

# TYPE APPROVAL CERTIFICATE

**This is to certify:**

**That the Gas Loaded Accumulator**

with type designation(s)

**10-330-22 ~ 50-330-22 (see page 2), 04-350-16,8 ~ 10-350-16,8 (see page 2), 01-350-11,4 ~ 05-350-11,4 (see page 2)**

Issued to

**Roth Hydraulics GmbH**  
**Biedenkopf, Hessen, Germany**

is found to comply with

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

**Application :**

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

Type:	Temperature range:	Operating media:	Design pressure:	Sizes:
<b>10-330-22 ~ 50-330-22 (see page 2)</b>	<b>-40°C to +80°C</b>	<b>hydraulic fluid / gas</b>	<b>330 bar</b>	<b>D200</b>
<b>04-350-16,8 ~ 10-350-16,8 (see page 2)</b>	<b>-40°C to +80°C</b>	<b>hydraulic fluid / gas</b>	<b>350 bar</b>	<b>D150</b>
<b>01-350-11,4 ~ 05-350-11,4 (see page 2)</b>	<b>-40°C to +80°C</b>	<b>hydraulic fluid / gas</b>	<b>350 bar</b>	<b>D100</b>

Issued at **Hamburg** on **2023-09-04**

for **DNV GL**

This Certificate is valid until **2028-09-03**.

DNV GL local station: **Essen**

Approval Engineer: **Le Loi Nguyen**

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**Olaf Drews**  
**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.



Job Id: **262.1-024323-2**  
Certificate No: **TAP00000WN**  
Revision No: **1**

## Product description

- Bladder accumulator, as a seamless steel bottle with oil valve, rubber compound bladder and gas connection,
- Types and sizes:

Typ	Size	Volume (L)	Design Pressure (bar)	Diameter (mm)
BLAK 10-330-22	D200	10	330	220
BLAK 20-330-22	D200	20	330	220
BLAK 24-330-22	D200	24	330	220
BLAK 32-330-22	D200	32	330	220
BLAK 40-330-22	D200	40	330	220
BLAK 50-330-22	D200	50	330	220
BLAK 04-350-16,8	D150	4	350	168
BLAK 06-350-16,8	D150	6	350	168
BLAK 10-350-16,8	D150	10	350	168
BLAK 01-350-11,4	D100	1	350	114
BLAK 2,5-350-11,4	D100	2,5	350	114
BLAK 05-350-11,4	D100	5	350	114

- Approved according to DNV-RU-SHIP Pt.4 Ch.7 (Edition July 2021), designed according to DIN EN 14359 (09/2017), fatigue calculation according to EN 13445-3 Ch. 18 (12/2021),
- For details of the bladder accumulator (e. g. design data, materials or dimensions) see approved drawings (listed below in "Type Approval documentation").

## Application/Limitation

- The bladder accumulators are graded as pressure equipment class I according to DNV-RU-SHIP Pt.4 Ch.7 Sec.1 Tab.2 (Edition July 2021),
- The accumulators have been designed for cyclic loading as follows:

Size	Cyclic load range (bar)	Allowed number of load cycles
D200	0 - 330	≤ 10.500
D200	157 - 300	≤ 2.000.000
D150	0 - 350	≤ 10.400
D150	155 - 318	≤ 2.000.000
D100	0 - 350	≤ 7.400
D100	143 - 318	≤ 2.000.000

The use of accumulators outside these cyclic load ranges shall be subject to special consideration by DNV in each individual case,

- In his operating instructions the manufacturer shall give advice about the allowable cyclic loadings, and the necessary inspections for the safe use of the accumulators regarding EN 13445-3 Annex M.2 (timing and scope of inspections due to cyclic loading).  
In case of cyclic loading, the user shall establish an inspection plan accordingly, track the number of cyclic loadings and arrange the necessary inspections,
- All pressurized material shall be delivered with material certificates according to DNV-RU-SHIP Pt.4 Ch.7 Sec.1 Tab. 5 (Edition July 2021),

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- The material of the accumulator components subject to pressure (**accumulator shell, oil valve and gas connection, but not the rubber bladder**) shall be delivered by a manufacturer holding a valid certificate according to DNV-CP-0346 'DNV approval of manufacturing scheme',
- The material 1.7220 PMA of the shell is according to EN 14359 or an EN Standard. Strength properties to be confirmed in the material certificate:

Size	D100	D150	D200	
Drawing	3_10X1135-04_1	3_10X1735-05_1	3_10X2233-09_1_A	3_10X2233-09_1_B
Rm N/mm <sup>2</sup>	985	825	965	880
Rp0,2 20°C N/mm <sup>2</sup>	870	730	865	755
Rp0,2 80°C N/mm <sup>2</sup>	800	660	800	705

Impact test at -40° C ≥ 27J, Rp0,2 80°C may be interpolated if Rp0,2 150°C is confirmed.  
 Material and strength properties of the oil vent and gas connection see approved stress calculation in the type approval documentation,

- The lowest design temperature of -40°C shall be increased to -32°C / -20°C / -15°C / -30°C / -15°C in case the bladder material is ECO / FKM / IIR / N28 / N33 (according to manufacturers specification),
- Each accumulator is to be:
  - Hydraulic pressure tested to minimum 1.43 x design pressure. **Shell, oil valve and gas connection may be tested separately, a pressure test of the rubber bladder is not necessary,**
  - Certified by DNV GL and to be delivered with a product certificate.

## Type Approval documentation

### Drawing Title:

Bladder accumulator  
 Bladder accumulator shell  
 Bladder accumulator shell  
 Oil valve  
 Valve housing  
 Holding ring  
 Bladder  
 Blase 7/8"  
 Stress calculation for Roth bladder accumulator  
 Overview load cycles

### Drawing No.:

3\_10X2233-09 Rev. 0  
 3\_10X2233-09\_1\_A Rev. 0  
 3\_10X2233-09\_1\_B Rev. 0  
 3\_10X2233-09\_2 Rev. 0  
 3\_10X2233-09\_2-1 Rev. 0  
 3\_6X3744-2\_DNV Rev. 0  
 3\_6X3744-5\_DNV Rev. 0  
 3\_6X4388\_DNV Rev. 0  
 to 3\_10X2233-09  
 3\_10X2233-09 Rev. 1

Bladder accumulator  
 Bladder accumulator shell  
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 Valve housing  
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3\_10X1735-05 Rev. 0  
 3\_10X1735-05\_1 Rev. 0  
 3\_10X1135-04\_2 Rev. 0  
 3\_10X1135-04\_2-1 Rev. 0  
 3\_6X4058-2\_DNV Rev. 0  
 3\_6X3744-5\_DNV Rev. 0  
 3\_6X4388\_DNV Rev. 0  
 to 3\_10X1735-05  
 3\_10X1735-05 Rev. 1

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Bladder accumulator	3_10X1135-04 Rev. 1
Bladder accumulator shell	3_10X1135-04_1 Rev. 0
Oil valve	3_10X1135-04_2 Rev. 0
Valve housing	3_10X1135-04_2-1 Rev. 0
Holding ring	3_6X4058-2_DNV Rev. 0
Bladder	3_6X3744-5_DNV Rev. 0
Blase 7/8"	3_6X4388_DNV Rev. 0
Stress calculation for Roth bladder accumulator	to 3_10X1135-04
Overview load cycles	3_10X1135-04 Rev. 1
Overview load cycles	3_10X1135-04 Rev. 1

## Marking of product

For traceability to this type approval the products are at least to be marked with:

- the name and domicile of the manufacturer,
- the manufacturer's type designation and serial number,
- the year of manufacture,
- the design pressure,
- the design temperature in °C,
- the hydraulic test pressure, and
- DNV GL's identifying mark

## Periodical assessment

The objective of the periodical assessment is to verify that the conditions for the type approval (TA) have not been altered.

The main scope of the periodical assessment will normally include:

- verification of the TA applicant's production and quality system w.r.t. ensuring continued consistent production of the TA products at the TA applicant's own premises and at other companies that are given the responsibility for manufacturing of the products
- review of TA documentation and that this is still used as basis for the production
- review of possible changes in the design, the materials and the performance of the product
- verification of the product marking

For retention of the TA certificate in its validity period the periodical assessments will be carried out bi-yearly.

Unscheduled assessments for retention of the certificate may be carried out when there is reason to believe that the type approval applicant has not adhered to the obligations stipulated in the type approval certificate.

## End of Certificate