

# TYPE APPROVAL CERTIFICATE

**This is to certify:**

**That the Chain, shackles, swivels, sockets**

with type designation(s)  
**Wide Body Shackles**

Issued to

**Crosby Group LLC**  
**Tulsa OK, United States**

is found to comply with  
**DNV Offshore Standard DNV-OS-E101, Drilling Plant, October 2013**  
**Standard for Certification No. 2.22 Lifting Appliances**

**Application :**

**See page 2**

This Certificate is valid until **2021-03-23**.

Issued at **Aberdeen** on **2017-03-24**

DNV GL local station: **Certification & Inspection Services**

Approval Engineer: **William Lines**



for **DNV GL**  
for DNV GL UK Ltd.

This document has been digitally signed and w  
therefore not have handwritten signatures

Doig, Alex  
Head of Section

**Alex Doig**  
**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.

Job Id: **262.1-012043-2**  
Certificate No: **TAS00000K9**

## Product description

This type approval certificate replaces DNV certificate no. D-4310

G-2160 and S-2160 Wide body Shackles (Sizes 7 to 1550 metric tonnes)

## Application/Limitation

WLL [tonnes]	Stock No. G- 2160BNC	Stock No. S- 2160BNC	Stock No. G- 2160E	Proof Load [x WLL]	Proof Load [kip]	Design Factor [x WLL]	Ultimate Load [kip]
7	1021256	1021548		2	30.87	5	77.18
12.5	1021265	1021557		2	55.13	5	137.81
18	1021274	1021566		2	79.38	5	198.45
30	1021283	1021575		2	132.30	5	330.75
40	1021285	1021584		2	176.40	5	441.00
55	1021287	1051593		2	242.55	5	606.38
75	1022101		1021500	2	330.75	5	826.88
125	1022110		1021509	1.6	441.00	5	1378.13
200	1022118		1021518	2	882.00	5	2205.00
300	1022127		1021527	2	1323.00	5	3307.50
400	1021334			1.33	1173.06	4.5	3969.00
500	1021343			1.33	1466.33	4.5	4961.25
600	1021352			1.33	1759.59	4.93	6522.39
700	1021361			1.33	2052.86	4.96	7655.76
800	1021254			1.33	2346.12	4.97	8767.08
900	1021389			1.33	2639.39	4.88	9684.36
1000	1021370			1.33	2932.65	4.94	10892.70
1250	1021272			1.33	3665.81	4.5	12403.13
1550	1022207			1.33	4545.61	4.5	15379.88

## Type Approval documentation

Job Id: **262.1-012043-2**  
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**Drawings :**

Drawing No.	Previous Revision	Current Revision	Description
1021256		0	7□t G□2160 Wide Body Shackle Assembly
1021548		0	7□t S□2160 Wide Body Shackle Assembly
1083331		0	7□t G□4079 Shackle Bolt Assembly
1513433	G0008499 Rev.1	A	Shackle Bow, Wide Body, 7t, Forging
3511784	G0008499 Rev.1	A	Shackle Bow, Wide Body, 7t, Thru Bolt Machining
1514460		0	7t Shackle Bolt Pin
3511859	G0008114 Rev.0	A	Shackle Bow, Wide Body, 7t, Screw Pin Machining
1021265		0	12.5□t G□2160 Wide Body Shackle Assembly
1021557		0	12.5□t S□2160 Wide Body Shackle Assembly
1083340		0	12.5□t G□4079 Shackle Bolt Assembly
1513439		0	12.5□t Wide Body Shackle Bow Forging
3512250	1513440 Rev.0	A	Shackle Bow, Wide Body, 12.5t, Thru Bolt Machining
1514462		0	12.5□t Shackle Bolt Pin
3512334	1514640 Rev.0	A	Shackle Bow, Wide Body, 12.5t, Screw Pin Machining
1514455	G0008503 Rev.3	A	Shackle Bow, Wide Body, 18t, Thru Bolt
1514456	G0008503 Rev.3	A	Shackle Bow, Wide Body, 18t, Forging
1021274		0	18□t G□2160 Wide Body Shackle Assembly
1021566		0	18□t S□2160 Wide Body Shackle Assembly
1083349		0	18□t G□4079 Shackle Bolt Assembly
1514458		0	18□t Shackle Bolt Pin
1513421	G0008506 Rev.4	4	Shackle Bow, Wide Body, 30t, Forging
1513420		A	Shackle Bow, Wide Body, 30t, Thru Bolt
1021283		0	30□t G□2160 Wide Body Shackle Assembly
1021575		0	30□t S□2160 Wide Body Shackle Assembly
Drawing No.	Previous Revision	Current Revision	Description

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Drawing No.	Previous Revision	Current Revision	Description
1083357		0	30□t G□4079 Shackle Bolt Assembly
1800032		0	30□t Shackle Bolt Pin
1513422		A	Shackle Bow, Wide Body, 40t, Thru Bolt
1513423	G0008507 Rev.4	4	Shackle Bow, Wide Body, 40t, Forging
1021285		0	40□t G□2160 Wide Body Shackle Assembly
1021584		0	40□t S□2160 Wide Body Shackle Assembly
1083366		0	40□t G□4079 Shackle Bolt Assembly
1800035		0	40□t Shackle Bolt Pin
1513344		A	Shackle Bow, Wide Body, 55t, Thru Bolt
1513345	G0008508 Rev.5	A	Shackle Bow, Wide Body, 55t, Forging
1021287		0	55□t G□2160 Wide Body Shackle Assembly
1021593		0	55□t S□2160 Wide Body Shackle Assembly
1083375		0	55□t G□4079 Shackle Bolt Assembly
1800038		0	55t Shackle Bolt Pin
2033298	0	A	Shackle Bow, 75t, 2160, Machined
2033963		0	75t Shackle Bolt Pin 2160BNC
5553018	G0008511 Rev. 8	A	Shackle Bow 75t, 2160, Forged/Bent
2033265		1	75t Shackle Bolt Pin 2160E
1022110		0	125t G□2160BNC Wide Body Shackle Assembly
1021309		1	125t G□2160E Wide Body Shackle Assembly
1089533		0	125□t G□4085 Shackle Bolt Assembly
1083429		0	125□t G□4089 Shackle Bolt Assembly
5552875	G0008512 Rev. 4	A	Shackle Bow, 125t, 2160, Forged/Bent
2032957	0	A	Shackle Bow, 125t, 2160, Machined
2033960		1	125t Shackle Bolt Pin 2160BNC
2032703		0	125t Shackle Bolt Pin 2160E
1022118		0	200t G□2160BNC Wide Body Shackle Assembly
1021320		0	200t G□2160E Wide Body Shackle Assembly
1089542		0	200t G□4085 Shackle Bolt Assembly
1083442		0	200t G□4089 Shackle Bolt Assembly

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Drawing No.	Previous Revision	Current Revision	Description
5552876	G0008513 Rev. 3	A	Shackle Bow, 200t, G-2160, Forged/Bent
2032965	0	A	Shackle Bow, 200t, G-2160 Machined
2033964		0	200t Shackle Bolt Pin 2160BNC
2032942		0	200t Shackle Bolt Pin 2160E
1022127		0	300t G□2160BNC Wide Body Shackle Assembly
1021330		0	300t G□2160E Wide Body Shackle Assembly
1089551		0	300t G□4085 Shackle Bolt Assembly
1083465		0	300t G□4089 Shackle Bolt Assembly
5552877	G0008514 Rev. 7	A	Shackle Bow 300t, 2160, Forged/Bent
2032962	0	A	Shackle Bow 300t, 2160, Machined
2033965		0	300t Shackle Bolt Pin 2160BNC
2032941		0	300t Shackle Bolt Pin 2160E
48521	G0007837 Rev.5	A	Shackle Bow, Wide Body, 400t, Machining
1423784	G0007824 Rev.7	A	Shackle Bow, Wide Bow, 400t, Casting
G0007850	11	12	400t Shackle Bolt Pin
1021334		0	400t G□2160BNC Wide Body Shackle Assembly
1083482		0	400t G□4079 Shackle Bolt Assembly
48549	G0007838 Rev.2	A	Shackle Bow, Wide Body, 500t, Machining
1423793	G0007825 Rev.5	A	Shackle Bow, Wide Body, 500t, Casting
G0007851	9	10	500t Shackle Bolt Pin
1021343		0	500t G□2160BNC Wide Body Shackle Assembly
1083507		0	500t G□4079 Shackle Bolt Assembly
48567	G0007839 Rev.2	A	Shackle Bow, Wide Body, 600t, Machining
1423800	G0007826 Rev.4	A	Shackle Bow, Wide Body, 600t, Casting
G0007852	9	10	600t Shackle Bolt Pin
1021352		0	600t G□2160BNC Wide Body Shackle Assembly
1083525		0	600t G□4079 Shackle Bolt Assembly

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Drawing No.	Previous Revision	Current Revision	Description
G0007840	3	3	700t Wide Body Shackle Bow Casting Machining
1423819	G0007827 Rev.5	A	Shackle Bow, Wide Body, 700t, Casting
48585	G0007837 Rev.0	A	Shackle Bow, Wide Body, 700t, Machining
G0007853	10	11	700t Shackle Bolt Pin
1021361		0	700t G□2160BNC Wide Body Shackle Assembly
1083543		0	700t G□4079 Shackle Bolt Assembly
1423873	G0007841 Rev.3	A	Shackle Bow, Wide Body, 800t, Machining
1423828	G0007828 Rev.5	A	Shackle Bow, Wide Body, 800t, Casting
G0007854	12	13	800t Shackle Bolt Pin
1021254		0	800t G□2160BNC Wide Body Shackle Assembly
2005189		0	800□t G□4079 Shackle Bolt Assembly
1423882	G0007842 Rev.2	A	Shackle Bow, Wide Body, 900t, Machining
1423837	G0007829 Rev.4	A	Shackle Bow, Wide Body, 900t, Casting
G0007855	10	11	900t Shackle Bolt Pin
1021389		0	900t G□2160BNC Wide Body Shackle Assembly
2005191		0	900t G□4079 Shackle Bolt Assembly
48601	G0007843 Rev.2	A	Shackle Bow, Wide Body, 1000t, Machining
1423846	G0007830 Rev.4	A	Shackle Bow, Wide Body, 1000t, Casting
G0007856	10	11	1000t Shackle Bolt Pin
1021370		0	1000t G□2160BNC Wide Body Shackle Assembly
1083561		0	1000t G□4079 Shackle Bolt Assembly
1423891	G0007844 Rev.2	A	Shackle Bow, Wide Body, 1250t, Machining
1423855	G0007831 Rev.5	A	Shackle Bow, Wide Body, 1250t, Casting
G0007857	9	10	1250t Shackle Bolt Pin
1021272		0	1250t G□2160BNC Wide Body Shackle Assembly
8026763		0	1250t G□4079 Shackle Bolt Assembly
1022207		0	1550t G□2160BNC Wide Body Shackle Assembly

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1089632		0	1550t G□4085 Shackle Bolt Assembly
2033414	0	A	Shackle Bow, Wide body, 1550t, Machining
2033413	0	A	Shackle Bow, Wide Body, 1550t, Casting
2033972	G0007858 Rev. 12	0	1550□t Shackle Bolt Pin

**Documentation :**

Crosby Engineering Specification ES-001 Revision 0 "DNV type Approval of 2160 Wide Body Shackles"  
Crosby 2160 Shackle Drawings and Calculations, September 2015

**Material Specifications :**

<b>Item</b>	<b>Material</b>	<b>Minimum Yield (ksi)</b>	<b>Minimum Tensile Strength (ksi)</b>
Bow (7t)	AISI 8630 (CG-L-6)	80.9	93.4
Pin (7t)	AISI 4037	52.3	110.6
Bow (12.5t)	AISI 8630 (CG-L-6)	81.0	87.2
Pin (12.5t)	AISI 4037	59.2	119.5
Bow (18t)	AISI 8630 (CG-L-6M)	68.8	83.3
Pin (18t)	AISI 8630 (CG-L-6)	56.9	114.4
Bow (30t)	AISI 8630 (CG-L-6M)	88.6	104.2
Pin (30t)	AISI 8630 (CG-L-6)	69.2	139.5
Bow (40t)	AISI 8630 (CG-L-6M)	69.3	86.7
Pin (40t)	AISI 8630 (CG-L-6)	60.1	122.5
Bow (55t)	AISI 8630 (CG-L-6M)	82.8	97.4
Pin (55t)	AISI 8630 (CG-L-6)	66.5	132.9
Bow (75t)	AISI 8630 (CG-L-6)	80.0	105.0
Pin (75t)	AISI 4340 (CG-G-2)	58.2	120.0
Bow (125t)	AISI 8630 (CG-L-6)	80.0	105.0
Pin (125t)	AISI 4340 (CG-G-2)	80.3	152.4
Bow (200t)	AISI 8630 (CG-L-6)	80.0	105.0
Pin (200t)	AISI 4340 (CG-G-2)	65.3	142.6
Bow (300t)	AISI 8630 (CG-L-6)	80.0	105.0
Pin (300t)	AISI 4340 (CG-G-2)	60.1	131.7
Bow (400t)	QCP 1325	44.4	107.1
Pin (400t)	AISI 4340 (CG-G-2F)	38.0	109.8
Bow (500t)	QCP 1325	56.7	107.0
Pin (500t)	AISI 4340 (CG-G-2F)	37.5	108.3
Bow (600t)	QCP 1325	49.1	107.0
Pin (600t)	AISI 4340 (CG-G-2F)	36.1	115.6
Bow (700t)	QCP 1325	52.3	106.9
Pin (700t)	AISI 4340 (CG-G-2F)	36.5	117.4
Bow (800t)	QCP 1325	55.4	107.0
Pin (800t)	AISI 4340 (CG-G-2F)	37.1	117.2
Bow (900t)	QCP 1325	55.8	106.9
Pin (900t)	AISI 4340 (CG-G-2F)	35.0	109.8
Bow (1000t)	QCP 1325	55.6	107.1
Pin (1000t)	AISI 4340 (CG-G-2F)	33.3	106.0
Bow (1250t)	QCP 1325	50.2	95.8
Pin (1250t)	AISI 4340 (CG-G-2F)	34.0	97.6
Bow (1550t)	QCP 1325	43.5	103.3
Pin (1550t)	AISI 4340 (CG-G-2)	37.8	118.1

**Material Specification Notes:**

1. Charpy impact testing to be conducted in accordance with DNV GL's Standard for Certification No. 2.22 "Lifting Appliances".
2. Materials may be substituted provided mechanical properties are equal or better.

**Fabrication Procedures:**

Proof Load testing in accordance with the Application/Limitations Table given on page 2 of this certificate. NDE to be carried out in accordance with DNV GL's Standard for Certification No. 2.22 "Lifting Appliances"

**Tests carried out**

Prototype testing of 7t (Part No. 1021256) and 12.5t Part No. 1021265) Wide Body Shackles, witnessed by DNV GL on 2016-04-05, Job No. A0268481.



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## **Marking of product**

For traceability the following marking is to be carried out on each product:

1. NV TAS0K9
2. Serial Number
3. Manufacturer's name or trademark
4. Working Load Limit

## **Periodical assessment**

For retention of the Type Approval, DNV GL's surveyor shall perform a survey every second year in accordance with DNV Standard for Certification No. 1.2.

## **Documentation required for each product/delivery**

1. Data book index
2. Equipment name, number, purchaser, etc.
3. Manufacturer's statement of compliance
4. Assembly drawing
5. Actual material certificates as purchased and Charpy impact test records
6. Heat treatment records/charts when applicable
7. Load test report
8. DNV GL Product Certificate
9. DNV GL Type Approval Certificate