

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Insulation Materials for Gas Carriers

with type designation(s)
KB-E-27

Issued to

Shanghai Enerji Insulation Technology Co., Ltd.
Shanghai, China

is found to comply with
DNV rules for classification – Ships

Application :

Pre-formed thermal insulation panels for LNG/LGP/LEG independent cargo and fuel tanks.

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

Issued at **Høvik** on **2022-10-07**

This Certificate is valid until **2027-10-06**.

DNV local station: **Shanghai**

Approval Engineer: **Gisle Hersvik**

for **DNV**

Gustav Heiberg
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

Thermal Insulation Panels: **KB-E-27** / Loyal F/GF-SA type Expandable Polystyrene (EPS) formed as thermal insulating panels.

- Nominal density: 27 kg/m³.
- Blowing agent: No blowing agents specified.

Properties	Test Method	Test Results	Manufacturer's Specification	Units
Thermal and Humid Aging (-30°C, 24 hrs) -Dimensional stability	ASTM D2126	L: -0.13 W: -0.38 H: -0.20	±2	%
Reaction to liquids (LNG) ^(*)	DIN 53428	0.93	±2	%
Density	ASTM D1622	26.6	27±2	kg/m ³
Tensile strength	ISO 1926	0.339	≥0.30	MPa
Tensile strength (-163°C)	ISO 1926	0.345	-	MPa
Flexural strength	ASTM C203	0.432	≥0.30	MPa
Flexural strength (-163°C)	ASTM C203	0.354	-	MPa
Shear strength	ASTM C273	0.258	≥0.20	MPa
Shear strength (-163°C)	ASTM C273	0.279	-	MPa
Compressive strength	ASTM D1621	0.170	≥0.14	MPa
Compressive strength (-163°C)	ASTM D1621	0.212	-	MPa
Closed Cell Content	ASTM D6226 / GB/T 10799	98.6	≥90	%
Thermal Conductivity (20°C)	ASTM C177 / ASTM C518	0.031	≤0.036	W/mK
Thermal Conductivity (-163°C)	ASTM C177 / ASTM C518	0.01401 0.01404	≤0.016	W/mK
Flammability	DIN 4102-1	B2	B2	-
(*) Immersion in LNG for 15 days. Testing laboratory conditions: - Ambient temperature: (23±2)°C, (50±5)% RH - Low temperature: -163°C				

Other properties may need to be documented for specific installations.

Application/Limitation

To form insulated envelopes using pre-formed panels surrounding LNG/LGP/LEG fuel and cargo tanks and pipeworks for marine applications. It should be noted that the 'reaction to liquids' is only documented for LNG immersion.

For each installation on DNV classed vessel the complete insulation scheme shall be reviewed and approved by DNV prior to installation.

Storage, handling and installation of the insulation material shall be in accordance with manufacturer's recommendations.

When installed, the insulation material shall be adequately protected against penetration of water vapor and mechanical damage.

Where the thermal insulation is located on or above the exposed deck, and in way of tank cover penetrations, it shall have suitable fire resistance properties in accordance with recognized standards or be covered with a material having low flame-spread characteristics and forming an efficient approved vapor seal.

Any significant changes in design and / or quality of the material will render the approval invalid.

Type Approval documentation

Tests carried out

Type Testing carried out in accordance with **Type Approval documentation**, with basis in IGC Code 4.19.3 including:
ASTM D1622/D1622M Apparent Density



Job Id: **262.1-037228-1**
Certificate No: **TAK000025N**

ISO 1926	Tensile Strength
ASTM C203	Flexural Strength
ASTM C273/C273M	Shear Strength
ASTM D1621	Compressive Strength
ASTM C518	Thermal Conductivity
ASTM D2126	Thermal and Humid Aging
DIN 4102-1	Flammability
DIN 53428	Reaction to liquids, vapors, gases and solid materials (LNG immersion)
ASTM D6226	Closed cell content [GB/T 10799 / ASTM D6226]

Marking of product

Product/package shall be marked with *manufacturer's name* and *type designation*; **KB-E-27**.

The marking is to be carried out in such a way that it is visible, legible and indelible. The marking of product is to enable traceability to the DNV Type Approval Certificate.

Periodical assessment

The scope of the Periodical Assessment is to verify that the conditions stipulated for the Type Approval is complied with and that no alterations are made to the product design or choice of materials.

Periodical assessments (for Certificate Retention / Certificate Renewal) shall be performed according to DNV-CP-0338.

This certificate is only valid if required Periodical assessments are carried out with satisfactory results. To check the validity of this certificate, please look it up in <https://approvalfinder.dnv.com>

END OF CERTIFICATE