Certificate No:
TAP00002H2

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Hydraulic cylinders for steering and reversing of water jet units

with type designation(s)
SH-9114, SH-9115

Issued to
Arcos Hydraulik AB
Sävsjö, Jönköpings Län, Sweden

is found to comply with
DNV standard DNV-ST-0194 – Hydraulic cylinders
DNV 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.

Type	Design pressure (push)	Design pressure (pull)	Cylinder sizes
SH-9114	250	250	See page 2
SH-9115	250	250	See page 2

Issued at **Høvik** on **2022-05-05**

This Certificate is valid until **2027-05-04**.

for **DNV**

DNV local station: **Sweden CMC**

Approval Engineer: **Sarah Miller**

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.

Product description

Two types of Hydraulic cylinder for steering and reversing of water jet units.

Dimensional Data:

Type	Cylinder outside Diameter (mm)	Cylinder Inside Diameter (mm)	Rod Diameter (mm)	Maximum stroke (mm)
SH-9114	150	125	63	419
SH-9115	95	80	50	424

Materials:

Type	Cylinder tube	Piston Rod	Piston	End eye	End cover	Stuffing box
SH-9114	1.4460/62 (EN10088 EN10204 , EN10272)	1.4460/62 (EN10088 EN10204 , EN10272)	S355J2+N (EN10025-2)	1.4460/62 (EN10088 EN10204 , EN10272)	1.4460/62 (EN10088 EN10204 , EN10272)	CC333G (SS 5716-15) EN 10204
SH-9115	1.4460/62 (EN10088 EN10204 , EN10272)	1.4460/62 (EN10088 EN10204 , EN10272)	S355J2+N (EN10025-2)	1.4460/62 (EN10088 EN10204 , EN10272)	1.4460/62 (EN10088 EN10204 , EN10272)	CC333G (SS 5716-15) EN 10204

* The material shall be fine grain treated according to RU-SHIP Pt.2 Ch.2 Sec.2 [2.6.6], RU-SHIP Pt.2 Ch.2 Sec.3 [1.5.3].
** If the end cover is made from rolled plate it is to be tensile tested in the Z-direction.

Application/Limitation

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

Type	Maximum working Pressure (push/pull) (bar)	Design Pressure (push/pull) (bar)	Test Pressure
SH-9114	200	250	375
SH-9115	200	250	375

Material requirements as in acc. to DNV-RU-Ship-Part2-Chap.2-Metallic Materials

Rolled bars and forgings with thickness above 50 mm, shall be taken with their longitudinal axis at least ¼th of the thickness or 80 mm below the surface, whichever is less. The given positions are relative to the heat-treated surface, not the surface after final machining.

All welding is to be carried out by qualified welders and according to approved welding procedures. Non-destructive testing of all welds is to be performed according to DNV-ST-0194 [2.3] - Hydraulic Cylinders.

Cylinder tube, piston rod, end covers, and end connections shall be Charpy-V impacted tested at minimum design temperature. Minimum specified average energy value shall be according to DNV-ST-0194 [2.1.1].

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

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

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 I required for VL and W material certificates.

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 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 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 DNV-CP-0338.