Certificate No:
TAP00002CT

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Hydraulic Cylinders

with type designation(s)
D004228, D005256, D005261, D005257, 1106259, 06834, D004227, 00959, 06835

Issued to
Servi AS
RISSA, **Norway**

is found to comply with
DNV GL standard DNVGL-ST-0194 – Hydraulic cylinders
DNV GL rules for classification – Ships Pt.4 Ch.6 Piping systems
DNVGL-OS-D101 – Marine and machinery systems and equipment, Edition January 2018

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
D004228	53 bar	250 bar	63/32-800
D005256	74 bar	250 bar	63/40-1000
D005261	51 bar	250 bar	80/40-1000
D005257	71 bar	250 bar	100/50-1050
1106259	80 bar	200 bar	100/63-1980
06834	119.2 bar	250 bar	125/63-1000
D004227	120 bar	250 bar	125/63-1000
00959	120 bar	250 bar	125/63-1000
06835	47 bar	250 bar	125/63-1650

Issued at **Høvik** on **2021-07-07**
This Certificate is valid until **2026-07-06**.
DNV local station: **Norway CMC, Mid-North**

Approval Engineer: **Thomas Wilhelm Juell**

for **DNV**

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 AS, its parent companies and their subsidiaries as well as their officers, directors and employees ("DNV") 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

9 types of double acting hydraulic cylinders for general machinery use.
Dimensional data:

Type	Outside diameter	Inside diameter	Piston rod diameter	Stroke
D004228	73	63	32	800
D005256	73	63	40	1000
D005261	95	80	40	1000
D005257	120	100	50	1050
1106259	115	100	63	1980
06834	145	125	63	1000
D004227	145	125	63	1000
00959	145	125	63	1000
06835	145	125	63	1650

Materials:

Type	Cylinder tube	Piston rod	Piston/ End eye	End cover with/without machined cylinder end eye	Stuffing box	Trunnion
D004228 D005256 D005261 06834 D004227 00959 06835	E355+SR (EN10305-1)	1.4418 +QT900 (EN10088-3/ EN10272)	S355J2+N (EN10025-2)	S355J2+N(1) (EN10025-2)	S355J2+N(1) (EN10025-2)	N/A
D005257	E355+SR (EN10305-1), S355J2H(1) (EN10210-1/ EN10219-1)	1.4418 +QT900 (EN10088-3/ EN10272)	S355J2+N (EN10025-2)	S355J2+N(1) (EN10025-2)	S355J2+N(1) (EN10025-2)	N/A
1106259	E355+SR (EN10305-1), S355J2H(1) (EN10210-1/ EN10219-1)	1.4418 +QT900 (EN10088-3/ EN10272)	S355J2+N (EN10025-2)	S355J2+N(1) (EN10025-2)	S355J2+N(1) (EN10025-2)	S355J2+N (EN10025-2)

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

Application/Limitation

Design temperature (min/max), test pressures, and the limiting number of full load cycles over the life span of the hydraulic cylinders:

Type	Design temperature (min/max)	Test pressure		Number of load cycles
		Push	Pull	
D004228	-20°C/ +80°C	375 bar	375 bar	15000
D005256	-20°C/ +80°C	375 bar	375 bar	29063
D005261	-20°C/ +80°C	375 bar	375 bar	15000
D005257	-20°C/ +80°C	375 bar	375 bar	15000
1106259	-20°C/ +80°C	315 bar	315 bar	1831366
06834	-20°C/ +80°C	375 bar	375 bar	15000
D004227	-20°C/ +60°C	375 bar	375 bar	15000
00959	-20°C/ +80°C	375 bar	375 bar	15000
06835	-20°C/ +80°C	375 bar	375 bar	15000

Pressure limitation shall be in accordance with the type approved drawings mentioned below.

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-ST-0194 [2.1.1].

The hydraulic cylinders are not approved to operate under emergency conditions, this limitation does not apply to material S355J2H as cylinder tube material.

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.

Reference to the load chart is to be given in the DNV product certificate.

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 DNVGL-CP-0338.