

# TYPE APPROVAL CERTIFICATE

## This is to certify:

that the Hydraulic Cylinders

with type designation(s)

VY120028219 - DN-160.125.1675-CFSP+HSSP-CIL, VY120028220 - DN-140.110.1435-CFSP+HSSP-CIL,  
VY120028221 - DNP-180.125.0960-CFSP+HSSP-CIL., VY120028222 - DNP-180.125.0960-CFSP+HSSP-CIL.,  
VY120028223 - DNP-140.080.0340-CFSP+GIHRSP-CIL., VY120028224 - DNP-140.080.0340-CFSP+GIHRSP-CIL.,  
VY120028226 - VDW 125/90-1435/GD-OS, VY120028227 - VDW 120/90-1215/GD-OS, VY120030619 - VDW 280/220-  
3100/GD-GS, VY120030620 - VDW 250/200-3400/GD-GS

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.6 Piping systems  
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<br>(push) | Design pressure<br>(pull) | Cylinder<br>sizes |
|-------------------------------------------------|---------------------------|---------------------------|-------------------|
| VY120028219 - DN-160.125.1675-CFSP+HSSP-CIL     | 320                       | 320                       | See page 2        |
| VY120028220 - DN-140.110.1435-CFSP+HSSP-CIL     | 320                       | 320                       | See page 2        |
| VY120028221 - DNP-180.125.0960-CFSP+HSSP-CIL.   | 320                       | 320                       | See page 2        |
| VY120028222 - DNP-180.125.0960-CFSP+HSSP-CIL.   | 320                       | 320                       | See page 2        |
| VY120028223 - DNP-140.080.0340-CFSP+GIHRSP-CIL. | 320                       | 320                       | See page 2        |
| VY120028224 - DNP-140.080.0340-CFSP+GIHRSP-CIL. | 320                       | 320                       | See page 2        |
| VY120028226 - VDW 125/90-1435/GD-OS             | 320                       | 320                       | See page 2        |
| VY120028227 - VDW 120/90-1215/GD-OS             | 320                       | 320                       | See page 2        |
| VY120030619 - VDW 280/220-3100/GD-GS            | 320                       | 320                       | See page 2        |
| VY120030620 - VDW 250/200-3400/GD-GS            | 320                       | 320                       | See page 2        |

Issued at **Høvik** on **2024-02-05**

This Certificate is valid until **2029-02-04**.

for **DNV**

DNV local unit: **Netherlands CMC**

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 300,000 USD.



## Product description

10 types of hydraulic cylinders designed according to DNV-ST-0194.

Dimensional data:

| Type        | Outside diameter | Inside diameter | Piston rod diameter | Stroke   |
|-------------|------------------|-----------------|---------------------|----------|
| VY120028219 | 194 mm           | 160 mm          | 125 mm              | 1675 mm* |
| VY120028220 | 171 mm           | 140 mm          | 110 mm              | 1435 mm* |
| VY120028221 | 220 mm           | 180 mm          | 125 mm              | 960 mm   |
| VY120028222 | 220 mm           | 180 mm          | 125 mm              | 960 mm   |
| VY120028223 | 170 mm           | 140 mm          | 80 mm               | 340 mm   |
| VY120028224 | 170 mm           | 140 mm          | 80 mm               | 340 mm   |
| VY120028226 | 155 mm           | 125 mm          | 90 mm               | 1435 mm* |
| VY120028227 | 150 mm           | 120 mm          | 90 mm               | 1215 mm* |
| VY120030619 | 355 mm           | 280 mm          | 220 mm              | 3100 mm* |
| VY120030620 | 323 mm           | 250 mm          | 200 mm              | 3400 mm* |

\* Load chart according to diagram in general arrangement.

Materials:

| Type        | Cylinder tube | Piston rod | Piston    | Rod eye    | Tube end       | Stuffing box |
|-------------|---------------|------------|-----------|------------|----------------|--------------|
| VY120028219 | S355J2H+N*    | S355J2+N*  | S355J2+N* | S355J2+AR* | S355J2+N*      | S355J2+N*    |
| VY120028220 | S355J2H+N*    | S355J2+N*  | S355J2+N* | S355J2+AR* | S355J2+N*      | S355J2+N*    |
| VY120028221 | S355J2H+N*    | S355J2+N*  | S355J2+N* | S355J2+AR* | S355J2+N*/**   | S355J2+N*    |
| VY120028222 | S355J2H+N*    | S355J2+N*  | S355J2+N* | S355J2+AR* | S355J2+N*/**   | S355J2+N*    |
| VY120028223 | S355J2H+N*    | S355J2+N*  | S355J2+N* | S355J2+AR* | S355J2+N*/**   | S355J2+N*    |
| VY120028224 | S355J2H+N*    | S355J2+N*  | S355J2+N* | S355J2+AR* | S355J2+N*/**   | S355J2+N*    |
| VY120028226 | P355NL1       | S355J2+N*  | S355J2+N* | S355J2+N*  | S355J2+N*      | S355J2+N*    |
| VY120028227 | P355NL1       | S355J2+N*  | S355J2+N* | S355J2+N*  | S355J2+N*      | S355J2+N*    |
| VY120030619 | S355J2H+N*    | S355J2+N*  | S355J2+N* | S355J2+N*  | S355J2G3+N*/** | S355J2G3+N*  |
| VY120030620 | S355J2H+N*    | S355J2+N*  | S355J2+N* | S355J2+N*  | S355J2G3+N*/** | S355J2+N*    |

\* The material shall be fully killed and fine grain treated according to DNV-RU-SHIP Pt.2 Ch.2 Sec.2 [2.6.6], RU-SHIP Pt.2 Ch.2 Sec.3 [1.5.3].

\*\* If the end cover is made from rolled plate it is to be tensile tested in the Z-direction.

Material standards:

| Material | Standard  |
|----------|-----------|
| P355NL1  | EN10216-3 |
| S355J2H  | EN10210-1 |
| S355J2   | EN10025-1 |
| S355J2G3 | EN10250-2 |

## Application/Limitation

Design temperature:

| Type                                                                          | Design temp.<br>(min/max) |
|-------------------------------------------------------------------------------|---------------------------|
| VY120028219, VY120028220, VY120028226 & VY120028227                           | -20/+70°C                 |
| VY120028221, VY120028222, VY120028223, VY120028224, VY120030619 & VY120030620 | -20/+80°C                 |

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

| Type       | Number load cycles |
|------------|--------------------|
| VY12003019 | 45000              |
| VY12003020 | 59000              |

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 [2.1.1].

## Type Approval documentation

Calculations - VY120028219  
cover VDW160-125-1675  
partlist VDW160-125-1675  
pistonrod VDW160-125-1675  
piston VDW160-125-1675  
Cylinderbody VDW160-125-1675  
rodeye VDW160-125-1675  
cylinder body partlist - VY120028219

General arrangement - VY120028220  
Calculations - VY120028220  
cover VDW 140-110-1435  
partlist VDW 140-110-1435  
pistonrod VDW 140-110-1435  
rodeye VDW 140-110-1435  
piston VDW 140-110-1435  
cylinderbody VDW 140-110-1435  
cylinder body partlist - VY120028220

### **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.

### **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
- 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 DNV-CP-0338.