

FiberForm

The perfect combination of thermoforming and injection molding

Engineering Passion

Krauss Maffei

Facts and figures regarding FiberForm technology

Application examples



Airbag housing



Ski binding

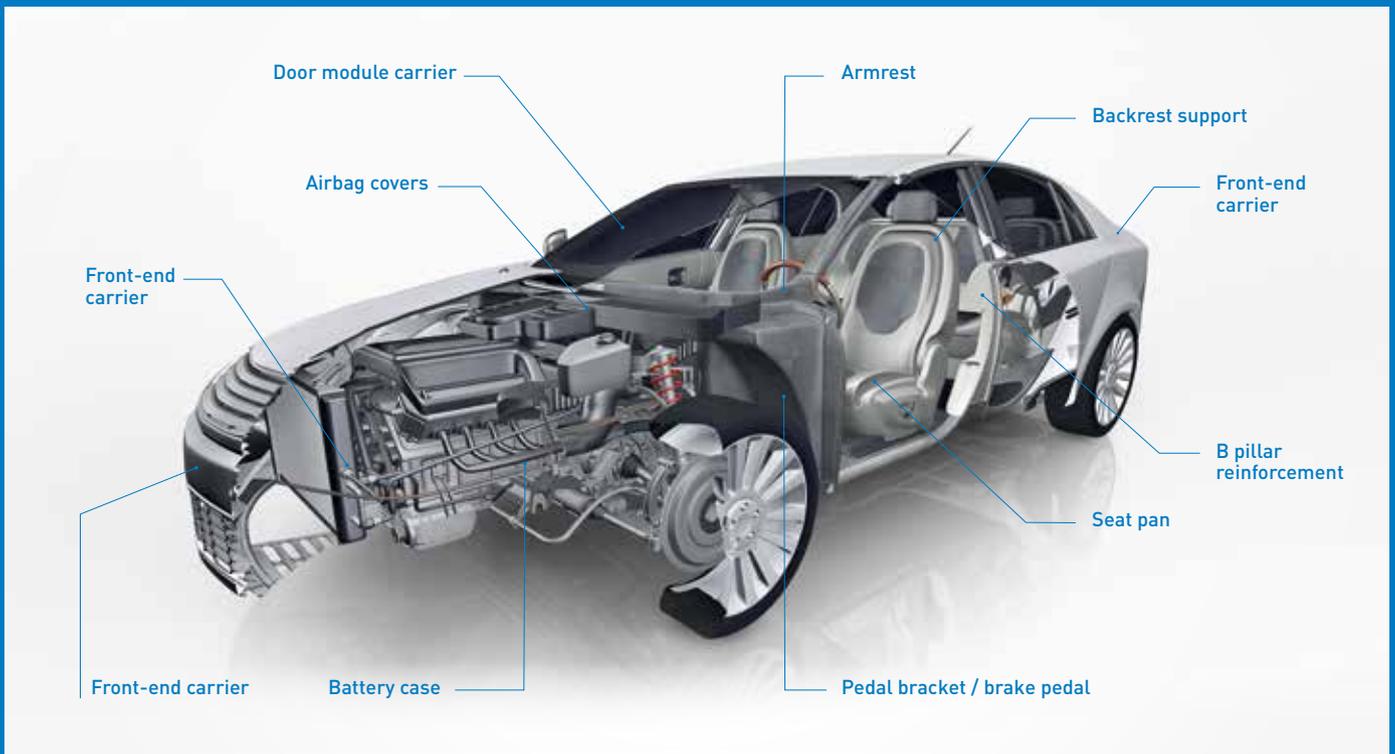


Hollow profile



Holder

FiberForm in automotive manufacturing



Lightweight construction with FiberForm

The intelligent combination of thermoforming and injection molding

Components made of thermoplastic fiber-reinforced composites are popular these days. They provide high levels of strength at extremely low weights and can be manufactured in short cycle times in large industrial quantities. They are increasingly replacing components made of metal or thick-walled plastic parts.

KraussMaffei uses proven standard injection molding machines for FiberForm technology. The automation concept, infrared heating station and peripherals can be defined regardless of the injection molding machine type – even for retrofitting. Conversely, FiberForm systems can also easily be used for standard injection molding processes. This is why FiberForm systems from KraussMaffei are extremely flexible and have high availability.

Your advantages:

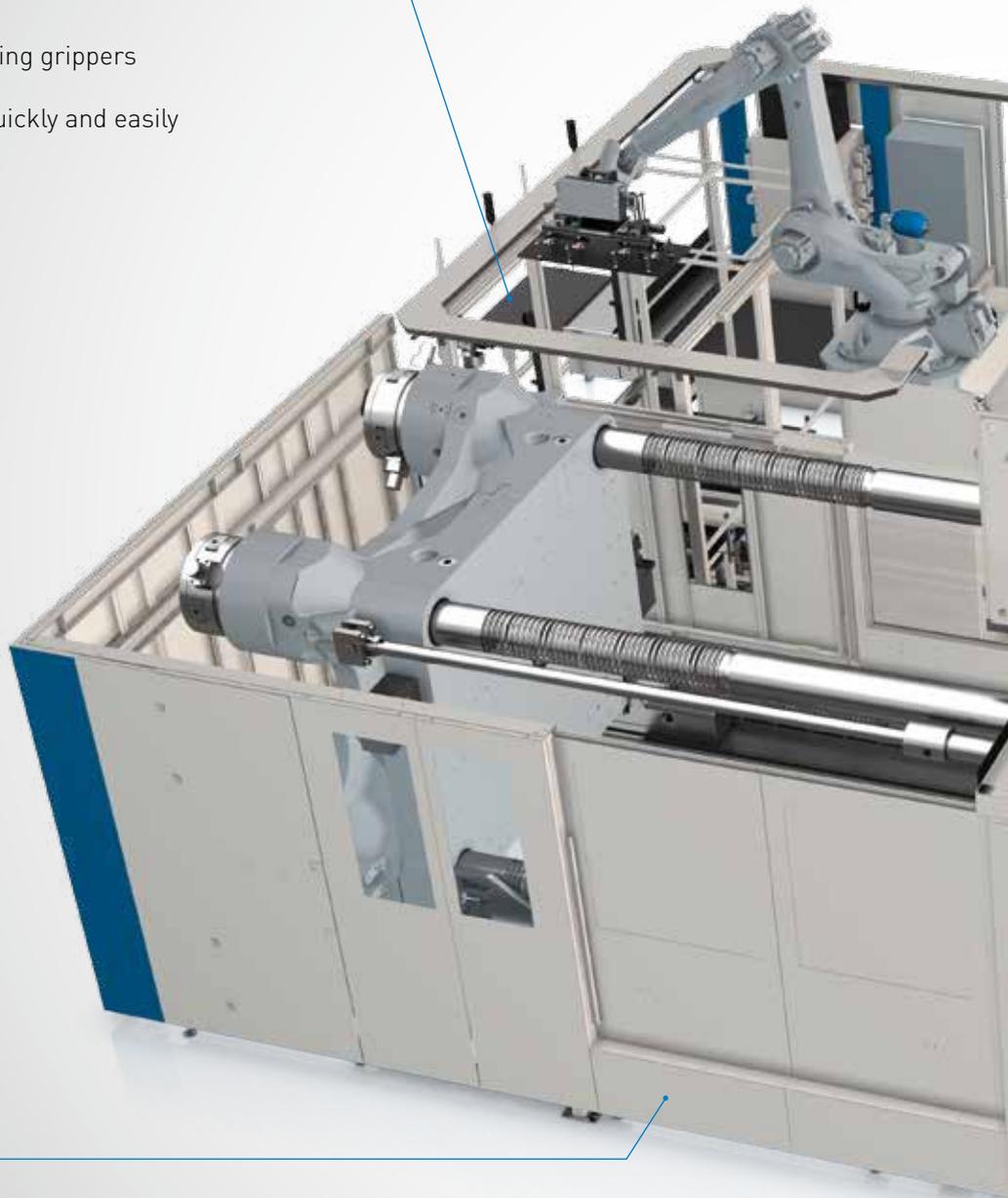
- Low component weight with high stiffness values
- High degree of functional integration
- Short cycle times thanks to fully automated manufacturing
- System and process expertise from a single source
- Extensive network of semifinished product suppliers, mold makers and material manufacturers

Transparent technology

The FiberForm system solution

Feeding of semifinished products

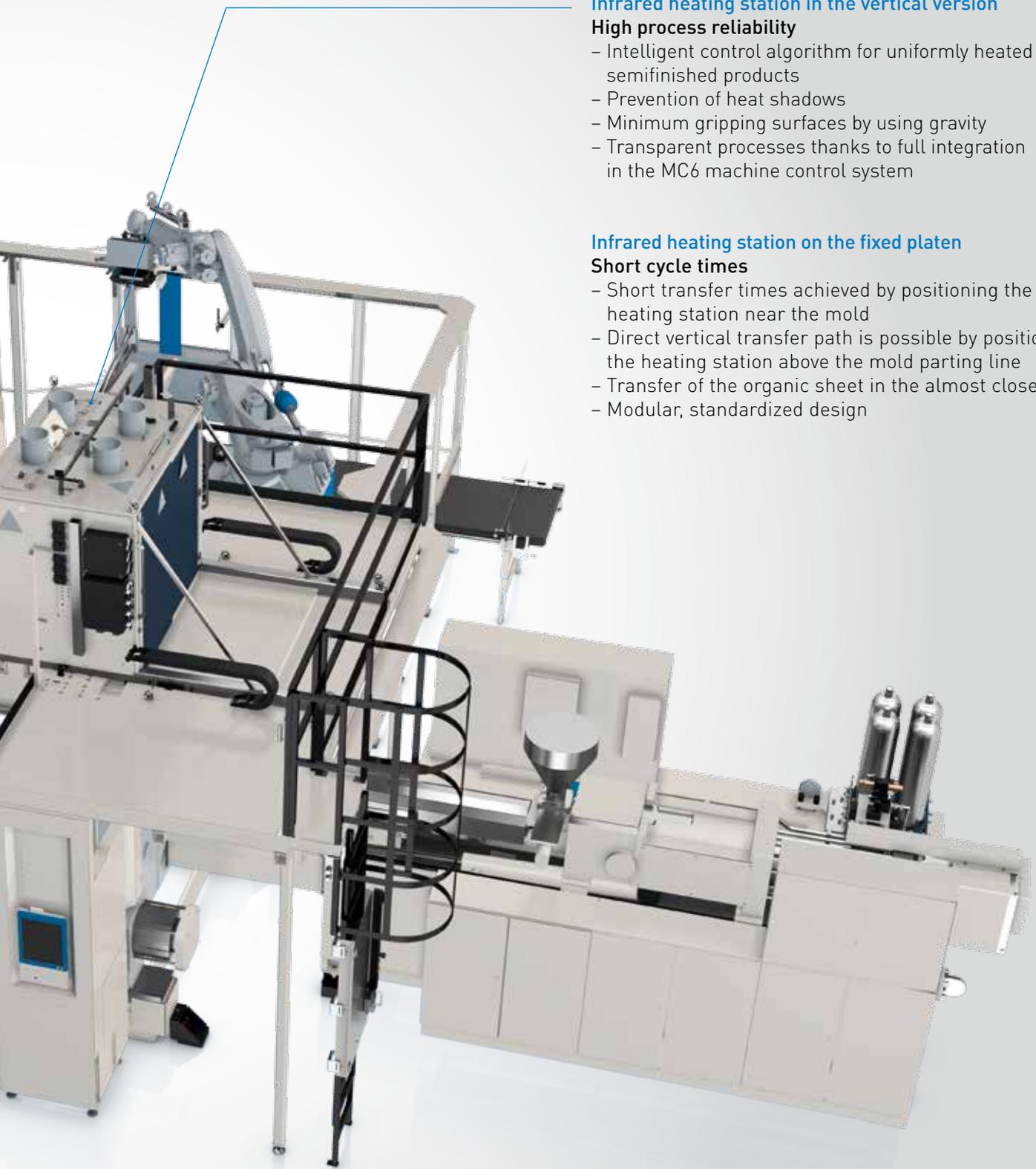
- Fed by container or drawer systems
- Can be filled during ongoing operation
- Held and handled by vacuum or clamping grippers
- Mechanical or optical centering
- Can be adapted to other geometries quickly and easily



Fully automated manufacturing cell

High level of productivity

- Standardized product-specific manufacturing solutions
- High system availability thanks to the modular design of the manufacturing cell
- Standard injection molding and thermoplastic lightweight construction without conversion
- Decoupling of the "Insert organic sheet" and "Demold component" process steps
- Minimum installation area thanks to intelligently arranged kinematic units
- Easy integration of peripherals and follow-up processes (such as quality assurance measures)



Infrared heating station in the vertical version

High process reliability

- Intelligent control algorithm for uniformly heated semifinished products
- Prevention of heat shadows
- Minimum gripping surfaces by using gravity
- Transparent processes thanks to full integration in the MC6 machine control system

Infrared heating station on the fixed platen

Short cycle times

- Short transfer times achieved by positioning the infrared heating station near the mold
- Direct vertical transfer path is possible by positioning the heating station above the mold parting line
- Transfer of the organic sheet in the almost closed mold
- Modular, standardized design

FiberForm system concepts

System and process expertise from a single source

To heat up the semifinished products using infrared heating technology, we have developed our own intelligent hardware and software solutions. They ensure fast, synchronous and uniform heating, and very short transfer times as the basis for efficient manufacturing of components in large series.

A manufacturing concept that is ready for large series production

All FiberForm concepts from KraussMaffei are characterized by the infrared heating station positioned directly on the fixed platen. This produces the shortest transfer paths for inserting the heated semifinished product into the mold.

Infrared heating technology

Infrared technology is used for heating. The advantages of this are the lower investment costs and the higher heating capacity compared with convection systems. Shorter heat-up times can therefore be achieved. Depending on the thickness of the semifinished products and the required cycle time, heating is

done on one side or both sides. The infrared heating surface depends on the size of the semifinished product and can be individually adapted to your needs.

Intelligent thermal management

KraussMaffei has developed its own patent-pending infrared heating technology (hardware and software) with a highly dynamic closed-loop control system and intelligent thermal management. Compared with conventional systems, it stops the semifinished product surface from overheating. Furthermore, fast and uniform heating of the organic sheets and a static energy state of the system are reliably attained before and during series production. Process conditions can be reproduced.



Your advantages:

- Low cooling of the semifinished products thanks to short transfer times
- Heating of semifinished products that is uniform and fast while also being gentle
- Central control of the processes and uniform operating concept thanks to the MC6 control system

Two robots decouple heating of the organic sheet and demolding of the finished part – for short cycle times.

High capacity utilization

The infrared heating station is easy to move horizontally. The position between the production setting and tool change can therefore be altered more quickly. This contributes significantly to the high system availability and makes it easy to use for standard injection molding tasks.

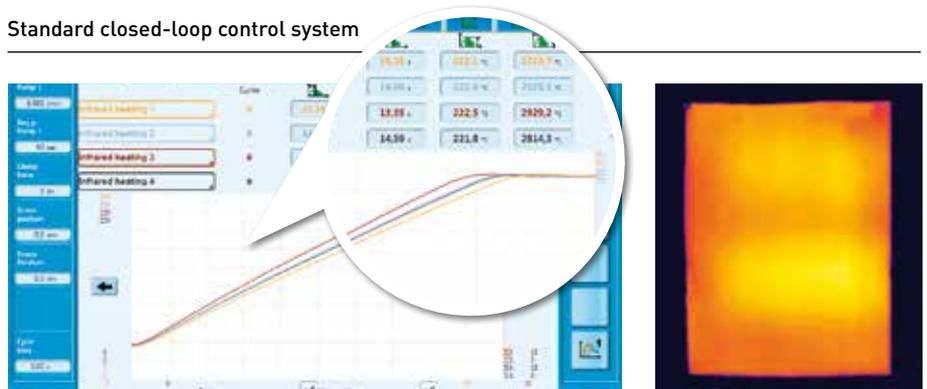
Uniform operating concept thanks to the MC6 control system

The control system of the infrared heating station is integrated in the MC6 machine control system. That makes it possible for an operator with a uniform operating concept to edit all oven and injection molding parameters at a central location.

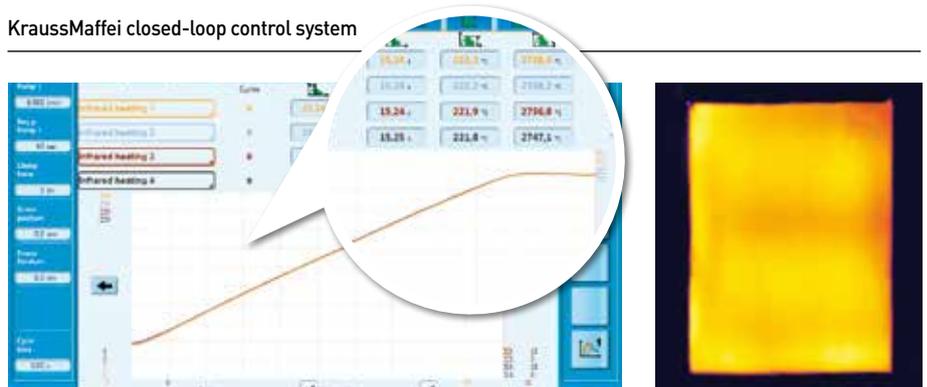
Important operating functions

- Assign heating zones / infrared emitters to different pyrometers
- Specify target temperatures of the semifinished product surfaces in the specified heating zones
- Monitor the actual temperatures of the semifinished product surface measured by the pyrometer
- Change mode of individual infrared emitters

Standard closed-loop control system



KraussMaffei closed-loop control system



The KraussMaffei closed-loop control system ensures uniform heating in all heating zones.

Easy mold change and unrestricted access to the clamping area thanks to a horizontally movable heating station.



Product-oriented automation solutions

Individual systems comprising standardized modules

Turnkey production solutions as the basis for production to start smoothly.



FiberForm technology from KraussMaffei combines thermoforming of thermoplastic semifinished products with injection molding. All FiberForm production systems from KraussMaffei have a modular design. Product-oriented automation solutions ensure efficient manufacturing.

Standardized concepts

KraussMaffei has developed three standardized, product-specific concepts for automation. Depending on the application and component size, they combine heating technology, the position of the heating station and the automation system into one sophisticated system concept. You can therefore produce long-fiber-reinforced thermoplastic components in large numbers of pieces and with very short cycle times. We work

from these standards to develop the optimum production solution for each of our customers according to their individual needs.

Decoupled working steps

For each of our manufacturing solutions, we use two independently acting robots. The necessary freedom of movement and payload determine which robot model is chosen. Two linear robots or two articulated-arm robots are used. Heating of the organic sheet, feeding of the semifinished product and demolding of the component can therefore be decoupled from each other in terms of time. This ensures short transfer times.

Your advantages:

- A manufacturing concept that is ready for large series production
- System solutions: Modular and highly productive
- Short cycles thanks to decoupled process steps
- Transparent processes thanks to higher-level process control

1. Fully automated feeding of semifinished products

- Fed by container or drawer systems
- Mechanical or optical centering is possible
- Held and handled by vacuum or clamping grippers

2. Heating of semifinished products

- Vertical feed
- Infrared heating technology
- Heating on one side or both sides (optional)

3. Transfer of the mold

- Form-locked or friction-locked transfer
- Use of standard injection molds
- Different mold concepts are possible

4. Thermoforming of semifinished products

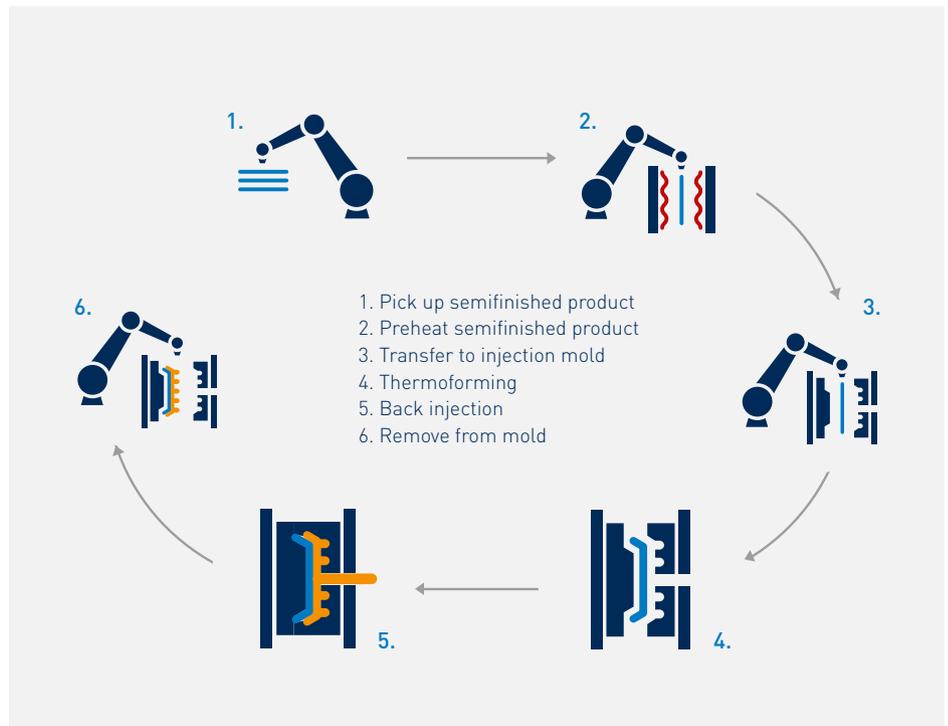
- Shaping by clamping the mold
- Low forming forces required
- Complex shaping can be realized thanks to additional splitters

5. Back injection

- Firmly bonding connection of the semifinished product to the injection molding material
- Functional integration through encapsulation of insertion elements
- Complex design options due to the injection molding process

6. Demolding finished parts

- Demolding with vacuum or clamping grippers
- Downstream quality assurance



FiberForm automation concepts

	Injection molding machine sizes			Heating principle	Position of the heating station	Automation	Semifinished product size (width x height)
	CX	GX	MX				
Concept 1	█			Infrared technology	Above the FP*	Linear unit with two kinematic units (LRX 250 TwinZ)	up to 350 x 350 mm
Concept 2		█		Infrared technology	Above the FP*	Linear unit with two kinematic units (LRX 500 TwinZ)	up to 850 x 850 mm
Concept 3			█	Infrared technology	Above the FP*	Two articulated-arm robots	up to 1350 x 850 mm

* Fixed platen

Further information which might also interest you



Are you looking for detailed information about the right injection molding machine and automated solution for your application?

KraussMaffei boasts an extensive range of injection molding machines. Find out about our hydraulic CX, GX and MX series and our fully electric PX series. We can offer you the right robot for every production task. You can also choose special mold clamping systems or other accessories for your injection molding machines.



We have also compiled extensive service information for you.

Using our general and maintenance services, you can increase the flexibility of your FiberForm system for the latest process requirements and extend its peak performance level over the long term.



Obtain information about the following, for example:

- Fiber-reinforced composite solutions for sophisticated lightweight components
- Versatile molds for productive automation
- Adaptive process control APC plus
- MaXecution, the Manufacturing Execution System from KraussMaffei

You can find our brochures and flyers with further information online at www.kraussmaffei.com. On request, we will also be pleased to send you the information and technical data for our products free of charge.

KraussMaffei

A strong brand in a unique global group

Cross-technology system and process solutions

Whether in Injection Molding, Reaction Process Machinery or Automation – the KraussMaffei brand stands for pioneering and cross-technology system and process solutions in plastics processing worldwide. For decades, our expertise, innovative ability and passionate commitment to plastics engineering have been your competitive edge. As a cross-industry system provider, we offer you modular and standardized systems as well as solutions customized to your needs.

There for you around the world

With our worldwide sales and service network, we offer our international customers an excellent basis for a successful business relationship. Due to the close proximity to our customers, we are able to answer your individual inquiries very quickly. We work out the best possible technical and economical solution for your product and production requirements together with you. Test our machine technology for your applications and let our experts put together an individualized service package for you.

Individualized service

Our employees from customer service, application technology and service help you with your questions and needs on every topic dealing with machines, systems and processes – around the globe, quickly and with a high level of expertise. We have developed an extensive customized service spectrum with our lifecycle design, which accompanies you throughout the entire lifecycle of your machines and systems. Take advantage of the personal interaction and flexibility we offer in our practically oriented seminars. We carry out customer-specific trainings either at your location or at our sales and service locations.

KraussMaffei Group

Comprehensive expertise

Unique selling proposition Technology³

The KraussMaffei Group is the only provider in the world to possess the essential machine technologies for plastics and rubber processing with its KraussMaffei, KraussMaffei Berstorff and Netstal brands: Injection Molding Machinery, Automation, Reaction Process Machinery and Extrusion Technology.

The group is represented internationally with more than 30 subsidiaries and over ten production plants as well as about 570 commercial and service partners. This is what makes us your highly skilled and integrated partner. Use our comprehensive and unique expertise in the industry.

You can find additional information at:
www.kraussmaffeigroup.com

You can find additional information about KraussMaffei at: www.kraussmaffeicom



The KraussMaffei Group has a global presence. Countries with subsidiaries are marked in dark blue. In the white-colored regions, the Group is represented by over 570 sales and service partners.

