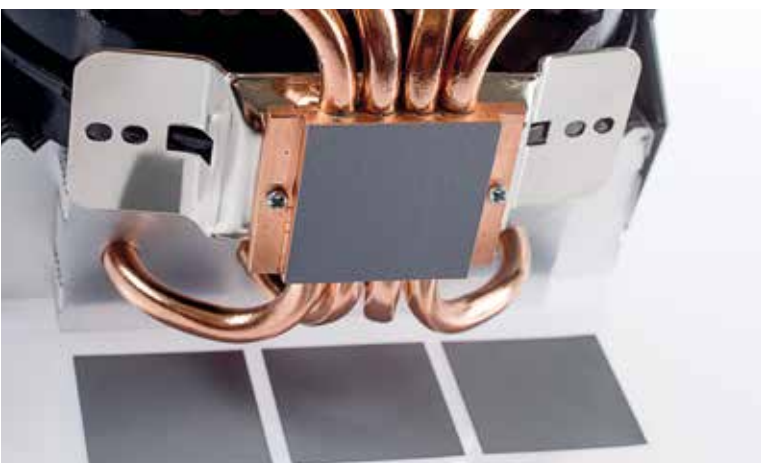


KERATHERM®

Thermal Management Solutions

Innovation in Technology and Environmental Protection



KERATHERM



The information provided in this Technical Data Sheet (TDS) including the recommendations for use and application of the product are based on our knowledge and experience of the product as at the date of this TDS. The product can have a variety of different applications as well as differing application and working conditions in your environment that are beyond our control. Kerafol is, therefore, not liable for the suitability of our product for the production processes and conditions in respect of which you use them, as well as the intended applications and results. We strongly recommend that you carry out your own prior trials to confirm such suitability of our product. All specifications are subject to change without notice. Any liability in respect of the information in the Technical Data Sheet or any other written or oral recommendation(s) regarding the concerned product is excluded. In case Kerafol would be nevertheless held liable, on whatever legal ground, Kerafol's liability will in no event exceed the amount of the concerned delivery. All Kerafol products are sold pursuant to the Kerafol's Terms and Conditions of sale and delivery in effect from time to time, a copy of which will be furnished upon request.

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KERAFOL®

Your partner for Thermal Solutions and Development Services!



Quality Assurance



Research & Development

Experienced, innovative and customer-oriented

Many years of experience with oxidic and non-oxidic ceramic materials, continuous development of innovative and customer-focused solutions, and a global sales and distribution network with short delivery times are just some of the reasons why we are one of the leading specialists and manufacturers for thermal management solutions.

Modern production facilities

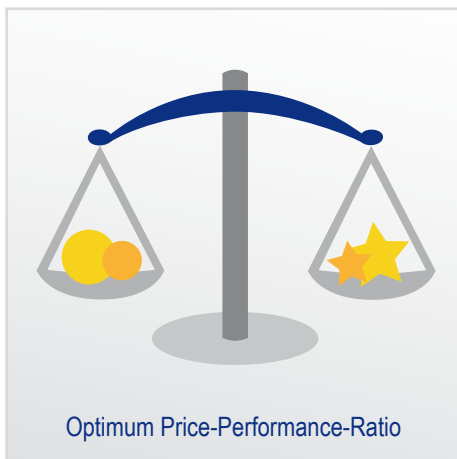
Our ceramic tapes are manufactured on the latest production facilities, either as standard or customer-specific products in a continuous process. The films can be ordered as endless, rolled material, or already individually punched in several thicknesses. Thereby the flexible ceramic films can be processed in customer specific geometries.



International Distribution Network

Development, quality control and environmental compatibility

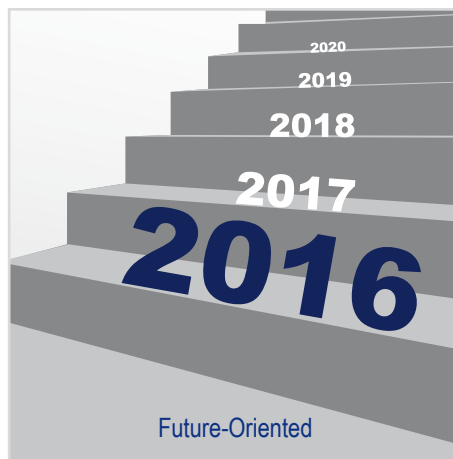
In order to offer our customers competent, customized advice and individual problem solutions, our engineers and staff are constantly doing research, development and tests on new, innovative and high quality materials in our in-house R&D laboratory. Through tests during product development, we guarantee the environmental compatibility of all raw materials, the manufacturing process and the recyclability of our products. **All Keratherm products are RoHS- and REACH compliant!**



Kerafol – Customer satisfaction in all areas

Kerafol offers a wide range of products, suitable for diverse applications, as for example in microelectronics, power supply, white goods, telecommunication or AC-DC converters.

Our foremost goal is to provide our customers with competent, customer-oriented problem solutions, which we guarantee through continuous quality control, optimization of processes and manufacturing steps.



Many years of experience and a wide variety of innovative solutions makes KERAFOl your essential partner in the field of “Thermal Management”.

Why “Thermal Solutions”?

The continuously increasing technical demands, placed by the electronics industry on electronic and electrical devices, have led to a dramatic rise in the problem of heat generation. Higher frequencies, component miniaturization, enhanced functionality and increased device power ratings all lead to high temperatures that need to be controlled to ensure excellent long term stability and durability. Heat sinks, cooling plates and ventilators are often used to dissipate the heat and to reduce the temperature of the electrical circuits to a minimum.

The thermal coupling of suitable conducting materials is also gaining importance in this area. Kerafol, with Keratherm products, offers an effective, uncomplicated and cost-effective range of products for this purpose.



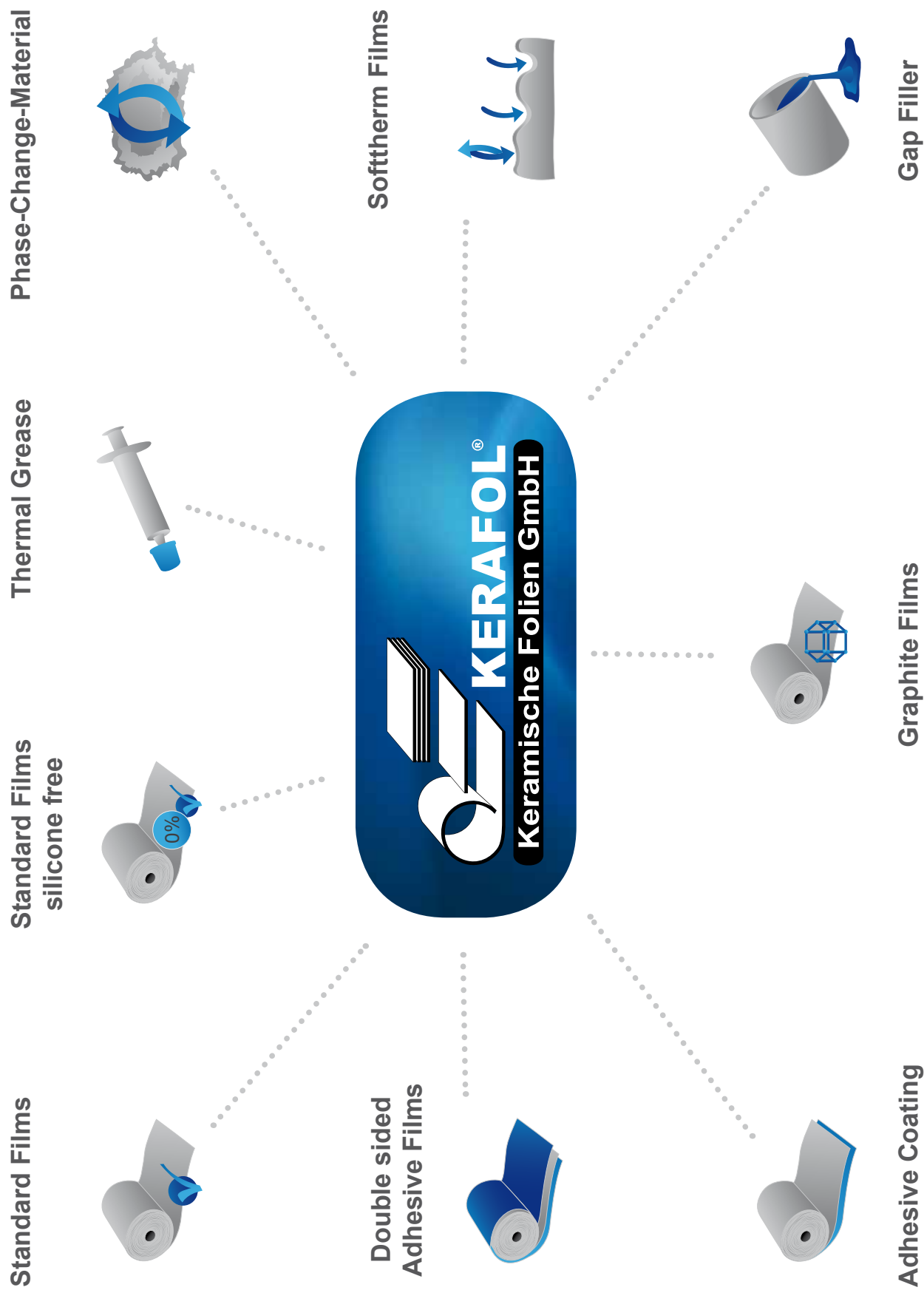
About Keratherm

Keratherm are highly flexible products that are comprised of thermally conductive and electrically insulating polymeras, either single or multicomponent filled with ceramic or heat conducting materials.

Keratherm, when mechanically reinforced with fibre glass or other materials, offers the user a versatile product that is superior to conventional ceramic or mica discs.

Keratherm Products: Advantages and Properties

- Keratherm heat conducting films are characterized by their high thermal conductivity and their electrical insulation.
- In contrast to discs made of mica, aluminum or polyamide, Keratherm can be used without a heat conducting compound.
- Compared to conventional heat conducting materials, Keratherm does not dry out during continuous use, thus retaining its good thermal conductivity properties over the years.
- By using Keratherm products, mounting problems, such as smearing and assembly errors, can be avoided.
- Silicone-based Keratherm facilitate component mounting, thanks to their self-adhesive properties.
- Single-sided adhesive coating is also available, and allows long term attachment, even up-side down.

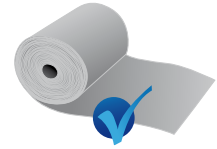


Keratherm Products

Standard Films

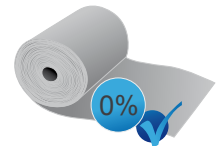
Standard Films white, green, pink, red, brown and the MT-films have a smooth surface, in order to ensure that there is no entrapped air that would interfere with the heat transfer between the component and the heat sink. The material smooths out microscopic irregularities in the contact surfaces, which improves the thermal interface and therefore increases the heat dissipation.

The thermoplastic elastomere MT-films provide very good insulating behaviour, excellent mechanical and thermal characteristics.



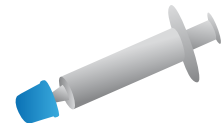
Standard Films silicone free

Silicone free standard films are used wherever the use of silicone can lead to problems. Besides excellent thermal and electrical properties, these films are characterized by their good cut-through resistance.



Thermal Grease

Thermal Grease is especially characterized, by its good plasticity and very low thermal resistance. There is no drying out or leaking of the silicone components.



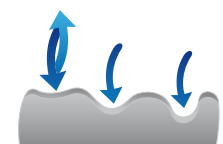
Phase-Change-Material

Phase-Change-Material comprises a combination of hot-melt waxes with or without support. These films smooth out even the smallest irregularities between the power module and heat sink, thereby optimizing the contact between the surfaces and increasing the heat transfer.



Softtherm Films

Softtherm is the ideal material for smoothing out even large component irregularities. Thanks to its outstanding compressibility, it produces an optimum thermal contact combined with electrical insulation. The supplied thicknesses range from 0.5 - 5.0 mm. Other thicknesses or shapes are available on request.



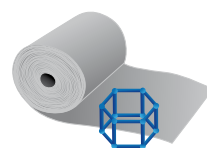
Gap Filler

Thermal Compounds can be used for encapsulating whole applications and dispensing housing lids or heat sinks. Thanks to its ease of use, it allows even the most complicated geometries to be encapsulated.



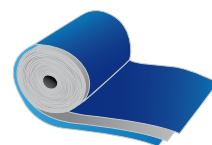
Graphite Films

Graphite Films are based on 100% pure graphite. The films are available as uncoated types or with filled adhesive or standard adhesives for specific applications.



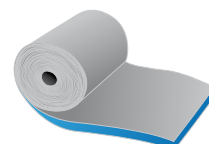
Adhesive Films

The Adhesive Films KL 90 und KL 91 are thermoconducting, electrically isolating, double sided adhesive films. They have an excellent, permanent adhesive strength with high thermal conductivity and outstanding insulation characteristics at the same time.



Adhesive Coating

Adhesive Coating: Every film type requires its own special adhesive system. Kerafol offers a variety of adhesives with various adhesive strength (from low to high) and fillings for improved heat transfer.



Standard Films

Film		thermal conductivity	thermal resistance	breakdown voltage	measured thickness	hardness	characteristics	page
		W/mK	K/W	kV	mm	Shore A		
86/82	red with fibre glass	6.5	0.09	1.0	0.250	60 - 70	very high thermal conductivity	20
86/60	pink, without fibre glass	4.5	0.14	> 5.0	0.250	60 - 75	high thermal conductivity and high isolation	19
86/50	Keratherm pink	3.5	0.16	1.5	0.225	70 - 80	high thermal conductivity	18
86/30	Keratherm white	2.5	0.22	1.5	0.225	70 - 80	good thermal conductivity / isolation	16
86/37	Keratherm green	1.8	0.32	8.0	0.225	65 - 75	high isolation	17
70/50	brown with fibre glass	1.4	0.44	5.0	0.250	80 - 90	good price-performance-ratio	21

Standard Films silicone free

Film		thermal conductivity	thermal resistance	breakdown voltage	measured thickness	hardness	characteristics	page
		W/mK	K/W	kV	mm	Shore A		
U 90	silicone free	6.0	0.082	4.0	0.200	70 - 85	silicone free, high thermal conductivity	23
U 85	silicone free	3.0	0.165	6.0	0.200	70 - 85	silicone free, high thermal conductivity and high isolation	22
U 80	silicone free	1.8	0.20	4.0	0.150	80 - 90	silicone free	23
MT 103	Elastomer-film	1.8	0.39	10.0	0.280	70 - 80	silicone free, high isolation	24
MT 102	Elastomer-film	1.1	0.53	10.0	0.250	65 - 75	silicone free, high isolation	24

Thermal Grease

Film		thermal conductivity	thermal resistance	measured thickness	characteristics	page
		W/mK	K/W	mm		
KP 96	ceramic filled silicone component	2.4	0.038	0.025	no drying out, very thin to apply	26
KP 97	ceramic filled silicone component	5.0	0.012	0.025	silicone based	26
KP 98	ceramic filled silicone component	6.0	0.01	0.025	silicone based, low thermal resistance	26
KP 99	ceramic filled silicone component	9.2	0.0068	0.025	very low thermal resistance	26
KP 12	silicone free thermal compound	10.0	0.006	0.025	silicone free	26

Gap Filler

Film		thermal conductivity	viscosity	dielectric breakdown	density	hardness	characteristics	page
		W/mK	Pas	kV/mm	g/cm ³	Shore 00		
GF 300	2-component silicone elastomer	3.0	55 - 85	14.0	1.9	40 - 55	good compressibility	48
GF 255	2-component silicone elastomer	1.5	30 - 55	8.0	1.7	10 - 25	very good compressibility	48

Gap Filler Liquid

Film		thermal conductivity	viscosity	dielectric breakdown	density	hardness	characteristics	page
		W/mK	Pas	kV/mm	g/cm ³	Shore 00		
GFL 3020		1.8	45 - 70	20	2.3	45 - 60	liquid gap filler	47
GFL 3030		2.9	40 - 70	12	2.6	40 - 60	liquid gap filler	47

Softtherm Films

Film		thermal conductivity	thermal resistance	breakdown voltage	measured thickness	hardness	characteristics	page
		W/mK	K/W	kV	mm	Shore 00		
86/600	Softtherm film	6.0	0.2	1.5	0.5	60 - 75	high thermal conductivity	42
86/525	Softtherm film	5.5	0.22	1.25	0.5	50 - 65	excellent thermal conductivity, very good compressibility	41
86/500	Softtherm film	5.0	0.25	1.0	0.5	65 - 75	high thermal conductivity	40
86/450	Softtherm film	4.5	0.27	5.0	0.5	65 - 75	very good thermal and dielectric characteristics	39
86/300	Softtherm film	3.0	0.41	7.0	0.5	60 - 75	flexible, high thermal conductivity	36
86/325	Softtherm film	3.0	0.41	6.0	0.5	35 - 50	soft, high thermal conductivity	38
86/320	Softtherm film	2.5	0.50	5.0	0.5	25 - 38	very soft, good dielectric properties	37
86/225	Softtherm film	2.0	0.60	6.0	0.5	30 - 45	fibreglass-reinforced, good self-adhesive behaviour on both sides	34
86/228	Softtherm film	2.0	0.6	6.0	0.5	30 - 45	double layer	34
86/235	Softtherm film	2.0	0.60	6.0	0.5	25 - 40	soft, high thermal conductivity	35
86/238	Softtherm film	2.0	0.6	6.0	0.5	25 - 40	double layer	35
86/128	Softtherm film	1.5	0.8	6.0	0.5	10 - 25	double layer	32
86/125	Softtherm film	1.5	0.80	6.0	0.5	10 - 25	soft, high compressibility	32
86/200	Softtherm film	1.0	1.20	8.0	0.5	10 - 20	soft, highly compressible	33

Softtherm Films silicone free

Film		thermal conductivity	thermal resistance	breakdown voltage	measured thickness	hardness	characteristics	page
		W/mK	K/W	kV	mm	Shore 00		
U 281	Softtherm epoxide resin	2.0	0.60	7.0	0.5	55 - 65	good compressibility, silicone free	44
Ac 500	Softtherm silicone free	4.2	0.3	2.0	0.5	60 - 75	silicone free	45

Graphite Films

Film		thermal conductivity	thermal resistance	breakdown voltage	measured thickness	hardness	characteristics	page
		W/mK	K/W	kV	mm	Shore D		
S 900	highly compressed Graphite film	7.5	0.08	not insulating	0.290	25 - 35	highest thermal conductivity	50
90/10	Graphite film	5.5	0.09	not insulating	0.200	25 - 35	good thermal conductivity	51

Adhesive Films

Film		thermal conductivity	thermal resistance	dielectric breakdown	measured thickness	hardness	characteristics	page
		W/mK	K/W	kV/mm	mm	Shore A		
KL 90	thermal conductive, adhesive film without fibre glass	1.40	0.52	20.0	0.300	45	thermoconducting and isolating, adhesive film	52
KL 91	thermal conductive, adhesive film with fibre glass	1.35	0.55	20.0	0.300	59	thermoconducting and isolating, adhesive film	52

PCM

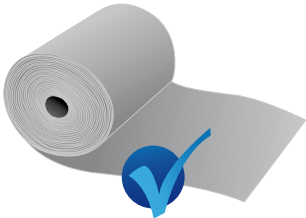
Film		thermal conductivity	thermal resistance	measured thickness	characteristics	page
		W/mK	K/W	mm		
PCM 115	filled hot setting wax	4.5	0.069	0.200	high thermal conductivity, self sticky, easy handling	25
PCM 471	filled hot setting wax	4.0	0.07	0.200	high thermal conductivity	25



Made in Germany

Standard Films

Cost effective standard solutions



Standard films are flexible and consist of a silicone elastomer, filled with various thermoconductive ceramic materials. All film types are electrically insulating. For increased mechanical strength, the films are also available with fibre glass reinforcement.

The standard films adapt to the component surface. Small irregularities can be evened out by using only minimal contact pressures.

The good thermal properties of these films guarantee optimum heat transfer to the heat sink and at the same time achieving good electrical insulation properties.



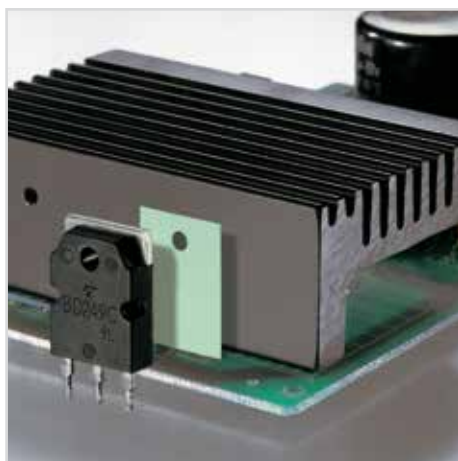


Properties

- good insulation properties
- heat-conducting
- good compressibility
- fully crosslinked
- flexible
- environmentally friendly
- RoHS conforming

Benefits

- smooth surface
- very good properties even at very low contact pressure
- low hardness
- high self-adhesion
- UL listed



Film Options

- optional single-sided adhesive coating
- special thicknesses available
- can be supplied on roll or already punched
- fibre glass reinforcement available

Applications

- power supplies
- automotive, engine controllers
- LCD displays
- white goods
- audio and video components
- power converters

86/30

Keratherm white



The highly thermoconductive white films, with its well-balanced thermal, electrical and dielectric behaviour and very good self-adhesion characteristics, is created by filling a silicone elastomer base with aluminum oxide. An increase in mechanical strength can be achieved through fibre glass reinforcement. These film types can optionally be supplied with an additional adhesive coating.

Applications

- power supplies
- audio and video components
- white goods
- power converters (AC-DC, DC-DC)
- engine controllers

Options

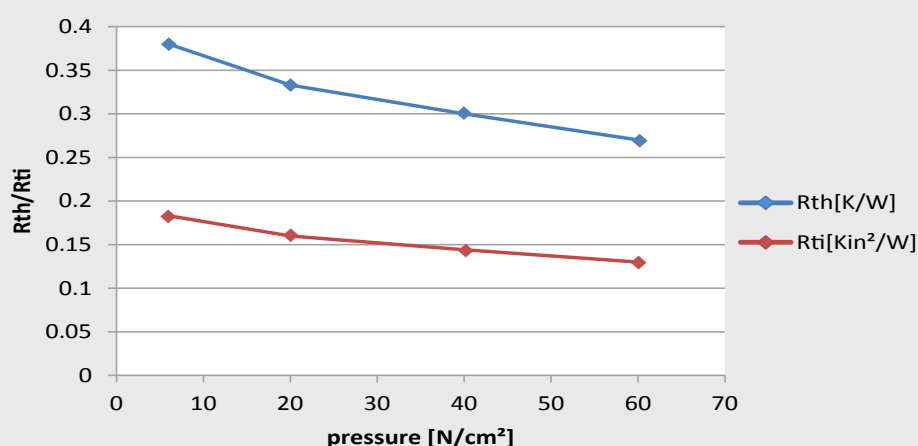
Type	Film structure	Overall thickness	Tensile strength	Breakdown voltage Ud	Thermal resistance
		mm	MPa	kV	K/W
86/10	with fibreglass	0,225	7,5	1,5	0,25
86/20	with fibreglass and adh. Coating	0,25	7,5	1,5	0,3
86/40	with adh. Coating	0,25	1,5	1,5	0,265

Data for engineer guidance only. Observed performance varies in application. Engineers are reminded to test the material in application.

Properties	Unit	86/30
Colour		white
Thermal Properties		
Thermal resistance R_{th}	K/W	0.22
Thermal impedance R_{ti}	°Cmm²/W	90
	Kin²/W	0.13
Thermal conductivity λ	W/mK	2.5
Electrical Properties		
Breakdown voltage $U_{d, ac}$	kV	1.5
Dielectric breakdown $E_{d, ac}$	kV/mm	7
Volume resistivity	Ωm	2.5×10^{11}
Dielectric loss factor $\tan \delta$	1	22×10^{-3}
Dielectric constant ϵ_r	1	3.0
Mechanical Properties		
Measured thickness (+/-10%)	mm	0.225
Hardness	Shore A	70 - 80
Tensile strength	N/mm²	1.5
Elongation	%	31
Physical Properties		
Application temperature	°C	-60 to +250
Density	g/cm³	2.33
Flame rating	UL-94	V-0
Possible thickness *	mm	0.125 / 0.225 / 0.300

*details see page 60

Compression 86/30





86/37

Keratherm green



This silicone elastomer film is characterized by its excellent electrical characteristics. It exhibits good thermal behaviour. Optional fibre glass reinforcement leads to very good mechanical properties. These film-types possess excellent mechanical stability along with good perforation strength. Because of its structure, Keratherm green has extremely good self-adhesive properties. Additional adhesive coatings available.

Applications

- automobiles
- telecommunication units
- high voltage units
- DC-DC converters

Options

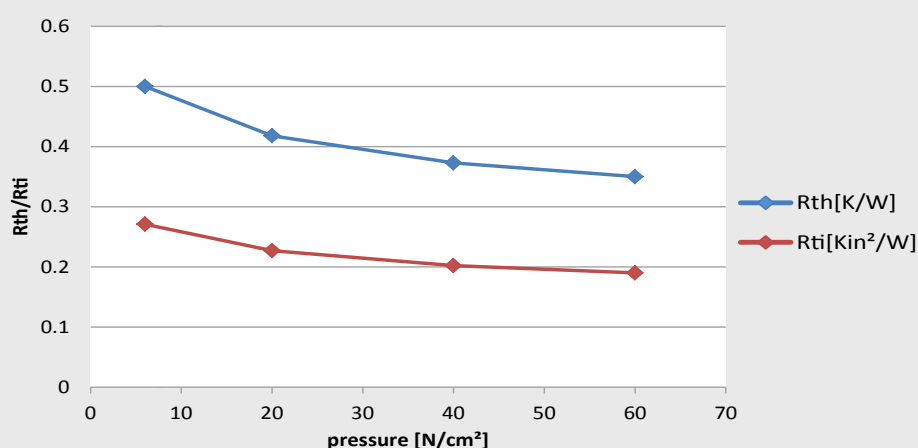
Type	Film structure	Overall thickness	Tensile strength	Breakdown voltage Ud	Thermal resistance
		mm	MPa	kV	K/W
86/17	with fibreglass	0,225	7,5	6,0	0,5
86/27	with fibreglass and adh. Coating	0,25	7,5	6,0	0,55
86/47	with adh. Coating	0,25	2,0	8,0	0,39

Data for engineer guidance only. Observed performance varies in application. Engineers are reminded to test the material in application.

Properties	Unit	86/37
Colour		green
Thermal Properties		
Thermal resistance R_{th}	K/W	0.32
Thermal impedance R_{ti}	$^{\circ}\text{Cmm}^2/\text{W}$	129
	Kin^2/W	0.20
Thermal conductivity λ	W/mK	1.8
Electrical Properties		
Breakdown voltage $U_{d, ac}$	kV	8
Dielectric breakdown $E_{d, ac}$	kV/mm	26
Volume resistivity	Ωm	2.5×10^{11}
Dielectric loss factor $\tan \delta$	1	6.0×10^{-3}
Dielectric constant ϵ_r	1	2.9
Mechanical Properties		
Measured thickness (+/-10%)	mm	0.225
Hardness	Shore A	65 - 75
Tensile strength	N/mm ²	2
Elongation	%	75
Physical Properties		
Application temperature	$^{\circ}\text{C}$	-60 to +250
Density	g/cm ³	2.29
Flame rating	UL-94	V-0
Possible thickness *	mm	0.125 / 0.225 / 0.300

*details see page 60

Compression 86/37



86/50

Keratherm pink



Keratherm pink offers outstanding thermal conductivity, which is achieved by a specially filled silicone elastomer. The good electrical insulation properties are thereby retained. On request, these films can also be supplied with fibre glass reinforcement and with or without adhesive coating. The excellent thermal resistance of this film enables the optimum heat transfer to the heat sink.

Applications

- automobiles
- audio and video components
- white goods
- power converters (AC-DC, DC-DC)
- engine controllers
- LCD displays

Options

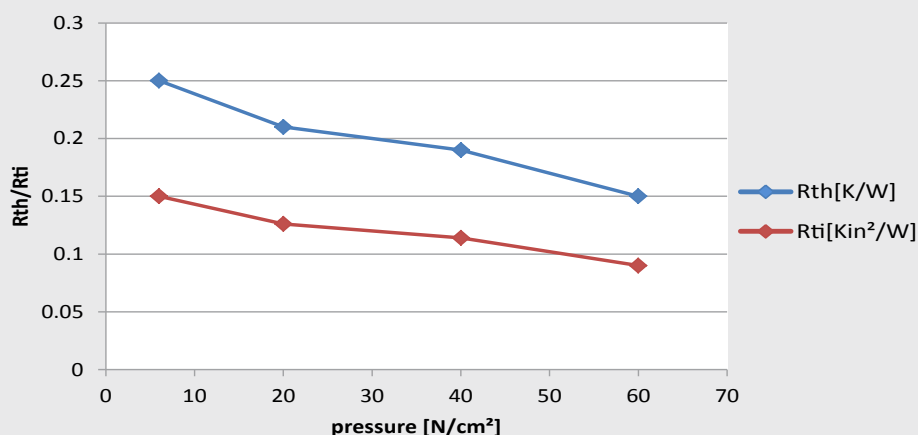
Type	Film structure	Overall thickness	Tensile strength	Breakdown voltage Ud	Thermal resistance
		mm	MPa	kV	K/W
86/51	with adh. Coating	0,25	1,3	1,5	0,26
86/52	with fibreglass	0,225	10,0	1,5	0,22
86/53	with fibreglass and adh. Coating	0,25	10,0	1,5	0,27

Data for engineer guidance only. Observed performance varies in application. Engineers are reminded to test the material in application.

Properties	Unit	86/50
Colour		pink
Thermal Properties		
Thermal resistance R_{th}	K/W	0.16
Thermal impedance R_{ti}	$^{\circ}\text{Cmm}^2/\text{W}$	64
	Kin^2/W	0.09
Thermal conductivity λ	W/mK	3.5
Electrical Properties		
Breakdown voltage $U_{d, ac}$	kV	1.5
Dielectric breakdown $E_{d, ac}$	kV/mm	7
Volume resistivity	Ωm	1.3×10^{14}
Dielectric loss factor $\tan \delta$	1	6.7×10^{-2}
Dielectric constant ϵ_r	1	2.3
Mechanical Properties		
Measured thickness (+/-10%)	mm	0.225
Hardness	Shore A	70 - 80
Tensile strength	N/mm ²	1.3
Elongation	%	25
Physical Properties		
Application temperature	$^{\circ}\text{C}$	-60 to +250
Density	g/cm ³	1.79
Flame rating	UL-94	V-0
Possible thickness *	mm	0.125 / 0.225 / 0.300

*details see page 60

Compression 86/50





86/60

Keratherm



Keratherm 86/60 offers outstanding thermal conductivity, which is achieved by a specially filled silicone elastomer. The excellent electrical insulation properties are thereby retained. The excellent thermal resistance of this film enables the optimum heat transfer to the heat sink.

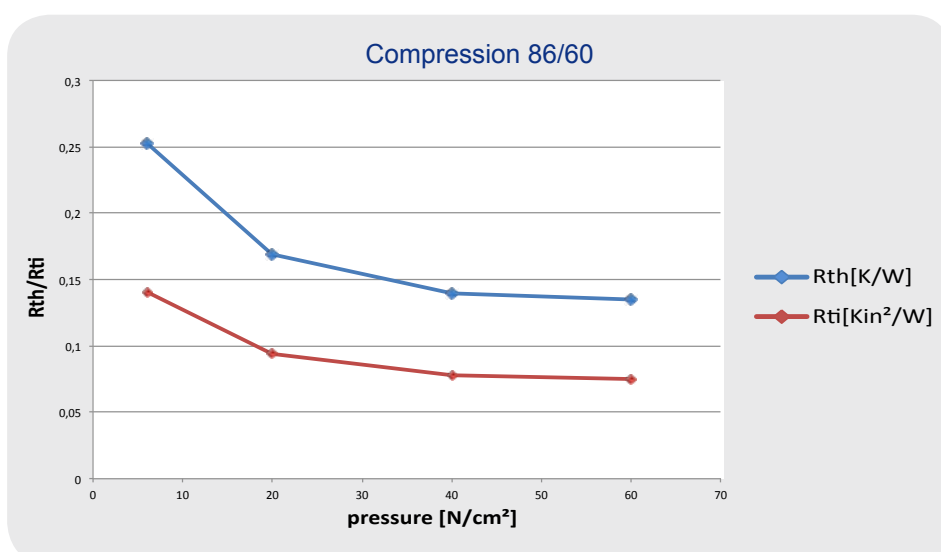
✓ Optionally available with
onside adhesive coating **86/60K**

Applications

- automobiles
- audio and video components
- white goods
- power converters (AC-DC, DC-DC)
- engine controllers
- LCD displays

Properties	Unit	86/60
Colour		pink
Assembly		single layer, without glass reinforcement
Thermal Properties		
Thermal resistance R_{th}	K/W	0.14
Thermal impedance R_{ti}	°Cmm²/W	56
	Kin²/W	0.079
Thermal conductivity λ	W/mK	4.5
Electrical Properties		
Breakdown voltage $U_{d: ac}$	kV	5.0
Dielectric breakdown $E_{d: ac}$	kV/mm	20
Volume resistivity	Ωm	> 600 x 10 ⁹
Dielectric loss factor $\tan \delta$	1	0.0
Dielectric constant ϵ_r	1	1.47
Mechanical Properties		
Measured thickness (+/-10%)	mm	0.250
Hardness	Shore A	60 - 75
Tensile strength	N/mm²	> 0.5
Elongation	%	25
Physical Properties		
Application temperature	°C	-60 to +250
Density	g/cm³	1.38
Flame rating	UL-94	V-0
Possible thickness *	mm	0.150 / 0.250 / 0.300

*details see page 60



Data for engineer guidance only. Observed performance varies in application. Engineers are reminded to test the material in application.

86/82

Keratherm red



This film is especially suitable for high-power applications. It has excellent thermal and electrical properties. Thanks to its good performance, Keratherm red can be used reliably in densely packed electronic applications.

✓ Optional available with adhesive coating as **86/82 K**

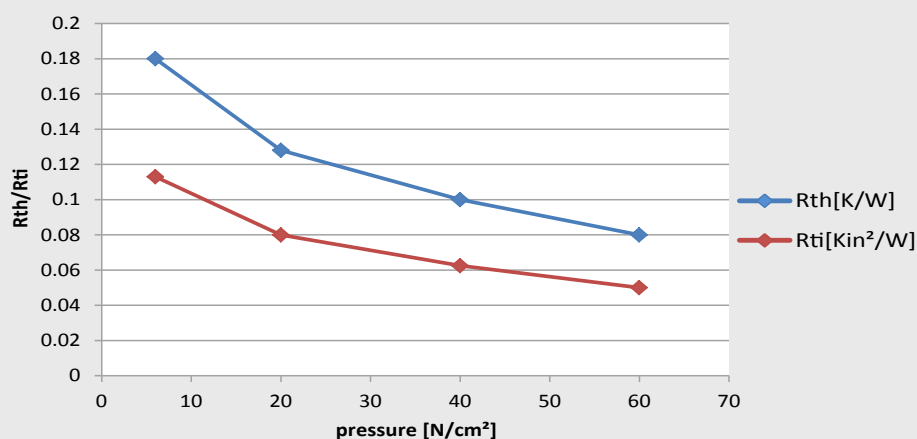
Applications

- "high end" solution
- control boards
- BGA applications
- hard-disc-drives

Properties	Unit	86/82
Colour		red
Thermal Properties		
Thermal resistance R_{th}	K/W	0.09
Thermal impedance R_{ti}	°Cmm²/W	35
	Kin²/W	0.05
Thermal conductivity λ	W/mK	6.5
Electrical Properties		
Breakdown voltage $U_{d, ac}$	kV	1
Dielectric breakdown $E_{d, ac}$	kV/mm	4
Volume resistivity	Ωm	2.0×10^{14}
Dielectric loss factor $\tan \delta$	1	1.4×10^{-2}
Dielectric constant ϵ_r	1	2.4
Mechanical Properties		
Measured thickness (+/-10%)	mm	0.250
Hardness	Shore A	60 - 70
Tensile strength	N/mm²	13
Elongation	%	2
Physical Properties		
Application temperature	°C	-40 to +200
Density	g/cm³	1.23
Flame rating	UL-94	V-0
Possible thickness *	mm	0.250 / 0.300

*details see page 60

Compression 86/82





70/50

Keratherm brown



Keratherm brown, with its very good thermal properties, is an excellent choice for cost-effective solutions. These fibre glass reinforced films, along with their very smooth surface, have very good thermal resistance with a high insulation capacity at low mounting pressures.

Applications

- automobiles
- engine controllers
- LCD displays
- power converters (AC-DC, DC-DC)
- audio and video components
- white goods

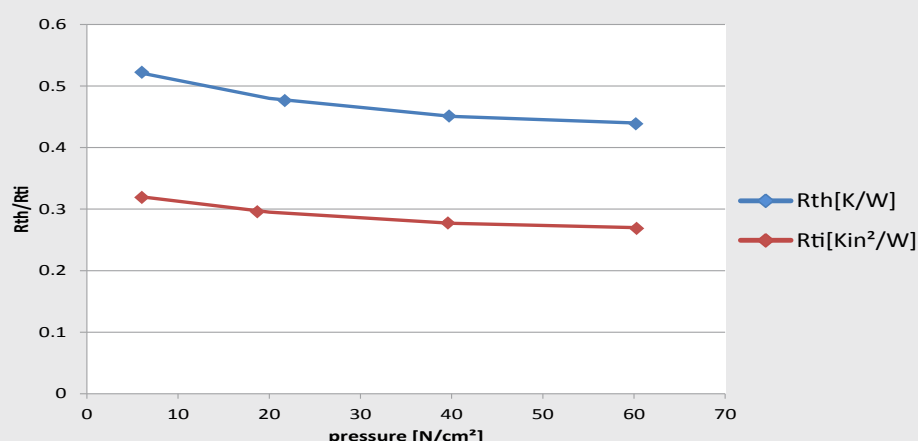
Options

Type	Film structure	Overall thickness	Tensile strength	Breakdown voltage Ud	Thermal resistance
		mm	MPa	kV	K/W
70/60	with adh. Coating	0,275	10,0	5,0	0,53

Properties	Unit	70/50
Colour		brown
Thermal Properties		
Thermal resistance R_{th}	K/W	0.44
Thermal impedance R_{ti}	$^{\circ}\text{Cmm}^2/\text{W}$	178
	Kin^2/W	0.27
Thermal conductivity λ	W/mK	1.4
Electrical Properties		
Breakdown voltage $U_{d, ac}$	kV	5
Dielectric breakdown $E_{d, ac}$	kV/mm	20
Volume resistivity	Ωm	1.0×10^{13}
Dielectric loss factor $\tan \delta$	1	7.3×10^{-3}
Dielectric constant ϵ_r	1	3.6
Mechanical Properties		
Measured thickness (+/-10%)	mm	0.250
Hardness	Shore A	80 - 90
Tensile strength	N/mm ²	10
Elongation	%	5
Physical Properties		
Application temperature	$^{\circ}\text{C}$	-40 to +200
Density	g/cm ³	2.18
Flame rating	UL-94	V-1
Possible thickness *	mm	0.250

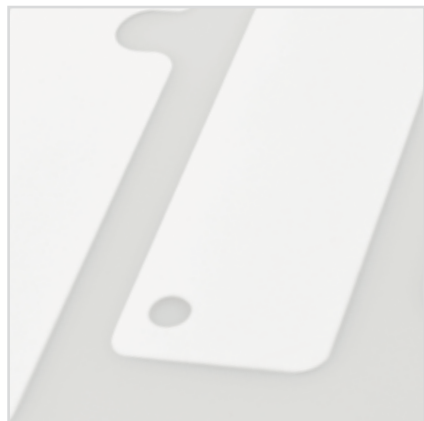
*details see page 60

Compression 70/50



U 85

Keratherm silicone free U-Film



In case of concerns about using epoxy, we offer you a ceramic-filled epoxy film as an alternative material. Besides good thermal and outstanding electrical properties, these films are characterized by very good performance strength.

These good physical properties are matched with an excellent price-performance ratio.

✓ Optional available with adhesive coating as **U 85 K**

Applications

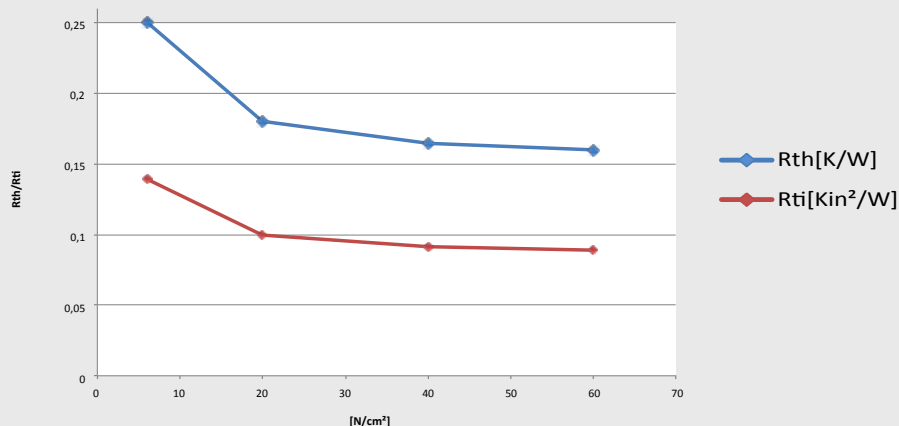
- medical applications
- laser equipment
- lighting systems
- CD-rom drives
- aero units
- space units

Properties	Unit	U 85
Colour		light blue
Thermal Properties		
Thermal resistance R_{th}	K/W	0.165
Thermal impedance R_{ti}	°Cmm ² /W	60.2
	Kin ² /W	0.091
Thermal conductivity λ	W/mK	3.0
Electrical Properties		
Breakdown voltage $U_{d, ac}$	kV	6
Dielectric breakdown $E_{d, ac}$	kV/mm	30
Volume resistivity	Ωm	4.08×10^9
Dielectric loss factor $\tan \delta$	1	26×10^{-3}
Dielectric constant ϵ_r	1	1.96
Mechanical Properties		
Measured thickness (+/-10%)	mm	0.200
Hardness	Shore A	70 - 85
Tensile strength	N/mm ²	1
Physical Properties		
Application temperature	°C	-40 to +150
Density	g/cm ³	1.44
Flame rating	UL-94	V-0**
Possible thickness *	mm	0.125 / 0.200 / 0.300

*details see page 60

**Kerafol test according to UL

Compression U 85



Data for engineer guidance only. Observed performance varies in application. Engineers are reminded to test the material in application.



U 80 & U 90

Keratherm silicone free U-Films



In case of concerns about using silicones, we offer you a ceramic-filled polyurethane film as an alternative material. Besides good thermal and outstanding electrical properties, these films are characterized by very good perforation strength.

These good physical properties are matched with an excellent price-performance ratio.

✓ Optional available with adhesive coating as **U 80 K / U 90 K**

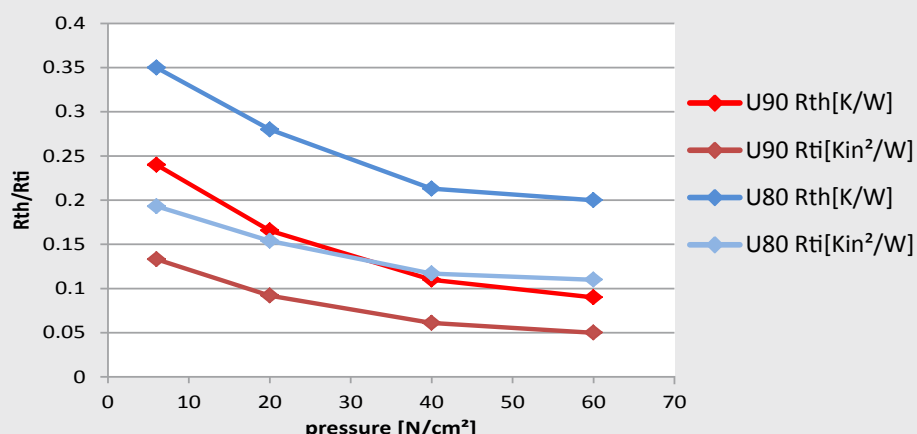
Applications

- medical applications
- laser equipment
- lighting systems
- CD-rom drives
- aero units
- space units

Properties	Unit	U 80	U90
Colour		blue	light blue
Thermal Properties			
Thermal resistance R_{th}	K/W	0.2	0.082
Thermal impedance R_{ti}	$^{\circ}\text{Cmm}^2/\text{W}$	73	32.9
	Kin^2/W	0.11	0.05
Thermal conductivity λ	W/mK	1.8	6
Electrical Properties			
Breakdown voltage $U_{d, ac}$	kV	4	4
Dielectric breakdown $E_{d, ac}$	kV/mm	25	25
Volume resistivity	Ωm	1.44×10^{14}	2.0×10^{11}
Dielectric loss factor $\tan \delta$	1	13×10^{-3}	13.7×10^{-3}
Dielectric constant ϵ_r	1	3.2	3.1
Mechanical Properties			
Measured thickness (+/-10%)	mm	0.150	0.200
Hardness	Shore A	80 - 90	70 - 85
Tensile strength	N/mm ²	3	2.0
Elongation	%	130	150
Physical Properties			
Application temperature	$^{\circ}\text{C}$	-40 to +125	-40 to +150
Density	g/cm ³	2.26	1.46
Flame rating	UL-94	V-0	V-0
Possible thickness *	mm	0.150 / 0.300	0.100 / 0.200 / 0.300

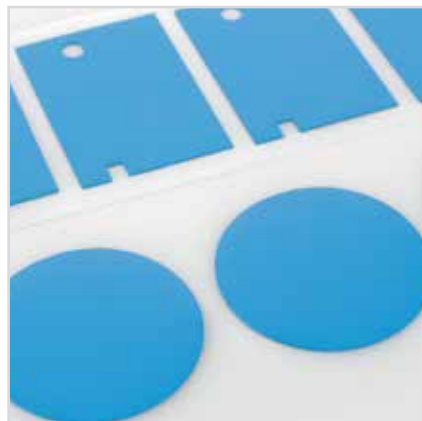
*details see page 60

Compression U 80 & U 90



MT 102 & 103

Keratherm silicone free MT-Films



Thermoplastic elastomer tape with very good insulating behaviour and excellent mechanical and good thermal characteristics.

- ✓ Delivery from:
Bulk good, optional with single sided adhesive coating. On rolls only available in combination with adhesive.

MT 102 K / MT 103 K

Applications

- automobiles
- high voltage technology
- power converters (AC-DC, DC-DC)

Benefits

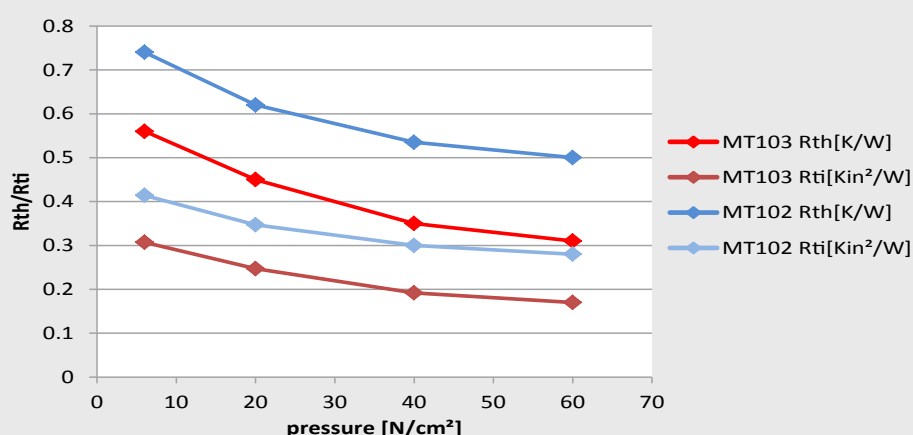
- very good mechanical properties
- very good insulating properties
- silicone free

Properties	Unit	MT 102	MT 103
Colour		blue	red
Thermal Properties			
Thermal resistance R_{th}	K/W	0.53	0.39
Thermal impedance R_{ti}	$^{\circ}\text{Cmm}^2/\text{W}$	200	156
	Kin^2/W	0.28	0.21
Thermal conductivity λ	W/mK	1.1	1.8
Electrical Properties			
Breakdown voltage $U_{d, ac}$	kV	10	10
Dielectric breakdown $E_{d, ac}$	kV/mm	25	25
Volume resistivity	Ωm	2.2×10^{10}	4.7×10^{10}
Dielectric loss factor $\tan \delta$	1	1.0×10^{-3}	1.0×10^{-3}
Dielectric constant ϵ_r	1	2.68	2.61
Mechanical Properties			
Measured thickness (+/-10%)	mm	0.250	0.280
Hardness	Shore A	65 - 75	70 - 80
Tensile strength	N/mm ²	2	2
Elongation	%	> 1000	200
Physical Properties			
Application temperature	$^{\circ}\text{C}$	-40 to +125	-40 to +125
Density	g/cm ³	1.87	1.88
Flame rating	UL-94	V-0	V-0
Possible thickness *	mm	0.250	0.280

*details see page 60

**Kerafol test according to UL

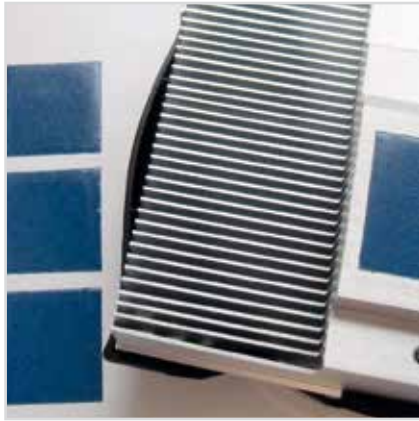
Compression MT 102 & MT 103





PCM 471 & PCM 115

Keratherm phase-change



Phase-Change-Materials smooth out even the smallest irregularities between the power module and heat sink, thereby improving surface contact and increasing the heat transfer.

Properties	Unit	PCM 115	PCM 471
Colour		titanium blue	grey
Compound		filled hot-setting wax	filled hot-setting wax
Thermal Properties			
Thermal resistance R_{th}	K/W	0.069	0.07
Thermal impedance R_{ti}	°Cmm²/W	27.7	25.6
	Kin²/W	0.043	0.039
Thermal conductivity λ	W/mK	4.5	4
Mechanical Properties			
Measured thickness (+/-10%)	mm	0.200	0.200
Hardness	Shore A	60 - 75	70 - 80
Softening interval	°C	54 - 60	> 46
Physical Properties			
Application temperature	°C	-40 to +100	-40 to +150
Density	g/cm³	1.9	1.82
Possible thickness *	mm	0.200	0.200

*details see page 60

Applications

- IGBT
- CPU

Benefits

- Very good thermal performance through optimised softening
- Easy application through increased tack

KP 96, 97, 98, 99 & 12

Keratherm Thermal Grease



Keratherm Thermal Greases are ceramic-filled single-component silicones with a high thermal conductivity. The non-cross-linked thermal compounds do not dry out. The silicone components do not leak from the compound.

The thermal grease KP 99 is a high-quality thermal grease. The homogeneous and thixotropic grease shows a very good fluidity thanks to its good viscosity characteristics. An optimum surface adaptation is guaranteed.

Applications

- Notebooks
- Desktop CPU's
- IGBT unit

Packing units

- Syringes: 5 ml
- Cartouche: 75 ml / 310 ml / 360 ml
- Cans: 0.5 kg / 1.0 kg



Special packing on request!

Properties	Unit	KP 96	KP 97	KP 98	KP 99	KP 12 silicone free
Colour		white	white	gray	anthracite	silver
<div>← soft/pasty →</div>						
Thermal Properties						
Thermal resistance R_{th}	K/W	0.038	0.012	0.01	0.0068	0.006
Thermal impedance R_{ti}	°Cmm²/W	11	4.5	4.1	2.72	2.2
	Kin²/W	0.017	0.007	0.0064	0.0042	0.0033
Thermal conductivity λ	W/mK	2.4	5	6	9.2	10
Electrical Properties						
Electrical conductivity (according to DIN 51412-1)	pS/m	8	0	0	0	53
Mechanical Properties						
Measured thickness (+/-10%)	mm	0.025	0.025	0.025	0.025	0.025
Physical Properties						
Application temperature	°C	-60 to 200	-60 to 200	-60 to 200	-60 to 200	-60 to 150
Density	g/cm³	1.87	1.88	1.3	1.9	1.4
Viscosity *	Pas	25 - 35	70 - 110	110 - 150	90 - 140	30 - 60
Total mass loss (TML)	Ma.-%	< 1.4	< 1.3	< 1.5	< 0.80	< 0.1
Possible thickness	mm	<div>← variable →</div>				
Long term stability (1000h / 85°C / 85 % relative humidity)						
Thermal resistance 1000h	K/W	0.038	0.012	0.008	0.0068	0.006

* Shear rate 4s⁻¹ / 25°C

The silicone-free thermal compound KP 12 consists of synthetic, thermal polymers and is suitable for a fast and effective heat dissipation. The paste is particularly suitable for silicone sensitive applications.

The KP's long-term stability guarantees full operability during the entire life time of the product. Under normal application conditions, Keratherm Thermal Grease does not cure, dry out or melt.

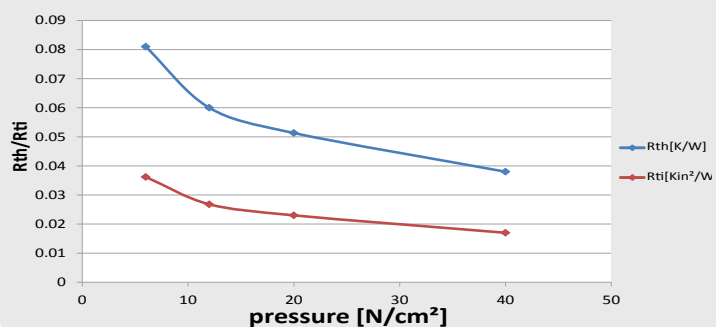
Special storage of Keratherm "Thermal Grease" is not required, therefore it can be stored under normal climate conditions for up to 12 months after manufacturing date.

If any separation of the filler materials becomes evident, the KP's must be mixed thoroughly before use.

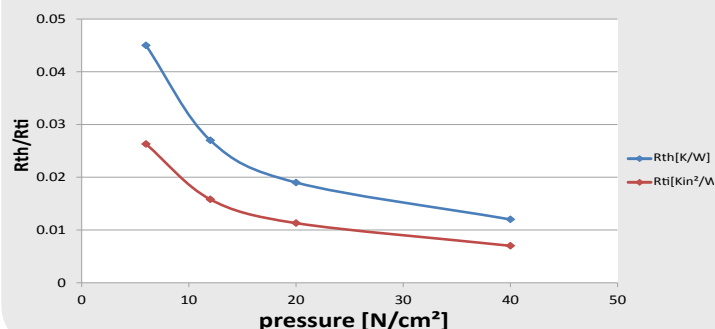


Comparison of pastes regarding thermal resistance in dependence on contact pressure

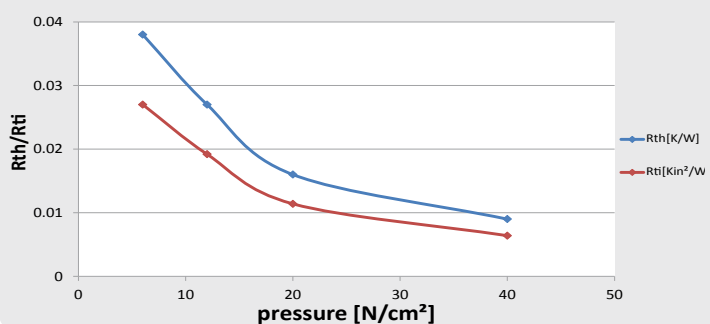
Compression KP 96



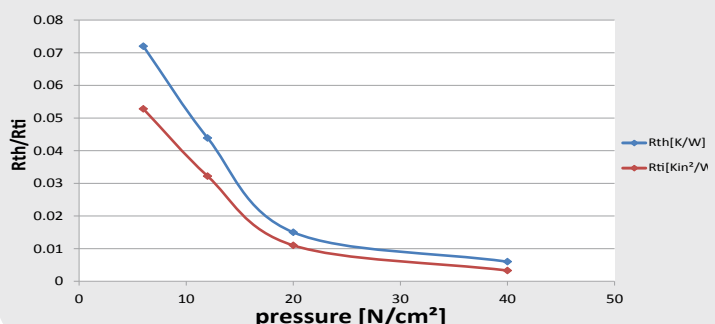
Compression KP 97



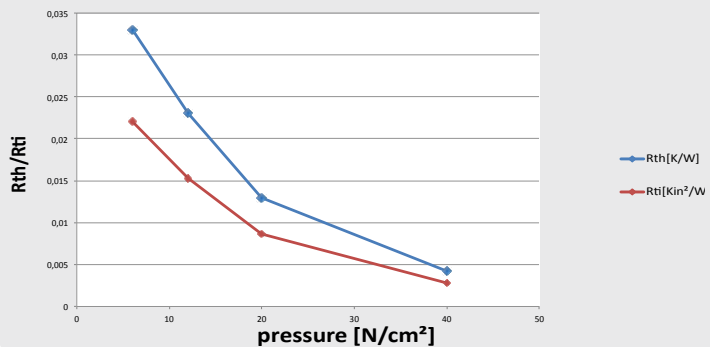
Compression KP 98

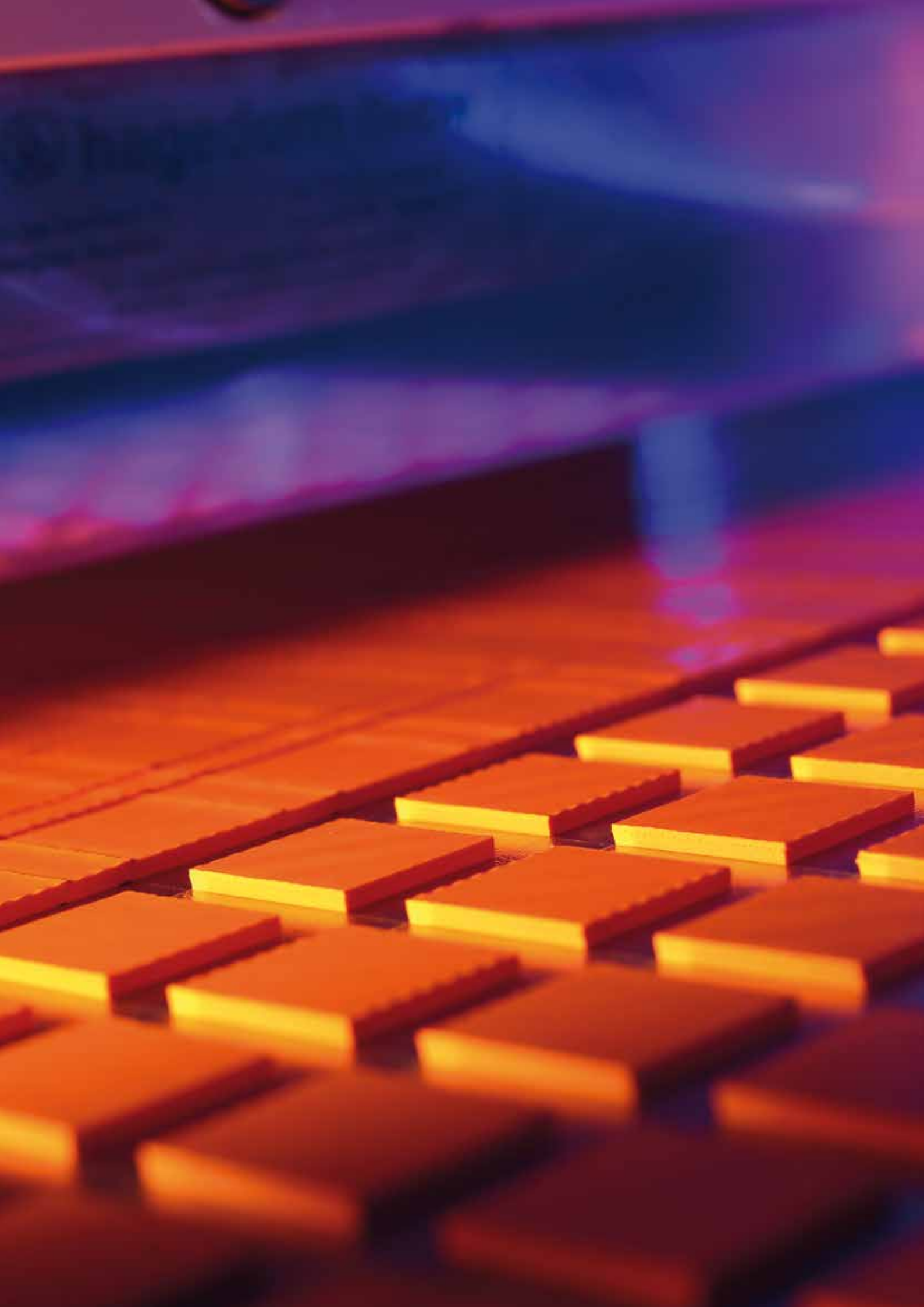


Compression KP 12



Compression KP 99

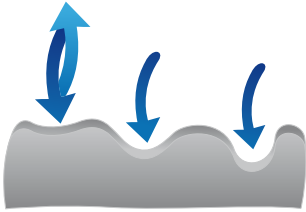






Softtherm Films

Highly elastic and compressible



Softtherm materials are highly elastic, perfectly conformable low-tension gap fillers. They achieve a very good balance of different surface mounting heights such as component differences, housing irregularities, gap-bridging in mechanical or electronic components, distortions of PCBs, etc. Softtherm is electrically insulating and possesses gradual heat conductivity. The self-adhesiveness of the film depends on the Softtherm type selected.

Kerafol offers two types of Softtherm Films

- Types 86/128, 86/200, 86/228 and 86/238 have a fibre glass reinforced carrier sheet with very good thermal characteristics. These Softtherm types can be provided with an adhesive application on the carrier sheet side. The mounting position of the film is determined by the carrier sheet and should always be mounted to the heat sinks or housing. This also guarantees that the formability will work effectively with the electronic components.



- Softtherm Films 86/120, 86/225, 86/300, 86/320, 86/325, 86/500 and 86/600 are reinforced by fibre glass fabric at thicknesses of 0.5 to 1.0 mm. These films can additionally be offered with an adhesive application as an assembly aid (except for type 86/125, 86/225 and 86/235).

Application

First remove the protective sheet on the soft, compressible side (yellow side of type 86/200, red side of type 86/128 and 86/228). With all other Softtherm Films the installation position can be ignored unless the film has an adhesive coating. In case of an adhesive application, make sure that the adhesive coating is always applied to the surface of the heat sink or the housing.



Then apply the film to the component and remove the second protective sheet from the back. When applying, make sure that the softer side of the film is covering the components and thus compensates for the different heights.

When using a Softtherm type with adhesive, the adhesive is applied to the back of the film (carrier film) and is covered with a "remove-liner". In this case, after the removal of the „remove-liner“ the film is applied with the adhesive side to the heat sink or the housing. Make sure in your application that both remove-liner on the back of the film and protective sheet on the soft side have been removed. Assemble your application and apply a mounting pressure, so that the material adapts to the components and parts.



Properties

- highly flexible tapes
- outstanding flexibility
- graduated thermal conductivity
- good electrical insulation
- high temperature stability

Benefits

- compensates for size variations for components
- optimized thermal transition
- good compression behaviour
- UL listed



Film Options

- optional single-sided adhesive surface
- single-sided adhesive coating possible
- can be supplied as sheets or already punched

Applications

- RD-RAM memory model
- heat pipe thermal solutions
- automotive engines
- control units
- plasma supply panels

Attention

At maximum pressure, Softtherm Films should not be compressed beyond 30% of the original thickness. In case the material should be compressed more than 30%, the Softtherm material may leak out.

86/125 & 86/128

high elastic

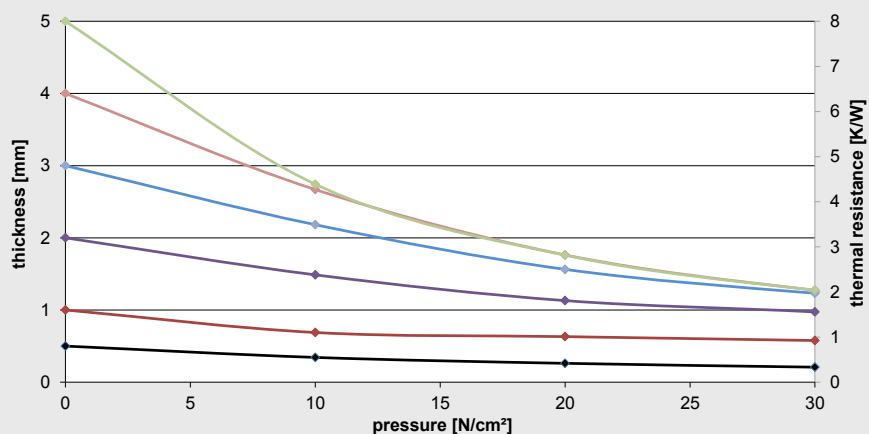


Softtherm 86/125 has an improved thermal performance without influencing the dielectric and mechanical properties. 86/125 is a single layer, supported with fibre glass reinforcement.

Properties	Unit	86/125	86/128
Colour		orange	pink - dark orange
Assembly		single layer, fibre glass reinforcement up to 4.0 mm	double layer carrier film
Thermal Properties			
Thermal resistance R_{th}	K/W	0.8	0.8
Thermal impedance R_{ti}	$^{\circ}\text{Cmm}^2/\text{W}$	322	322
	Kin^2/W	0.5	0.5
Thermal conductivity λ	W/mK	1.5	1.5
Electrical Properties			
Breakdown voltage $U_{d, ac}$	kV	6	6
Dielectric breakdown $E_{d, ac}$	kV/mm	12	12
Volume resistivity	Ωm	61.3×10^9	1.79×10^{12}
Dielectric loss factor $\tan \delta$		153×10^{-3}	1.0×10^{-3}
Dielectric constant ϵ_r		4.28	2.302
Mechanical Properties			
Measured thickness (+/-10%)	mm	0.500	0.500
Hardness	Shore 00	10 - 25	10 - 25
Young's modulus	N/cm ²	23.6	67
Physical Properties			
Application temperature	$^{\circ}\text{C}$	-40 to +180	-40 to +180
Density	g/cm ³	2.0	1.9
Total mass loss (TML)		< 0.29	< 0.29
Flame rating	UL-94	V-0	V-0**
Possible thickness *	mm	0.5 - 5.0	0.5 - 5.0

**Kerafol test according to UL

Compression 86/125



Data for engineer guidance only. Observed performance varies in application. Engineers are reminded to test the material in application.



86/200

high elastic



These highly elastic films are characterized by their excellent compressibility with moderate thermal and excellent dielectric behaviour. Type 86/200 is constructed in two layers.

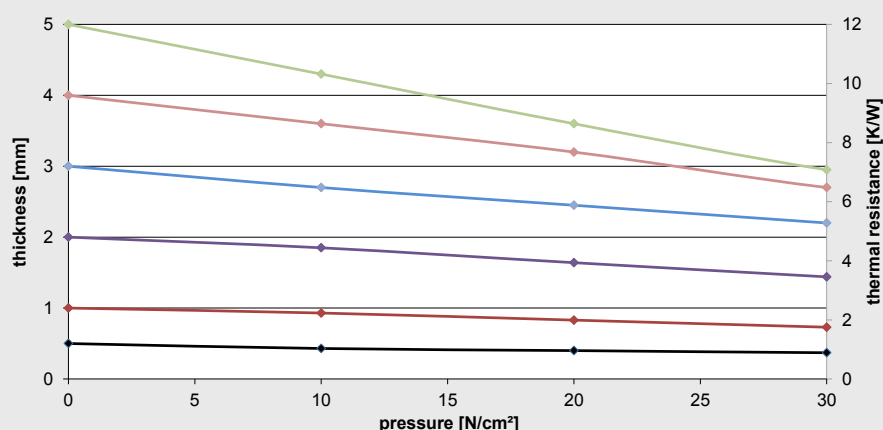


Optional available with adhesive coating as **86/200 K**

Properties	Unit	86/200
Colour		pink/yellow
Assembly		double layer, carrier film 86/52 in 0.125 mm
Thermal Properties		
Thermal resistance R_{th}	K/W	1.2
Thermal impedance R_{ti}	°Cmm²/W	480
	Kin²/W	0.75
Thermal conductivity λ	W/mK	1
Electrical Properties		
Breakdown voltage $U_{d, ac}$	kV	8
Dielectric breakdown $E_{d, ac}$	kV/mm	16
Volume resistivity	Ωm	1.0×10^{11}
Dielectric loss factor $\tan \delta$	1	1.5×10^{-3}
Dielectric constant ϵ_r	1	3.9
Mechanical Properties		
Measured thickness (+/-10%)	mm	0.500
Hardness	Shore 00	10 - 20
Young's modulus	N/cm²	22
Physical Properties		
Application temperature	°C	-60 to +200
Density	g/cm³	1.61
Total mass loss (TML)		< 0.40
Flame rating	UL-94	V-0
Possible thickness *	mm	0.5 - 5.0

*details see page 61

Compression 86/200



Data for engineer guidance only. Observed performance varies in application. Engineers are reminded to test the material in application.

86/225 & 86/228

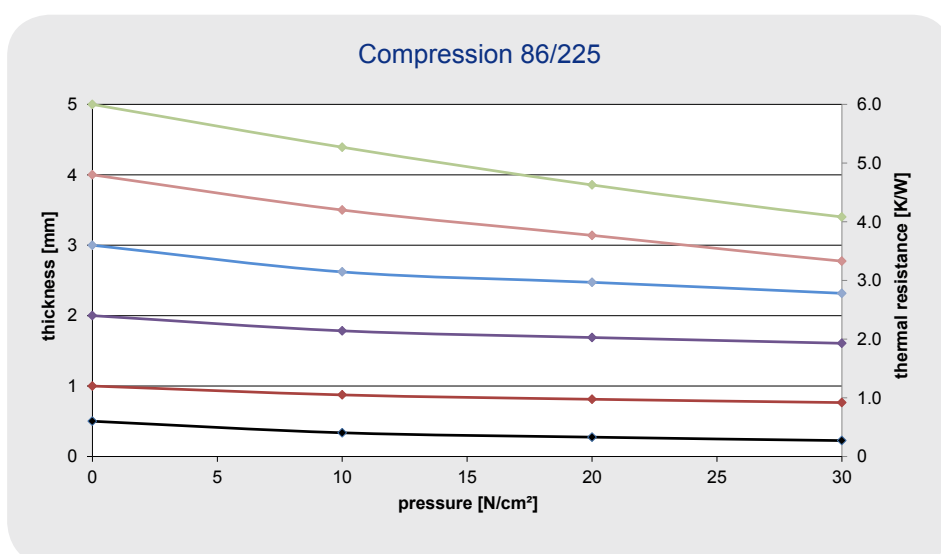
high elastic



Single layer Softtherm Films with graded thermal behaviour. These films are partial fibre glass reinforced and an alternative to the two-layer Softtherm Films.

Properties	Unit	86/225	86/228
Colour		orange	pink orange
Assembly		single layer, fibre glass reinforcement up to 4.0 mm	double layer carrier film
Thermal Properties			
Thermal resistance R_{th}	K/W	0.9	0.6
Thermal impedance R_{ti}	°Cmm²/W	240	240
	Kin²/W	0.37	0.37
Thermal conductivity λ	W/mK	2	2
Electrical Properties			
Breakdown voltage $U_{d, ac}$	kV	6	6
Dielectric breakdown $E_{d, ac}$	kV/mm	12	12
Volume resistivity	Ωm	2.2×10^{11}	2.8×10^{11}
Dielectric loss factor $\tan \delta$		1×10^{-3}	1×10^{-3}
Dielectric constant ϵ_r		3.6	2.54
Mechanical Properties			
Measured thickness (+/-10%)	mm	0.500	0.500
Hardness	Shore 00	30 - 45	30 - 45
Young's modulus	N/cm²	58	160
Physical Properties			
Application temperature	°C	-40 to +180	-40 to +180
Density	g/cm³	1.65	1.95
Total mass loss (TML)		< 0.44	< 0.44
Flame rating	UL-94	V-0	V-0**
Possible thickness *	mm	0.5 - 5.0	0.5 - 5.0

**Kerafol test according to UL



Data for engineer guidance only. Observed performance varies in application. Engineers are reminded to test the material in application.



86/235 & 86/238

low bleeding

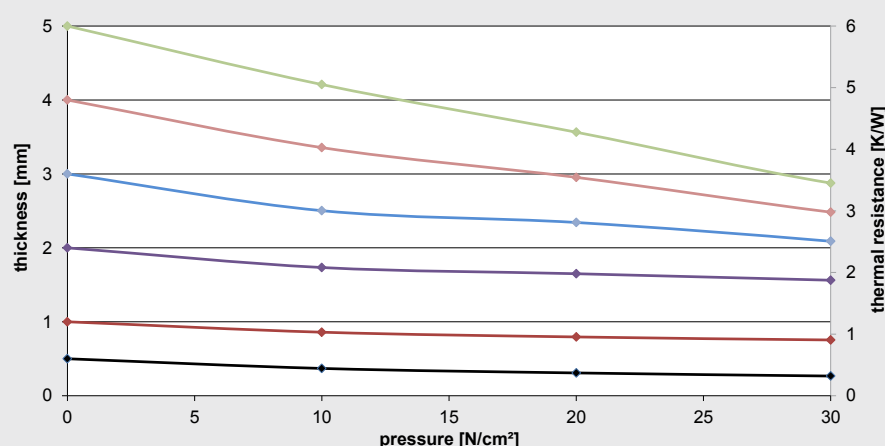


Innovative, customer-oriented development. Type 86/235 is a single layer, with good thermal, mechanical and dielectric properties. Volatile silicone (<150 ppm).

Properties	Unit	86/235	86/238
Colour		yellow	pink yellow
Assembly		single layer, fibre glass reinforcement up to 2.0 mm	double layer carrier film
Thermal Properties			
Thermal resistance R_{th}	K/W	0.6	0.6
Thermal impedance R_{ti}	°Cmm²/W	240	240
	Kin²/W	0.37	0.37
Thermal conductivity λ	W/mK	2	2
Electrical Properties			
Breakdown voltage $U_{d, ac}$	kV	6	6
Dielectric breakdown $E_{d, ac}$	kV/mm	12	12
Volume resistivity	Ωm	176.1×10^9	4.72×10^{11}
Dielectric loss factor $\tan \delta$	1	20.2×10^{-3}	1.0×10^{-3}
Dielectric constant ϵ_r	1	3.70	1.92
Mechanical Properties			
Measured thickness (+/-10%)	mm	0.500	0.500
Hardness	Shore 00	25 - 40	25 - 40
Young's modulus	N/cm²	32	122
Physical Properties			
Application temperature	°C	-40 to +180	-40 to +180
Density	g/cm³	1.65	1.65
Total mass loss (TML)		< 0.10	< 0.05
Flame rating	UL-94	V-0	V-0**
Possible thickness *	mm	0.5 - 5.0	0.5 - 5.0

**Kerafol test according to UL

Compression 86/235



86/300

compressibility & softness

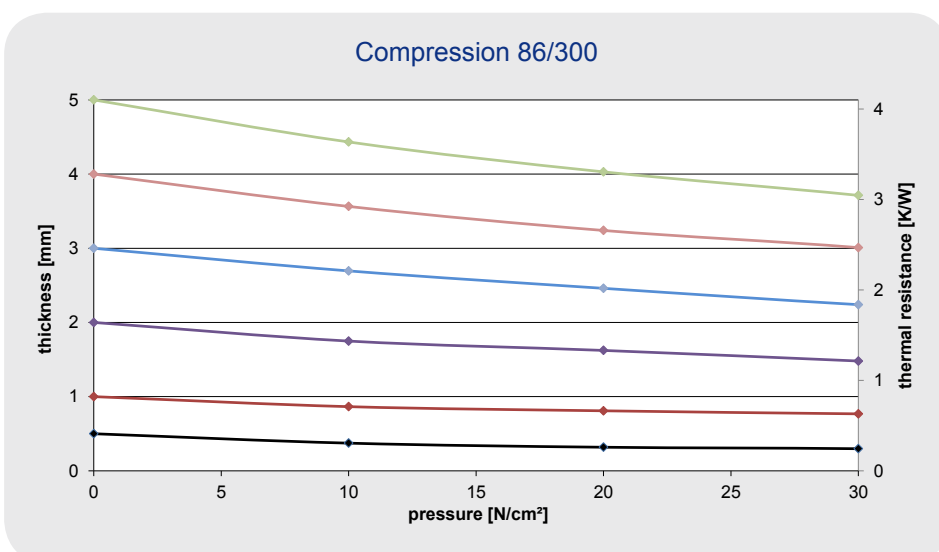


Graduated compressibility and softness, with good thermal behaviour characterize this group of Softtherm Films. These single-layer films may be enhanced with fibre glass reinforcement up to a thickness of 1.0 mm.

✓ Optionally available with adhesive coating as **86/300 K**

Properties	Unit	86/300
Colour		blue
Assembly		single layer, fibre glass reinforcement up to 1.0 mm
Thermal Properties		
Thermal resistance R_{th}	K/W	0.41
Thermal impedance R_{ti}	°Cmm ² /W	164
	Kin ² /W	0.25
Thermal conductivity λ	W/mK	3
Electrical Properties		
Breakdown voltage $U_{d, ac}$	kV	7
Dielectric breakdown $E_{d, ac}$	kV/mm	14
Volume resistivity	Ωm	1.0×10^{11}
Dielectric loss factor $\tan \delta$	1	5.0×10^{-3}
Dielectric constant ϵ_r	1	3.3
Mechanical Properties		
Measured thickness (+/-10%)	mm	0.500
Hardness	Shore 00	60 - 75
Young's modulus	N/cm ²	24
Physical Properties		
Application temperature	°C	-60 to +200
Density	g/cm ³	1.71
Total mass loss (TML)		< 0.35
Flame rating	UL-94	V-0
Possible thickness *	mm	0.5 - 5.0

*details see page 61



Data for engineer guidance only. Observed performance varies in application. Engineers are reminded to test the material in application.



86/320

high elastic



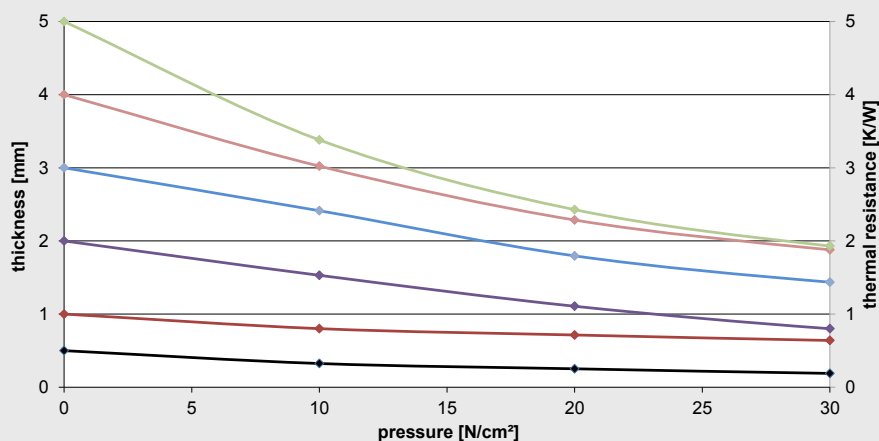
Single layer Softtherm Films with graded thermal behaviour. These films are partially fibre glass reinforced and an alternative to the two-layer Softtherm Films.

Properties	Unit	86/320
Colour		yellow
Assembly		single layer, fibre glass reinforcement up to 1.5 mm
Thermal Properties		
Thermal resistance R_{th}	K/W	0.5
Thermal impedance R_{ti}	$^{\circ}\text{Cmm}^2/\text{W}$	147
	Kin^2/W	0.23
Thermal conductivity λ	W/mK	2.5
Electrical Properties		
Breakdown voltage $U_{d, ac}$	kV	5
Dielectric breakdown $E_{d, ac}$	kV/mm	10
Volume resistivity	Ωm	0.68×10^{12}
Dielectric loss factor $\tan \delta$	1	29×10^{-3}
Dielectric constant ϵ_r	1	3.4
Mechanical Properties		
Measured thickness (+/-10%)	mm	0.500
Hardness	Shore 00	25 - 38
Young's modulus	N/cm ²	32
Physical Properties		
Application temperature	$^{\circ}\text{C}$	-40 to +180
Density	g/cm ³	1.69
Total mass loss (TML)		< 0.49
Flame rating	UL-94	V-0**
Possible thickness *	mm	1.0 - 5.0

*details see page 61

**Kerafol test according to UL

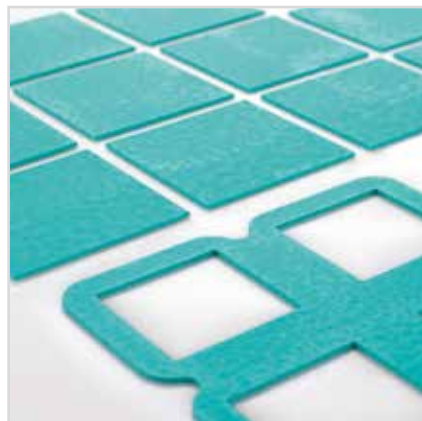
Compression 86/320



Data for engineer guidance only. Observed performance varies in application. Engineers are reminded to test the material in application.

86/325

compressibility & softness

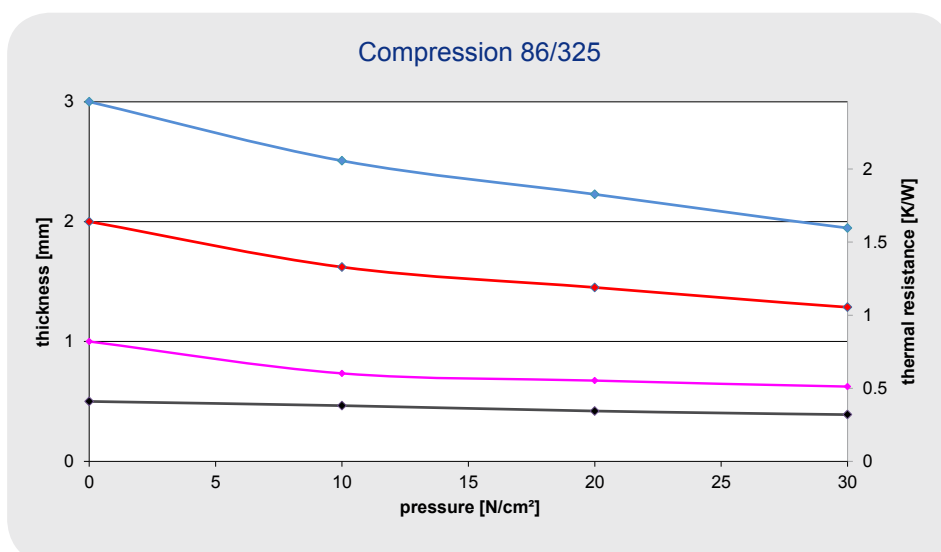


Graduated compressibility and softness along with good thermal behaviour characterize this group of Softtherm Films. These single-layer films may be enhanced with fibre glass reinforcement up to a thickness of 1.0 mm.

Properties	Unit	86/325
Colour		mint
Assembly		single layer, fibre glass reinforcement up to 1.0 mm
Thermal Properties		
Thermal resistance R_{th}	K/W	0.41
Thermal impedance R_{ti}	°Cmm²/W	164
	Kin²/W	0.25
Thermal conductivity λ	W/mK	3
Electrical Properties		
Breakdown voltage $U_{d, ac}$	kV	6
Dielectric breakdown $E_{d, ac}$	kV/mm	12
Volume resistivity	Ωm	85.4×10^9
Dielectric loss factor $\tan \delta$	1	145×10^{-3}
Dielectric constant ϵ_r	1	3.77
Mechanical Properties		
Measured thickness (+/-10%)	mm	0.500
Hardness	Shore 00	35 - 50
Young's modulus	N/cm²	64
Physical Properties		
Application temperature	°C	-40 to +180
Density	g/cm³	1.95
Total mass loss (TML)		< 0.35
Flame rating	UL-94	V-0**
Possible thickness *	mm	0.5 - 4.0

*details see page 61

**Kerafol test according to UL



Data for engineer guidance only. Observed performance varies in application. Engineers are reminded to test the material in application.



86/450

high thermal conductivity



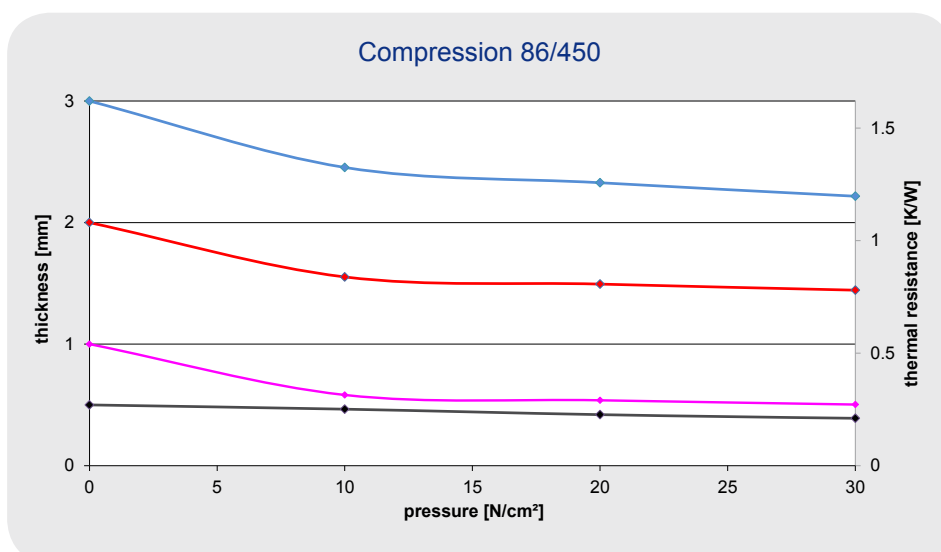
This group of Softtherm Films is characterized by its extremely high thermal conductivity. The single-layer films without fibre glass reinforcement are soft and compressible. The good dimensional stability of these films ensures a controlled and automated processing.

✓ Optionally available with
onside adhesive coating **86/450K**

Properties	Unit	86/450
Colour		brown
Assembly		single layer, without fibre glass reinforcement
Thermal Properties		
Thermal resistance R_{th}	K/W	0.27
Thermal impedance R_{ti}	°Cmm ² /W	108
	Kin ² /W	0.18
Thermal conductivity λ	W/mK	4.5
Electrical Properties		
Breakdown voltage $U_{d, ac}$	kV	5
Dielectric breakdown $E_{d, ac}$	kV/mm	10
Volume resistivity	Ωm	3.6×10^{12}
Dielectric loss factor $\tan \delta$	1	145×10^{-3}
Dielectric constant ϵ_r	1	2.5
Mechanical Properties		
Measured thickness (+/-10%)	mm	0.500
Hardness	Shore 00	65 - 75
Young's modulus	N/cm ²	94.5
Physical Properties		
Application temperature	°C	-40 to +180
Density	g/cm ³	1.32
Total mass loss (TML)		< 0.4
Flame rating	UL-94	V-0**
Possible thickness *	mm	0.5 - 4.0

*details see page 61

**Kerafol test according to UL



Data for engineer guidance only. Observed performance varies in application. Engineers are reminded to test the material in application.

86/500

high thermal conductivity



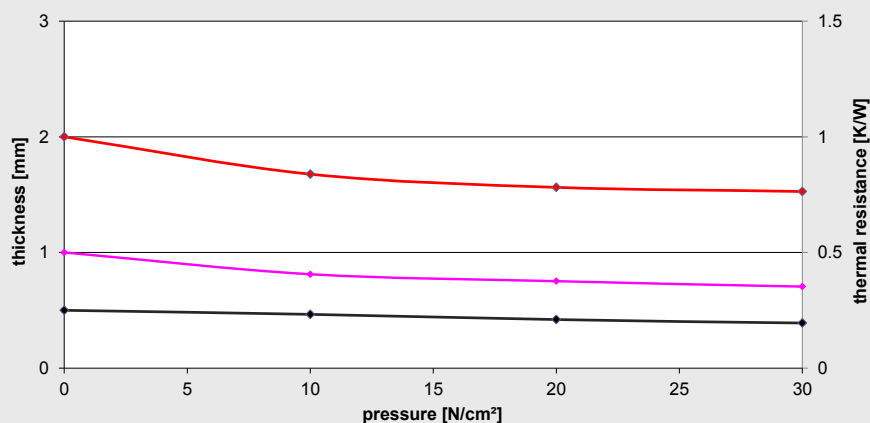
This group of Softtherm Films is characterized by their extremely high thermal conductivity. The single-layer films without fibre glass reinforcement are soft and compressible. The good dimensional stability of these films ensures a controlled and automated processing.

✓ Optionally available with adhesive coating as **86/500 K**

Properties	Unit	86/500
Colour		brown
Assembly		single layer, without fibre glass reinforcement
Thermal Properties		
Thermal resistance R_{th}	K/W	0.25
Thermal impedance R_{ti}	°Cmm²/W	100
	Kin²/W	0.15
Thermal conductivity λ	W/mK	5
Electrical Properties		
Breakdown voltage $U_{d, ac}$	kV	1
Dielectric breakdown $E_{d, ac}$	kV/mm	2
Volume resistivity	Ωm	1.0×10^{11}
Dielectric loss factor $\tan \delta$	1	1.5×10^{-3}
Dielectric constant ϵ_r	1	3.9
Mechanical Properties		
Measured thickness (+/-10%)	mm	0.500
Hardness	Shore 00	65 - 75
Young's modulus	N/cm²	70
Physical Properties		
Application temperature	°C	-60 to +200
Density	g/cm³	1.33
Total mass loss (TML)		< 0.24
Flame rating	UL-94	V-0
Possible thickness *	mm	0.5 - 2.0

*details see page 61

Compression 86/500



Data for engineer guidance only. Observed performance varies in application. Engineers are reminded to test the material in application.



86/525

high thermoconductive



Group of highly thermoconductive Softtherm Films. Low thermal transitions with good dielectric behaviour and good compressibility characterize these Softtherm Films.

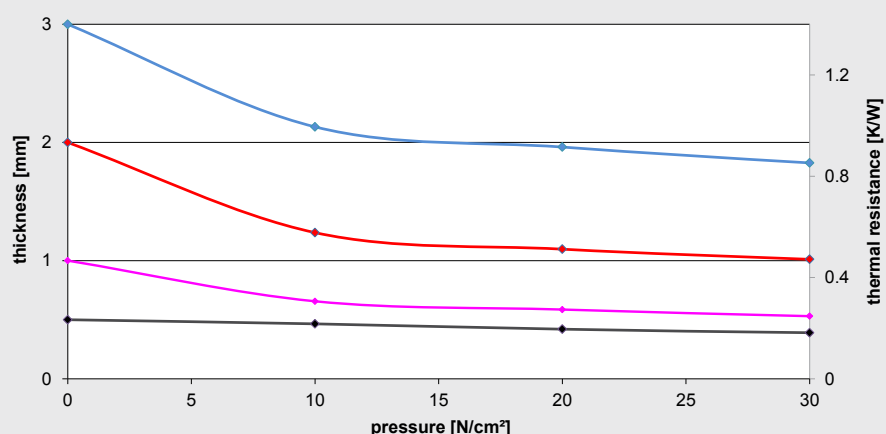


Optionally available with adhesive coating as **86/525 K**

Properties	Unit	86/525
Colour		brown
Assembly		single layer, without fibre glass reinforcement
Thermal Properties		
Thermal resistance R_{th}	K/W	0.22
Thermal impedance R_{ti}	°Cmm ² /W	89
	Kin ² /W	0.14
Thermal conductivity λ	W/mK	5.5
Electrical Properties		
Breakdown voltage $U_{d, ac}$	kV	1.25
Dielectric breakdown $E_{d, ac}$	kV/mm	2.5
Volume resistivity	Ωm	16×10^{12}
Dielectric loss factor $\tan \delta$	1	1×10^{-3}
Dielectric constant ϵ_r	1	2.7
Mechanical Properties		
Measured thickness (+/-10%)	mm	0.500
Hardness	Shore 00	50 - 65
Young's modulus	N/cm ²	98.5
Physical Properties		
Application temperature	°C	-40 to +180
Density	g/cm ³	1.18
Total mass loss (TML)		< 0.35
Flame rating	UL-94	V-0
Possible thickness *	mm	0.5 - 3.0

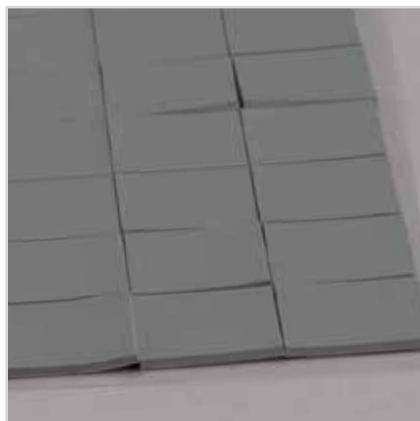
*details see page 61

Compression 86/525



86/600

high thermal conductivity



This group of Softtherm Films is characterized by its extremely high thermal conductivity. The single-layer films without fibre glass reinforcement are soft and compressible. The good dimensional stability of these films ensures a controlled and automated processing.

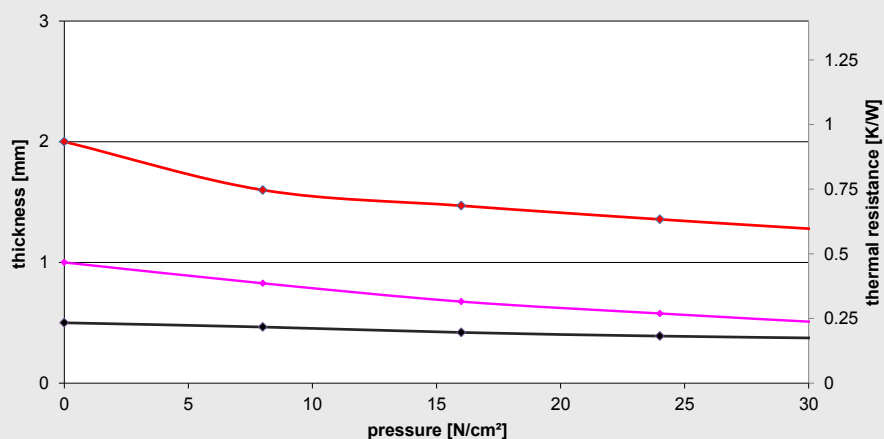
✓ Optionally available with adhesive coating as **86/600 K**

Properties	Unit	86/600
Colour		grey
Assembly		single layer, without fibre glass reinforcement
Thermal Properties		
Thermal resistance R_{th}	K/W	0.2
Thermal impedance R_{ti}	°Cmm ² /W	80
	Kin ² /W	0.12
Thermal conductivity λ	W/mK	6
Electrical Properties		
Breakdown voltage $U_{d, ac}$	kV	1.5
Dielectric breakdown $E_{d, ac}$	kV/mm	3.0
Volume resistivity	Ωm	1.7×10^{10}
Dielectric loss factor $\tan \delta$	1	2.0×10^{-3}
Dielectric constant ϵ_r	1	2.5
Mechanical Properties		
Measured thickness (+/-10%)	mm	0.500
Hardness	Shore 00	60 - 75
Young's modulus	N/cm ²	77
Physical Properties		
Application temperature	°C	-60 to +180
Density	g/cm ³	1.28
Total mass loss (TML)		< 0.40
Flame rating	UL-94	V-0**
Possible thickness *	mm	0.5 - 1.5

*details see page 61

**Kerafol test according to UL

Compression 86/600



Data for engineer guidance only. Observed performance varies in application. Engineers are reminded to test the material in application.



U 281

silicone free



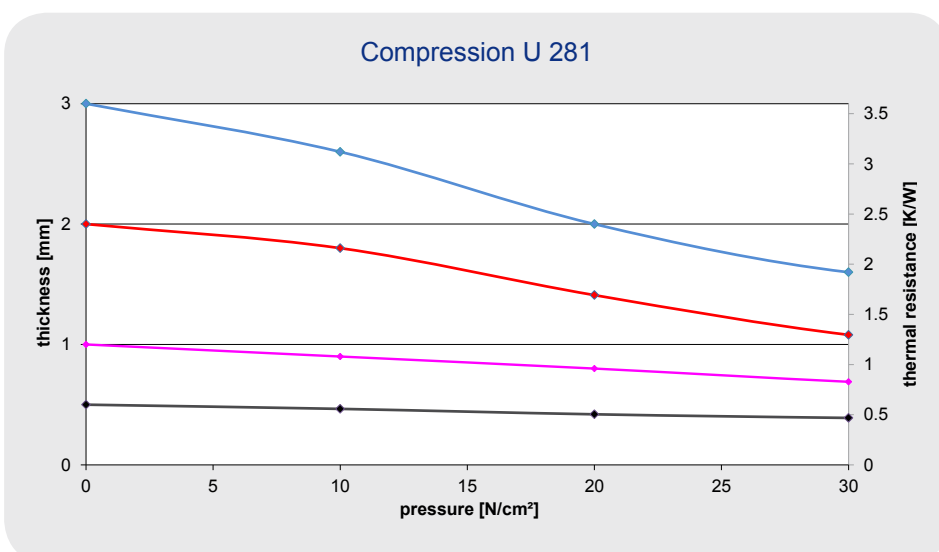
Flexible ceramic, thermoconducting and insulating. Softtherm U 281 is particularly suitable for silicone-sensitive applications and an alternative to silicone-based Softtherm Films.

The silicone free Softtherm Film offers high electrical insulation and very good thermal conductivity.

✓ Optionally available with PET-Film!

Properties	Unit	U 281
Colour		grey
Assembly		single layer, without fibre glass reinforcement
Thermal Properties		
Thermal resistance R_{th}	K/W	< 0.6
Thermal impedance R_{ti}	°Cmm²/W	240
	Kin²/W	0.37
Thermal conductivity λ	W/mK	2
Electrical Properties		
Breakdown voltage $U_{d, ac}$	kV	7
Dielectric breakdown $E_{d, ac}$	kV/mm	14
Volume resistivity	Ωm	5.32×10^9
Dielectric loss factor $\tan \delta$	1	78×10^{-3}
Dielectric constant ϵ_r	1	5.57
Mechanical Properties		
Measured thickness (+/-10%)	mm	0.500
Hardness	Shore 00	55 - 65
Young's modulus	N/cm²	244
Physical Properties		
Application temperature	°C	-40 to +130
Density	g/cm³	2.6
Total mass loss (TML)		< 0.9
Flame rating	UL-94	V-0
Possible thickness *	mm	0.5 - 3.0

*details see page 61

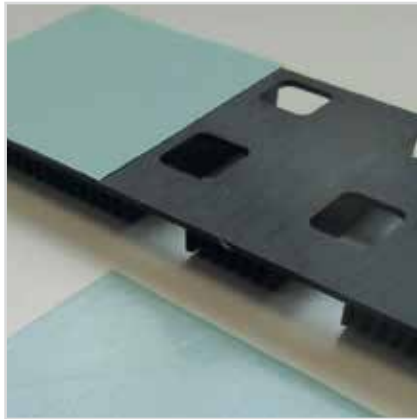


Data for engineer guidance only. Observed performance varies in application. Engineers are reminded to test the material in application.



Ac 500

silicone free



Softtherm Ac 500 is suitable for silicone sensitive applications and an alternative to silicone based Softtherm Films.

Applications

- Optical applications
- Silicone sensitive applications

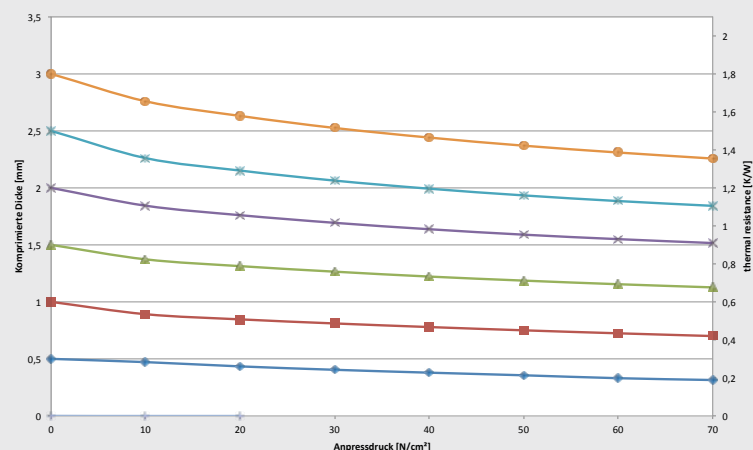
Benefits

- High thermal conductive
- Silicone free
- High compressible
- Good dielectric properties

Properties	Unit	Ac 500
Colour		moss green
Assembly		single layer, fibre glass reinforcement up to 3,0 mm
Thermal Properties		
Thermal resistance R_{th}	K/W	< 0.3
Thermal impedance R_{ti}	°Cmm²/W	120
	Kin²/W	0.186
Thermal conductivity λ	W/mK	4.2
Electrical Properties		
Breakdown voltage $U_{d, ac}$	kV	2.0
Dielectric breakdown $E_{d, ac}$	kV/mm	4.0
Volume resistivity	Ωm	3.05×10^{12}
Dielectric loss factor $\tan \delta$	1	0.008
Dielectric constant ϵ_r	1	2.19
Mechanical Properties		
Measured thickness (+/-10%)	mm	0.500
Hardness	Shore 00	60 - 75
Young's modulus	N/cm²	142.5
Physical Properties		
Application temperature	°C	-40 to +125
Density	g/cm³	1.19
Total mass loss (TML)		< 0.7
Flame rating	UL-94	V-0
Possible thickness *	mm	0.5 - 3.0

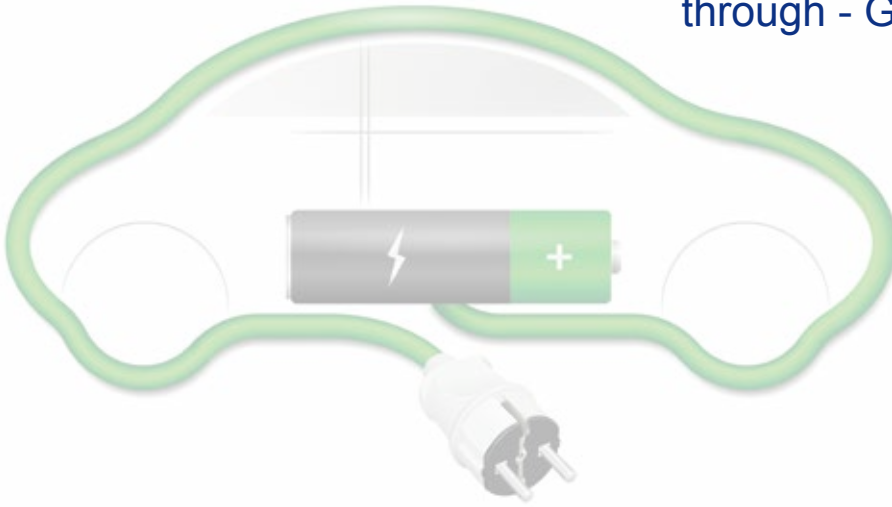
*details see page 61

Compression Ac 500



Data for engineer guidance only. Observed performance varies in application. Engineers are reminded to test the material in application.

Optimised thermal management for **e-mobility** and performance electronics through - Gap Filler "liquids".

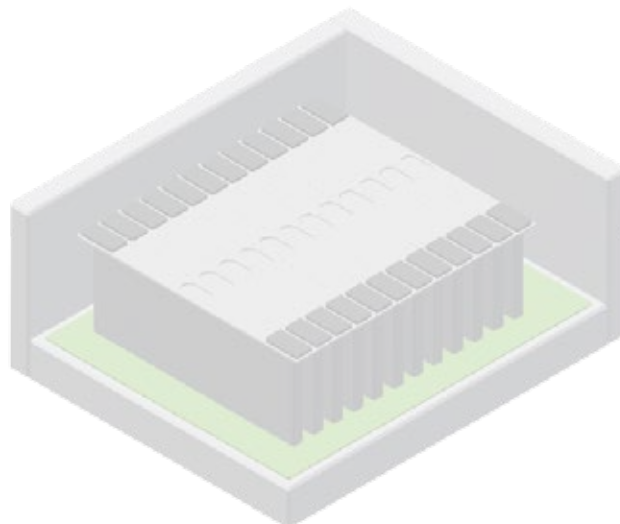


The use of thermal pad setups in **e-mobility** has been proven for years.

Alongside the existing thermally cross-linking thermal materials for the dispensation procedure (GF 255 and GF 300), Kerafol® also offers novel masses for mass casting as a room temperature cross-linking variant (GFL 3020 and GFL 3030), as an alternative to conventional heat conduction pads.



The thermal materials capable of dispensation allow the production of permanently elastic film layers across a wide range of layer thicknesses, which are otherwise not obtainable in the combination of properties. Owing to the excellent processing features (wet-in-wet processing), it is possible to realise short cycle lengths. Especially the combination of long-term stability and reliability at high thermal conduction capacities and a minimal mechanical component load make this material group particularly interesting. [Request our application recommendations]





GFL 3020 & GFL 3030

Gap Filler Liquid



Ceramic filled, solvent free two component silicone elastomer. Room temperature curing makes it suitable for wet in wet production.

Properties	Unit	GFL 3020	GFL 3030
Colour		yellow	green
Basic material		silicone	silicone
Mixing ratio		1 : 1	1 : 1
Curing	T [°C]	1h ;RT	1h ;RT
Thermal Properties			
Thermal resistance R_{th}	K/W	0.7	0.43
Thermal conductivity λ	W/mK	1.8	2.9
Electrical Properties			
Breakdown voltage $U_{d:ac}$	kV	10	6
Dielectric breakdown $E_{d:ac}$	kV/mm	20	12
Mechanical Properties			
Measured thickness (+/-10%)	mm	-0.500	0.500
Hardness	Shore 00	45 - 60	40 - 60
Physical Properties			
Application temperature	°C	-40 to +200	-40 to +150
Density	g/cm ³	2.3	2.6
Viscosity	Pas	45 - 70	40 - 70
Possible thickness *	mm	0.2 - 5.0	0.2 - 5.0

* Shear rate 4s⁻¹ / 25°C

Applications

- All applications with high fabrication tolerances
- Encapsulation
- Electric vehicles
- High energy rechargeable batteries

Benefits

- Room temperature curing
- Liquid assembly

Dispensing technology as a Service: consulting, development & production

As a specialist for dispensing technology, we offer consulting, development and production services for the application of thermal material to different heat sinks or to customized components.

You Benefit from

- ✓ a professional service-provider for dispensing production and technology
- ✓ a more economical dispensing material compared to conventional thermal pastes and tapes
- ✓ a time-saving, easy assembly due to the prefabricated, ready-dispensed components

Data for engineer guidance only. Observed performance varies in application. Engineers are reminded to test the material in application.

GF 255 & GF 300

Gap Filler



Ceramic-filled, solvent-free two-component silicone elastomers. Because of their various conductivities, their good dielectric properties and their compressibility characteristics, these Gapfillers are ideally suitable for encapsulating or dispensing. A wide range of different material viscosities make them suitable for “wet-in-wet” production. Customized solutions for the compound and processing technology are available.

Applications

- RD-RAM modules
- memory chips
- chipsets
- micro BGA
- heat pipe thermal solutions
- high voltage electronic components
- electric vehicles
- high energy rechargeable batteries

Benefits

- outstanding adaptability and compressibility
- low mechanical stress
- high thermal conductivity
- long term stability
- compatible with industrial production sequences
- good electrical insulation

Properties	Unit	GF 255	GF 300
Colour		red	blue
Assembly		silicone	silicone
Thermal Properties			
Thermal resistance R_{th}	K/W	0.83	0.41
Thermal conductivity λ	W/mK	1.5	3
Electrical Properties			
Breakdown voltage $U_{d, ac}$	kV	4	7
Dielectric breakdown $E_{d, ac}$	kV/mm	8	14
Mechanical Properties			
Measured thickness (+/-10%)	mm	0.500	0.500
Hardness	Shore 00	10 - 25	60 - 75
Physical Properties			
Application temperature	°C	-40 to +200	-40 to +200
Density	g/cm ³	1.7	1.28
Viscosity	Pas	30 - 55	55 - 85
Total mass loss (TML)		30 - 55	< 0.40
Flame rating	UL-94	V-0**	V-0**
Possible thickness *	mm	0.2 - 4.0	0.5 - 3.0

* Shear rate 4s⁻¹ / 25°C

Data for engineer guidance only. Observed performance varies in application. Engineers are reminded to test the material in application.



90/10, 90/15 & 90/20

100% pure graphite



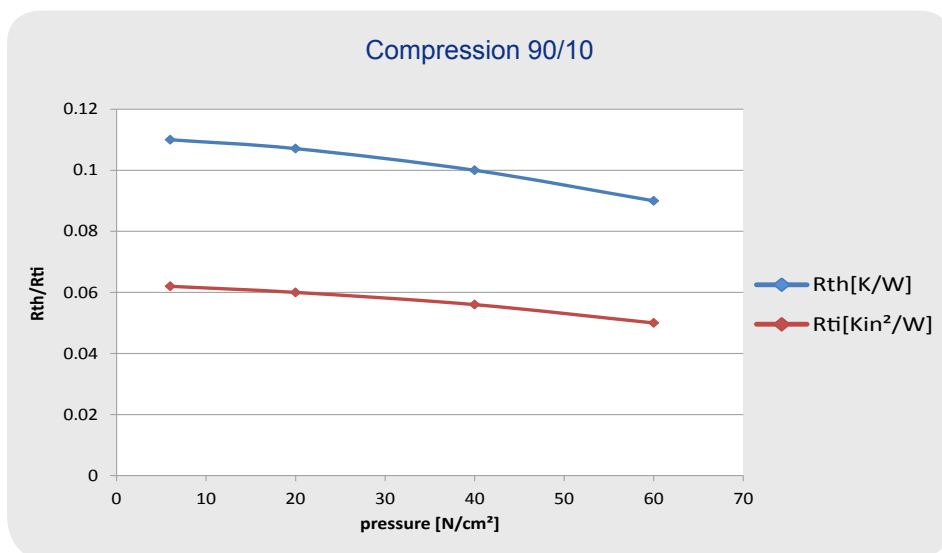
Graphite Films are based on 100% pure graphite. The films are available as uncoated types and, for specific applications, with filled adhesive or standard adhesives. Due to their high thermal conductivity they are used in the CPU sectors for example.

Properties	Unit	90/10
Colour		black
Thermal Properties		
Thermal resistance Rth	K/W	0.09
Thermal impedance Rti	°Cmm²/W	36
	Kin²/W	0.05
Thermal conductivity λ z (x/y)	W/mK	5.5 (200)
Electrical Properties		
Breakdown voltage Ud; ac	kV	conductive
Electrical resistance z (x/y)	Ωµm	650 - 700 (6 - 8)
Mechanical Properties		
Measured thickness (+/-10%)	mm	0.200
Hardness	Shore D	25 - 35
Tensile strength	N/mm²	5.5
Elongation	%	10
Physical Properties		
Application temperature	°C	-40 to +500
Density	g/cm³	> 1.0
Total mass loss (TML)	Ma. -%	0.01
Flame rating	UL-94	V-0
Possible thickness	mm	0.150 / 0.200

*details see page 61

Applications

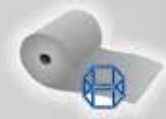
- chipsets
- memory chips
- micro BGA



Options

Type	Film structure	Overall thickness	Tensile strength	Thermal resistance	
		mm	N/mm²	K/W	Kin²/W
90/15	90/10 with filled adhesive	0.2	6.0	0.07	0.04
90/20	90/10 with standard adhesive	0.25	5.50	0.16	0.1

Data for engineer guidance only. Observed performance varies in application. Engineers are reminded to test the material in application.



S 900

Interface Material



Graphite S 900 is a highly dense, natural graphite without binding material, which is rolled or pressed into films or plates. S 900 has exceptional qualities and is therefore used particularly as a cost-effective alternative to conventional interface material. Especially, the anisotropy of the thermal properties (coupled with a possible weight saving of up to 30% compared to conventional materials made of copper or aluminum), makes the S 900 interesting for headspreader applications.

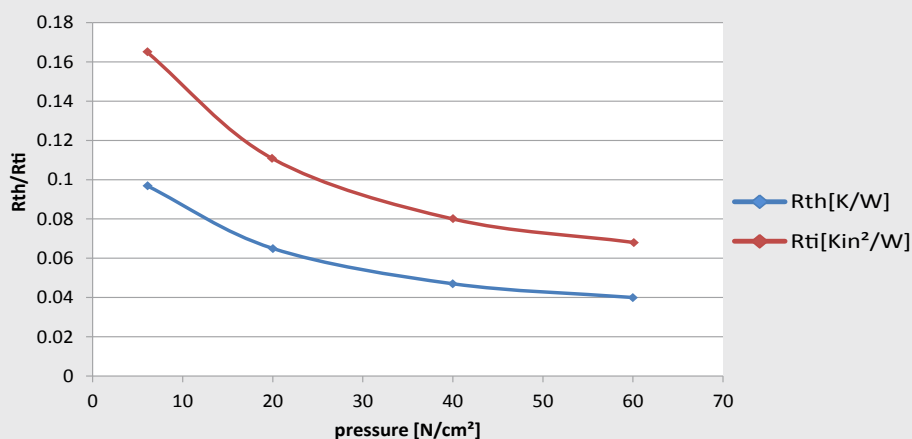
In addition, applications in vacuum or even at high temperatures (400 °C) are possible. Graphite S 900 has no electrical insulation and can be customized and applied with an adhesive coating.

✓ Optionally available with
oneside adhesive coating as **S 900 K**

Properties	Unit	S 900
Colour		black
Thermal Properties		
Thermal resistance R_{th}	K/W	0.08
Thermal impedance R_{ti}	°Cmm ² /W	34
	Kin ² /W	0.047
Thermal conductivity λ_z (x/y)	W/mK	7.5 (> 300)
Electrical Properties		
Breakdown voltage U_d ; ac	kV	conductive
Electrical resistance z (x/y)	Ωμm	700 - 800 (7 - 9)
Mechanical Properties		
Measured thickness (+/-10%)	mm	0.290
Hardness	Shore D	25 - 35
Tensile strength	N/mm ²	10
Elongation	%	5
Physical Properties		
Application temperature	°C	-40 to +500
Density	g/cm ³	> 1.6
Total mass loss (TML)	Ma.-%	0.01
Flame rating	UL-94	V-0
Possible thickness	mm	0.150 / 0.290

*details see page 61

Compression S 900



KL 90 & KL 91

ceramic filled adhesive film



Ceramic filled double-sided adhesive film - with or without fibre glass!

KL 90 and KL 91 are double sided adhesive films. They have an excellent, permanent adhesive strength with high thermal conductivities and very good insulation characteristics at the same time.

Low thermal contact resistances can be achieved with a very reliable adhesive strength on different surfaces.

Mechanical fixation with clips, screws or rivets is needed.

Due to the soft surface finish, tolerances can be compensated very well. Light weight, easy handling and high elasticity are further advantages.

Applications

Thermal connection of

- CPUs, LEDs
- Flips Chips, DSPs
- BGAs, PPGAs
- MOSFETS on heat sinks

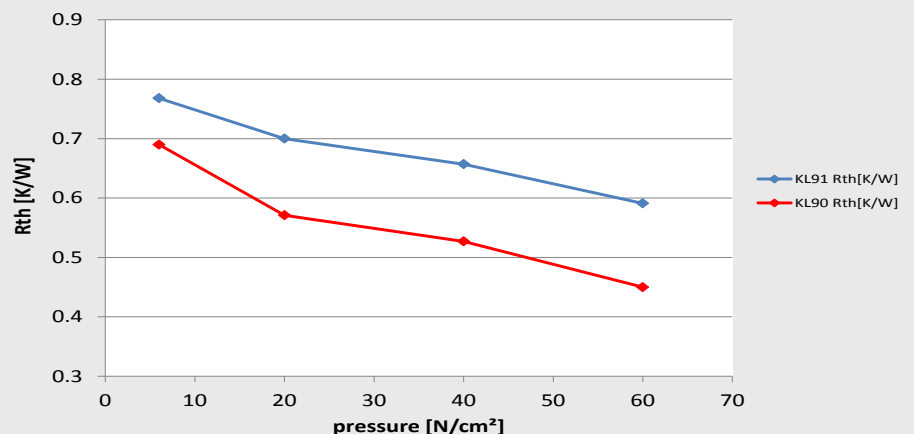
For example in

- power supplies and inverter modules
- computers
- telecommunication electronics
- automotive electronic

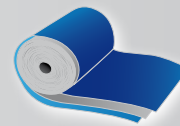
Properties	Unit	KL 90	KL 91
Colour		black	black
Basic material		acrylate	acrylate
Reinforcement (fibre glass)		without	with
Thermal Properties			
Thermal resistance Rth	K/W	0.52	0.55
Thermal impedance Rti	°Cmm²/W	208	220
	Kin²/W	0.32	0.34
Thermal conductivity λ	W/mK	1.4	1.35
Electrical Properties			
Breakdown voltage Ud; ac	kV	6	6
Dielectric breakdown Ed; ac	kV/mm	20	20
Volume resistivity	Ωm	2.6 x 10 ⁴	2.6 x 10 ⁴
Dielectric loss factor tan δ	1	305 x 10 ⁻³	305 x 10 ⁻³
Dielectric constant εr	1	18.5	18.5
Mechanical Properties			
Measured thickness (+/-10%)	mm	0.300	0.300
Hardness	Shore A	45	59
Tensile strength	N/mm²	0.25	11.28
Physical Properties			
Application temperature	°C	-40 to +125	-40 to +125
Density	g/cm³	1.98	1.87
Total mass loss (TML)	Ma.-%	< 0.15	< 0.15
Flame rating	UL-94	V-0	V-0
Possible thickness	mm	0.15 - 0.5	0.150 - 0.300

*details see page 6

Compression KL 90 & KL 91



Data for engineer guidance only. Observed performance varies in application. Engineers are reminded to test the material in application.



Specific film characteristics	Unit	KL 90	KL 91
		(without fibre glass)	(with fibre glass)
Application temperature (continuous)	°C	-40 to +125	-40 to +125
Testing the reflow stability 10s/270°C		passed	passed
Adhesive film thickness (+/-10%)	µm	300	300
Shelf Life	month	12	12

Specific film characteristics	Unit	KL 90	KL 91
		(without fibre glass)	(with fibre glass)
Application [pressure/time]	N/cm²/sec.	10/10	10/15
Tensile shear strength [25mmx25mm-adhesive area-180° aluminum – adhesive film – aluminum]	N/cm² [DIN EN 1465]	>30	>25
Tensile shear strength -20°C	N/cm²	157.2	146.8
temperature-depending** +20°C	[DIN EN 1465]	51.7	50.3
[25mmx25mm-adhesive area-180° aluminum – adhesive film – aluminum]	[ASTM D 1003]	14.1	13.6
+70°C		12.0	10.7
+80°C		10.7	9.5
Tensile shear strength	N/cm²	31.5	32.5
after vibration test (sinusoidal with temperature overlay at 60°C); vibration 10–500 Hz; 50 s/m² (5g) test cycle 24h (6h per axis) [1]			
Tensile shear strength	N/cm²	32.1	35.9
after vibration test (sinusoidal at RT); vibration 10–500 Hz; 100 s/m² (10g) test cycle 24h (8h per axis) [2]			
Adhesion* (bonding strength)	Nmm	> 1.2	> 1.0
Tack* (surface adhesiveness)	mm	> 1.5	>1.2
Peel strength [90°-on aluminum]	N/25mm	3 [adhesive]	9 [adhesive]

*used measurement - Texture Analyser (TA.XT-plus) **according to test standard DIN EN 1465; test speed 0.5 inch/min; adhesion area of 25x25mm² (1inch²); glued on an AlCuMg1-substrate, stored at room temperature of 62 hours. [1], [2]: sinusoidal vibration test - Fc gem. DIN EN 60068-2-6 and DIN EN 60068-2-2; VDE 0468-2-2

1. Processing and handling instructions

When the basic rules of processing and handling are followed, KL90 and KL91 double-sided adhesive films display very good processing characteristics. They allow mechanical fastening aids, such as clamps, screws or rivets, to be dispensed with. In addition to the good thermal and dielectric characteristics, their outstanding adhesive strength and good plasticity ensure reliable processability.

3. Cleaning the surfaces

Depending on the component's condition, its surface may need to be cleaned mechanically or chemically. Mechanical cleaning roughens the surface. Make sure that the surface roughness is not as deep as the adhesive tape's thickness. Chemical cleaning should be done with soft, clean cloths and solvents that are compatible with the material, such as alcohols, benzines, esters or ketones. These solvents' residues must not be left on the surfaces because they interfere with the tape's adhesion.

2. Surface conditions

The surfaces must be dry and free of impurities, (such as oil, fat, dust, paint coatings and possible solvent contamination). Condensation (e.g. when changing from cold to warm) must be avoided. A clean surface guarantees that KL90 and KL91 adhesive films provide best performance.

4. Adhesion

Naturally on plastics containing plasticizers and those of a nonpolar character, the bond is impaired. Besides appropriate adhesion tests on these materials, a chemical or physical surface treatment is, if necessary a prerequisite for improved bonding of the materials.

1. Processing temperatures and necessary transmission forces

The adhesive tapes' processing temperature lies between +18°C and +35°C with a relative air humidity of 50% – 70%. A different temperature or air humidity will change the initial strength (adhesion). Increased contact pressure improves the tape's adhesion on the surface of the component. For larger, flatter bonds, adhesion can be improved by using a pressure roller or a surface press (contact pressure about 10 – 15 N/cm²). The final, highest adhesive strength is reached about 24 to 72 hours after application. A moderate temperature treatment to a maximum of 80°C supports this process and shortens the time (dynamic cycle with 30 minutes' hold time).

2. Protective sheets and application to the component

The KL 90 and KL 91 adhesive films are covered with two different siliconized sheets. To apply the adhesive film, first the 70 µm thick PP sheet must be peeled off the tape (release lightly!). Then the adhesive tape (or also stamping) is pressed onto the surface to be adhered to (as described above). This can be followed by direct further processing or interim storage. Before the final assembly, the second, 50 µm thick PETP protective sheet is removed and the intended surface is adhered.

3. Storage and Shelf Life

KL 90 and KL 91 double-sided adhesive films must be stored at room temperature and normal humidity (room temp. = 18°C – 22°C; rel. humidity = 50% – 70%). Direct (effects of) sunlight or storage near heat sources must be absolutely avoided. To prevent pressure points, the rolls should also stand vertically in storage. When the storage conditions are met, the adhesive tapes remain stable for at least the indicated shelf life period. After this time, the adhesive tapes can continue to be used only if a test is made by the customer.

Adhesive Coatings

Always a good option

Each film type requires its own special adhesive system. Besides flexible adhesives with low adhesive strength, Kerafol also offers adhesives with high adhesive strength or with various fillings for improved heat transfer.

Properties	Unit	Sil-S1	Sil-S2	Acryl-A1	Acryl-2	Acryl-3
Colour		transparent	transparent	transparent	transparent	milky white
Film type		PSA silicone	Gel silicone	Acrylate	Acrylate removable	filled Acrylate
Suitable for film types		standard silicone films with/without reinforcement	standard silicone films with/without reinforcement	for all silicone free films	for all silicone free films	for all silicone free films
Application temperature	°C	-60 to +250	-60 to +250	-40 to +180	-40 to +180	-40 to +180
Suitable for reflow process	(10sec. - 270°C)	yes	yes	no	no	yes
Peel resistance*	N/25mm	2 - 10	1 - 5	5 - 12	2 - 5	2 - 5
Bonding strength	Nmm	> 0.15	> 0.2	> 0.3	> 0.2	> 0.2
Tack (surface adhesiveness)	mm	> 0.5	< 1.0	> 1.0	> 0.8	> 0.5
Shelf Life**	month	8	8	12	12	12

*Peel resistance: peeling at 180°, peel speed: 300 mm/min.; Width of test strip: 25 mm; length of test strip: 220 mm; Final test method in accordance with DIN 53375, 53282, 53283.

**Shelf Life: Silicone adhesive: eight (8) months from date of manufacture provided the material has been stored in its original packaging and at max. 21°C (70°F) and 50% relative humidity. Acrylate adhesive: twelve (12) months from date of manufacture provided the material has been stored in its original packaging and at max. 21°C (70°F) and 50% relative humidity.

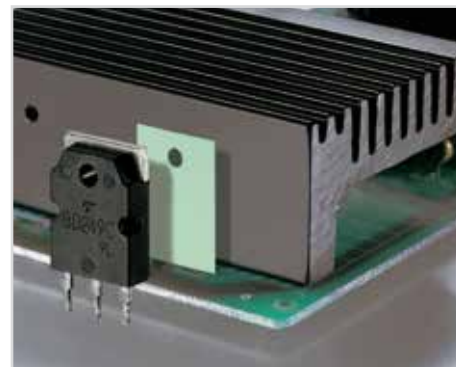
Notice: By using adhesives as single-sided coating for Keratherm thermal conductive films the thermal impedance increases.

Keratherm Films

Keratherm Films are mainly resistant to water, oils and their mixtures, organic solvents and chlorinated hydrocarbons, as well as the cleaning agents used to degrease and wash heat sinks, housings and printed circuit boards.

These materials merely cause swelling of exposed edges of the heat-conducting film, in which the degree of swelling depends on the contact period and the type of solvent applied.

After dry-out, the exposed edges return to their original state with no change in thermal or electrical properties. Due to the short contact times involved, Keratherm may be exposed to the conventional baths used in soldering processes.



Standard application of Keratherm

The various Keratherm products are crosslinked and cured to elastomers during the manufacturing process. Keratherm products involve none of the substances specified on the VDA list of declarable substances. Our products do not require labeling in accordance with „ChemG/Gefahrstoff V“ (Act for the Protection against Hazard Substances / Hazardous substance V). Keratherm products contain no asbestos, lead, mercury, chromium-6, cadmium and/or halogenated hydrocarbons.

All listed products in our catalog meet the requirements of RoHS!

Delivery form

Besides a large number of standard shapes (TO, TIP, DO or other power housing shapes), we can supply punch parts in customized shapes of any arbitrary size based on customer drawings (max. 400x400 mm). Roll goods can be supplied

in widths of 15 mm up to 500 mm. The Softtherm Films are supplied as sheets.

Tolerances

Keratherm Standard Films: In terms of geometry, as well as position and shape of the parts or holes to be punched or relevant recesses and outlines, the tolerances are fixed at a minimum of 0.10 mm in accordance with DIN ISO 2768-m. Regarding the thickness, a deviation from the required dimension of $\pm 10\%$ of the total thickness is allowed.

Keratherm Softtherm Films: the geometry, as well as position and shape of the parts are also fixed at a minimum of 0.10 mm in accordance with DIN ISO 2768-c. For holes or relevant recesses and outlines the following table applies.

Thickness	Tolerances
up to 1.0 mm	± 0.5 mm
up to 2.0 mm	± 1.0 mm
up to 3.0 mm	± 1.5 mm
up to 4.0 mm	± 2.0 mm
up to 5.0 mm	± 2.5 mm

Dimensions are measured with a Quick-Scope (QS-PAK 3.0) image processing measurement system, or using a dial gauge or measuring microscope. All tools and punched materials are qualified by means of the first sample inspection report.

Keratherm Graphit tolerances according DIN ISO 2768-c.

Batchwise determination of thermal properties

An equi-area measurement sample (4 cm² base area) is placed between a heatable upper die and a cooled lower die. The lower die is pressed against the upper one by means of a pneumatic pressure cylinder. The pressure dependance of the thermal resistance of the samples is derived from the variation in contact pressure. After approx. 20 minutes, the resultant temperature gradient above the sample is determined via Pt-100 sensors. The thermal resistance (R_{th}) and the thermal conductivity (λ) are calculated on the basis of this temperature gradient, the heating power passed through the sample, and the sample geometry.



Storage conditions and preservation instructions for Keratherm products

All Keratherm and Softtherm products that are not adhesive lined generally have unlimited shelf life and usability when appropriately stored under standard conditions (room temperature of 18°C - 22°C, rel. humidity 50-70%, no direct sunlight) in their original closed packaging. Exceptions to this are Keratherm heat transfer compounds, PCM and PCE - materials that should be refrigerated (10°C - 15°C) when stored. Variant or limited shelf lives exist for double-sided adhesive tapes and adhesive lined films. Kerafol offers various types of adhesives for different Keratherm and Softtherm products. For their respective shelf life data, please see the separate Keratherm data sheet – adhesive coating or processing and handling instructions for KL-90 and KL-91.

Determination of electrical properties

The electrical insulation effect of the heat-conducting films is characterized by their dielectric strength. The higher the breakdown voltage, the better the insulation behaviour. Measurements are performed with an AC high-voltage detector.

Determination of mechanical properties

State-of-the-art equipment and measurement devices facilitate the batchwise determination of tensile strength and elongation of the films. In addition to this, the peel strength of adhesive coated materials is determined on the basis of the "FINAT Test Method No.1" (180°).

Determination of flame rating

The available Keratherm products have been certified and categorized into classes with regard to their inflammability by the American institute "Underwriters Laboratories Inc." (UL). In addition to this, the company Kerafol endeavours to test its products on the basis of the latest findings in research and development.

YOUNGS MODULUS studies

Kerafol analyses the behaviour of flexible films under pressure, using the method described in ASTM D 575-91, to determine the so-called YOUNG'S MODULUS. The sample geometry of the individual film types is 30x30mm at 2.5 mm thickness, and pressure is applied with a constant traverse path of 1mm/min (0.04 in/min). The pressure dependence of the films is shown on the graphs.

Further information regarding the UL identifiers of Kerafol products is available on the UL website. Visit <http://www.ul.com> and select the category "Online Certifications Directory". From there you can search for the Kerafol file under the following file number:

QMFZ2E140693: Plastics Component. This category contains all Kerafol products.

Keratherm

Discription	Unit	Test Methode	
Thermal resistance Rth*	K/W	Kerafol - test methode	
Thermal conductivity *	W/mK	Kerafol - test methode	ASTM D 5470
Breakdown voltage (Ud; ac)	kV	IEC 243 1+2	ASTM D 149
Dielectric breakdown (Ed; ac)	kV/mm	IEC 243 1+2	ASTM D 149
Volume resistivity	Ω m	DIN 53483-3	ASTM D 257
Dielectric loss factor tan d	1	DIN 53483	ASTM D 150
Dielectric constant ϵ_r	1	DIN 53483	ASTM D 150
Electrical conductivity	pS/m	DIN 51412-1	
Measured thickness	mm	DIN 53370	ASTM E 252
Tensile strength	N/mm ²	DIN EN ISO 527-3	ASTM D 412a
Elongation	%	DIN EN ISO 527-3	ASTM D 412a
Hardness	Shore (A,D) Shore 00	DIN 53505	ASTM D 2240
Compressibility**	mm	DIN ISO 815-1	ASTM D 395
Youngs Modulus**	N/cm ²	-	ASTM D 575
Flame rating	UL (Kerafol internal)	UL 94 / E140693 (Kerafol Test according to UL)	UL 94 / E140693
Total mass loss (TML)	Ma.-%		ASTM E 595

Modified test geometry

- * Thermal conductivity λ , thermal resistance R_{th} and thermal impedance R_{ti} (4 cm²)
- ** Compressibility and "Young's Modulus" (3.0 cm x 3.0 cm = 9.0 cm²)

Conversion

Shape: 1000 mil = 1 inch (1") = 2.54 cm = 25.4 mm
 Area: 1 inch² = 6.45 cm² = 645 mm²
 Pressure: 100 N/cm² = 1MPa = 10 bar = 145.037 psi

List of available thicknesses

Thickness	0,100	0,125	0,150	0,175	0,200	0,225	0,250	0,275	0,280	0,300	0,325	max. available dimensions mm x meter	description
86/30		X				X				X		500 x meter	standard
86/40			X				X				X	470 x meter	86/30 + adhesive
86/10		X				X				X		500 x meter	reinforcement
86/20			X				X				X	470 x meter	86/10 + adhesive
86/37		X				X				X		500 x meter	standard
86/47							X				X	470 x meter	86/37 + adhesive
86/17		X				X				X		500 x meter	reinforcement
86/27							X				X	470 x meter	86/17 + adhesive
86/50		X				X				X		500 x meter	standard
86/51							X				X	470 x meter	86/50 + adhesive
86/52		X				X				X		500 x meter	reinforcement
86/53							X				X	470 x meter	86/52 + adhesive
86/60			X		X		X			X		500 x meter	standard
86/60 K				X		X		X			X	470 x meter	86/60 + adhesive
86/82							X			X		500 x meter	standard
86/82 K								X			X	470 x meter	86/82 + adhesive
70/50							X					500 x meter	standard
70/60								X				470 x meter	70/50 + adhesive
U 80			X							X		470 x meter	standard
U 80 K				X							X	460 x meter	U 80 + adhesive
U 85		X			X					X		500 x meter	standard
U 85 K			X			X					X	470 x meter	U 85 + adhesive
U 90	X				X					X		470 x meter	standard
U 90 K		X				X					X	460 x meter	U 90 + adhesive
MT 102							X					230 x meter	standard
MT 103									X			230 x meter	standard
MT 102 K								X				220 x meter	MT 102 + adhesive
MT 103 K										X		220 x meter	MT 103 + adhesive
PCM 471					X							150 x meter	standard
PCM 115					X							400 x meter	standard

 Special thickness on request!

Thickness	0.150	0.200	0.225	0.300	0.500							mm x meter	description
KL 90				x	x							400 x meter	
KI 91				x								400 x meter	reinforcement
90/10	x	x										500 x meter	standard
90/15		x										460 x meter	90/10 + filled adhesive
90/20		x	x									460 x meter	90/10 + adhesive
Thickness	0.150	0.180	0.290	0.315								mm x meter	
S 900	x		x									500 x sold by the meter	standard
S 900 K		x		x								500 x sold by the meter	S 900 + adhesive
Thickness	0.500	0.800	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500	5.000	mm x meter	
86/125	x		x	x	x	x	x	x	x	x	x	450 x 250	standard
86/128	x		x	x	x	x	x	x	x	x	x	450 x 250	standard
86/200	x	x	x	x	x	x	x	x	x	x	x	450 x 250	standard
86/225	x		x	x	x	x	x	x	x	x	x	450 x 250	standard
86/228	x		x	x	x	x	x	x	x	x	x	450 x 250	standard
86/235	x		x	x	x	x	x	x	x	x	x	450 x 250	standard
86/238			x	x	x	x	x	x	x	x	x	450 x 250	standard
86/300	x	x	x	x	x	x	x	x	x	x	x	450 x 250	standard
86/320			x	x	x	x	x	x	x	x	x	450 x 250	standard
86/325	x		x	x	x	x	x	x	x			450 x 250	standard
86/450	x		x	x	x	x	x	x	x			450 x 250	standard
86/500	x		x	x	x							450 x 250	standard
86/525	x		x	x	x	x	x					450 x 250	standard
86/600	x		x	x								450 x 250	standard
U 281	x		x	x	x	x	x					450 x 250	silicone free
Ac 500	x	x	x	x	x							450 x 250	standard

 Special thickness on request!



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Edition 10-2016

Customized solutions.

We are looking forward to receiving your inquiry!

Kerafol products are applied in vehicle electronics, telecommunications, aerospace, computers and the semi-conductor industry – in fact, in all areas in which generated heat has to be dissipated from sensitive components to the heat sink.

Discover our broad range of products and take advantage of the diverse application possibilities!

