

# TYPE APPROVAL CERTIFICATE

**This is to certify:****That the Bow Shackles**with type designation(s)  
**S-2135, S-2135 CT, S-2145**

Issued to

**Crosby Europe N.V.**  
**Heist-op-den-Berg, Belgium**

is found to comply with

**DNV GL standard DNVGL-ST-0377 – Standard for shipboard lifting appliances**  
**DNV GL standard DNVGL-ST-0378 – Standard for offshore and platform lifting appliances****Application :****Products approved by this certificate are accepted for DNVGL product certification.**Issued at **Hamburg** on **2020-06-29**This Certificate is valid until **2025-02-24** .for **DNV GL**DNV GL local unit: **Belgium CMC**Approval Engineer: **Heiko Herrmann**

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**Jörg Kallies**  
**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.

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV GL AS, its parent companies and subsidiaries as well as their officers, directors and employees ("DNV GL") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to 300,000 USD.



Job Id: **262.1-032161-1**  
Certificate No: **TAS00002AX**  
Revision No: **1**

## Product description

Alloyed Anchor Bow Shackles

Type No.	Type Description	Extended Annotation	Load Range SWL/WLL	Dimensions acc. to Annex 1
<b>1</b>	Crosby S-2135	Shackle	85t - 1500t	Table 5
<b>2</b>	Crosby S-2135 CT	Cold Tough Shackle	85t - 600t	Table 5
<b>3</b>	Crosby S-2145	Super Load Shackle	120t - 175t	Table 6

Table 1

## Application/Limitation

### Safe Working Load/Working Load Limit, Test- and Minimum Break Loads:

Detailed Type	Load Limit SWL/WLL [t]	Test Load L <sub>pstat</sub> [t]	Break Load MBL [t]	Detailed Type	Load Limit SWL/WLL [t]	Test Load L <sub>pstat</sub> [t]	Break Load MBL [t]
<b>S-2135<sup>CT</sup> 85</b>	85	127.5	425	<b>S-2135 700</b>	700	874	3500
<b>S-2135<sup>CT</sup> 120</b>	120	166.4	600	<b>S-2135 800</b>	800	996	4000
<b>S-2135<sup>CT</sup> 150</b>	150	203	750	<b>S-2135 1000</b>	1000	1240	5000
<b>S-2135<sup>CT</sup> 200</b>	200	265	1000	<b>S-2135 1250</b>	1250	1545	6250
<b>S-2135<sup>CT</sup> 250</b>	250	325	1250	<b>S-2135 1500</b>	1500	1850	7500
<b>S-2135<sup>CT</sup> 300</b>	300	386	1500				
<b>S-2135<sup>CT</sup> 400</b>	400	508	2000	<b>S-2145 120</b>	120	166.4	600
<b>S-2135<sup>CT</sup> 500</b>	500	630	2500	<b>S-2145 150</b>	150	203	750
<b>S-2135<sup>CT</sup> 600</b>	600	752	3000	<b>S-2145 175</b>	175	233.5	875

Table 2

Table 2 continued

**Load cycles:** Fatigue is not in scope of this approval; load cycles are limited to 20.000.

**Material:** Basic requirements in following table, alternatively equivalent steel grades in accordance with EN ISO 683-2:09-2018 Part 2 'Alloy steels for quenching and tempering' might be used. Extended delivery conditions listed in Annex 2, Table 7.i. Materials shall be supplied with 3.1 material certificates (ISO-10474/EN-10204).


Type No.	Design Temperature	Material Selection	Impact strength at Design Temp.
<b>1</b>	-20°C	42CrMo4+QT (1.7225), 42CrMoS4+QT (1.7227), 34CrNiMo6+QT (1.6582)	27J
<b>2</b>	-40°C	34CrNiMo6+QT (1.6582), 30CrNiMo8+QT (1.6580)	42J
<b>3</b>	-20°C	42CrMo4+QT (1.7225), 42CrMoS4+QT (1.7224), 34CrNiMo6+QT (1.6580), 30CrNiMo8+QT (1.6580)	27J

Table 3

**Testing:** To obtain a DNV GL Product Certificate, each item shall be load tested in presence of DNV GL according to Table 7-4 (ST-0377) respectively Table 14-2 (ST-0378).  
 $L_{pstat} = (1.22 \times SWL) + 20t$

## Type Approval documentation

### Tests carried out



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Prototype test report with numbers 2000-19-[404, 405, 407, 409-418, 441], witnessed by DNV GL, dated 2019-07-23 and 2019-07-24, filed in NPS Job ID 262.1-030908-1.

### **Marking of product**

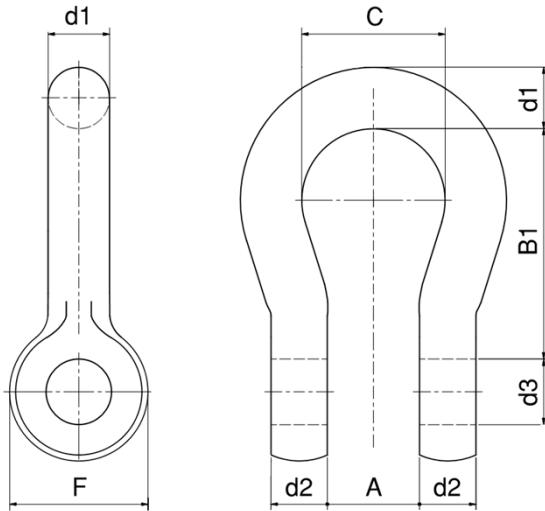
Each shackle shall be marked with at least manufacturer's name or trademark and nominal load (SWL/WLL) in tonnes. Serial number/batch code, year of construction and reference to a type approval shall be traceable via 3.1 manufacturer certificate.

### **Periodical assessment**

For retention of the Type Approval, a DNV GL Surveyor shall perform a periodical assessment after 2 years and after 3.5 years. A renewal assessment will be performed at renewal of the certificate.

### **End of Certificate**

## Annex 1: Dimensions



### Type S-2135 and S-2135 CT (marked \*)

Load Limit <b>SWL/WLL</b> [t]	Bow Diameter <b>d1</b> [mm]	Pin Diameter <b>D</b> [mm]	Inner Diameter <b>C</b> [mm]	Inner Width <b>A</b> [mm]	Inner Height <b>B1</b> [mm]	Eye Diameter <b>F</b> [mm]	Eye Thickness <b>d2</b> [mm]
85*	85	83	190	127	330	162	80
120*	95	95	238	144	380	200	89
150*	105	108	275	165	385	230	100
200*	120	125	280	180	450	270	110
250*	130	140	305	205	520	290	115
300*	140	150	305	205	530	315	120
400*	160	175	325	230	575	365	160
500*	180	185	350	250	650	385	160
600*	200	205	375	275	650	430	185
700	210	215	400	300	650	440	200
800	210	220	400	300	650	450	200
1000	240	240	420	340	700	500	210
1250	260	270	450	360	750	570	225
1500	280	290	450	360	800	610	225

Table 5

### Type S-2145

<b>SWL/WLL</b> [t]	<b>d1</b> [mm]	<b>D</b> [mm]	<b>C</b> [mm]	<b>A</b> [mm]	<b>B1</b> [mm]	<b>F</b> [mm]	<b>d2</b> [mm]
120	85	83	190	127	330	162	80
150	95	95	238	144	380	200	89
175	105	108	275	165	385	230	100

Table 6

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## Annex 2: Mechanical Properties

### Type S-2135

Load Limit <b>SWL/WLL</b> [t]	Bow Yield Strength <b>R<sub>p0.2</sub></b> [MPa]	Bow Tensile Strength <b>R<sub>m</sub></b> [MPa]	Pin Yield Strength <b>R<sub>p0.2</sub></b> [MPa]	Pin Tensile Strength <b>R<sub>m</sub></b> [MPa]	Bow & Pin Elongation <b>A</b> [%]
85	610	750	600	730	14
120	710	870	580	710	14
150	740	900	580	710	14
200	700	850	580	710	14
250	740	900	580	710	14
300	740	900	620	760	14
400	660	810	580	710	14
500	690	840	620	820	14
600	640	790	600	790	14
700	660	820	620	820	14
800	760	940	680	900	14
1000	740	920	760	1000	14
1250	740	920	760	1000	14
1500	740	920	760	1000	14

Table 7.1

### Type S-2135 CT

<b>SWL/WLL</b> [t]	<b>R<sub>p0.2</sub></b> [MPa]	<b>R<sub>m</sub></b> [MPa]	<b>R<sub>p0.2</sub></b> [MPa]	<b>R<sub>m</sub></b> [MPa]	<b>A</b> [%]
85	610	750	600	730	14
120	710	870	580	710	14
150	740	900	580	710	14
200	700	850	580	710	14
250	740	900	580	710	14
300	740	900	620	760	14
400	660	810	580	710	14
500	690	840	620	820	14
600	640	790	600	790	14

Table 7.2

### Type S-2145

<b>SWL/WLL</b> [t]	<b>R<sub>p0.2</sub></b> [MPa]	<b>R<sub>m</sub></b> [MPa]	<b>R<sub>p0.2</sub></b> [MPa]	<b>R<sub>m</sub></b> [MPa]	<b>A</b> [%]
120	810	1000	770	960	14
150	840	1100	710	930	14
175	840	1100	680	900	14

Table 7.3