

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Hydraulic cylinders for steering and reversing of water jet units**

with type designation(s)

Steering Cylinder, Reversing Cylinder

Issued to

Arcos Hydraulik AB**Sävsjö, Jönköpings Län, Sweden**

is found to comply with

DNV GL standard DNVGL-ST-0194 – Hydraulic cylinders**DNV GL rules for classification – Ships Pt.4 Ch.10 Steering gear****Application :****Product(s) approved by this certificate is/are accepted for installation on vessels classed by DNV GL.**

Type	Max working press. (push)	Max working press. (pull)	Cylinder sizes
Steering Cylinder	200	200	80/50 x 425
Reversing Cylinder	200	200	125/63 x 385

This Certificate is valid until **2025-03-30**.Issued at **Høvik** on **2020-03-31**DNV GL local station: **Gothenburg FIS**for **DNV GL**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.

If any person suffers loss or damage which is proven to have been caused by any negligent act or omission of the Society, then the Society shall pay compensation to such person for his proven direct loss or damage. However, the compensation shall not exceed an amount equal to ten times the fee charged for the service in question. The maximum compensation shall never exceed USD 2 million.

In this provision the "Society" shall mean DNV GL AS as well as all its direct and indirect owners, affiliates, subsidiaries, directors, officers, employees, agents and any other person or entity acting on behalf of DNV GL AS.

Certificate No: **TAP00001ZT**
File No: **778.94**
Job Id: **262.1-017731-3**

Product description

Two double acting hydraulic cylinders, types: SH-7737 (Steering Cylinder) & SH-7736 (Reverse Cylinder); with threaded pistons and stuffing box.

	Steering Cylinder	Reversing Cylinder
Cylinder diameter (outside/inside)	95 mm / 80 mm	150 mm / 125 mm
Rod diameter (outside/inside)	50 mm / 0	63 mm / 0
Stroke	425 mm	385 ± 5 mm
End eyes center to center distance	938 mm	809 mm

Material: (for both types)

Cylinder, piston rod, end cover and end eyes: 1.4460+AT/1.4462+AT according to EN10088-3

Cylinder end: CuAl10Ni5Fe4 (Aluminum bronze acc. to SS5716-15)

Piston: S355J2+N according to EN10025-2

1.4460+AT/1.4462+AT according to EN10088-3

Application/Limitation

Design Data : (For both types)

- Maximum working Pressure (Push & Pull): 200 bar
- Design Pressure (Push & Pull) : 250 bar
- Test Pressure: 375 bar (Tests carried out are to be in accordance to DNVGL-ST-0194)
- Design Temperature (min/max): -20°C/80°C
- Corrosion allowance: 0.3 mm

The materials test unit size for tensile and impact test shall not exceed the requirements given in RU-SHIP Pt.2 Ch.2 Sec.2

The material grade S355J2 according to EN10025-2 for pressurized parts shall be fully killed and fine grain treated according to RU-SHIP Pt.2 Ch.2 Sec.2 [2.6.6].

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-ST-0194 - Hydraulic Cylinders in presence of DNV GL surveyor.

The hydraulic cylinders are to be manufactured by a manufacturer holding a valid welding workshop approval (WWA).

The cylinder tube and piston rod shall be delivered with VL material certificate. The end covers, end eyes and pistons shall be delivered with W material certificate. Approval of manufacturer is required for VL and W material certificates.

Type Approval documentation

Marking of product

Hydraulic cylinders shall be permanently marked in order to enable unique traceability to this type approval the products with:

- Manufacturer's name or trade mark
- Type designation/Serial no.

Periodical assessment

For retention of the Type Approval, a DNV GL surveyor shall perform periodical assessment after 2 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.