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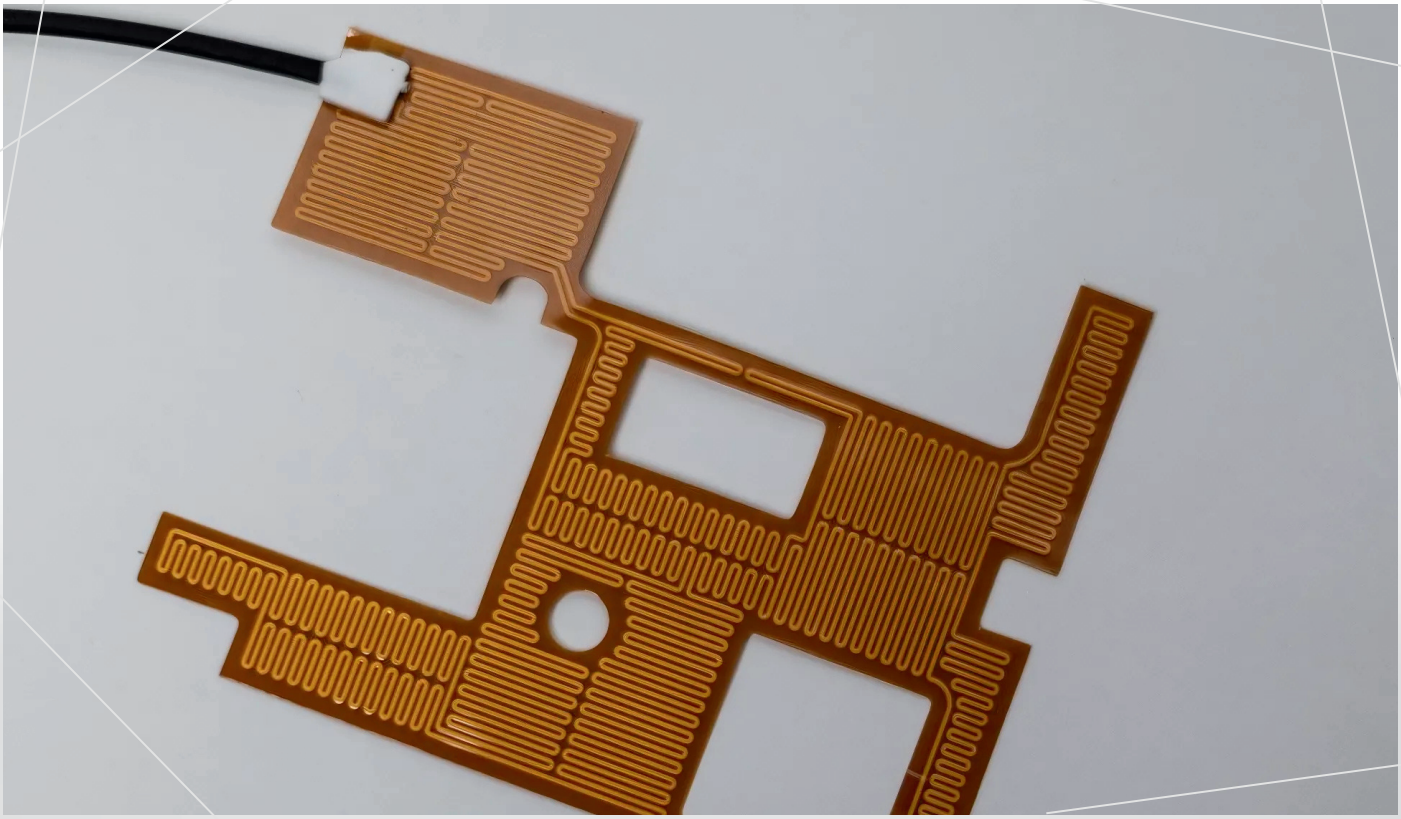
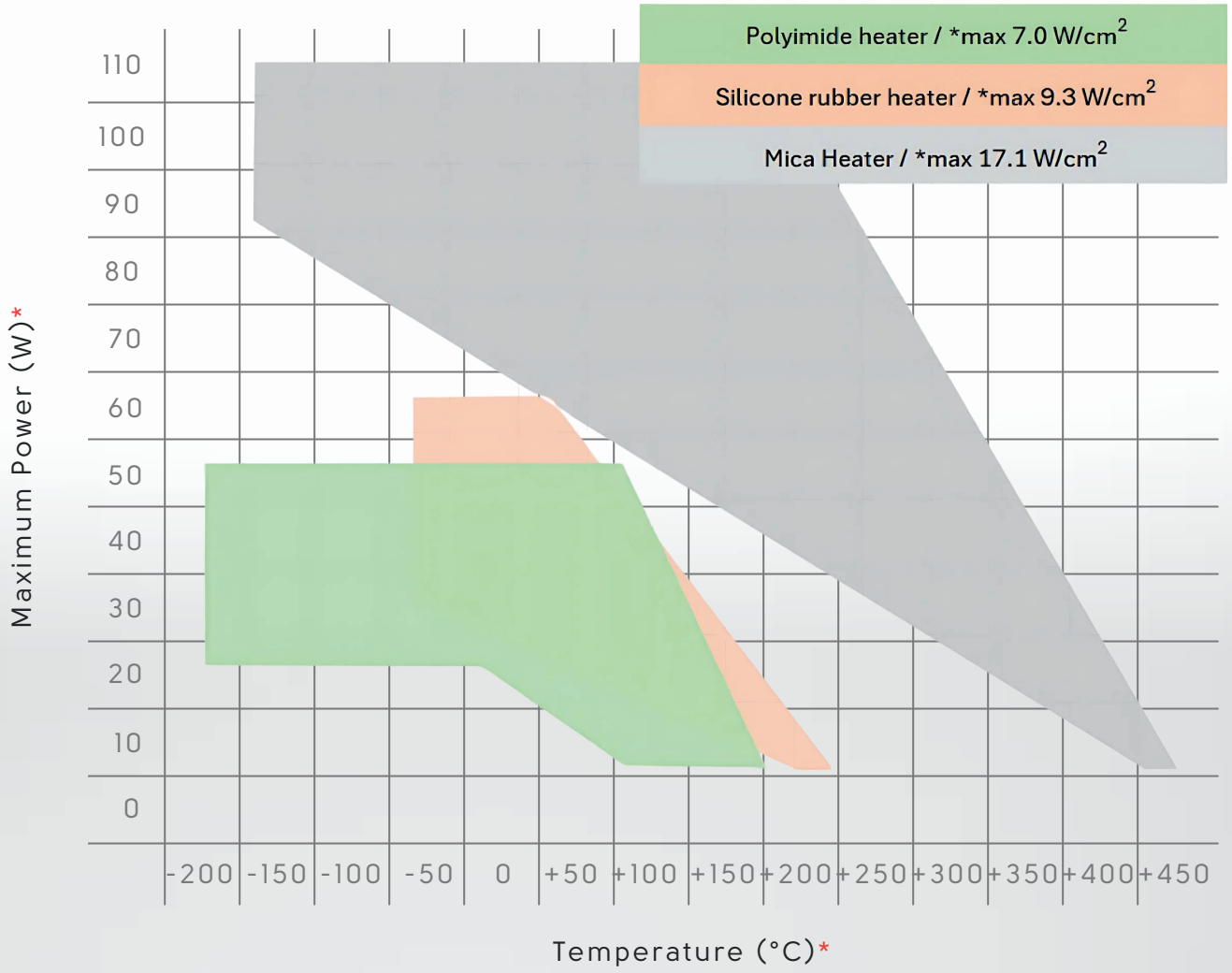


GENERAL INFORMATION

Power vs Temperature

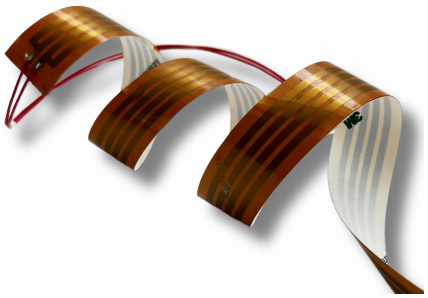
Overview for basic evaluation

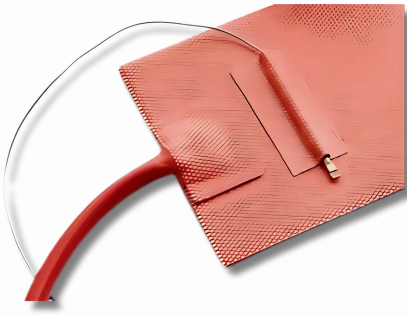


*indicative values

GENERAL INFORMATION

Overview of standard Heater Foil technologies



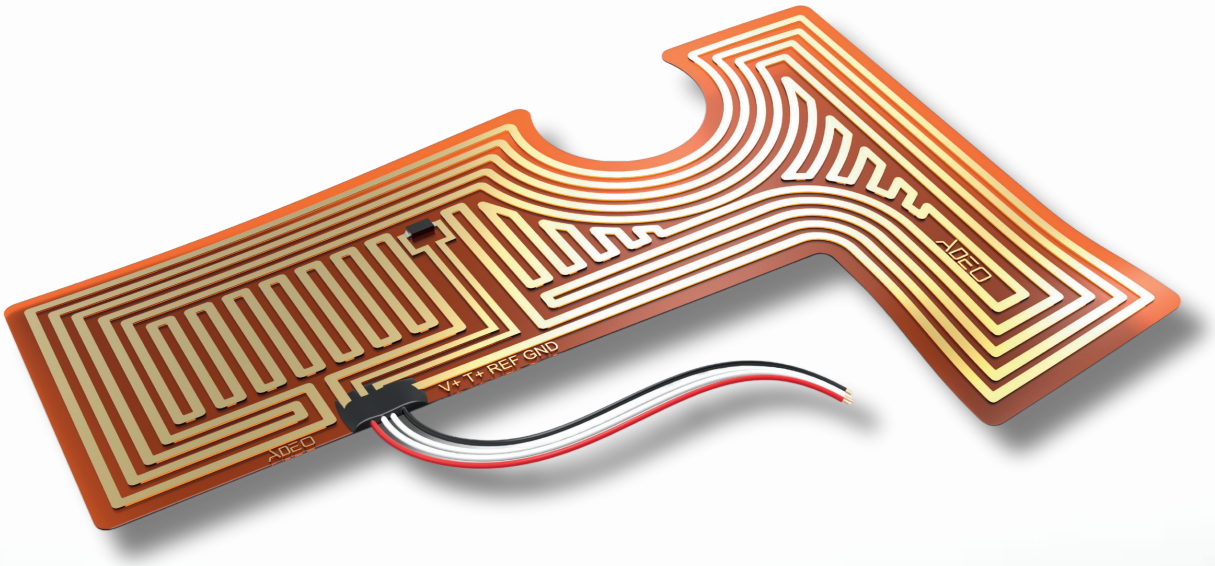


ADEO HEATER FOIL	KAPTON	SILICONE	MICA
Isolation	Polyimide/Kapton	Silicone Rubber	Mica
Temperature range (max)	-50°C to +200°C	-45°C to +235°C	-150°C to +450°C
Material flexibility	*****	***	*
Resistance Density (max)	70 Ω/cm²	30 Ω/cm²	4 Ω/cm²
Standard mounting by	Adhesive	Adhesive	Clamping
Resistance to chemicals	***	*****	*

POLYIMIDE HEATER FOIL

General Information

Polyimide Heater Foil (Kapton[1])



Typical description of technical specification:

- Thin, lightweight and easy to apply (adhesive backside)
- Etched-foil heating technology provides a big flexibility on shapes
- Internal or external adhesive, good lifetime up to 150°C (302 °F)
- Standard adhesive is mostly curing acrylic pressure sensitive PSA
- Fair resistant to most chemicals, acids and solvents
- Single Layer *maximum power density = 7.0 Watts/cm^2 (without PSA)

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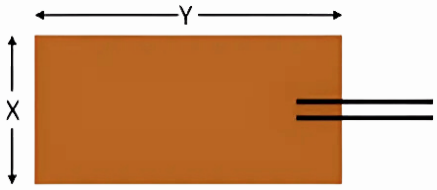
[1]*Kapton is a trade name of DuPont polyimide films*

POLYIMIDE HEATER FOIL

Standard ADEO Heater Foils
Polyimide Heater Foil (Kapton[1])

Specification:

Temperature range	-35°C to +150°C (optional -80°C to +200°C, without PSA)
Adhesive	Curing acrylic adhesive (PSA), 3M9485 or similar
Max. resistance density	70 Ω/cm² (without PSA)
Material heater layer	Polyimide/Kapton, thin, semitransparent, excellent
Cable length	Dialectric etched foil, resistance depend on design typ. 150 mm, PTFE, without connector



Size (X)	Size (Y)	Voltage (V)	Power (W)	Resistance (Ω)	Order No./ PN
10 mm	50 mm	12 24	5.00 20.00	28.80	HFP/10-50-24/20 PSA PN 11104
10 mm	50 mm	12 24	3.30 13.25	43.50	HFP/10-50-28/18 PSA PN 11026
25 mm	50 mm	12 24 28	1.80 7.35 10.00	78.50	HFP/25-50-28/10 PSA PN 10720
25 mm	75 mm	12 24 28	2.75 11.00 15.00	52.00	HFP/25-75-28/15 PSA PN 10721
39.4 mm	77.5 mm	12 24 32	3.65 14.60 26.00	39.50	HFP/39-77-32/26 PSA PN 10726

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[1]*Kapton is a trade name of DuPont polyimide films*

POLYIMIDE HEATER FOIL

Standard ADEO Heater Foils

Polyimide Heater Foil (Kapton[1])

Size (X)	Size (Y)	Voltage (V)	Power (W)	Resistance (Ω)	Order No./ PN
50 mm	50 mm	115 32 24	20.00 1.55 0.80	661.25	HFP/50-50-115/20 PSA PN 10722
50.8 mm	101.6 mm	32 24 12	48.00 27.00 12.00	21.35	HFP/50-101-32/48 PSA PN 1077
75 mm	75 mm	115 32 24	45.00 3.45 1.95	295.00	HFP/75-75-115/45 PSA PN 10723
100 mm	100 mm	115 32 24	80.00 6.20 3.45	165.00	HFP/100-100-115/80 PSA PN 10724
101.6 mm	177.8 mm	24 12 5	52.00 13.00 2.25	11.25	HFP/101-177-24/52 PSA PN 10728
101.6 mm	203.2 mm	115 32 24	160.00 12.35 6.95	82.70	HFP/101-203-115/160 PSA PN 10725
115 mm	26 mm	24 12 5	20.00 5.00 0.85	28.80	HFP/115-26-24/20 PSA PN 10729
200 mm	200 mm	230 115	20.00 5.00	2645.00	HFP/200-200-230/20 PSA PN 10730

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[1]*Kapton is a trade name of DuPont polyimide films*

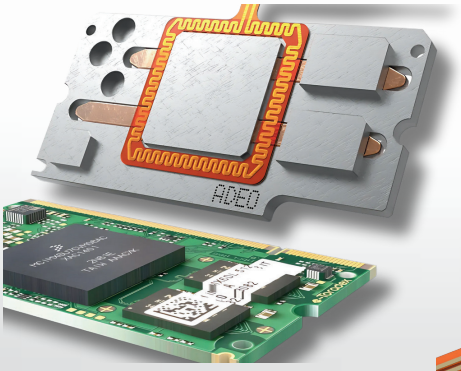
POLYIMIDE HEATER FOIL

Customized ADEO Heater Foils

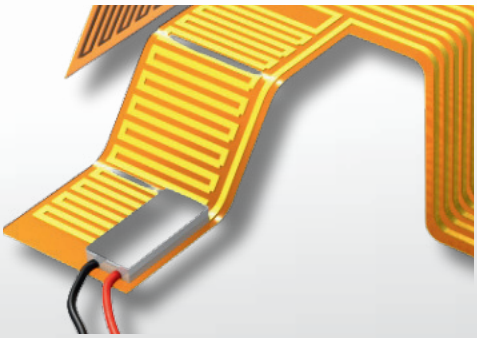
Polyimide Heater Foil (Kapton[1])

Specification:

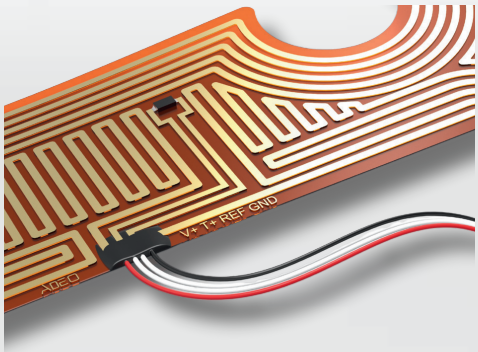
Temperature range	Can be adjusted by selection of PSA and isolation material
Shape	Customized kiss-cut, precision laser-cut, pre bending
Layers	Additional aluminum foil inlay, 2+ power sections, 2+ heat layers
Sensors	4-wire versions with: NTC, PTC or other sensors/logic assembled
Cables	Sized cables, assembling of connectors, premounted assembly
Engineering	Thermal engineering support (CFD), Heater foil design support



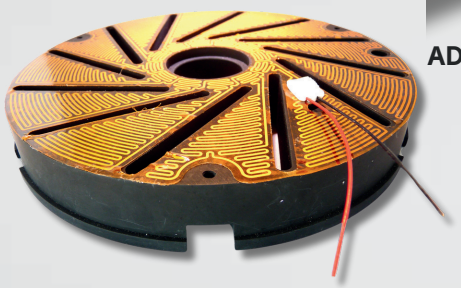
ADEO Heating & Cooling



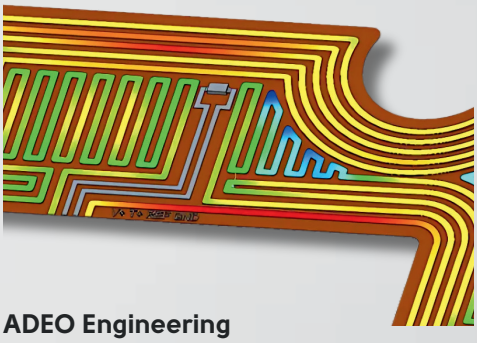
ADEO factory bended



ADEO 4-wire / sensor



ADEO Assembly Services



ADEO Engineering

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[1]*Kapton is a trade name of DuPont polyimide films*

SILICONE HEATER FOIL

General Information

Silicone Heater Foil (Rubber)

Silicone rubber is a rugged, flexible elastomer material with excellent temperature properties. It is most suited to larger heaters and industrial waterproof, mostly chemical applications because of his oil and outdoor resistance.

Features:

- Silicone heaters provides high reliability in a wide range of ruggedized industrial heating applications
- Components can be implemented vulcanization process
- Good properties outdoor, waterproof
- Maximum power density around 9.3 Watts/ cm^2

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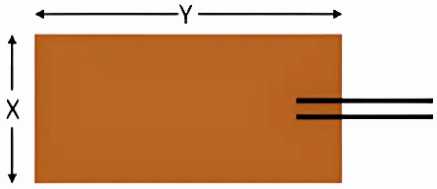
SILICONE HEATER FOIL

Standard ADEO Heater Foils
Silicone Heater Foil (Rubber)

Specification:

Temperature range	-50°C to +235°C
Mounting	Standard without adhesive PSA (with PSA on request only)
Material	Fiberglass textile reinforced silicone rubber
Cable length	Standard 150 mm, without connector



Size (X)	Size (Y)	Voltage (V)	Power (W)	Order No./ PN
10 mm	50 mm	28	18.00	HFS/10-50-28/18 PSA // PN 10731
10 mm	100 mm	28	10.00	HFS/10-100-28/10 PSA // PN 10732
25 mm	25 mm	28	10.00	HFS/25-25-28/10 PSA // PN 10733
25 mm	75 mm	28	15.00	HFS/25-75-28/15 PSA // PN 10734
25 mm	125 mm	115	25.00	HFS/25-125-115/25 PSA // PN 10735
75 mm	75 mm	115	45.00	HFS/75-75-115/45 PSA // PN 10736
75 mm	125 mm	115	75.00	HFS/75-125-115/75 PSA // PN 10737
100 mm	100 mm	115	308.00	HFS/100-100-115/308 PSA // PN 10738
100 mm	200 mm	115	160.00	HFS/100-200-115/160 PSA // PN 10739

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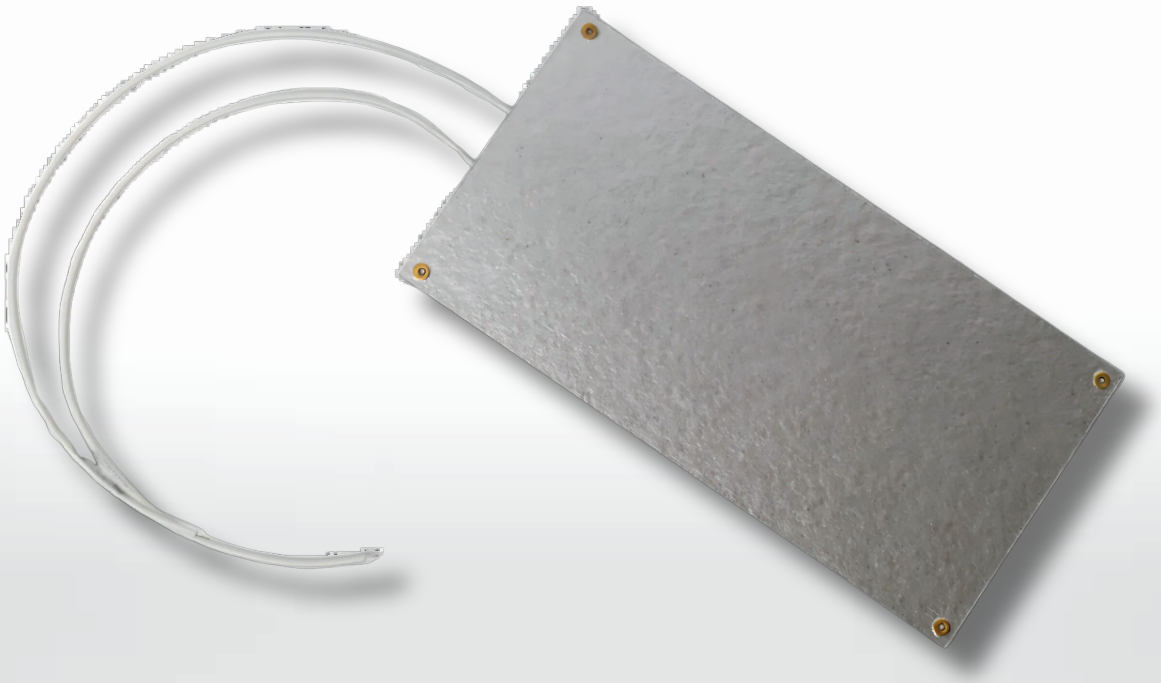
MICA HEATER FOIL

General Information

Mica Heater Foil (Glimmer)

Mica heaters is build by an etched foil element, sandwiched between layers of mica. The unique technical point of MICA heater is, they provide the fastest temperature rise until 600°C and power density.



Features:

- Highest power density capability, 17 Watts/cm^2
- Mounting or better heat induction is an important issue to this heater technology
- Because of mechanical issues-bigsize are not very common

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MICA HEATER FOIL

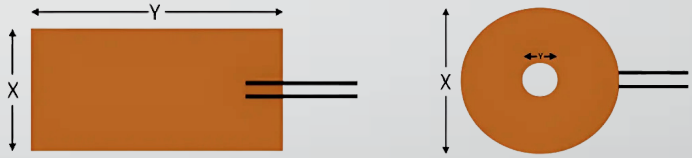
Standard ADEO Heater Foils
MICA Heater Foil (Glimmer)

Specification:

Temperature range	-150°C to +500°C
Adhesive	None, standard without PSA (adhesive)
Material	MICA, diameter or shapes (punching tool)
Mounting	Mounting with high mechanical pressure, no bending possible
Cable	PTFE or high temperature textile cable, without connector

Size (X)	Size (Y)	Voltage (V)	Power (W)	Order No./ PN
25 mm	100 mm	22	21.20	HFM/25-100-22/21 000 // PN 10740
50 mm	200 mm	18	24.00	HFM/50-200-18/24 000 // PN 10741
76 mm	200 mm	18	46.30	HFM/76-200-18/46 000 // PN 10742
100 mm	200 mm	18	21.00	HFM/100-200-18/21 000 // PN 10824
200 mm	200 mm	18	42.50	HFM/200-200-18/42 000 // PN 10743

Dia (X)	Dia (Y)	Voltage (V)	Power (W)	Order No./ PN
2 mm	50 mm	22	18.30	HFM/dia-50-22/18 000 // PN 10744
3 mm	76 mm	18	21.40	HFM/dia-76-18/21 000 // PN 10745
4 mm	100 mm	18	54.80	HFM/dia-100-18/54 000 // PN 10746
6 mm	150 mm	18	63.20	HFM/dia-150-18/63 000 // PN 10747



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ORDER CODE

Order information

Selection of the proper heater foil for specific application requires an evaluation of the total system in which the heater will be used.
For most applications it should be possible to use one of the standard heater foil configurations while in certain cases a special design may be needed to meet electrical, mechanical or other requirements. Although we encourage the use of a standard device whenever possible.

ADEO specializes in the development and manufacture of custom heater foil and we will be pleased to quote an unique foil / solution that will exactly meet your requirements.

The overall heating system is dynamic in nature and system performance is a function of several interrelated parameters. We urge to validate by qualified testing the heater foil to your requirements.
The publishing of thermal data entails some risk because there are numerous application parameters and conditions that will affect the end result. Therefore we cannot be held responsible an damaging any equipment by using our standard foils.

Requesting of other specifications, shape, please use the below nommenclature:

Technology	Length (mm)	Width (mm)	Voltage (V)	Power (W)	Adhesive	Shape/Spec
HFP/HFS/HFM	10	50	24	20	PSA*/without PSA**	div.
**PSA > HFP/10-50-24/20 PSA (3M9077, 3M9485, ...) // **without PSA > HFP/10-50-24/20 000*						

- *please consider power loss on cable, adhesive and mounting driven factors*
- *custommade versions need to be defined by spec. (watts/voltage) and the shape by drawing (DWG,DXF)*

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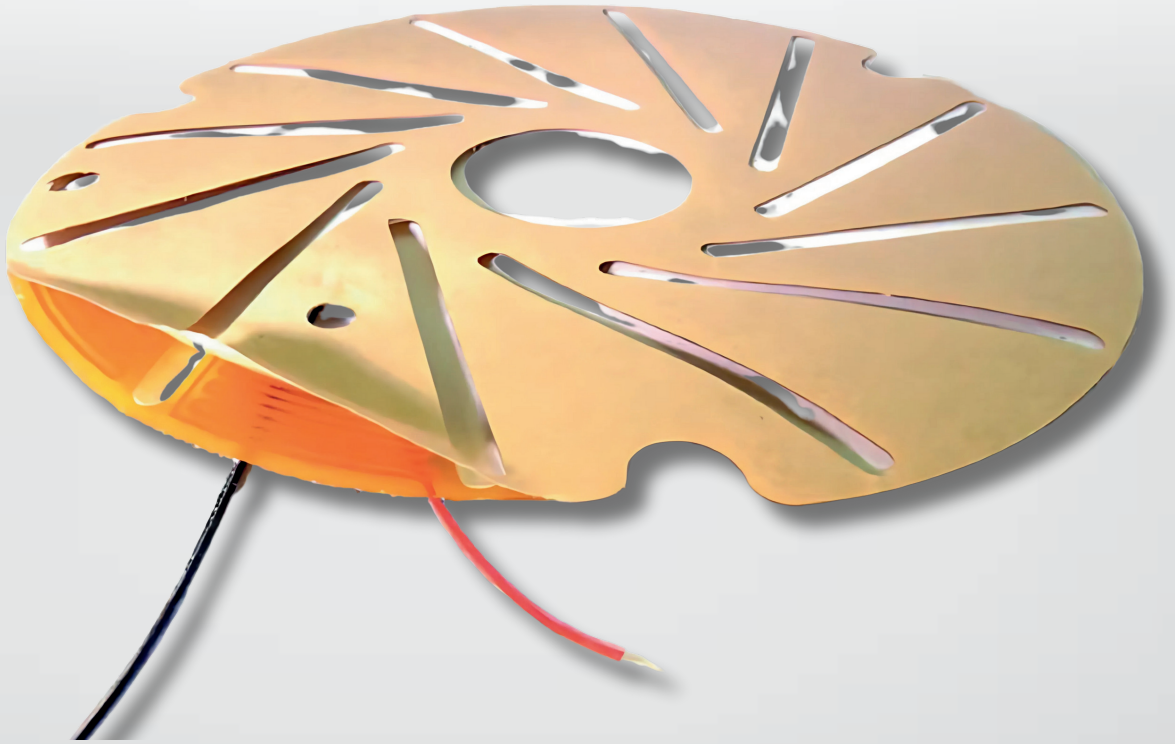
CUSTOMIZED HEATER

ADEO heater foils give you design options that other heater vendors cannot match. ADEO's custom design options can be qualified into three sections:

Design elements:
Freedom of patterns, outline shapes, heat specifications and usage can be fine-tuned to create the exact thermal and physical component to fit your requirements. Get more information below.

Integration of components:
Integrating temperature sensors or glue logic directly on the ADEO heater foil, giving your heater foil design the possibility to be an active component of your equipment.

Value-added services:
Complete thermal subassembly can provide a turn-key solution for your application like, assembled on metall sheet - implemented in plastic parts, special cable assemblies with connectors or others.



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