



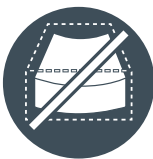
Kaiflex R-FORCE

SERIEF: Semi-rigid elastomeric foam

World premiere!



High compressive strength



Ultra low thermal expansion



The material

Kaiflex R-FORCE is not actually a material, but a technology. An elastomeric insulating material, known as Kaiflex, forms the basis of a patented method which is used to produce a high-quality, compression resistant, fine-celled foam. This allows its strength to vary over a wide range of up to more than 150 kPa (EN 816). Kaiflex R-FORCE gives elastomeric products unique properties no other material can achieve:

All Kaiflex R-FORCE materials have exceptional compression characteristics. The greater the exerted pressure, the disproportionately more the counteracting force developed by the Kaiflex R-FORCE. This progressive behaviour under pressure provides much greater application reliability in comparison to thermoplastic or rigid foams: While standard foams only follow the pressure proportionally, Kaiflex R-FORCE builds up extreme counter pressure which halts the compression. Strong rigid foams on the other hand, will break at some point. Any potential collapse of Kaiflex R-FORCE will occur very late on, and then only gradually, never abruptly.

The technology

Kaiflex R-FORCE combines two specifically bridged networks in a single material: three-dimensionally interlinked (vulcanised) rubber and a three-dimensionally interlinked copolymer. This bond reacts firmly and rigidly to pressure and loads, yet yields selectively under bending forces.

Kaiflex R-FORCE is used in combination with a fully continuous production process based on granulate technology. Standard foams and highly specialised materials profit from this technology for professional use under extreme conditions.



The applications

Kaiflex R-FORCE foams are ideal for all applications which require stability together with simple handling and the partial retention of rubber properties:



- Pipe supports and cradles, cushions for supports, shafts and pipes



- Load-bearing accessible insulation of pipework and vessels



- Prefabricated fitting and system insulation (prefabs), e.g. pumps, valves.
- Half-shells for pipes, T-pieces, etc.



- Insulation of earth conductors

Kaiflex R-FORCE materials are specifically developed for the following areas:



- Marine & offshore



- Oil & gas, raw material mining



- Chemical and pharmaceutical industry



- Energy generation and transportation

The Kaiflex R-FORCE types

Kaiflex R-FORCE – good compression resistance

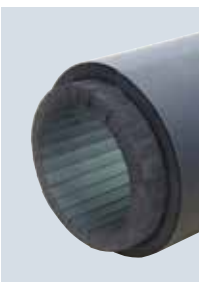
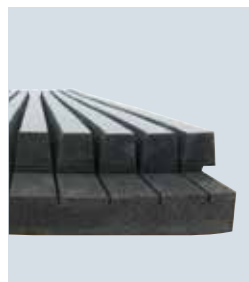
- Economic and homogeneous with respect to its properties thanks to the fully continuous production process, yet as finecelled as block foam
- Hard and firm like rigid foam, but still flexible thanks to its rubber-based production
- Shatterproof and thus capable of bearing large loads
- High degree of application reliability thanks to the progressive compression force
- Closed-celled, and thus water and vapour resistant; does not melt or creep under high temperatures or pressure

Kaiflex R-FORCEplus – the mat making pre-insulation obsolete

- Fast, safe and versatile insulation anywhere on site or in the workshop thanks to the patent pending Kaiflex R-FORCEplus V-Cut mats.
- Properties of Kaiflex R-FORCE, applied like a prefab.

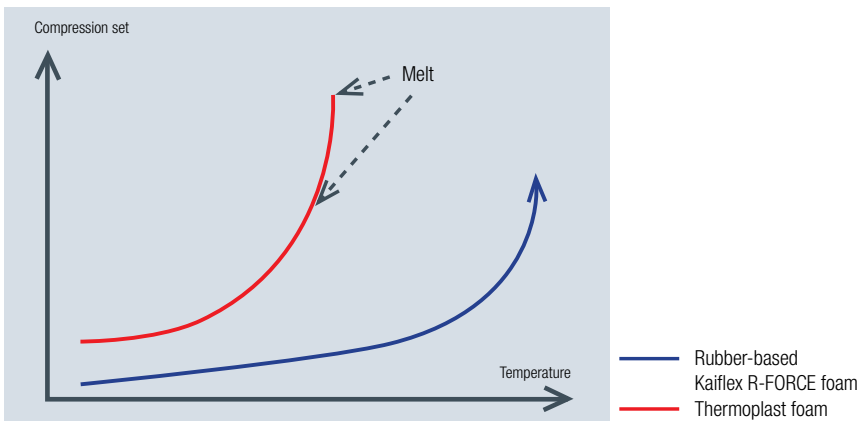
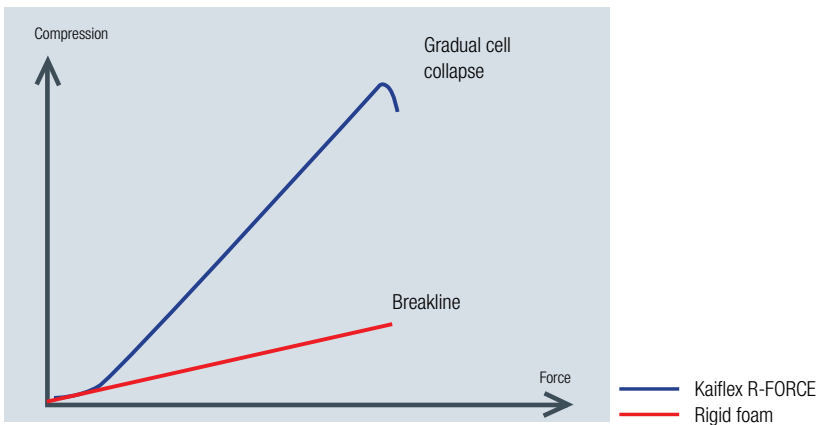


- Low thermal expansion coefficient; does not collapse under cryogenic temperatures and does not inflate at high temperatures

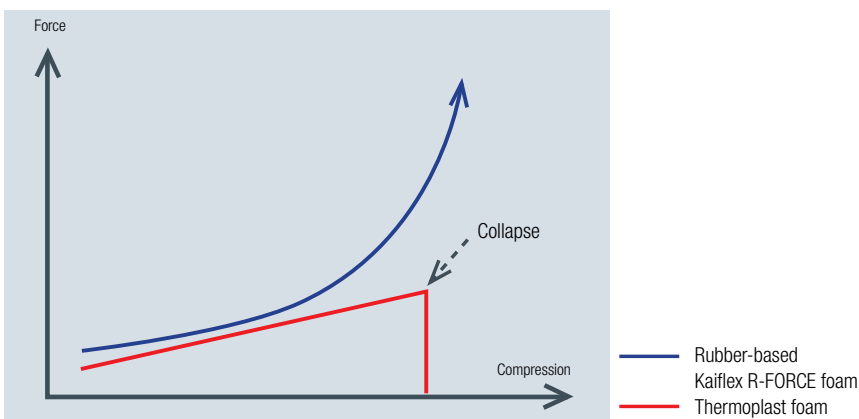


The comparison

Kaiflex R-FORCE in comparison with thermoplastic materials



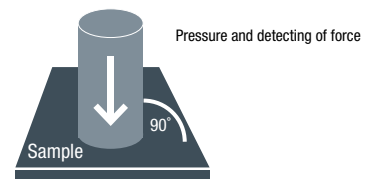
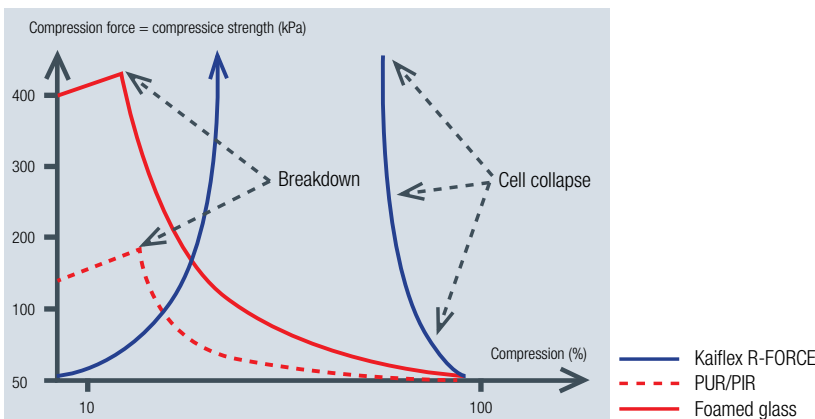
No creeping under pressure or gravity.



No cell collapse at high load or sudden impact.



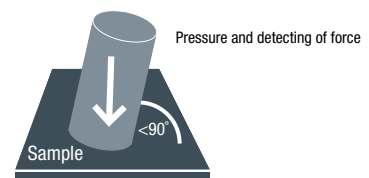
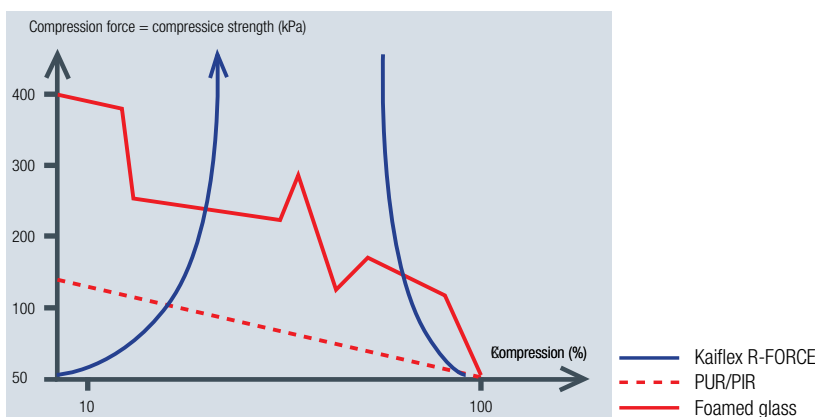
Kaiflex R-FORCE in comparison with rigid materials



Applying 90° angle weight load

(e.g. EN 826):

PIR and glass start high, but break soon. Kaiflex R-FORCE starts lower but progressively sets a counterforce to pressure; does not break.



Applying non-rectangular load:

Sheer force or vibration leads to destruction of rigid materials; glass will irregularly crack down, PIR will be sheared to dust. Kaiflex R-FORCE response is independent from the angle the force applied.

The advantages

Kaiflex R-FORCE elastomeric rigid foams offer new, versatile opportunities:

Broad property profile

- Densities from 60 to 300 kg/m³
- Thermal conductivity $\lambda \leq 0,040$ W/(m·K) at +10 °C
- Moisture barrier effect up to $\mu \geq 10.000$ without or $\mu \geq 50.000$ with Kaiflex Claddings
- Compressive strengths from 50 to 160 kPa (EN 826)
- Ultra low thermal expansion $3,94 \times 10^{-6}K^{-1}$

Extremely easy to handle

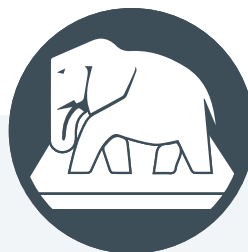
- Very easy to cut; can be milled and drilled, yet remains slightly flexible and not brittle
- Bonds easily with Kaiflex adhesives 415plus or 494 HHF
- Prefabs for ultra-quick insulation of fittings

Application reliability

- Consistent insulating values over time (cell gas is air!)
- Low moisture absorption and hydrophobic surface mean no moisture penetration, which would otherwise increase thermal conductivity
- Vapour barrier effect (immanent vapour barrier) which protects installations from moisture condensation and corrosion

Kaiflex R-FORCE creates a world exclusive out of rubber-based foam: **elastomeric rigid foam**. Together with other products from the Kaimann range, e.g. Kaiflex rubber foam, Kaisound acoustic insulation and Kaifinish corrosion protection, it **forms a complete** insulation system **for all purposes**. The innovative products are also backed up by the Kaimann **expertise** with company specialists on hand to provide designers, users and operators with **optimised, customised solutions**.

- Rubber, but compression resistant
- Compression resistant, but shatterproof
- Unique, patent pending
- Universal



High compressive strength
>50 kPa



Ultra low thermal expansion
 $3,94 \times 10^{-6}K^{-1}$

Kaiflex R-FORCE Technical Data

Patent pending

Material		Semi-rigid elastomeric foam (SERIEF)	Test acc. to ASTM D 1056/ASTM D 6576
Characteristics		High load-bearing durable foam, semi-rigid, still bendable and not brittle	
Application		Temperature and/or noise shielding	
Cell structure		Closed, very fine cell	
Colour		Black	
Upper temperature limit		+85 °C	
Lower temperature limit		-50 °C (-200 °C)	See remark (1)
Compressive strength		>50 kPa (25 %)	Test acc. to EN 826/ASTM C 165
Tensile strength		>3 MPa	Test acc. to DIN 53 504 / ISO 37 / ASTM D 412
Elongation at break		>80 %	Test acc. to DIN 53 504 / ISO 37 / ASTM D 412
Thermal conductivity	$\lambda_{0, °C} = 0,039 \text{ W/(m}\cdot\text{K)}$	$\lambda_{\vartheta} = 0,039 + \vartheta \cdot 8 \cdot 10^{-6} + \vartheta^2 \cdot 7 \cdot 10^{-7} \text{ W/(m}\cdot\text{K)}$	Test acc. to DIN EN ISO 8497 / ASTM C 177
Water vapour permeability	Moisture resistance factor μ	≥ 5.000	Test acc. to DIN EN 12086
Water absorption		<3 %	Test acc. to ISO 26 / ASTM D 570
Fire classification	Euroclass [◊] Self-extinguishing	E B _L -s1, d0 * Yes (E)	Test acc. to DIN EN 13501-1 Test acc. to ISO 11925-1
Practical fire behaviour		Flame retardant, self-extinguishing, does not melt or drip	
Other attributes	pH-Value	7 (neutral)	
Thermal expansion coefficient	Cryogenic temperature +22 °C to -196 °C	$3,94 \times 10^{-6} \text{K}^{-1}$	Test acc. to EN 13471
Acoustic Properties	Sound reduction L_{in} Sound absorption level α_w	>12 dB (A) >0,20 (H)	Test acc. to EN 14388 Test acc. to ISO 354 / ISO 11654
Resistance to	Mould growth Chemicals	Very good Very good / good (oil, petrol, water, low concentrated acids)	In acc. with VDI 6022 In acc. with DIN EN ISO 2812-1
Environmental aspects		ODP Zero GWP Zero	
Health aspects		Dust & fibre free Heavy metal (e.g. cadmium, lead) and formaldehyde free	
Storage		Store in a dry room at a typical relative humidity (between 50 % and 70 %) and room temperature (between 0 °C and +35 °C)	
Outdoor applications		Needs protection against UV-radiation	See remark (2)
Glueing		With Kaiflex adhesive 415plus, Kaiflex adhesive 494 HHF (hexan and halogen free)	

Remark (1) For temperatures below -50 °C please contact our Technical Support Team for advice.

Remark (2) To protect against UV-induced deterioration Kaiflex should be either painted using Kaifinish paint or covered with a suitable UV resistant cladding system within 3 days of being installed outdoors (e.g. Kaiflex Protect R elastomeric cladding, Kaiflex INCERAM fire protection cladding).

* With Kaiflex INCERAM-Cladding.

◊ The Euroclass rating applies to metallic or solid mineral substrates.

