

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Hydraulic cylinders for steering and reversing of water jet units**with type designation(s)
D017511, D017512, D017513

Issued to

Servi AS
RISSA, Norway

is found to comply with

DNV GL class guideline DNVGL-CG-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 all vessels classed by DNV GL.**

Type	Design pressure (push)	Design pressure (pull)	Cylinder sizes
D017511	175 bar	175 bar	63/32 x 200
D017512	175 bar	175 bar	80/50 x 210
D017513	175 bar	175 bar	140/90 x 300

Issued at **Høvik** on **2018-07-09**This Certificate is valid until **2023-07-08**.for **DNV GL**DNV GL local station: **Trondheim**Approval Engineer: **Zrinka Cizmek**

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.



Job Id: **262.1-029150-1**
Certificate No: **TAP00001FK**

Product description

3 type of the hydraulic cylinders for steering and reversing of water jet units

Model	Working pressure Push and pull	Design pressure Push and pull	Test pressure	Load cycles	Tube Outer diameter	Tube Inner diameter	Rod diameter	Stroke
D017511	140 bar	175 bar	263 bar	42 671	73 mm	63 mm	32 mm	200 mm
D017512	140 bar	175 bar	263 bar	193 821	95 mm	80 mm	50 mm	210 mm
D017513	140 bar	175 bar	263 bar	180 551	165 mm	140 mm	90 mm	300 mm

Material for all three cylinders	Cylinder tube	Piston Rod	Piston	End eye	End cover
D017511, D017512 and D017513	E355+SR (EN 10305-1)	1.4418 (EN 10088-3)	S355J2+N (EN10025-3)	S355J2+N (EN10025-3)	S355J2+N (EN10025-3)

Design temperature: -20°C / 80°C

Application/Limitation

1. The stud is welded on top of the circumferential weld for the end cover. NDE is to be done for each weld and for each cylinder. Surveyor shall review relevant reports.
2. 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.
3. The cylinder tube and piston rod shall be delivered with VL material certificate. The end covers, end eyes and pistons shall be delivered with 3.1 certificate.

Type Approval documentation

Drawing No	Rev.	Title	Status
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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



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sequence. Testing are to be in accordance with to DNVGL class guideline CG-0194 - Hydraulic Cylinders in presence of DNV GL surveyor.

Marking of product

The hydraulic cylinders are to be marked with manufacturer's name or trademark, type designations and serial number.

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.