Certificate No:
TAP00002HN

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Hydraulic Cylinders

with type designation(s)
ET2166

Issued to
ET Hydraulikk AS
Vatne, **Norway**

is found to comply with
DNV standard DNV-ST-0378 – Offshore and platform lifting appliances
DNV standard DNV-ST-0194 – Hydraulic cylinders

Application :

Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV.

Design pressure (push)	**250 bar**
Design pressure (pull)	**250 bar**
Cylinder sizes	**100/70 x 1250 mm**

Issued at **Høvik** on **2022-04-08**

This Certificate is valid until **2027-04-07**.

for **DNV**

DNV local station: **Mid-North Norway FiS**

Approval Engineer: **Khurram Saeed Khaliq**

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Per Esvall
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

Tube outer diameter: 120 mm
Tube inner diameter: 100 mm
Rod diameter: 70 mm
Stroke: 1250 mm

Design pressure (push): 250 bar
Design pressure (pull): 250 bar

Max number of cycles: 15.000

Design temperature: -20°C to +60°C

Materials

Cylinder tube	Piston rod	Piston	Stuffing box	Rod end eye	End cover + end eye
E355+SR	1.4418	S355J2*	S355J2+N*	S165M	S355J2+N*

* Material shall be fine grain treated as per RU-SHIP Pt.2 Ch.2 Sec.2 [2.6.6]

Application/Limitation

1. 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 DNVGL-ST-0194. Minimum requirement to NDT is UT and MT.
2. Fatigue calculations for the weld on the end eye and steering edge has not been submitted for review. Therefore, the number of full load cycles has been limited to 15 000 cycles over the life span.

Type Approval documentation

Drawing no.	***Rev.***	***Title***
ET2166-200	0	Weld arrangement
ET2166-002	0	Piston rod
ET2166-003	0	Piston
	-	Swing-up Azimuth Thruster
ET2166-005	-	End eye
ET2166-004	-	Piston rod eye
ET2166-001	-	Cylinder tube
ET2166-006	-	End cover
	-	Documentation PO 59679
ET2166-101	A	Dimensional sketch 100/70x1250
ET2166-100	A	GA Cylinder

Tests carried out

Each cylinder is to be hydraulically pressure tested to 1.5 times of the design pressure or 1.5 times the safety relief valve set pressure, whichever is the greatest, and be delivered with a DNV product certificate. The test pressure is to be applied on both sides of the piston in sequence. Testing is to be in accordance with DNVGL-ST-0194 - Hydraulic Cylinders, in presence of DNV surveyor.

Marking of product

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

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.