

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Hydraulic Cylinders**

with type designation(s)
003-00000051, 003-00000052

Issued to

MacArtney Hydraulics A/S
Lemvig, Midtjylland, Denmark

is found to comply with

DNV GL rules for classification – Ships Pt.4 Ch.6 Piping systems
DNV GL standard DNVGL-ST-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
003-00000051	210 bar	210 bar	250/125-1397
003-00000052	210 bar	210 bar	250/125-1060

Issued at **Høvik** on **2020-06-30**

This Certificate is valid until **2025-06-29**.

for **DNV GL**

DNV GL local station: **Denmark CMC**

Approval Engineer: **Renata Rossi**

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Zeinab Sharifi
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.



Product description

2 types of double acting hydraulic cylinders.

Dimensional data:

Type	Outside diameter	Inside diameter	Piston rod diameter	Stroke
003-00000051	298 mm	250 mm	125 mm	1397 mm
003-00000052	298 mm	250 mm	125 mm	1060 mm

Materials:

Type	Cylinder tube	Piston rod	Piston	Rod End eye	End cover and cylinder end eye	Stuffing box
003-00000051	E355+SR (EN10305-1)	1.4418 +QT900 (EN 10088-3)	S355J2+N* (EN10025-2)	S355J2+N* (EN10025-2)	S355J2G3** (EN10250-2)	S355J2G3** (EN10250-2)
003-00000052	E355+SR (EN10305-1)	1.4418 +QT900 (EN 10088-3)	S355J2+N* (EN10025-2)	S355J2+N* (EN10025-2)	S355J2G3** (EN10250-2)	S355J2G3** (EN10250-2)

*The material shall be fine grain treated and shall comply RU-SHIP Pt.2 Ch.2 Sec.2 [2.6.6]

**The test unit size shall comply with RU-SHIP Pt. 2 Ch. 2 Sec. 6 [1.10]

Application/Limitation

Design temperature(min/max): -20°/80°C

Test pressures:

Type	Pull	Push
003-00000051	315 bar	315 bar
003-00000052	315 bar	315 bar

The following cylinders are limited to the following number of full load cycles over the life span:

Type	Number load cycles
003-00000051	61787
003-00000052	61787

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-ST-0194 - Hydraulic Cylinders. Minimum requirement to NDT is UT and MT.

Cylinder tube, piston rod, end covers, and end eyes shall be charpy tested according to DNVGL-RU-SHIP Pt. 2 Ch. 2.

The hydraulic cylinders are not approved to operate under emergency conditions.

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 Standard ST-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.

Job Id: **262.1-033822-1**
Certificate No: **TAP000024F**

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.