

TYPE APPROVAL CERTIFICATE

This is to certify:

that the Hydraulic Cylinders

with type designation(s)

VDW 160/90-200/FD-DS, VDW Continous Rod Cyl 250/190/190-1397/GD-GS, VPA 250-100,0L (Accumulator)

issued to

VREMAC Cylinders B.V.

Apeldoorn, Gelderland, Netherlands

is found to comply with

DNV standard DNV-ST-0194 – Hydraulic cylinders

DNV rules for classification – Ships Pt.4 Ch.7 Pressure equipment

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
VDW 160/90-200/FD-DS	25 bar	25 bar	160/90-200
VDW Continous Rod Cyl 250/190/190-1397/GD-GS	350 bar	350 bar	250/190/190-1397
VPA 250-100,0L (Accumulator)	350 bar	350 bar	ID:250 mm

Issued at **Høvik** on **2025-01-27**

This Certificate is valid until **2030-01-26**.

for **DNV**

DNV local unit: **Netherlands VMC**

Approval Engineer: **Mohsen Mohebbi**

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 USD 300 000.

Product description

Hydraulic cylinders designed in accordance with DNV-ST-0194

Cylinder type	Tube diameters	Rod diameter	Stroke	Design pressure	Design temperature
250/190/190-1397	310 mm x 250 mm	190 mm	1397mm	350 bar	-20 to +70 deg C
160/90-200	185 mm x 160 mm	90 mm	200 mm	25 bar	-20 to +70 deg C

Accumulator designed in accordance with DNV Rules Pt.4 Ch.7 and EN14359

Accumulator type	Design pressure	Design temperature	Class	Corrosion allowance
VPA 250-100,0L	350 bar	-20 to +70 deg C	I	1 mm

Application/Limitation

The materials used for hydraulic cylinders must comply with the requirements specified in section 2.1 of DNV-ST-0194.

For hydraulic cylinders, the material used for primary load bearing and pressure containment must meet the impact test requirements as specified in DNV-ST-0194 §2.1.2 and Table B-2.

For hydraulic cylinders, the welding processes, personnel qualifications, and extent of non-destructive testing (NDT) shall adhere to the requirements specified in DNV-ST-0194 section 2.2.

The material used for accumulator must comply with the requirements specified in DNV Rules Part 2, Chapter 2, Section 3, Clause 3. Additionally, materials for accumulators must be accompanied by a material certificate as outlined in DNV Rules Part 4, Chapter 7, Section 1, Table 5.

Type Approval documentation

Production Testing and certification

Production Testing and Certification of accumulators shall follow EN 14359 and the latest applicable edition of the Rules (as mentioned on the front page of this certificate).

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 is to be in accordance with to DNV standard DNV-ST-0194 - Hydraulic Cylinders in presence of DNV surveyor.

Marking of products

Hydraulic cylinders shall be permanently marked in order to enable unique traceability to a product certificate or a type of approval certificate. The marking shall at least consist of the following:

- manufacturer's name or trademark
 - design pressure
 - type designation
 - DNV product certificate number, if applicable
 - charge number for the materials used in the cylinder tube and the piston rod.
- Additional marking may be done at the manufacturer's option.

The marking of Accumulator shall show at least the following particulars:

- manufacturer's name and address
- type designation and serial number
- year of manufacture
- maximum allowable working pressure
- hydrostatic test pressure.

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 at <https://approvalfinder.dnv.com>.