}$;* n.s. means not specified.

Chemical composition(%) specification (Ref.MPS R5 Rev.03 & Ref.MPR5 Rev.05) on ladle of steel grade QR5 for chains diameter 220mm max.:

Element	C (1)	Mn	Si	P	S	Ni (2)	Mo	Cr	Al	Cu
min	0.18	1.20	0.20	-	-	0.95	0.50	1.00	0.015	-
max	0.26	1.40	0.35	0.020	0.008	1.40	0.65	1.10	0.040	0.25
Element	Sn	V	Ti	As	Sb	B	N2(ppm)	O2 (ppm)	H2(ppm)	Others
min	-	0.09	-	-	-	n.s.*	-	-	-	-
max	0.030	0.12	0.015	0.025	0.005	-	150	25	1.1	n.s.*

(1) C content: 0.21-0.24% for 181mm>Ø>120mm, 0.22-0.26% for Ø>180mm;(2) Ni content: 0.95-1.15% for 181mm>Ø, 1.00-1.40% for Ø>180mm; * n.s. means not specified.

- Specification for the manufacturing of R5 quality material - MPR5 Rev.05 dated 03/01/2012 issued by Vicinay Cadenas S.A. (Bilbao)-Deusto site,
- Magnetic particle inspection procedure Ref.PM-40000 Rev.12 dated 04/08/2011 and Ref.PM-40000 Rev.14 dated 08/04/2013 issued by Gerdau Sidenor,
- Ultrasonic examination procedure Ref. US-40001 Rev.03 dated 08/05/2011 issued by Gerdau Sidenor and Ref.US-40002 Rev.0 dated 28/11/2014.

3. TEST REPORTS :

- R4 Steel Approval Report N° R4/0198 dated 09/01/1998,
- R3S Steel Approval Report N°R3S/0298 dated 09/01/1998 (up to 139 mm diameter), R3S Steel Approval Report N° R3S/0398 dated 4/05/1998 (up to 185 mm diameter),
- R3S Steel alternative specification Ref.MPSR3S Rev.02, Approval Report N° R3S/0315 dated 13/03/2015 (up to 186,5 mm diameter),
- R4/R4S Steel Approval Report N°R4/0201 dated November 2001, No.R4/0314 dated 13/03/2014 and Test certificate Ref.1708396 dated 12/02/2014,
- Inspection certificates referenced in document named "R4 chain historical data" dated March 2015 issued by Vicinay Sestao,
- Inspection certificates referenced in document named "R4S chain historical data" dated March 2015 issued by Vicinay Cadenas S.A.- Deusto site,
- R5 steel approval report No. R5/0112 dated 25/01/2012 issued by Gerdau Sidenor-Reinosa Plant and report No.VS-2013-001 dated May 2014, Mill test certificate Ref. PD2011 238 CO44068 dated 26/03/2012 issued by Gerdau Sidenor - Reinosa Plant, Test certificates No.1683323and No.1684334 dated 15/11/2013,Mill test certificate Ref.PS2015 615/1 CO4406815 dated 10/09/2015, Test report No.R5/0915 dated September 2015,
- As per NDT reports issued by Gerdau Sidenor - Reinosa Plant and dated years 2012 and 2013,
- R3 steel approval report N°R3/0615 dated June 2015 issued by Gerdau Sidenor - Reinosa Plant, test certificate No.1806453 dated 21/04/2015.

4. APPLICATION / LIMITATION :

As per Bureau Veritas Rules for Classification. Round bars used for the fabrication of chain cables at Vicinay Cadenas S.A. (Bilbao)- Deusto and Vicinay Sestao sites.

5. PRODUCTION SURVEY REQUIREMENTS :

The round bars are to be supplied by Sidenor Aceros Especiales, S.L. (Reinosa) in compliance with the type and the requirements described in this certificate. This type of product is within the category IBV of Bureau Veritas Rule Note NR320. BV product certificate is required.

6. MARKING OF PRODUCT :

As per Bureau Veritas Rules for Classification.

7. OTHERS :

This certificate replaces approvals from No.37273/A0 BV to No.37273/A3 BV, No.90081/08188/A0/PRS0 BV, and, approvals from No.08188/A1 BV to No.08188/C0 BV.

***** END OF CERTIFICATE *****