

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Pressure Vessel

with type designation(s)
0.102m³/1.0 LNG Pump Sump, 0.061m³/1.0 LNG Pump Sump

Issued to

Zhangjiagang Furui Heavy Equipment Co., Ltd.
Zhangjiagang, Jiangsu, China

is found to comply with

DNV rules for classification – Ships Pt.4 Ch.7 Pressure equipment
DNV rules for classification – Ships Pt.5 Ch.7 Liquefied gas tankers

Application :

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

Type:	Max. working temp.:	Design pressure:	Operating Medium
0.102m ³ /1.0 LNG Pump Sump	-165 to +80°C	10 bar / -1bar	LNG / Air
0.061m ³ /1.0 LNG Pump Sump	-165 to +45°C	10 bar / -1bar	LNG / Air

Issued at **Hamburg** on **2022-05-09**

This Certificate is valid until **2027-05-08**.

DNV local station: **Jiangyin NB & CMC**

Approval Engineer: **Astrid Caschube**

for **DNV**

Jonathan Struwe
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

Vacuum isolated process pressure vessels to be used as flanged LNG Pump Sumps with two nozzle connections.

Dimensions:

Type	Inner Vessel		Outer vessel	
	Shell	Ellipsoidal Head	Shell	Flat bottom
LNG Pump Sump				
0.102m ³ /1.0	Ø 372 x 6	Ø 372 x 6 (4.5)	Ø 462 x 6	590 x 590 x 14
0.061m ³ /1.0	Ø 372 x 6	Ø 372 x 6 (4.5)	Ø 462 x 6	590 x 590 x 14

For details of the sumps (e.g. dimensions and material particulars) see approved documentation (listed below in 'Type Approval documentation').

Place of production

Application/Limitation

Applied Rules and Design Codes:

- DNV-RU-SHIP Pt.4 Ch.7 'Pressure Equipment' (Edition July 2021)
- DNV-RU-SHIP Pt.5 Ch.7 'Liquified gas tankers' (Edition July 2021)

The pressure vessels are graded as pressure equipment class I according to DNV-RU-SHIP Pt.4 Ch.7 Sec.1 Table 2.

The materials shall be delivered by a material manufacturer holding a valid certificate acc. to:

- DNV-CP-0346 'DNV approval of manufacturer scheme'.

All used materials shall be delivered with certificates acc. to DNV-RU-SHIP Pt.4 Ch.7 Sec.1 Table 5.

Corrosion allowance is 0 mm.

The welding work for this pressure equipment shall be carried out by a welding workshop holding a valid certificate acc. to following DNV class programmes:

- DNV-CP-0261 'Approval of manufacturers – Pressure equipment' and
- DNV-CP-0352 'Approval of manufacturers – Manufacture of welded products – Welding workshop'.

The welding joint efficiency is $v = 1$.

The installation on board the ship shall be performed in a way, that for possible forced vibrations on the pressure vessel and their nozzles resulting from e.g. diesel engine or the propulsion chain will be adequately taken care for.

This type approval is related to the strength of the parts of the pump sumps subjected to pressure. The function has not been assessed.

Cyclic loading has not been specified by the manufacturer. Maximum number of fatigue cycles during life time of 25 years is therefore limited to 1000 cycles.

The installation of the gas pressure vessel on board gas fueled ships shall be subject to an individual approval of the entire ship arrangement and system in accordance with DNV-RU-SHIP Pt.6 Ch.2 Sec.5. Additional Flag State requirements might be applicable.

Each pressure vessel manufactured to this type approval is to be:

- Constructional checked and hydraulic pressure tested to minimum 1.5 times design pressure (not exceeding the test pressure considered in the 'Type Approval documentation'),
- Certified by DNV and delivered with a product certificate.

For pressure testing a standard blind flange has to be used suitable for the testing parameters in this case.

Type Approval documentation

Tests carried out

Calculations

Marking of product

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

- Name and domicile of the manufacturer,
- Manufacturer's type designation (equipment name) and serial number,
- Year of manufacture,
- Maximum allowable working pressure (design vapour pressure),
- Design temperature in °C,
- Hydraulic test pressure,
- DNV'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 with relation to 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 material and the performance of the product,
- Verification of the product marking.

Periodical assessments for type approvals with a validity period of five years will be required after two years (+/- 90 days) and after 3.5 years (+/- 90 days).

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

END OF CERTIFICATE