

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Preheater, Electrically Heated

with type designation(s)

Type 4700

Issued to

ELWA Elektro-Wärme GmbH & Co. KG
Maisach, Bayern, Germany

is found to comply with

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

Application :

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

Temperature range: 0°C to 120°C
Max. operating temperature: 100°C
Design temperature: 120°C
Design pressure: 6 bar
Operating medium: Oil (flash point above 60°C)

Issued at **Hamburg** on **2023-07-10**

for **DNV**

This Certificate is valid until **2028-07-09**.

DNV local station: **Augsburg**

Approval Engineer: **Frank Juckel**

.....
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.

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

Pressure vessel type 4700 intended for electric heated continuous flow heaters, main pressure bearing parts are the successively arranged heat exchanger plates (2 to 14) which are covered by front- and rear plate forming the heat exchanger block. The whole arrangement is fixed by bolting connections as well as the special screwed inlet- and outlet tube. Flat electric heating elements are arranged between the heat exchanger plates. Only the pressure bearing parts are covered by this type approval. Any electrical- and all other equipment is not part of this type approval.

Type		4701	4702	4703	4704	4705	4706	4707	4708	4709	4710	4711	4712	4713
Exch. Plates	(no.)	2	3	4	5	6	7	8	9	10	11	12	13	14
Volume	(Ltr.)	1,0	1,5	2,0	2,5	3,0	3,5	4,0	4,5	5,0	5,5	6,0	6,5	7,0
Weight	(kg)	60	64	68	72	76	82	86	90	94	98	102	106	110

For the details of the pressure vessel (e.g. dimensions and materials particulars) see approved documentation.

Place of manufacture

ELWA Elektro-Wärme GmbH & Co KG
 Frauenstr. 26
 82216 Maisach, Germany

Application/Limitation

Applied Rules and Design Codes:

- DNV SHIP Pt.4 Ch.7 'Pressure Equipment' (Edition July 2020, amended August 2020)
- IACS UR-P2 'Rules for piping design, construction and testing' (Edition 1981/Rev.2 2001)

The pressure equipment is classified in pressure equipment class II (PEC II) acc. to DNV-RU-SHIP Pt.4 Ch.7 Sec.1 Table 2 (Edition July 2020, amended August 2020).

The materials used for the design and fabrication of the pressure vessels shall be suitable for the environmental and specific service conditions, the applicable fluids and shall be resistant to corrosion and wear during the intended service life time.

The materials used shall be in compliance with the technical requirements of the DNV RU-SHIP Pt.4 Ch.7 Sec.2 [1.1.1] (Edition July 2020, amended August 2020).

The materials of the pressure vessels for PEC II shall be delivered by a material manufacturer holding a valid certificate according to DNV CP-0346 'DNV approval of manufacturing scheme'.

All material used for pressurized parts shall be delivered with material certificates according to DNV RU-SHIP Pt.4 Ch.7 Sec.1 [Table 6].

The welding work and manufacturing for pressure equipment of class II shall be carried out by a welding workshop holding a valid certificate according to DNV CP-0261 'Approval of manufacturers – Pressure equipment' and DNV CP-0352 'Approval of manufacturers – Manufacture of welded products – Welding workshop', refer to DNV RU-SHIP Pt.4 Ch.7 Sec. 7 [1.1.1].

Proper manufacturing of the heat exchanger plates shall be demonstrated by the required documentation including the sub-supplier.

The gasket-/seal materials shall be suitable for the specified design parameter and used fluid media.
 Approval scope and approved media:

- This type approval is related to the strength of the parts of oil preheater assembly subjected to pressure. The preheater function has not been assessed.
- The present TA applies to the strength of the heater as a pressure vessel, it is covering the steel (pressure bearing) part of the heaters only, excluding any equipment (electrical-/ safety-/ control-equipment, etc.).
- The use of subject heater(s) is restricted to media oil with flash point above 60°C, e.g. suitable fuel oil or -lube oil.
- A new burst pressure test shall be conducted latest at renewal of this TA.

Following monitoring of the heaters shall be ensured on site, therefore shall be stated on each product certificate:

- The specific operation manual shall be observed.
- DNV RU SHIP Pt.4 Ch.7 Sec.1 [1.1.4] shall apply.
- Monitoring of the heaters shall be carried out as required by DNV RU SHIP Pt.4 Ch.7 Sec.6 [2.1.1].
- Automatic control of the heaters shall be equivalent to DNV RU SHIP Pt.4 Ch.7 Sec.6 [6.1.1, 6.1.2].
- Monitoring of the heaters shall be equivalent to DNV RU SHIP Pt.4 Ch.7 Sec.6 [6.2.1].
- Monitoring of continuous oil flow through the heater tripping an alarm (automatic shutdown – safety action) equivalent to DNV RU SHIP Pt.4 Ch.7 Sec.6 [6.2.1 Table 5 'Flow low'].
- The specific requirements for electric oil heaters apply, refer to DNV RU SHIP Pt.4 Ch.8 Sec.8 [1.3] especially [1.3.7].

Following installations aboard shall be ensured on site, therefore shall be stated on each product certificate:

- The threaded connections on the systems side of the heater shall be type approved by DNV for the service conditions and the intended application.
- Installation of splash guards / protection sheet metal housing covering the threaded connections on the heater's limiter and safety valve side.
- Installation of an oil collecting basin underneath the heater containing an approved leakage detector which trips an alarm (automatic shutdown – safety action) in case of any leakage.
- The installation on board the ship shall be performed in such a way that for possible forced vibrations on the preheaters and their nozzles resulting from e.g. diesel engine or the propulsion chain will be adequately taken care for.

Manufacturing, workmanship and testing shall be done according to DNV RU-SHIP Pt.4 Ch.7 Sec.7.

Each preheater assembly is to be

- constructional tested and hydraulic pressure tested to minimum 1.5 times design pressure upon completion in the presence of a DNV Surveyor, refer to "Specification of electrical heater incl. type testing programme",
- certified by DNV and delivered with a product certificate.

Type Approval documentation

This DNV type approval is based on the following documentation

Design approval ref. GL 05-053472/Mal dated 2005-08-08 containing:

- Burst pressure test Technical Specification, dated 2005-07-08 (document no. 04-71-FB-020, version 00 dated 1999-05-21)
- Strength recalculations (GL)
- Test Certificate, dated 2005-07-08 (document no. Abnahme_4700, version 00 dated 2005-02-27)

Burst pressure test 4700 dated 2021-03-19 (version 2012-07) with following attachments:

- Prüfprotokoll Manometer dated 2020-08-27
- Material certificate no. 492772/001/D1 (01) dated 2019-10-11
- Test certificate no. RN2000184237
- Material certificate no. 200083162/0001 dated 2018-03-23

Burst pressure test 4700 dated 2021-08-02 (version 2012-07)

Burst pressure test 4700 - Wärmetauscherplatte dated 2023-04-26 (version 2012-07)

Belonging ELWA Calculation dated 2023-07-10

Drawings/Documents:

<u>Title</u>	<u>Rev.</u>	<u>Art.-no. short designation</u>
Series 4700 ELWA Operating instructions	1.3	N.A.
Elektro-Durchlauferhitzer Type 4700evo_Version II	1	40248_KEH 4700 evo
Elektro-Durchlauferhitzer Type 4700evo, & part list (part list – TechDoc no. 19)	2	40448_4700 Zulassungszeichnung
KEH-4700evo Zu-Auslaufrohr mit Ø6,5 Bohrungen (Material grade 1.4307 solely covered)	5	19900_Zu-Ablaufrohr
19800_WT-Platte f.4700evo	2	19800
19800_WT (MAWE_ZB_WärmetauscherS08_V9)	5	19800_WT
KEH-4700evo End-Dichtring	-	19986_End-Dichtring
20985_Distanzhülse (20343 Distanzring) (Material grade 1.4301 solely covered)	1	20985_Distanzhülse
(Schraubendichtung 4700) BONDED SEALS 800017	-	33536
KEH-4700evo Konsole komplett	2	19798_Konsole
KEH-4700evo Seitenteil komplett	6	19991_Seitenblech kpl
KEH-4700evo Frontblech komplett	11	20992_Frontblech kpl
Test Certificate version 2012-07	-	Abnahme_4700

DNV forms:

Application for DNV Type Approval, Form TAA 901, dated 2020-10-26
 Type Approval Assessment Report, dated 2021-04-08

Tests carried out

Burst pressure tests & supporting calculations.

Marking of product

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

- manufacturer's name and address,
- manufacturer's type designation and serial number,
- year of manufacture,
- maximum allowable heating power
- maximum allowable working pressure (design pressure),
- hydrostatic test pressure,
- max. operating temperature [°C]
- design temperature [°C],
- minimum flow rate
- 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 continue consistent production of the type approved 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.

Periodical assessments for TA 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 TA 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