Certificate no.:
TAP00002WX

TYPE APPROVAL CERTIFICATE

This is to certify:

that the Hydraulic Cylinders

with type designation(s)
Cylinder 5856, Cylinder 5857

issued to
Melcal S.p.A.
Calatafimi SEGESTA, TP, Italy

is found to comply with
DNV rules for classification – Ships Pt.4 Ch.6 Piping systems
DNV standard DNV-ST-0194 – Hydraulic cylinders
DNV-OS-D101 – Marine and machinery systems and equipment, Edition July 2021

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
Cylinder 5856	250 bar	250 bar	ø200/170 x 1208 (mm)
Cylinder 5857	100 bar	200 bar	ø140/80 x 3500 (mm)

Issued at **Høvik** on **2024-10-10**
This Certificate is valid until **2029-10-09**.
DNV local unit: **Italy/Malta CMC**

for **DNV**

Approval Engineer: **Sarah Miller**

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

Two types of double acting hydraulic cylinders designed according to DNV-ST-0194.

Dimensional data:

Type	Outside diameter	Inside diameter	Piston rod diameter	Stroke
5856	200 mm	170 mm	100 mm	1208 mm
5857	140 mm	80 mm	55 mm	3500 mm

Materials:

Type	Cylinder tube	Piston rod	Rod eye, Piston & Stuffing box	Tube end	Trunnion
5856	P355N (EN 10216-3)	ASTM A350 LF2/ AISI 630	ASTM A350 LF2	S355J2+N*/** (EN10250-2)	N/A
5857	E355+SR (EN10305-1)	ASTM A350 LF2/ AISI 630	S355J2+N* (EN10025-2)	S355J2+N*/** (EN10250-2)	N/A

* The material shall be fine grain treated according to DNV-ST-0194 Appendix B
** 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°/50°C.

Test pressures:

Type	Pull/Push	Design temperature(min/max)
5856	250 bar	-20°C to +35°c
5857	200/100 bar	-20°C to +45°c

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

Type	Number load cycles
5856	21,000,000
5857	49,300,000,000

The hydraulic cylinders are not intended to operate under emergency conditions.

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 [2.1.2].

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, piston, 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:

- manufacturer’s name or trade mark
- design pressure
- type designation
- DNV product certificate number, if applicable
- charge number for the materials used in the cylinder tube and the piston rod.

Periodical assessment

This certificate is only valid if required periodical assessments are carried out with satisfactory results.

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.

To check the validity of this certificate, please look it up in https://approvalfinder.dnv.com.