

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Hydraulic Cylinders**with type designation(s)
3719087, 3716220, 3716530, 3710939, 3718346

Issued to

**Parker Hannifin Europe Sárl, Luxembourg, Swizerland
Branch, Etoy
Borås, Västra Götalands Län, Sweden**

is found to comply with

**DNV GL standard DNVGL-ST-0378 – Standard for offshore and platform lifting appliances
DNV GL class guideline DNVGL-CG-0194 – Hydraulic cylinders****Application :****Product(s) approved by this certificate is/are accepted for installation on vessels classed by DNV GL.**

Type	Design pressure (push)	Design pressure (pull)	Cylinder sizes
3719087	200 bar	250 bar	140/70x360
3716220	60 bar	250 bar	160/80x1600
3716530	60 bar	250 bar	160/80x1600
3710939	210 bar	210 bar	160/110x1450
3718346	155 bar (see page 3)	220 bar	125/65x1100

This Certificate is valid until **2023-12-19**.Issued at **Høvik** on **2018-12-20**DNV GL local station: **Gothenburg**for **DNV GL**Approval Engineer: **Iselinn Vindstad**

**Marianne Spæren Marveng
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

Hydraulic cylinders for lifing of Rolls Royce Marine thrusters.

Dimensional data:

Cylinder type	Outside diameter cylinder barrel	Inside diameter cylinder barrel	Piston rod diameter	Stroke
3719087	170 mm	140 mm	70 mm	360 mm
3716220	182.4 mm	160 mm	80 mm	1600 mm
3716530	182.4 mm	160 mm	80 mm	1600 mm
3710939	190 mm	160 mm	110 mm	1450 mm
3718346	145 mm	125 mm	65 mm	1100 mm

Materials:

Cylinder type	Cylinder barrel***	Piston rod***	Piston	Cylinder end eye***	Rod end eye***	Stuffing box***	End cover***
3719087	E355+SR (EN 10305-1)	1.4418 QT900 (EN 10088-3)	S355J2+N (EN 10025-3)	S355J2+N (EN 10025-3)	1.4460 (EN 10088-3)	S355J2+N (EN 10025-3)	S355J2+N Z25 (EN 10025-3)
3716220	E355+SR (EN 10305-1)	1.4460 (EN 10088-3)	S355J2+N (EN 10025-3)	S355J2 (EN 10025)*	1.4460 (EN 10088-3)	S355J2+N (EN 10025-3)	S355J2+N (EN 10025-3)
3716530	E355+SR (EN 10305-1)	1.4460 (EN 10088-3)	S355J2+N (EN 10025-3)	S355J2 (EN 10025)*	1.4460 (EN 10088-3)	S355J2+N (EN 10025-3)	S355J2 (EN 10025)*
3710939	E355+SR (EN 10305-1)	1.4418 QT900 (EN 10088-3)	S355J2+N (EN 10025-3)	Domex 420ML (Datasheet 2271)	Domex 420ML (Datasheet 2271)	S355J2+N (EN 10025-3)	S355J2+N (EN 10025-3) **
3718346	E355+SR (EN 10305-1)	1.4460 (EN 10088-3)	S355J2+N (EN 10025-3)	S355J2+N (EN 10025-3)	1.4460 (EN 10088-3)	S355J2+N (EN 10025-3)	S355J2+N (EN 10025-3)

*The material shall be fine grain treated, and shall comply with DNVGL-RU-SHIP Pt.2 Ch.2 Sec. 2, Table 8 and Table 10.

**If the end cover is made from a rolled plate, the plate shall have through thickness (Z-direction) properties.

***The cylinder tube, piston rod, end cover and end eyes shall be charpy tested. Transverse charpy V-notch requirement shall be 27 J at minimum design temperature (alternatively 41 J longitudinal).

Application/Limitation

All welding is to be carried out by qualified welders and according to approved welding procedures. Non-destructive testing of all welds are to be performed according to DNVGL-CG-0194 - Hydraulic Cylinders. Minimum requirement to NDT is UT and MT.

The hydraulic cylinders are limited to 15 000 full load cycles over the life span.

Hydraulic cylinder 3718346 is approved for the following pressure – stroke rating:

Stroke	Pressure
100 mm	155 bar
300 mm	154 bar
500 mm	130 bar
700 mm	105 bar
900 mm	90 bar
1100 mm	73 bar

Type Approval documentation

Production test and Certification

Each cylinder is to be hydraulically pressure tested to 1.5 times of the design pressure and be delivered with a DNV GL product certificate. The test pressure is to be applied on both sides of the piston in sequence. Testing are to be in accordance with to DNVGL class guideline CG-0194 - Hydraulic Cylinders in presence of DNV GL surveyor.

Materials for cylinder tube, piston rod, end covers and end eyes shall be delivered with 3.1 material certificates.

Non destructive testing shall be carried out as per DNVGL-CG-0194 [10].

Marking of product

Hydraulic cylinders shall be permanently marked in order to enable unique traceability to a product certificate or a type approval certificate. The marking shall at least consist of the following:

- manufacturers name or trade mark
- type designation
- DNV GL product certificate number, if applicable
- charge number for the materials used in the cylinder tube and the piston rod.

Periodical assessment

For retention of the Type Approval, a DNV GL surveyor shall perform periodical assessment after two years (+/-90 days) and after 3.5 years (+/-90 days) to verify that the conditions for the approval are complied with. Reference is made to DNVGL-CP-0338.