TYPE APPROVAL CERTIFICATE

Certificate no.:
TAP00001K1
Revision No:
1

This is to certify:

that the Gaskets and Sealings

with type designation(s)
Flat Gasket - KLINGERSIL® C-4300, KLINGERSIL® C-4324, KLINGERSIL® C-4400, KLINGERSIL® C-4408, KLINGERSIL® C-4409, KLINGERSIL® C-4430, KLINGERSIL® C-4500, KLINGERSIL® C-4509, KLINGER® CompenSil, KLINGER® top-sil ML1, KLINGER® Gaja

issued to
Rich. Klinger Dichtungstechnik GmbH & Co. KG
Gumpoldskirchen, Niederösterreich, **Austria**

is found to comply with
ASTM F36:15(2021) Standard Test Method for Compressibility and Recovery of Gasket Materials
DIN 28090-2 Static gaskets for flange connections – Gaskets made from sheets – Part 2: Special test procedures for quality assurance
API 607

Application:

Refer to section Application in the certificate.

Temperature range:	**Refer to certificate and manufacturer's instruction.**
Max. working press.:	**Refer to certificate and manufacturer's instruction.**
Design:	**Plate material**
Sizes:	**Refer to Certificate and manufacturer's instruction.**

Issued at **Hamburg** on **2024-10-07**

This Certificate is valid until **2029-08-26**.

for **DNV**

DNV local unit: **Augsburg**

Approval Engineer: **Thilo Pabst**

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

The following **asbestos free flat gasket materials** are included in this Type Approval Certificate:
KLINGERSIL® C-4300, KLINGERSIL® C-4324,
KLINGERSIL® C-4400, KLINGERSIL® C-4408, KLINGERSIL® C-4409, KLINGERSIL® C-4430
KLINGERSIL® C-4500, KLINGERSIL® C-4509
KLINGER® CompenSil
KLINGER® top-sil ML1
KLINGER® Gaja

Dimensions of plate material KLINGERSIL® C-Series:
(valid for all products, except KLINGERSIL® C-4409, KLINGERSIL® C-4509)

- Sizes: 1000 x 1500 mm, 2000 x 1500 mm
- Thicknesses: 0.5 mm, 1.0 mm, 1.5 mm, 2.0 mm, 3.0 mm
- Tolerances: Thickness acc. DIN 28091-1
  Length ± 50 mm, width ± 50 mm

KLINGERSIL® C-4300 (olive green colour) **- Aramid fibres bonded with NBR**

Values for 2.0 mm thickness[1]:

Technical data	Standard	Conditions	Value	Unit
Density	DIN 28090-2	--	1.6	g/cm³
Compressibility	ASTM F36J	--	14	%
Recovery	ASTM F36J	--	50	%
Tightness	DIN 28090-2	--	0.03	mg/s x m
Klinger cold compression	Klinger	50 MPa / 23°C [2]	10	%
Klinger hot compression	Klinger	50 MPa / 300°C [2]	22	%

KLINGERSIL® C-4324 (black/green colour) **- Synthetic high-performance fibres bonded with NBR**

Values for 2.0 mm thickness[1]:

Technical data	Standard	Conditions	Value	Unit
Density	DIN 28090-2	--	1.85	g/cm³
Compressibility	ASTM F36J	--	10	%
Recovery	ASTM F36J	--	55	%
Tightness	DIN 28090-2	--	0.03	mg/s x m
Klinger cold compression	Klinger	50 MPa / 23°C [2]	10	%
Klinger hot compression	Klinger	50 MPa / 300°C [2]	25	%

Note [1]: Reference “Declaration of conformity acc. to DIN EN ISO 17050-1” issued by KLINGER Dichtungstechnik GmbH & Co. KG, 2024-07-03
Note [2]: Test conditions: Seating stress [MPa] / Test temperature [°C]
These conditions may be not equivalent to maximum service conditions. (see manufacturer’s instruction / PT-diagram).

KLINGERSIL® C-4400 (green colour) **- Aramid fibres bonded with NBR. Fire safe acc. API 607 / DIN EN ISO 10497.**

Values for 2.0 mm thickness[1]:

Technical data	Standard	Conditions	Value	Unit
Density	DIN 28090-2	--	1.6	g/cm³
Compressibility	ASTM F36J	--	11	%
Recovery	ASTM F36J	--	55	%
Tightness	DIN 28090-2	--	0.02	mg/s x m
Klinger cold compression	Klinger	50 MPa / 23°C [2]	10	%
Klinger hot compression	Klinger	50 MPa / 300°C [2]	20	%

KLINGERSIL® C-4408 (green/olive colour) **- Aramid fibres bonded with NBR**

Values for 2.0 mm thickness[1]:

Technical data	Standard	Conditions	Value	Unit
Density	DIN 28090-2	--	1.9	g/cm³
Compressibility	ASTM F36J	--	8	%
Recovery	ASTM F36J	--	50	%
Tightness [3]	DIN 28090-2	--	--	--
Klinger cold compression	Klinger	50 MPa / 23°C [2]	10	%
Klinger hot compression	Klinger	50 MPa / 300°C [2]	18	%

KLINGERSIL® C-4409 (green/yellow colour) **- Synthetic fibres bonded with NBR**

- Sizes: 1000 x 1500 mm, 2000 x 1500 mm
- Thicknesses: 1.0 mm, 1.5 mm
- Tolerances: Thickness acc. DIN 28091-1
  Length ± 50 mm, width ± 50 mm

Values for 1.5 mm thickness[1]:

Technical data	Standard	Conditions	Value	Unit
Density	DIN 28090-2	--	2.0	g/cm³
Compressibility	ASTM F36J	--	7	%
Recovery	ASTM F36J	--	50	%
Tightness [3]	DIN 28090-2	--	--	--
Klinger cold compression	Klinger	50 MPa / 23°C [2]	10	%
Klinger hot compression	Klinger	50 MPa / 300°C [2]	10	%

KLINGERSIL® C-4430 (white/green colour) **- Synthetic fibres bonded with NBR.**
Fire safe acc. API 607 / DIN EN ISO 10497

Values for 2.0 mm thickness[1]:

Technical data	Standard	Conditions	Value	Unit
Density	DIN 28090-2	--	1.8	g/cm³
Compressibility	ASTM F36J	--	9	%
Recovery	ASTM F36J	--	55	%
Tightness	DIN 28090-2	--	0.05	mg/s x m
Klinger cold compression	Klinger	50 MPa / 23°C [2]	8	%
Klinger hot compression	Klinger	50 MPa / 300°C [2]	11	%

Note [1]: Reference “Declaration of conformity acc. to DIN EN ISO 17050-1” issued by KLINGER Dichtungstechnik GmbH & Co. KG, 2024-07-03
Note [2]: Test conditions: Seating stress [MPa] / Test temperature [°C]
These conditions may be not equivalent to maximum service conditions. (see manufacturer’s instruction / PT-diagram).
Note [3]: No tightness test acc DIN 28090-2 available. For more information see Tightness performance graph acc. datasheet.

KLINGERSIL® C-4500 (black colour) **- Carbon fibres bonded with NBR. Fire safe acc. API 607 / DIN EN ISO 10497**

Values for 2.0 mm thickness[1]:

Technical data	Standard	Conditions	Value	Unit
Density	DIN 28090-2	--	1.6	g/cm³
Compressibility	ASTM F36J	--	11	%
Recovery	ASTM F36J	--	60	%
Tightness	DIN 28090-2	--	0.05	mg/s x m
Klinger cold compression	Klinger	50 MPa / 23°C [2]	10	%
Klinger hot compression	Klinger	50 MPa / 300°C [2]	15	%

KLINGERSIL® C-4509 (black colour) **- Carbon fibres bonded with NBR**

- Sizes: 1000 x 1500 mm, 2000 x 1500 mm
- Thicknesses: 1.0 mm, 1.5 mm
- Tolerances: Thickness acc. DIN 28091-1
  Length ± 50 mm, width ± 50 mm

Values for 1.5 mm thickness[1]:

Technical data	Standard	Conditions	Value	Unit
Density	DIN 28090-2	--	2.0	g/cm³
Compressibility	ASTM F36J	--	10	%
Recovery	ASTM F36J	--	62	%
Tightness [3]	DIN 28090-2	--	--	--
Klinger cold compression	Klinger	50 MPa / 23°C [2]	8	%
Klinger hot compression	Klinger	50 MPa / 300°C [2]	6	%

Note [1]: Reference “Declaration of conformity acc. to DIN EN ISO 17050-1” issued by KLINGER Dichtungstechnik GmbH & Co. KG, 2024-07-03
Note [2]: Test conditions: Seating stress [MPa] / Test temperature [°C]
These conditions may be not equivalent to maximum service conditions. (see manufacturer’s instruction / PT-diagram).
Note [3]: No tightness test acc DIN 28090-2 available. For more information see Tightness performance graph acc. datasheet.

Dimensions of plate material KLINGER® CompenSil, KLINGER® top-sil ML1, KLINGER® Gaja

- Sizes: 2000 x 1500 mm
- Thicknesses: 0.8 mm, 1.0 mm, 1.5 mm, 2.0 mm, 3.0 mm
- Tolerances: Thickness acc. DIN 28091-1
  Length ± 50 mm, width ± 50 mm

KLINGER® CompenSil (orange colour) **- Mineral fibres bonded with NBR**

Values for 2.0 mm thickness[1]:

Technical data	Standard	Conditions	Value	Unit
Density	DIN 28090-2	--	1.5	g/cm³
Compressibility	ASTM F36J	--	22	%
Recovery	ASTM F36J	--	45	%
Tightness	DIN 28090-2	--	0.01	mg/s x m
Klinger cold compression	Klinger	50 MPa / 23°C [2]	18	%
Klinger hot compression	Klinger	50 MPa / 300°C [2]	22	%

KLINGER® top-sil (yellow colour) **- Combination of synthetic fibers and different elastomers, bonded in a multi-layer structure. Fire safe acc. API 607 / DIN EN ISO 10497.**

Values for 2.0 mm thickness[1]:

Technical data	Standard	Conditions	Value	Unit
Density	DIN 28090-2	--	1.7	g/cm³
Compressibility	ASTM F36J	--	9	%
Recovery	ASTM F36J	--	50	%
Tightness	DIN 28090-2	--	0.05	mg/s x m
Klinger cold compression	Klinger	50 MPa / 23°C [2]	8	%
Klinger hot compression	Klinger	50 MPa / 300°C [2]	15	%

KLINGER® Gaja (off-white colour) **- Combination of natural materials (rubber, bio-circular silica, cellulose fibers, mineral fillers) and environmentally friendly additives**

Values for 2.0 mm thickness[1]:

Technical data	Standard	Conditions	Value	Unit
Density	DIN 28090-2	--	1.8	g/cm³
Compressibility	ASTM F36J	--	9	%
Recovery	ASTM F36J	--	45	%
Tightness	DIN 28090-2	--	0.02	mg/s x m
Klinger cold compression	Klinger	50 MPa / 23°C [2]	12	%
Klinger hot compression	Klinger	50 MPa / 200°C [2]	20	%

Note [1]: Reference “Declaration of conformity acc. to DIN EN ISO 17050-1” issued by KLINGER Dichtungstechnik GmbH & Co. KG, 2024-07-03

Note [2]: Test conditions: Seating stress [MPa] / Test temperature [°C]
These conditions may be not equivalent to maximum service conditions. (see manufacturer’s instruction / PT-diagram).

APPLICATION / LIMITATION

This is a Non-Class Type Approval Certificate (TA-NONCL - for products where a Type Approval is not mandatory) on basis of test according to international standards.

The above listed gasket material sheet type may be used under consideration of the mechanical and technical characteristics as well as physical and chemical properties for the following applications:

- On board ships and other structures classed by DNV as follows:
  Ship's piping systems as specified in DNV-RU-SHIP Pt.4, Ch.6 Piping systems and cargo lines on oil tankers.
- The selection of the gaskets for the corresponding application and appropriate installation has to be in accordance with the instructions of the manufacturer.
- Piping/Gaskets shall be hydrostatically tested: 1.5 times of the system design pressure (DNV-RU-SHIP Pt.4 Ch.6 – Piping)
- Piping of cargo handling systems on Oil Tanker shall be electrically bonded. (DNV-RU-SHIP Pt.5 Ch.5 – Oil Tanker)

LIMITATION / EXCLUSIONS

- Pipelines for LNG, flammable gas systems and cryogenic fluids.
- Cargo lines on chemical and gas tankers carrying flammable and/or noxious media, propylene oxide and mixtures of ethylene and propylene oxide.

TYPE APPROVAL DOCUMENTATION

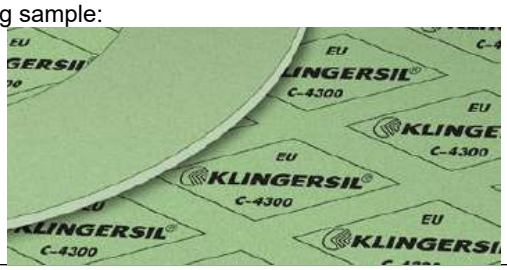
TESTS CARRIED OUT

Documentation of tests performed are the basis for this Type Approval as referenced in the list above and DNV Ref.-Nos. 262.1-029484.

MARKING OF PRODUCT

For traceability of products, marking shall be legible and indelible.
Products are to be marked at least as follows:

Marking sample:

- Manufacturer's name / label - Product type / name	Marking sample: 

PERIODICAL ASSESSMENT

For retention of the Type Approval, a DNV Surveyor shall perform periodical assessment to verify that the conditions for the Type Approval are complied with (refer to the Class Programme DNV-CP-0338, Sec. 4).

To check the validity of this certificate, please look it up in https://approvalfinder.dnv.com

END OF CERTIFICATE