

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Positive Displacement Pumps - Reciprocating

with type designation(s)
G3E, G3S, G3F, G3L, G3G

Issued to

LEWA GmbH
Leonberg, Baden-Württemberg, Germany

is found to comply with

DNV rules for classification – Ships Pt.5 Ch.7 Liquefied gas tankers
DNV rules for classification – Ships Pt.4 Ch.6 Piping systems
DNV class programme DNV-CP-0505 – Type approval – Pumping units

Application :

Products approved by this certificate are accepted for installation on all vessels classed by DNV.

Type	Max. working press.:	Operating media:	Temperature range:
G3E	400 bar	see certificate	-55°C to 150°C
G3S	400 bar	see certificate	-55°C to 150°C
G3F	400 bar	see certificate	-55°C to 150°C
G3L	400 bar	see certificate	-55°C to 150°C
G3G	400 bar	see certificate	-55°C to 150°C

Issued at **Høvik** on **2023-02-22**

This Certificate is valid until **2028-02-21**.

for **DNV**

DNV local unit: **Essen**

Approval Engineer: **Guido Friederich**

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Dalibor Bukarica
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.

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

Metering diaphragm pump unit consisting of pump head and pump drive.

The diaphragm pump provides a three-chamber design comprising of an operating chamber for pressurized fluid flow transfer, separated by a sandwich diaphragm from a hydraulic pressure chamber and a hydraulic reservoir chamber.

The three chamber pump head design ensures a high metering and efficiency accuracy.

This type approval comprises the pump head.

Remark:

Scope of type approval documentation provided as confidential attachment to this certificate.

Design and operating features

Pump type	Max. operating pressure (bar)	Flow @ max. operating pressure (l / hr)	Strokes per Minute (1 / Min)	Stroke length (mm)	Rated speed (1 / Min)	Pump head type	Hydraulic Power @ Strokes per minute (spm) (kW)	Max. possible flow (l / hr)
G3E	400	900	400	30	1432	M91xS	10 @ 400	12000
G3L	400	1800	350	55	1440	M91xS	20 @ 350	20000
G3S	400	2600	350	60	1470	M91xS	30 @ 350	30000
G3F	400	4500	300	90	1470	M91xS	55 @ 300	40000
G3G	400	8000	300	120	1470	M91xS	110 @ 300	52000

Flange connection / Pressure rating

Pump head type	DN / PN	Design temperature (°C)
G3E	Dependent on	-55°C to 150°C
G3L	Pump head	-55°C to 150°C
G3S	and	-55°C to 150°C
G3F	Pump size	-55°C to 150°C
G3G		-55°C to 150°C

Pump head type - Materials ^{1,2}

Item	Material Standard / Material type [ASTM / EN]
Pump head / valve body	ASTM SA 182; 316, 316L / EN 1.4401, 1.4404
Diaphragm	ASTM SA 182; 316, 316L / EN 1.4401, 1.4404
Valve seat / insert ring	ASTM SA 182; 316, 316L / EN 1.4401, 1.4404

¹ Materials for fabrication of pressure retaining pump items shall be supplied by DNV Approved Material Manufacturers.

² Materials for pumps to be installed in cryogenic systems shall comply with DNV Rules Pt.5 Ch.7 – Liquefied gas tankers, Section 6 – Materials of construction, quality control and marking. Material certificates shall provide Charpy impact test results for the relevant sub-zero test temperature.

Application

Diaphragm pump head approved for the use in ships piping, machinery piping, fuel systems and cargo handling piping systems. Operating media may include water, thermal oil, fuel oil, hydraulic oil. ³

³ Pump designs scheduled for use and installation in ammonia (NH₃) and methanol (CH₃OH) ship fuel systems require additional approval by the flag state administration for each ship as these fuels are not covered by the IGF Code at present.

Limitation

Diaphragm pump head not approved for gaseous and liquid hydrogen and operating fluids specified as toxic media.⁴

⁴ See United Nations (UN) Globally Harmonized System of Classification and Labelling of Chemicals (GHS)

Tests carried out

Test Standards

DNV Rules Pt.4 Ch.6 – Piping systems

DNV Rules Pt.5 Ch.7 – Liquefied gas tankers

DNV Class Program CP-0505 – Type approval pumping units

API 675 – Positive displacement pumps

Type of test	Purpose of test
Hydrostatic test	Strength test of pump head housing, test pressure in amount of 1,5 times the design pressure.
Flow characteristic test	Determination of flow rate depending on pump speed and stroke frequency. Test fluid: Water

Test results: All tests performed with satisfactory results and without objections in presence of DNV Surveyor

Marking of product

The pump provides the following marking:

- Manufacturer's name or trademark
- Pump head type designation
- Pump head size
- Maximum / Minimum design pressure and temperature
- Flow capacity
- Arrow to indicate the flow direction

Periodical assessment

A condition for retention of the Type Approval Certificate in its validity period is that periodical assessments are successfully carried out.

For retention of the Type Approval, a DNV GL Surveyor shall perform periodical assessment after two years (+/- 90 days) and after 3.5 years (+/- 90 days) to verify that the conditions for the Type Approval are complied with. Refer to DNVGL-CP-0338, Sec.4.

END OF CERTIFICATE

Confidential attachment: Following one confidential page (Empty page for persons outside LEWA GmbH)



Job Id: **262.1-035649-1**
Certificate No: **TAM000019E**