DNV·GL

Certificate No:
TAS000011V

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Lifting set for Offshore containers and Portable Offshore Units

with type designation(s)
Green Pin Standard and Green Pin Polar shackles

Issued to
Van Beest B.V.
SLIEDRECHT, Netherlands

is found to comply with
DNV 2.7-1 Offshore Containers (2013)
DNVGL-ST-E273 Standard 2.7-3 Portable offshore units (2016)
EN 12079-2 Offshore containers and associated lifting sets – Part 2: Lifting sets Design, manufacture and marking
EN 13889 Forged steel shackles for general lifting purposes - Dee shackles and Bow shackles - Grade 6 - Safety
Federal Specification Chains and Attachments, Carbon and Alloy Steel, RR-C-271G
IMO/MSC Circular 860

Application :

Shackles for Lifting Sets for Offshore Containers and Portable Offshore Units

Issued at **Høvik** on **2017-06-26**

This Certificate is valid until **2021-06-30**.
DNV GL local station: **Rotterdam**

Approval Engineer: **Nina Thorvaldsen Moberg**

for **DNV GL**

Digitally Signed By: Hals, Inger-Helene
Signing Date: 27.06.2017
Location: Høvik, Norway

Inger-Helene Hals
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid.
The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

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Product description

This Type Approval Certificate replaces Type Approval Certifiicate S-7593.

Shackles for use in Lifting Sets for Offshore Containers certified to DNV 2.7-1 Offshore Containers or Portable Offshore Units certified to DNV GL-ST-E273 Standard 2.7-3 Portable Offshore Units:

- Green Pin Standard dee and bow shackles with screw collar pin, Type G-4151 and G-4161
- Green Pin Standard dee and bow shackles with safety bolt, Type G-4153 and G-4163
- Green Pin Polar dee and bow shackles with safety bolt, Type G-5153 and G-5163
- Green Pin Fixed Nut Standard Shackles, dee and bow shackles with safety bolt and fixed nut, Type G-4133 and G-4143
- Green Pin Fixed Nut Polar Shackles, bow shackles with safety bolt and fixed nut, Type G-5143

With the following exemptions from the EN13889 for the Green Pin Polar shackles, dee and bow shackles with safety bolt, Type G-5153 and G-5163:

- Green Pin Polar shackles, Type G-5153 and G-5163 are manufactured to Grade 8 strength.
- Green Pin Polar shackles, Type G-5153 and G-5163 are approved for design temperature -40°C.

Implementation of RFID on Green pin shackles from 17t and upward:

- Green Pin Standard dee and bow shackles with safety bolt, Type G-4153 and G-4163
- Green Pin Polar dee and bow shackles with safety bolt, Type G-5153 and G-5163

Dimensions of shackles are in compliance with Federal Specification Chains and Attachments, welded and weldless, RR-C-271G.

Detailed product information and range of certified products covered by this Type Approval are listed in Appendix 1 of this Type Approval Certificate.

Application/Limitation

For application of shackles the minimum shackle working load limit (WLL_S) shall be decided according to the strength requirements for lifting sets on offshore containers as given in DNV 2.7-1 Offshore Containers, Section 8.

Shackles shall be of bolt type with hexagon nut and split pin. Screw pin shackles shall not be used. However, on existing containers where location and design of pad eyes are such that it is not possible to use shackles with nut and split pins, screw pin shackles may be used. They should be secured to prevent unintentional withdrawal.

Tests to be carried out:

- Production testing: According to DNV 2.7-1 Offshore Containers and EN standard EN 13889 "Forged steel shackles for general lifting purposes - Dee shackles and Bow shackles - Grade 6 - Safety" in agreement with the DNV GL surveyor.
- Material to be impact tested by Charpy impact method according to DNV 2.7-1 Offshore Containers, Section 8.4.

The manufacturer shall issue product certificates according to Section 8.5 in DNV 2.7-1, using the certificate form no KF-10-490B as listed below. This certificate form is only to be used for slings certified according to this Type approval Certificate.

Applications for shackle to be used on Portable Offshore Unit according to DNVGL-ST-E273:

Prior to selection of shackles the minimum required shackle working load limit (WLL) shall be decided according to the strength requirements for lifting sets on portable offshore units as given in DNVGL-ST-273, Section 7.3.3. Resulting sling force (RSF) can be found in the Design Verification Report (DVR) issued by DNV GL for the Portable Offshore Unit. The DVR shall be available for the shackle manufacturer.

If shackle can experience significant out-of-plane loading, then shackle WLL shall be de-rated in accordance with DNVGL-ST-E273, Section 7.3.3.

Type Approval documentation

Drawing No.	Rev.	Title
MEMO_DNV_05-17 (20 pages)	2017-05-12	Renewal of DNV Type Approval Certificate S-7593 DNV ref. A0332420
KP-09-01D (2 pages)	2014-06-30	Quality assurance – 9.2.1 Process Shackle Manufacturing (internal use)
KS-06-05P (8 pages)	2016-12-15	Quality assurance – 6.4.5 Material PSt-52-3 Untreated - German Standard Number: 1.0572
KS-06-06O (8 pages)	2016-12-15	Quality assurance – 6.4.6 Material SAE 8620 Untreated - German Standard Number: 1.6523
KS-06-08K (2 pages)	2016-08-16	Quality assurance – 6.4.08 Hexagon Nuts Metric and Unc (Inch Series)
KS-06-14M (7 pages)	2017-06-20	Quality assurance – 6.4.13 Requirements Pins 6 - 50mm for Green Pin® Shackles
KS-06-15B (2 pages)	2016-04-18	Quality assurance – 6.4.15 Split pins for Green Pin Shackle with safety bolt
KS-06-18F (7 pages)	2017-06-20	Quality assurance – 6.4.13 Requirements Bodies 5 - 38mm for Green Pin® Shackles
KI-418-01A (2 pages)	2015-07-06	Kwaliteitszorg systeem – 9.5.418.01 Instructie boren RFID
KI-418-02A	2016-03-14	Kwaliteitszorg systeem – 9.5.418.02 Instructie boren fixed nut
2218	D	Dimensions hexagon nuts MMF06-16 and MUF12-38
2219	G	Dimensions hexagon thin nuts MUF42-83
2255	B	Overall max. dimensions Dee shackles GP/SU/PO with hexagon head pin (G-4153, G-5153)
2256	D	Overall max. dimensions Anchor shack. GP/SU/PO with hexagon head pins (G-4163, G-5163)
2257	C	Overall max. dimensions Dee shackles GP/SU/PO with screw collar pin (G-4151)
2258	C	Overall max. dimensions Anchor shack. GP/SU/PO with hexagon head pins (G-4161)
2251	C	Drilling drawing RFID bolts
2365	F	Dimensions bow shackles GP/SU/PO with additional security pin
2366	F	Dimensions Dee shackle with additional locking pin
RQA932625		Quality Management System Certificate – ISO 9001:2015
KF-10-490B	2015-10-16	Certificate for Green Pin Shackles for Offshore Containers Form

Additional documents used for information: KS-06-01F(dated 2009-10-06), KS-06-10D (2013-12-13), KS-06-11I (2009-10-05), KI-450-01-01C (2017-01-23).
Test report No. ROT 04.4133.1 endorsed by DNV Rotterdam dated 2004-09-28.
Type Approval Assesment Report endorsed by DNV GL Rotterdam dated 2017-05-11.

Tests carried out

Prototype tests according to DNV 2.7-1 and EN 13889.

Marking of product

Marking should be according to DNV 2.7-1 Offshore Containers, Section 8, EN 13889 "Forged steel shackles for general lifting purposes - Dee shackles and Bow shackles - Grade 6 – Safety" and VanBeest's internal procedure.

Periodical assessment

For retention of the Type Approval, a DNV GL surveyor shall perform an assesment with intervals not exceeding 6 months and before the expiry date of this certificate to verify that the type approval is complied with.

END OF CERTIFICATE

Appendix 1

Product description and details

Grade 6 Green Pin Standard dee and bow shackles with screw collar pin:*)

Type	Nom. size [mm]	SF**)	WLL [t]	MPF ***) [kN]	Min. BF***) [kN]
G-4151 and G-4161	13,5	6	2,0	39,2	98,1
G-4151 and G-4161	16	6	3,25	63,8	160
G-4151 and G-4161	19	6	4,75	93,2	233
G-4151 and G-4161	22	6	6,5	127,5	319
G-4151 and G-4161	25	6	8,5	166,8	417
G-4151 and G-4161	28	6	9,5	186,4	466
G-4151 and G-4161	32	6	12,0	235,4	589
G-4151 and G-4161	35	6	13,5	264,9	662
G-4151 and G-4161	38	6	17,0	333,5	834
G-4151 and G-4161	45	6	25,0	490,5	1226
G-4151 and G-4161	50	6	35,0	686,8	1717
G-4151 and G-4161	57	6	42,5	834,0	2085
G-4151 and G-4161	65	6	55,0	1079,2	2698

Grade 6 Green Pin Standard and Grade 8 Green Pin Polar Shackles, dee and bow with safety bolt:

Type	Nom. size [mm]	SF**)	WLL [t]	MPF ***) [kN]	Min. BF***) [kN]
G-4153, G-4163, G-5153 and G-5163	13,5	6	2,0	39,2	98,1
G-4153, G-4163, G-5153 and G-5163	16	6	3,25	63,8	160
G-4153, G-4163, G-5153 and G-5163	19	6	4,75	93,2	233
G-4153, G-4163, G-5153 and G-5163	22	6	6,5	127,5	319
G-4153, G-4163, G-5153 and G-5163	25	6	8,5	166,8	417
G-4153, G-4163, G-5153 and G-5163	28	6	9,5	186,4	466
G-4153, G-4163, G-5153 and G-5163	32	6	12,0	235,4	589
G-4153, G-4163, G-5153 and G-5163	35	6	13,5	264,9	662
G-4153, G-4163, G-5153 and G-5163	38	6	17,0	333,5	834
G-4153, G-4163, G-5153 and G-5163	45	6	25,0	490,5	1226
G-4153, G-4163, G-5153 and G-5163	50	6	35,0	686,8	1717
G-4153 and G-4163	57	6	42,5	834,0	2085
G-4153, G-4163, G-5153 and G-5163	65	6	55,0	1079,2	2698
G-4153, G-4163, G-5153 and G-5163	75	6	85,0	1667,7	4169

*) Regarding screw pin shackles, see Application/Limitations
**) Manufacturers factor of safety against breaking
***) Manufacturing Proof Force and Minimum Breaking Force according to EN 13889

Appendix 2

On offshore containers certified according to the 1989 and 1995 editions of DNV 2.7-1 the dimensioning of shackles was based on the breaking strength. On some containers both the diameter of the shackle pin hole and the location of the padeye may not allow the use of larger shackles.
Where existing pad eye on the Offshore Container does not fit with the required shackle dimension, application of shackles should be as follows:

Minimum required breaking force, BF_{min} (kN), for shackles should be calculated according to the following formula:

$$BF_{min} = \frac{R \cdot g}{1000 \cdot (n-1) \cdot \cos(v)} \cdot SF$$

where:

R = Rating
g = Standard acceleration of gravity (~9,81 m/s^2)
n = Number of legs
v = The angle of sling leg from vertical
SF = Safety Factor (table 2), between given values the SF can be found by linear interpolation

The shackle should have a BF ≥ BF_{min}, where the applicable BF, according to DNV 2.7-1, can be found in table 1.
For wire rope lifting sets, if not possible to fit the shackle in the wire leg eye, it is acceptable to fit an intermediate link between the leg and the shackle, with a WLL ≥ WLL_{min} as calculated for the leg according to DNV 2.7-1 Offshore Containers, section 8, see figure 1.

Table 1

Nom. size [mm]	MPF*) [kN]	BF*) [kN]
13,5	47,1	117,7
16	76,5	191,3
19	111,8	279,6
22	153,0	382,6
25	200,1	500,3
28	223,7	559,2
32	282,5	706,3
35	317,8	794,6
38	400,2	1000,6
45	588,6	1471,5
50	824,0	2060,1
57	1000,6	2501,6
65	1295,0	3237,3
75	2001,2	5003,1

*) Tested Breaking Force and Manufacturing Proof Force based on manufacturers factor of safety, for Green Pin Standard and Polar shackles Type G-4151, G-4161, G-4153, G-4163, G-5153 and G-5163.

Table 2

Rating, R (kg)	Safety Factor (SF)
≤ 6000	8,0
10000	6,8
15000	5,8
20000	5,2
25000	5,0

Figure 1