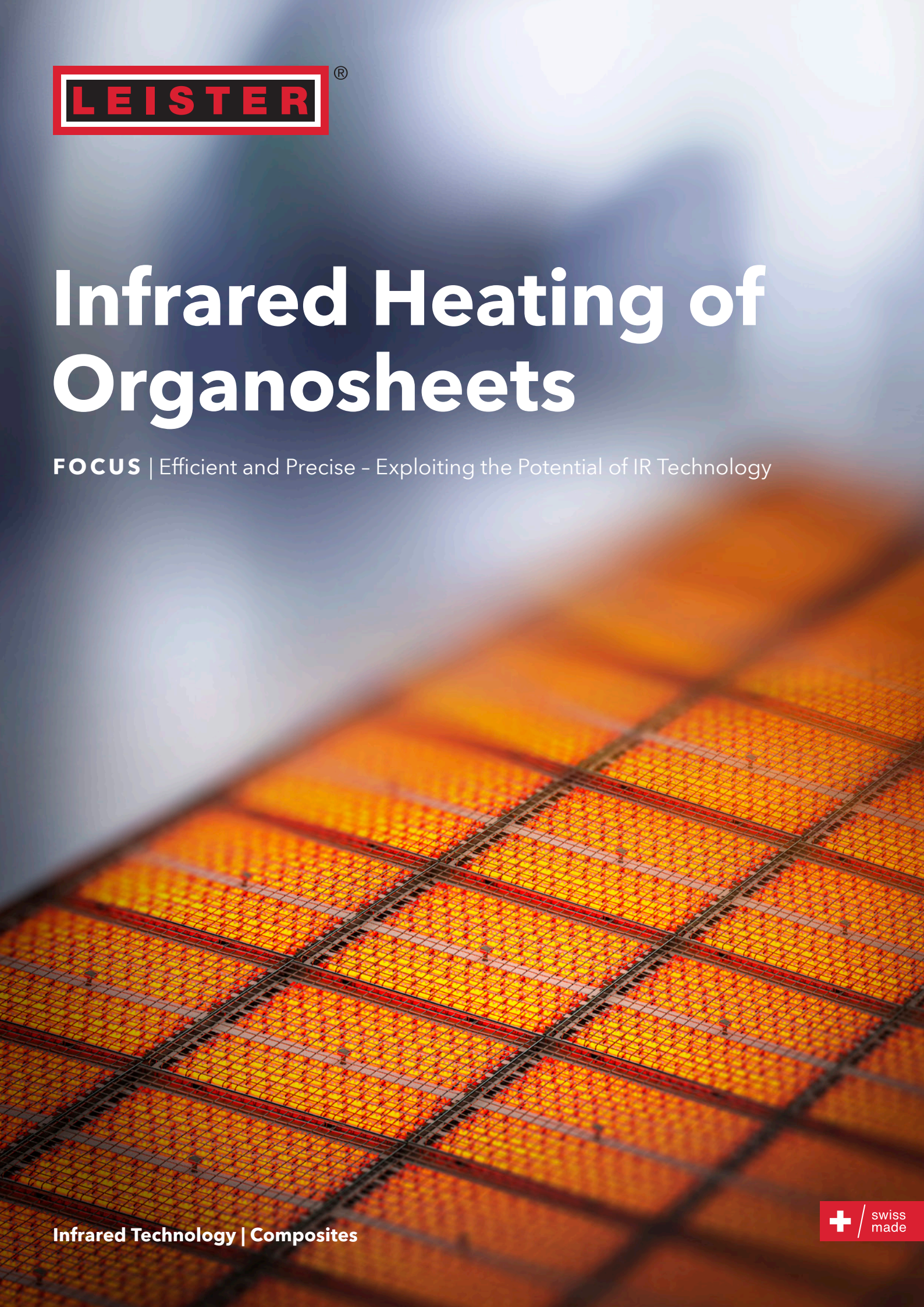
LEISTER®

Infrared Heating of Organosheets

FOCUS | Efficient and Precise – Exploiting the Potential of IR Technology



Infrared Technology | Composites

swiss made

Infrared Technology from Leister for the Plastics Industry

Precise and Optimized Heating with Infrared Heaters from Leister

The powerful Leister infrared heaters are ideal for processing thermoplastic composites. When you need precise control of product temperature, high efficiency through optimal wavelength, short response times, and durability, Leister infrared solutions are the number one choice. They have proven themselves worldwide.

We know how.

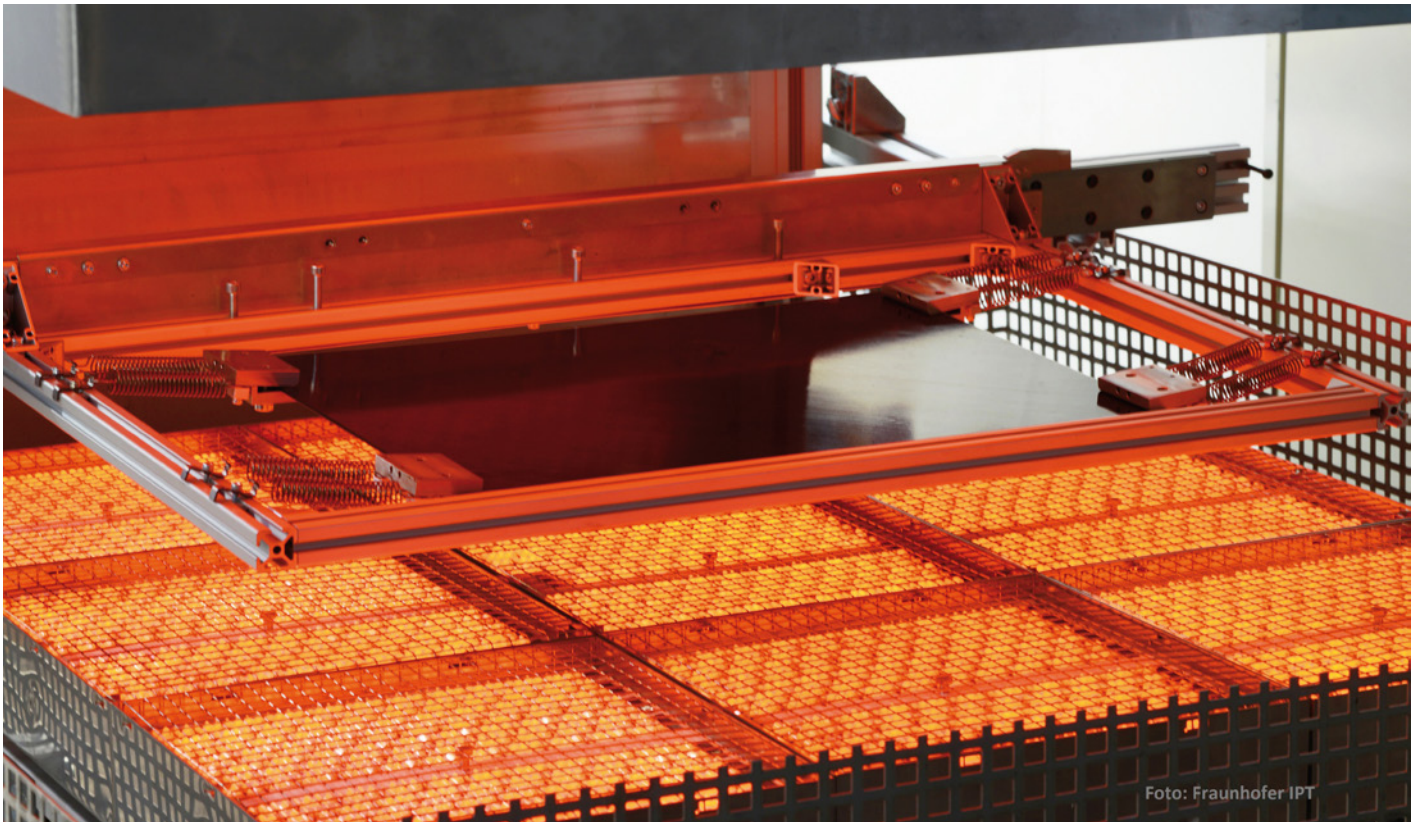
Content

Heating Composites with Infrared

Composites are excellent lightweight materials. These include organosheets: continuous fiber-reinforced, plate-shaped semi-finished products with a thermoplastic matrix. They are becoming increasingly popular in the automotive and aircraft manufacturing industries. To process the semi-finished products, they must be heated. This is preferably done using infrared radiation.

Lightweight construction and composite parts are at the heart of current innovations, particularly in automotive and aircraft manufacturing. Thermoplastic fiber composites are becoming increasingly important because they offer advantages over thermoset materials, such as shorter production cycle times and improved recyclability. Organosheets are particularly relevant here for the efficient large-scale production of complex parts.

The key to successfully processing these materials lies in heating them precisely to the forming temperature. This heating process should be energy-efficient and easy to control, ensuring good temperature consistency in the semi-finished product. Infrared radiation has become the heating technology of choice in the plastics processing industry.



Organosheets in an infrared oven

Hybrid Injection Molding – Two in One

Hybrid injection molding combines thermoforming with the injection molding process. The parts produced using this method combine high mechanical strength of continuous fiber-reinforced organic sheets with the versatility of the injection molding process. This allows for a high level of functional integration with short cycle times.

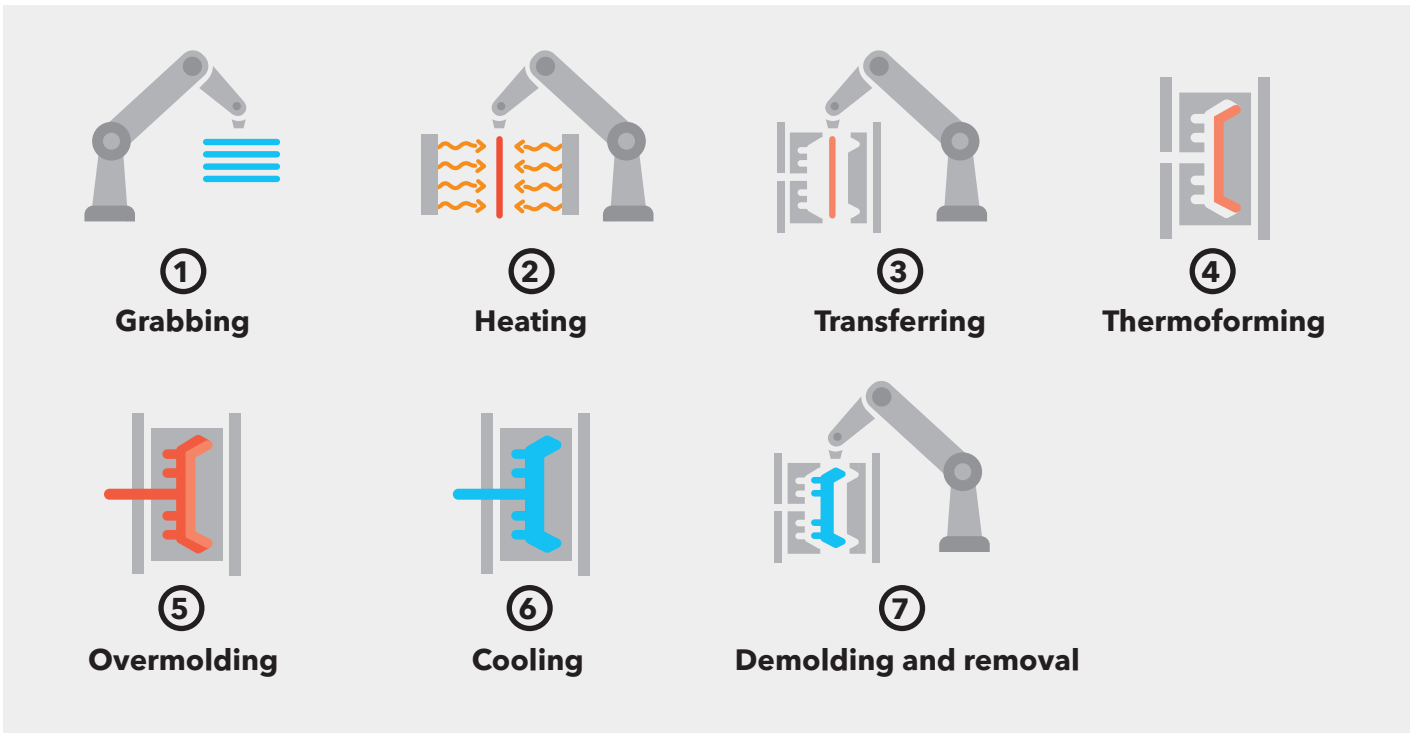
The Best of Both Worlds

With hybrid injection molding, the preheated organic sheet is formed directly in the injection mold. This is then followed by the injection of a reinforced plastic of the same type as the matrix. Combining thermoforming and injection molding processes further improves the rigidity of finished parts. This is achieved, for example, through the targeted insertion of ribs, which enhances the potential for lightweight construction. At the same time, additional functional elements can be integrated in the same process step. Open edges are reliably sealed – for clean, functional component geometry.

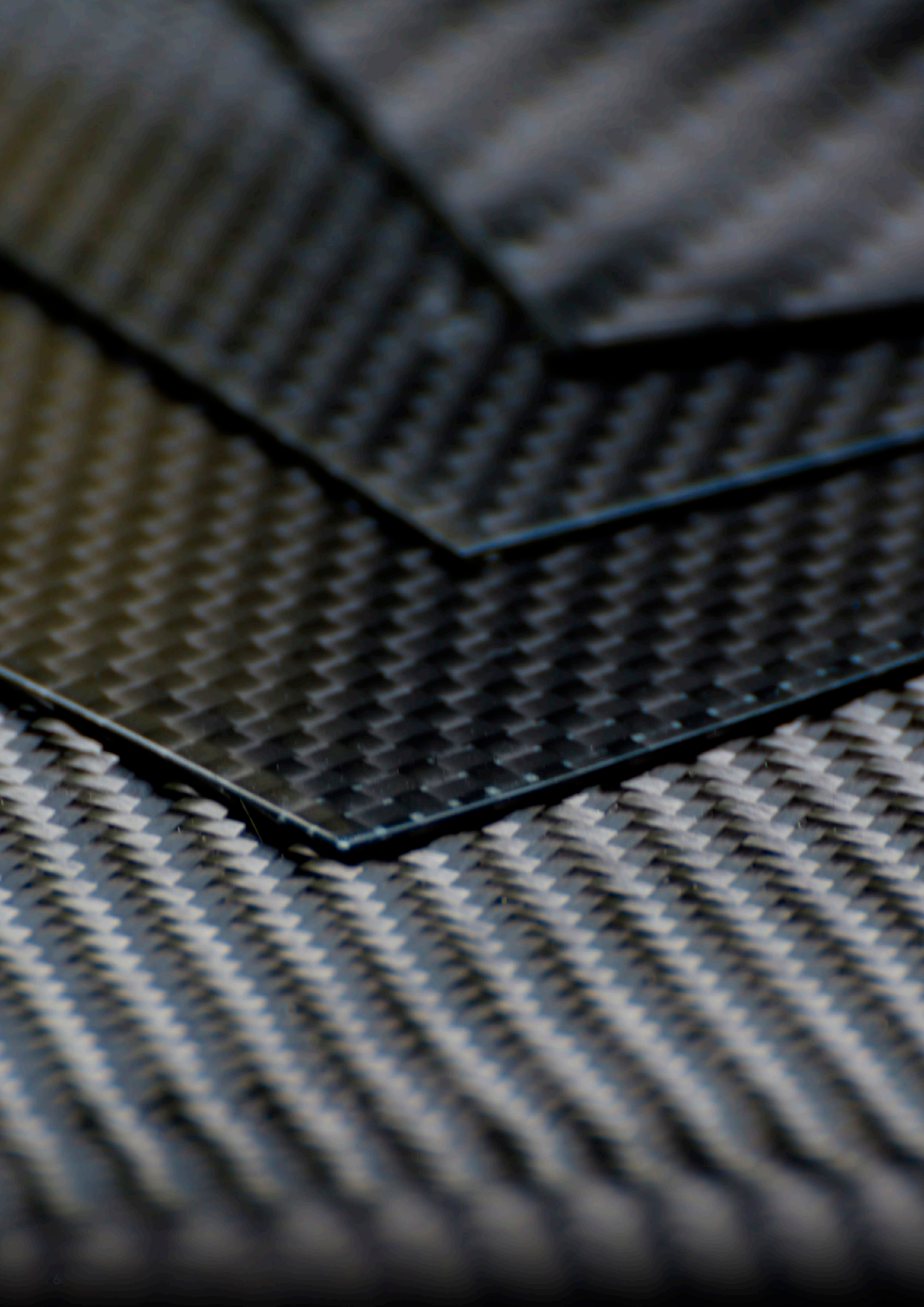
Short Cycle Times thanks to Parallel Processes

The hybrid injection molding process is divided into the following process steps:

- Grabbing
- Heating
- Transferring
- Thermoforming
- Overmolding
- Cooling
- Demolding and removal



The parallel processes – heating in the IR oven (2) and shaping/injection molding in the machine (4–6) – allow short cycle times of 40 to 80 seconds, with quality ensured by fast transfers and precise temperature management.

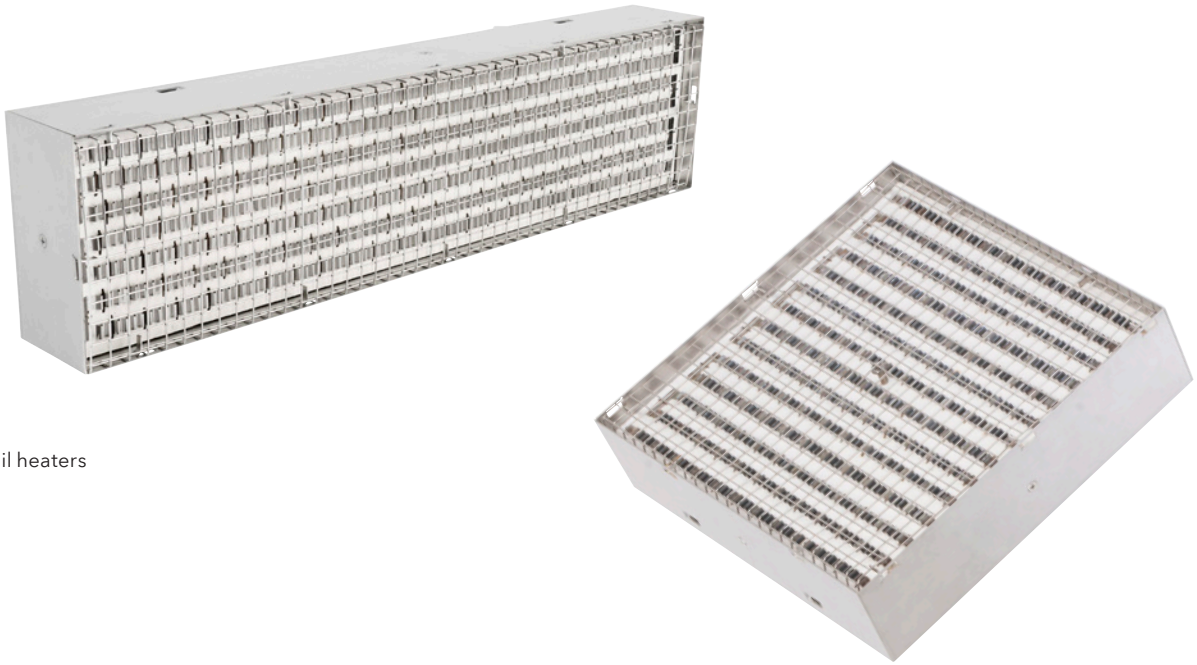


Focus on Heating: IR Radiation

Heating with infrared heaters is now the standard method for preheating thermoplastic composites. The energy is applied to the material surface in a contactless and efficient manner, while the interior is heated by thermal conduction. Dynamic adjustment of the heater power is essential for short cycle times.

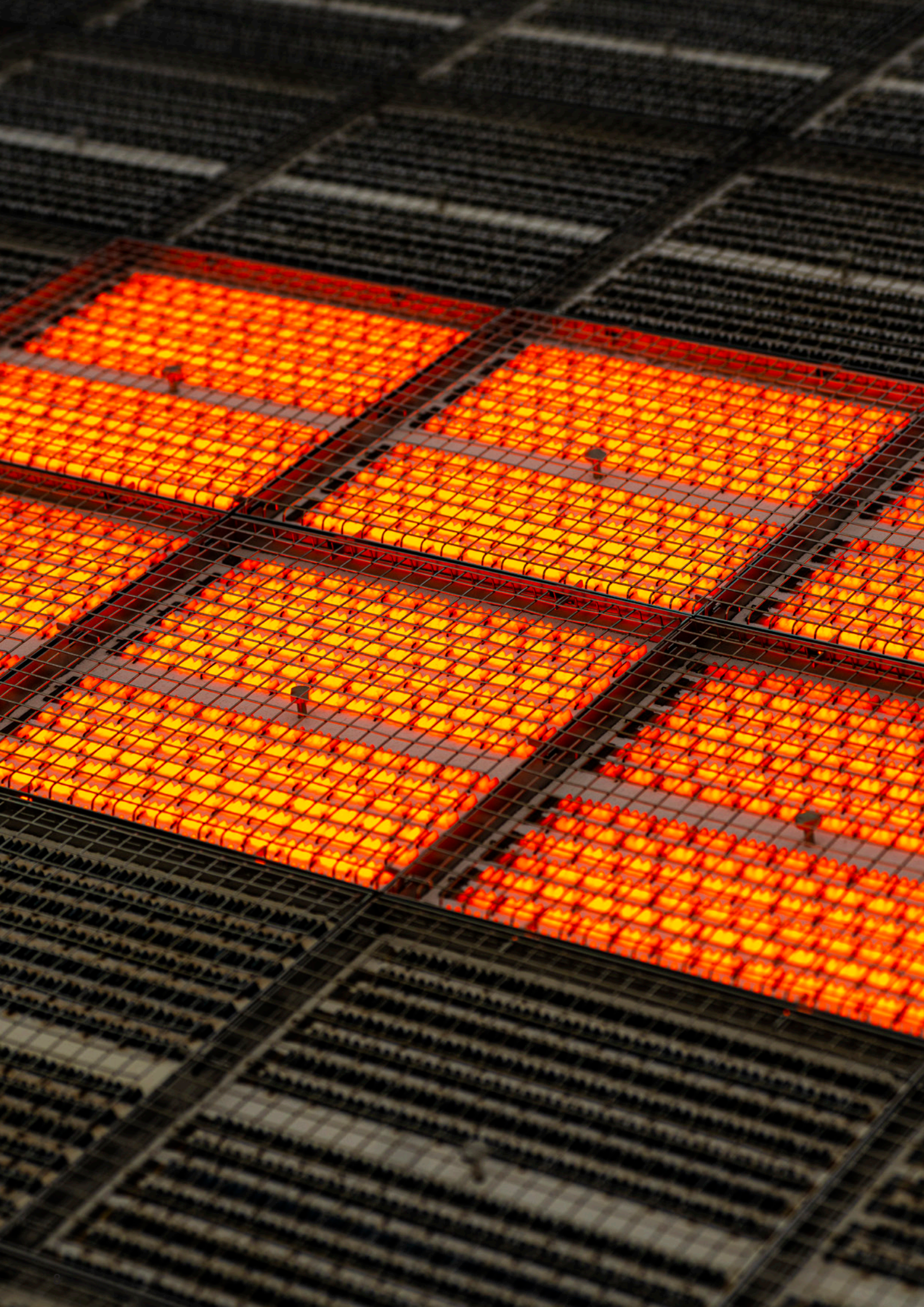
Various types of heaters are used for industrial applications of IR radiation:

- Short-wave glass tube heaters: Emit radiation in the range of 1–1.7 µm at temperatures of 1400–2400 °C. Fast-reacting and powerful, they are less efficient for thermoplastics, as these mainly absorb in the wavelength range of 1.4–3.6 µm.
- Medium-wave ceramic heaters: Operate at 700–850 °C and 2.6–3 µm. They are plane and robust but respond slowly and are more suitable for continuous processes.
- Medium-wave quartz heaters: Available in various designs, tubular or as modules. Behave similarly to ceramic heaters and react relatively slowly.
- Medium-wave metal foil heaters: Combine fast response times with the optimal wavelength (2.5–2.6 µm) and are ideal for dynamic heating of organicsheets. They are modular, energy-efficient, and enable individual zone control for complex parts.



Metal foil heaters

Request a free Expertise now



Control Strategy

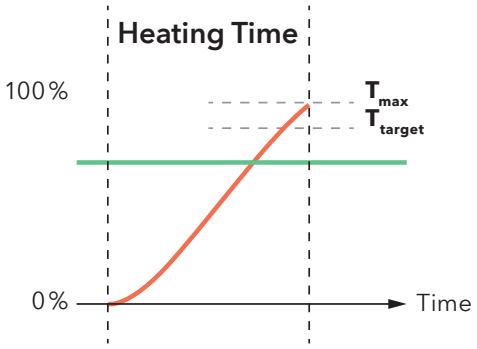
The heating process for organosheets must meet various requirements. Fast, so that it does not affect the cycle time. Homogeneous to minimize temperature gradients. Precise and consistent temperature to reliably prevent overheating of the semi-finished product. This is made possible not only by selecting suitable heaters, but also by using a process-optimized control strategy.

A precise heating process is crucial for the quality of the finished parts. There are time-controlled and temperature-controlled processes:

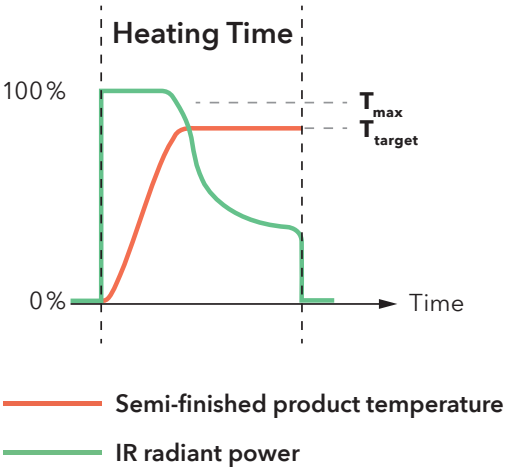
- Time-controlled: The semi-finished product is heated for a set period of time. Once the target temperature has been reached, the IR heater is removed to prevent overheating.
- Temperature-controlled: The surface temperature is measured without contact using a pyrometer, and the radiant power is adjusted accordingly. This reliably prevents overheating and ensures even temperature distribution, especially with thicker materials.

Temperature-controlled process management has become an established practice and can be implemented using dynamic IR heaters and zone-based control. The heating zones are divided into separately controllable areas, allowing peripheral regions to be heated more intensively and compensating for factors such as draughts. Complex parts with varying wall thicknesses require many small, individually controlled heater modules, which makes the control technology challenging but delivers optimal results.

Time-Controlled Process

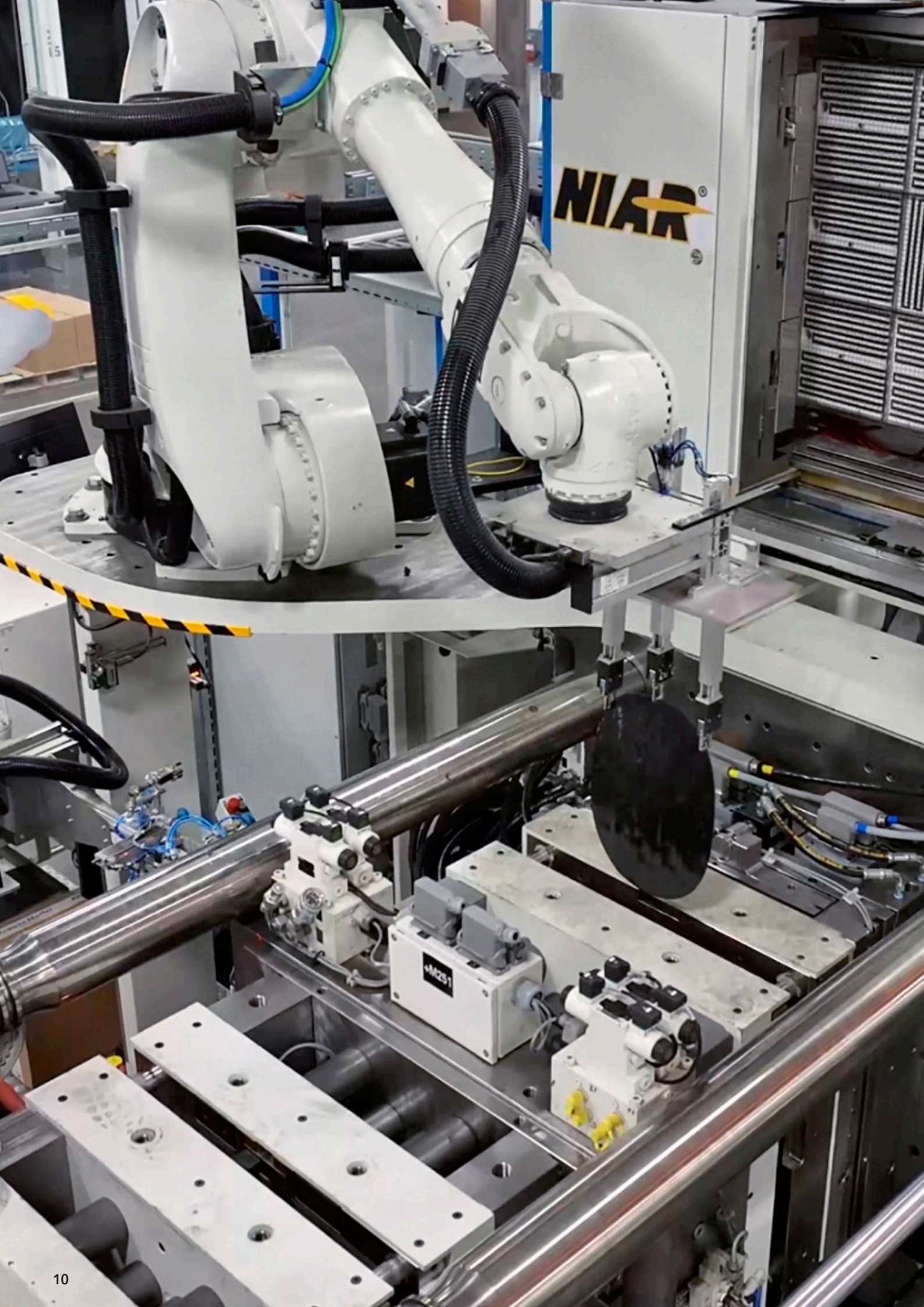


Temperature Regulated Process



It is good to notice that overheating of the plastic semi-finished product can be reliably prevented through temperaturecontrol in a temperature regulated process.

Arrange a consultation with experts


NIAR

Infrared Heaters

Controller

KraussMaffei Technologies GmbH, From passenger to cargo aircraft: Renowned NIAR Institute relies on FiberForm technology from KraussMaffei, Press release, 24.04.2024

KRELUS G14-25 MINI

KRELUS G14-25 MINI square infrared modular heaters are ideal for larger or smaller fields with one or more separately controlled heating zones.

Technical data

Phases	1x	
Voltage	200–240 V	
Frequency	50/60 Hz	
Power	1360–3565 W	
Power density	21.76–57.04 kW/m²	14.03–36.79 W/in²
Max. ambient temperature	500 °C	932 °F
Length	248 mm	9.76 in
Width	248 mm	9.76 in
Height	65 mm	2.55 in
Weight	2.7 kg	5.95 lb
Approvals	CE	
Protection class (IEC 60529)	IP20	
Protection class	I	

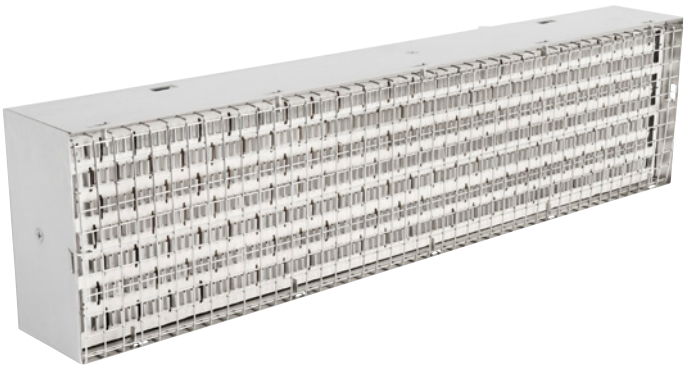
Product items

KRELUS IR-Heater G14-25 MINI 4, 230V/1360W	116.688
KRELUS IR-Heater G14-25 MINI 5, 230V/1700W	116.690
KRELUS IR-Heater G14-25 MINI 6, 230V/2000W	116.691
KRELUS IR-Heater G14-25 MINI 7.5, 230V/2500W	116.692
KRELUS IR-Heater G14-25 MINI 9, 230V/3100W	116.769
KRELUS IR-Heater G14-25 MINI 6 PS, 230V/2000W	116.949
KRELUS IR-Heater G14-25 MINI 6 PC, 230V/2000W	117.101
KRELUS IR-Heater G14-25 MINI 10.5, 230V/3565W	122.539
KRELUS IR-Heater G14-25 MINI 6, 220V/2000W	126.934
KRELUS IR-Heater G14-25 MINI 6, 240V/2000W	126.935
KRELUS IR-Heater G14-25 MINI 7.5, 200V/2200W	126.950

Further product articles available.

Configure product

KRELUS G7-50 MINI



KRELUS G7-50 MINI rectangular infrared heaters can be combined into heater fields. They can also be used with KRELUS G14-25 MINI heaters in one heater field.

Technical data

Phases	1x	
Voltage	200–240 V	
Frequency	50/60 Hz	
Power	1360–3565 W	
Power density	21.76–57.04 kW/m²	14.03–36.79 W/in²
Max. ambient temperature	500 °C	932 °F
Length	496 mm	19.52 in
Width	123 mm	4.84 in
Height	65 mm	2.55 in
Weight	2.7 kg	5.95 lb
Approvals	CE	
Protection class (IEC 60529)	IP20	
Protection class	I	

Product items

KRELUS IR-Heater G7-50 MINI 6 PS, 230V/2000W	117.131
KRELUS IR-Heater G7-50 MINI 4, 230V/1360W	117.770
KRELUS IR-Heater G7-50 MINI 5, 230V/1700W	119.412
KRELUS IR-Heater G7-50 MINI 6, 230V/2000W	119.424
KRELUS IR-Heater G7-50 MINI 7.5, 230V/2500W	119.452
KRELUS IR-Heater G7-50 MINI 9, 230V/3100W	119.453
KRELUS IR-Heater G7-50 MINI 6 PC, 230V/2000W	119.469
KRELUS IR-Heater G7-50 MINI 6, 220V/2000W	128.216
KRELUS IR-Heater G7-50 MINI 6, 240V/2000W	128.451
KRELUS IR-Heater G7-50 MINI 7.5, 200V/2200W	129.431
KRELUS IR-Heater G7-50 MINI 10.5, 230V/3565W	130.387

Further product articles available.

Configure product

KRELUS G14-25 MINI-MINI

KRELUS G14-25 MINI-MINI rectangular heaters are half the size of the KRELUS-MINI heaters. That means it offers great flexibility when setting up heater fields.

Technical data

Phases	1x	
Voltage	200–240 V	
Frequency	50/60 Hz	
Power	904–1300 W	
Power density	28.93–41.6 kW/m²	18.66–26.83 W/in²
Max. ambient temperature	500 °C	932 °F
Length	248 mm	9.76 in
Width	123 mm	4.84 in
Height	65 mm	2.55 in
Weight	1.35 kg	2.97 lb
Approvals	CE	
Protection class (IEC 60529)	IP20	
Protection class	I	

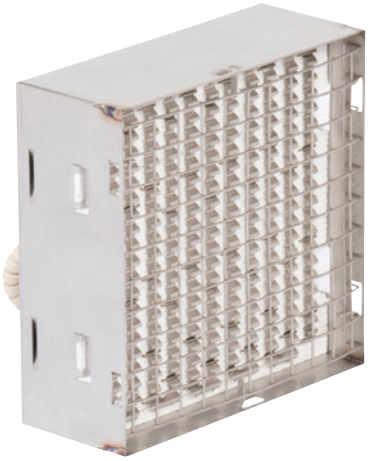
Product items

KRELUS IR-Heater G14-25 MM 3, 230V/1000W	122.604
KRELUS IR-Heater G14-25 MM 3.3, 230V/1200W	122.609
KRELUS IR-Heater G14-25 MM 3 PS, 230V/1000W	122.657
KRELUS IR-Heater G14-25 MM 3.3 PS, 230V/1200W	122.785
KRELUS IR-Heater G14-25 MM 3, 220V/915W	123.850
KRELUS IR-Heater G14-25 MM 3, 240V/1090W	123.852
KRELUS IR-Heater G14-25 MM 3 PS, 220V/915W	124.166
KRELUS IR-Heater G14-25 MM 3 PS, 240V/1090W	124.217
KRELUS IR-Heater G14-25 MM 3.3, 220V/1090W	124.624
KRELUS IR-Heater G14-25 MM 3.3, 240V/1300W	124.629
KRELUS IR-Heater G14-25 MM 3.3 PS, 200V/904W	124.636
KRELUS IR-Heater G14-25 MM 3.3 PS, 220V/1090W	124.672
KRELUS IR-Heater G14-25 MM 3.3 PS, 240V/1300W	124.706

Further product articles available.

Configure product

KRELUS G11-12 SUPER-MINI



KRELUS G11-12 SUPER-MINI square surface heaters can be used in smaller fields thanks to their reduced size. Like the other KRELUS modular heaters, they can also be used alone or in combination.

Technical data

Phases	1x	
Voltage	77 V	
Frequency	50/60 Hz	
Power	540–960 W	
Power density	34.56–61.44 kW/m²	22.29–39.63 W/in²
Max. ambient temperature	500 °C	932 °F
Length	123 mm	4.84 in
Width	123 mm	4.84 in
Height	50 mm	1.96 in
Weight	0.6 kg	1.32 lb
Approvals	CE	
Protection class (IEC 60529)	IP20	
Protection class	I	

Product items

KRELUS IR-Heater G11-12 SM 5, 77V/960W	122.786
KRELUS IR-Heater G11-12 SM 5 P, 77V/960W	122.787
KRELUS IR-Heater G11-12 SM 5 L, 77V/540W	122.795
KRELUS IR-Heater G11-12 SM 5 LP, 77V/540W	122.796

Configure product

KRELUS Controller

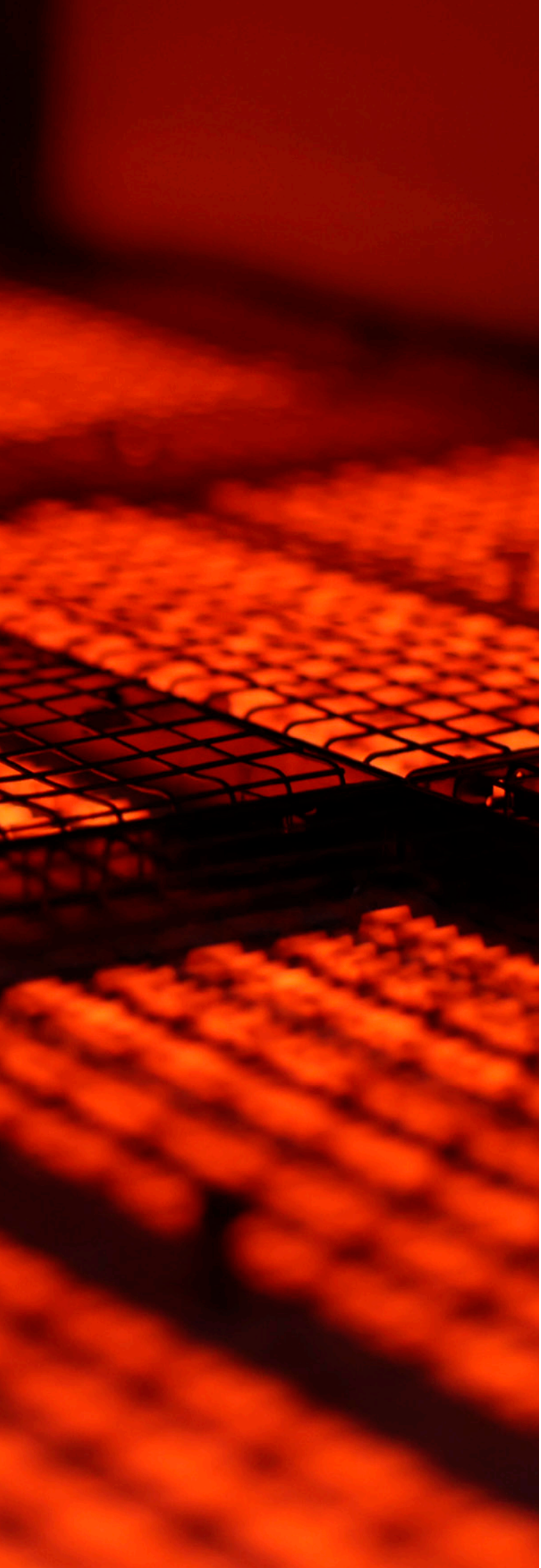
For all infrared modular heaters and infrared heater fields, as well as for all customized infrared heaters, there is always the right KRELUS Controller. Tailored, versatile and efficient.

Technical data

Phases	1x/3x
Voltage	200–480 V
Frequency	50/60 Hz

Further products and customized solutions on request.

Configure product



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Industry Segment / Organosheets / 10.2025 / EN