

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Miscellaneous**

with type designation(s)

**Cylinder Gland Upgrade Kit Dwg. 0253952,
Cylinder Gland Upgrade Kit, Bolt-on Style Dwg. 0276998,
Cylinder Piston Upgrade Kit Dwg. 0254051**

Issued to

**Logan Industries International Corp.
Hempstead, TX, USA**

is found to comply with

DNVGL-OS-E101 – Drilling facilities, Edition January 2018**DNVGL-SI-0166 – Verification for compliance with Norwegian shelf regulations, Edition July 2018****Application :****Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL when accompanied with a DNV GL Product Certificate (PC).**Issued at **Houston** on **2020-01-24**This Certificate is valid until **2025-01-23**.for **DNV GL**DNV GL local station: **Certification & Inspection
Services**Approval Engineer: **Mark Miser**

**Christian Nilsen
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.



Product description

Cylinder Gland and Piston upgrade kits for existing knuckle boom lifting appliance cylinders.

References

- [1] DNVGL-ST-0378 'Offshore and Platform lifting appliances' Ed. July 2019
[2] DNVGL-ST-0194 'Hydraulic cylinders' Ed. October 2019

Application/Limitation

Design Limitations:

<u>Design Parameter</u>	<u>Value</u>	<u>(equivalent)</u>
Minimum Design Temperature	: -4°F	(-20°C)
Maximum Operating Pressure	: 5,004 psi	(345.0 bar)
Maximum Design Pressure	: 5,254 psi	(362.3 bar)
*Minimum Hydrostatic Test Pressure	: 7,881 psi	(543.4 bar)

*Note: Minimum hydrostatic test pressure is determined per DNVGL-ST-0194 §4.1.1. Hydraulic Cylinders with safety relief valves may require different hydrostatic test pressures per DNVGL-ST-0195 §4.1.1. Hydrostatic test pressures may also be limited to the original cylinder test pressure if agreed with the attending DNV GL Surveyor.

Item	Nominal Barrel Bore diameter (mm)	Nominal Rod diameter (mm)	Cylinder Size Requirements			
			Min. Length of Thread Engagement Gland to Barrel (in)	Min. Length of Thread Engagement Piston to Rod (in)	Min. OD of Piston-to-Gland contact area (in)	Min. Flange thickness of Gland (in.)
0	240	160	2.09	3.74	7.60	1.00
1	260	170	2.26	3.94	8.12	1.09
2	280	180	2.44	4.14	8.65	1.17
3	300	200	2.61	3.90	9.49	1.25
4	320	220	2.78	3.71	10.35	1.34
5	340	220	2.95	4.32	10.54	1.42
6	360	240	3.12	4.15	11.39	1.50
7	380	250	3.29	4.36	11.92	1.59
8	380	260	3.29	4.01	12.24	1.59
9	400	340	3.47	2.29	15.14	1.67
10	420	340	3.64	2.72	15.31	1.75
11	440	340	3.81	3.17	15.48	1.84
12	450	340	3.89	3.41	15.57	1.88
13	460	350	3.98	3.38	16.00	1.92
14	460	360	3.98	3.12	16.34	1.92
15	470	360	4.07	3.35	16.43	1.96
16	480	360	4.15	3.58	16.52	2.01
17	500	380	4.32	3.53	17.38	2.09
18	520	390	4.49	3.74	17.90	2.17
19	540	400	4.67	3.94	18.42	2.26
20	550	410	4.75	3.92	18.85	2.30
21	560	420	4.84	3.89	19.27	2.34
22	580	440	5.01	3.85	20.13	2.42
23	600	450	5.18	4.05	20.65	2.51

Note: minimum values include applied tolerance from approved drawings.

Type Approval documentation



Job Id: **262.1-033102-1**
Certificate No: **TAD000018B**

Tests carried out

Procedures related to testing, welding, NDT, etc. are to be reviewed/approved by DNV GL's local surveyor.

Marking of product

Marking shall:

1. Be reviewed and approved by the local DNV GL Surveyor.
2. Identify and differentiate each production unit <i.e. serial number>.
3. Establish traceability to the product design and fabrication documentation.

Periodical assessment

For retention of the Type Approval, DNV GL's surveyor shall perform a retention survey every second year in accordance with dNV GL Type Approval Scheme DNVGL-CP-0338.

END OF CERTIFICATE