DNV·GL

Certificate No:
TAP00001UC

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Hydraulic Cylinders

with type designation(s)
D018011, D018012, D018013

Issued to
Servi AS
RISSA, Norway

is found to comply with
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
D018011	270 bar	270 bar	200/100 x 810
D018012	270 bar	270 bar	160/80 x 810
D018013	270 bar	330 bar	250/160 x 1950

Issued at **Høvik** on **2019-06-05**
This Certificate is valid until **2024-05-08**.
DNV GL local station: **Norway CMC, Mid-North**

Approval Engineer: **Zrinka Cizmek**

for **DNV GL**

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.

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Product description

3 types of hydraulic cylinders.

Dimensional data:

Type	Tube outer diameter	Tube inner diameter	Rod diameter	Stroke
D018011	235 mm	200 mm	100 mm	810 mm
D018012	185 mm	160 mm	80 mm	810 mm
D018013	298 mm	250 mm	160 mm	1950 mm

Materials:

Type	Cylinder tube	Piston Rod	Piston	End eye	End cover	Stuffing box
D018011 and D018012	E355+SR (EN 10305-1)	1.4462, (EN 10088-3)	S355J2+N (EN10025-3)	S355J2+N (EN10025-3)	S355J2+N* (EN10025-3)	S355J2+N (EN10025-3)
D018013	E355+SR (EN 10305-1)	1.4418, (EN 10088-3)	S355J2+N (EN10025-3)	S355J2+N (EN10025-3)	S355J2+N* (EN10025-3)	S355J2+N (EN10025-3)

* If the end cover is made from rolled plate it is to be tensile tested in the Z-direction.

Application/Limitation

Working pressures and test pressures:

Type	Test pressure
D018011	405 bar
D018012	405 bar
D018013	495 bar

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

Type	Number load cycles
D018011	15 000
D018012	15 000
D018013	15 000

D018011: Design temperature: -20°C / 60°C
D018012: Design temperature: -20°C / 80°C
D018013: Design temperature: -20°C / 60°C

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.

Cylinder tube, piston rod, end covers, and end eyes shall be charpy tested. Transverse charpy V-notch requirement is 27J at minimum design temperature, alternatively 41 J longitudinal.

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.

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.