

The right high-pressure  
mixing head  
for every production task

*Engineering Passion*

**Krauss Maffei**



## The right high-pressure mixing head for every production task

The tailored linear and transfer mixing heads from KraussMaffei with variable output rates provide the right solution for every production requirement. The nozzle elements of the 2- to 6-component versions are customized to the production requirements and processing parameters.

### The highlights at a glance:

#### Tailored by means of:

- Practical selection of mixing head types specially for your application
- Electronic shot time logging
- Optional proportional technology (depending on series)

#### User-friendly thanks to:

- Simplified change of nozzle elements with cartridge technology
- Self-cleaning design
- Comfortable and low-maintenance operation

#### Durable thanks to:

- Material pairings customized to the specific application
- Long service life
- Extremely high cost-efficiency

# Transparent technology

## Take a tour of the mixing head

### 12/18 ULP-4K

#### Finely tuned nozzle range for high production flexibility

- Perfectly geared to the technical process conditions and customer-specific requirements

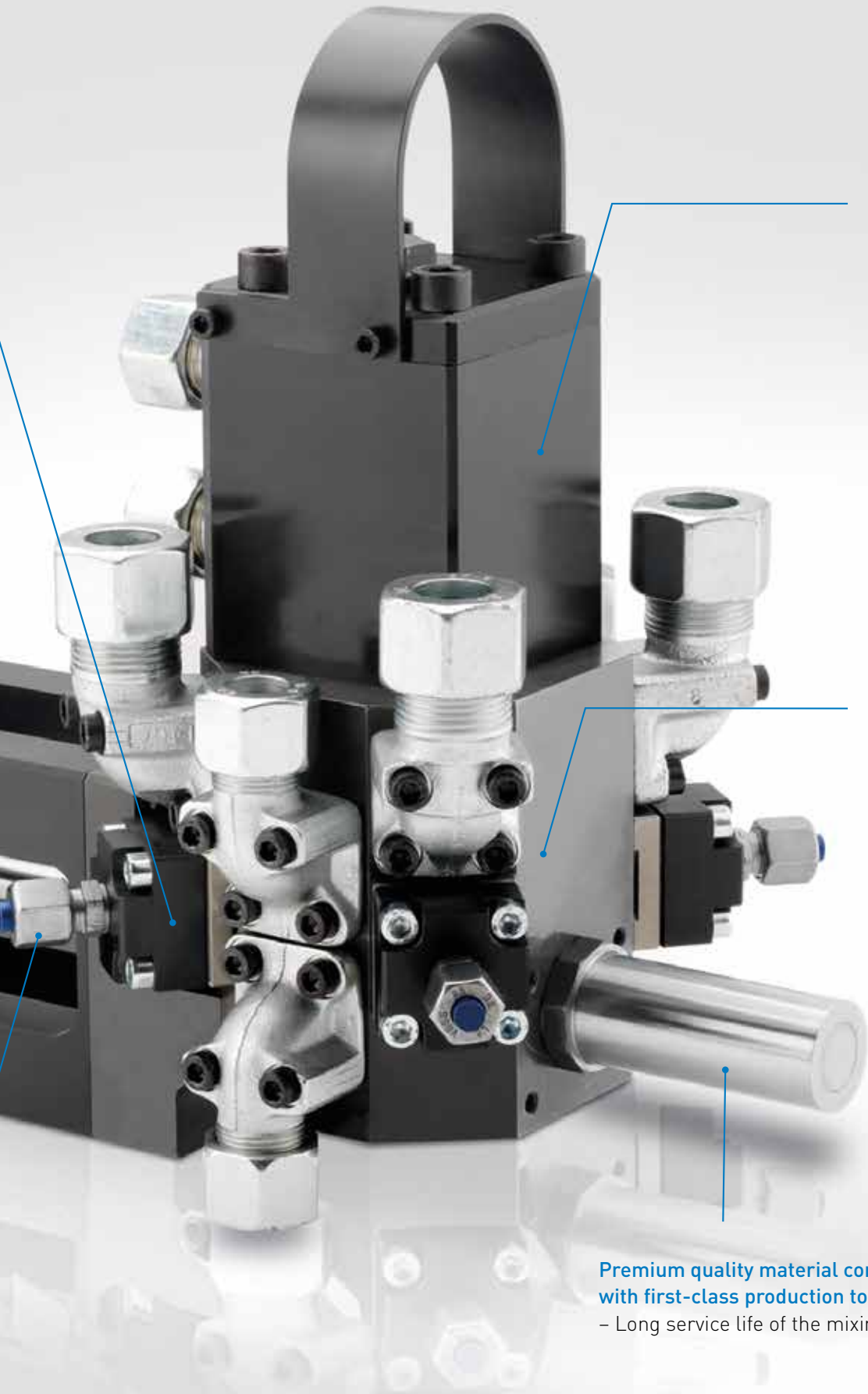
#### Mixing head available as a bell head, some versions with foam blocker technology

- No foam carryover into hydraulic oil
- Lower maintenance costs



#### Component pressure control by patented Vario nozzles

- Simple system: Integration possible without changing the control system
- Constant volume and pressure conditions during shot
- Wide adjustment range of output rate up to 5:1 with almost constant pressure level



**Patented and proven mixing head principle**

- Simple, user-friendly configuration
- Laminar output behavior
- High mixing quality

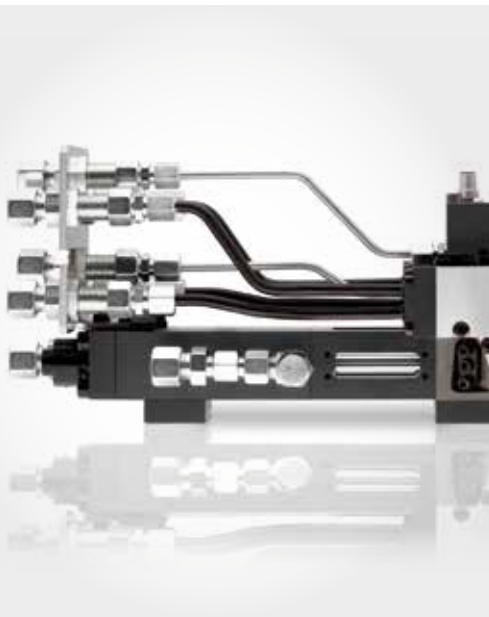
**Recirculation mixing head with needle nozzles**

- Easy handling, cleaning and maintenance

**Premium quality material components with first-class production tolerances**

- Long service life of the mixing head

## Transfer mixing heads for high standards Versatile, for sophisticated systems and laminar pouring



Mixing head MK 3.5-5 UL-2KVV

For processing demanding systems and for laminar pouring of the mixture into open molds, KraussMaffei offers the proven transfer mixing head in their product range.

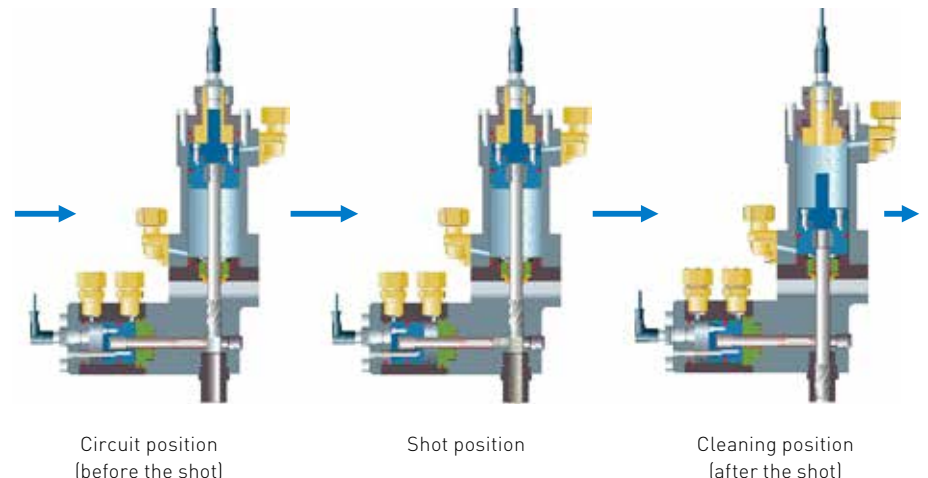
In the transfer mixing head, the components are homogeneously mixed in the mixing chamber. The high quality is mainly the result of the special angle of injection into the mixing chamber. Downstream of the mixing chamber, the output tube for reducing turbulence in the reaction mixture as it flows out is positioned at an angle of 90°. The high-pressure circuit of the components upstream of the shot operates according to the proven recirculation groove princi-

ple. The positioning of the cleaning piston in the outlet tube influences the mixing quality and the discharge behavior of the mixture. Transfer mixing heads are available for 2 to 6 components. They work cost-effectively and reliably with long service lives and high availability.

### Your benefits:

- Laminar, homogeneous pouring into open molds
- Outstanding, highly repeatable mixing quality at different output rates
- Flexible processing of different material systems
- Self-cleaning mixing head
- Cartridge system simplifies changing nozzle elements
- Maintenance-friendly

### Transfer mixing head: Shot cycle sequence



## Linear mixing heads for instant accuracy Proven and reliable

Linear mixing heads from KraussMaffei operate with high-pressure mixing according to the counterflow injection principle: Pressure energy is transformed into speed energy, reliably ensuring that the components are intensively mixed.

Linear mixing heads are relatively light and are available in 2-, 3-, 4- or 5-component versions. These are KraussMaffei standard mixing heads and they have proven their worth in many millions of shots. All component nozzles are simultaneously opened and closed by the mixing head control

piston. The electronic shot-time logging guarantees very small shot-weight tolerances.

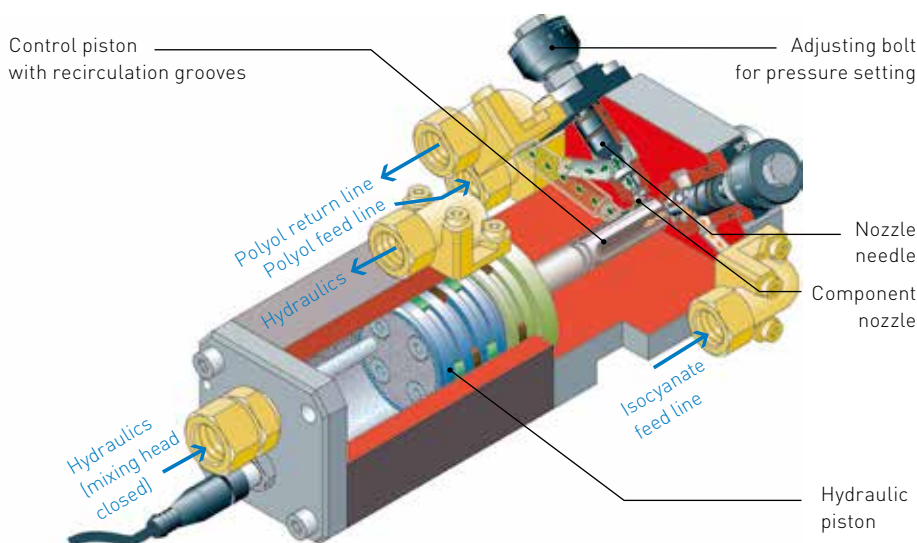
### Your benefits:

- Attractive price
- Cost-effective investment
- Small size
- Light weight
- Trouble-free handling
- Minimal shot time down to 0.3 s (depends on polyurethane system)
- Electronic shot-time logging for very small shot-weight tolerances
- Top results when pouring into closed mold
- Compatible with many foam systems
- High reliability
- Low-maintenance



Mixing head MK 5-2K-RTM

### Configuration of a linear mixing head



## MKE-3B mixing heads

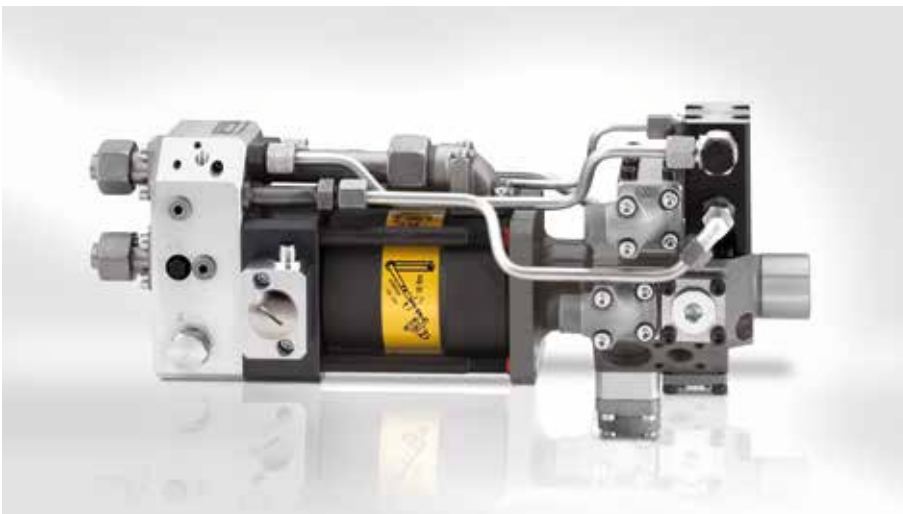
### Cost-effective alternative to laminar pouring of the mixture

The tried-and-tested high-pressure mixing technique by KraussMaffei and specific engineering details of the MKE-3B mixing heads ensure outstanding component mixing and laminar pouring.

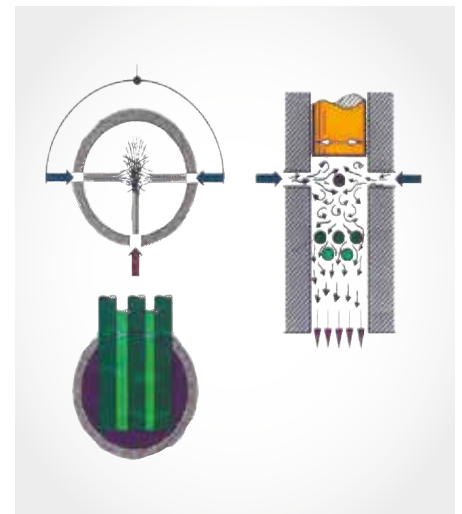
T-mixing is highly efficient because the dual mixing fronts make sure injection energy translates into excellent mixing quality. It ensures balanced, well-centered conditions in the mixing chamber, so that virtually no turbulence occurs outside of the mixing mid-point. B pins ensure non-turbulent flow and enhanced mixing effect by employing principles of hydraulic flow.

#### Your benefits:

- 3-nozzle technology for two components
- Capable of processing higher-viscosity materials
- Laminar, splash-free pouring due to B-pin damping in mixing head
- Rapid shot sequences:  
Opening and closing in under 0.5 s
- Wide range of pour rates
- Maximum reproducibility
- Simple, reliable hydraulic positive action control

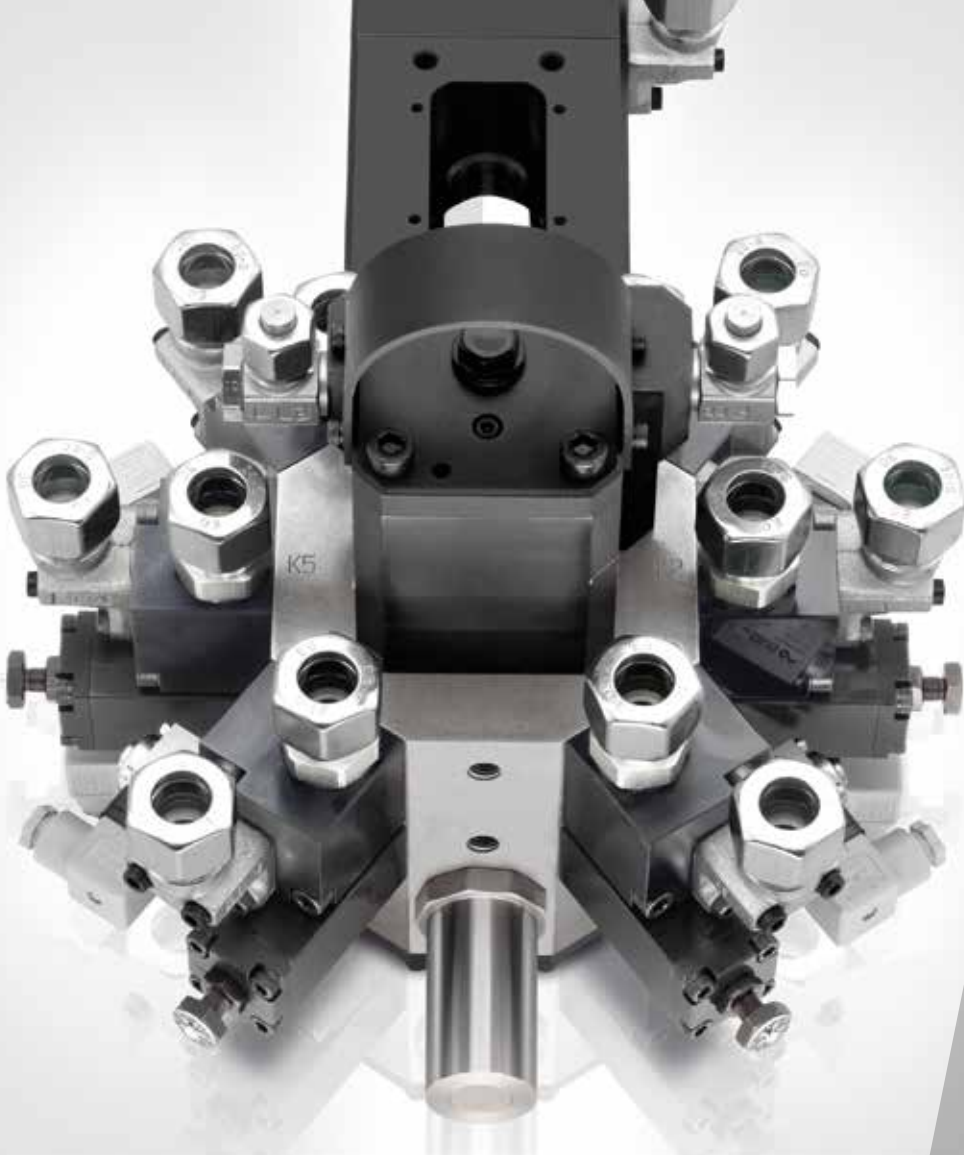


Mixing head MKE-3B



T-injection results in two mixing fronts





Mixing head MK 18/22-ULP-6CN-G

## Multicomponent CN transfer mixing heads Fast and precise

Multicomponent mixing heads play an important role in the production of PU flexible foam. The shorter the time intervals between shots, the higher the requirements of the mixing head controllers.

The KraussMaffei multicomponent mixing heads are equipped with four or six hydraulically controlled needle valves grouped in a star formation around the mixing chamber for component change-over and a bypass system designed for maximum efficiency. This permits up to six components for flexible PUR foam mixtures to be selected quickly. The 4 and 6-component mixing heads not only simplify switching between different PUR formulations, they also contribute to improving foam quality thanks to the optimized nozzle design and the variable cleaning piston positioning.

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### Your benefits:

- One mixing head for processing from 2 to 6 different components
  - Very short shot times
  - Extremely short shot sequence of 0.8 s with cleaning stroke and complete formulation adjustment
  - High mixing quality thanks to an excellent nozzle geometry and variable cleaning piston positioning
  - Change in output rates and formulations from shot to shot
  - Adjustment of pour rate via new Vario nozzle in the range 1:5
-

# KraussMaffei cleaning piston positioning

## Variation of flow restriction position from shot to shot

To achieve a particularly high mixing quality with transfer mixing heads, the polyurethane flow is restricted once again when it leaves the mixing chamber to optimize the flow behavior. The cleaning piston is positioned so that the cross-section of the mixing chamber outlet is tuned to the output rate.

### Cleaning piston positioning during the shot

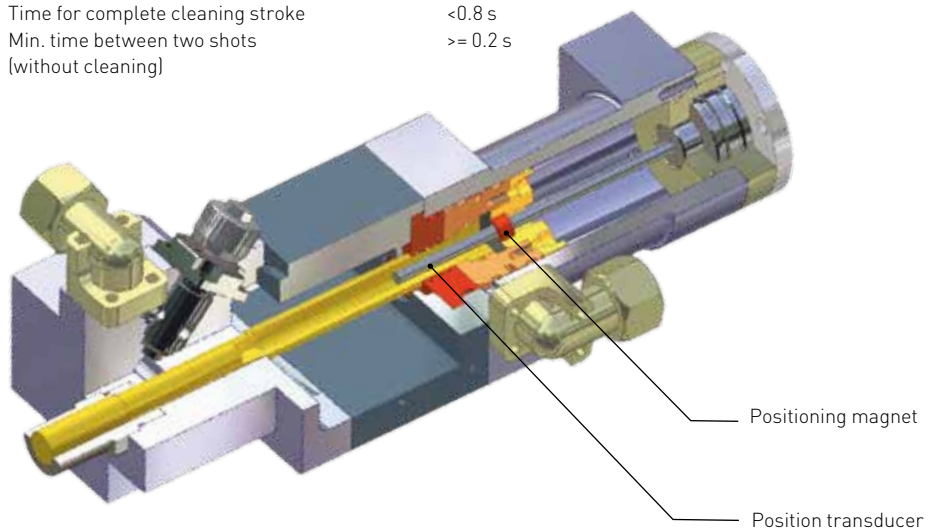
The fast and automatic positioning of the cleaning piston makes another useful process variant possible. The cleaning piston can thus also be moved during the shot. In this manner, the flow restriction can also be adapted exactly if the output rate changes during the shot. We therefore have the right solution to your flexible foam challenges.

### Your benefits:

- Fast and reproducible adaptation of the mixing head to different processing requirements
- Positioning from shot to shot
- Premium quality processing of mixtures with different output rates and viscosities
- Production of top quality parts with different hardness zones

### Control of the cleaning piston (cleaning position)

Position accuracy of the cleaning piston	+/- 0.1 mm
Setting time between 2 flow restriction positions	0.2 s
Time for complete cleaning stroke	<0.8 s
Min. time between two shots (without cleaning)	>= 0.2 s



## LFI process mixing head

### Fibers and PUR in composite material

The LFI-PUR (long-fiber injection polyurethane) process developed by KraussMaffei has a successful track record in the production of high-strength, lightweight parts.

The LFI process head performs three main tasks that are decisive in determining the quality of the end product.

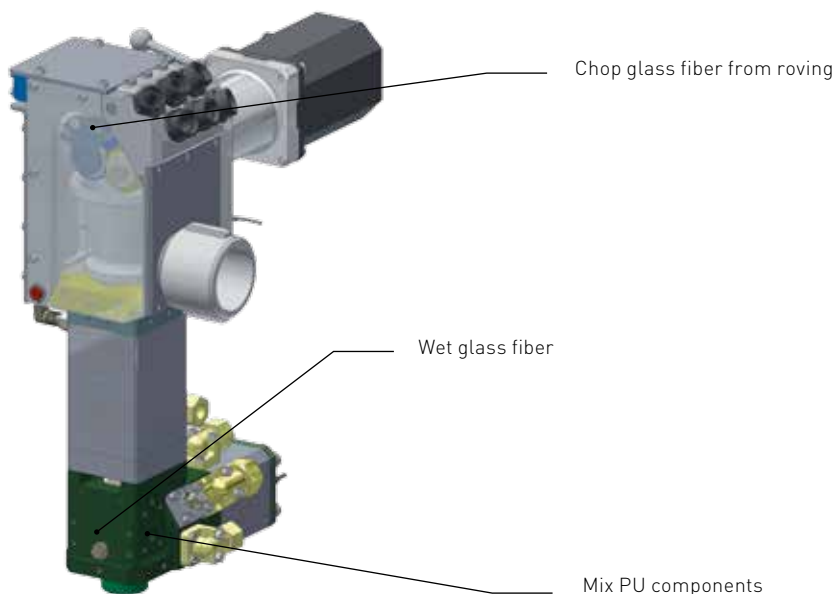
- Transporting and chopping the roving
- Mixing the reaction components
- Wetting the reinforcement fibers with the reaction mix.

The reaction components are mixed according to the high-pressure, counter-flow injection principle, i.e. the components are injected at high velocity into a mixing chamber where the speed energy is transformed into mixing energy. The reaction mix then moves to the stilling chamber of the mixing head. Here, the flow-optimized geometry of the cleaning piston generates a hollow, hose-shaped material flow. The glass fiber from the roving, chopped by the cutter head is forced by air pressure through the cleaning piston into the center of this hose-shaped flow where it is wetted with the reaction mix and, simultaneously, poured into the open cavity.

#### Your benefits:

- Wide variety of applications, including instrument panel substrates, interior trim and, in combination with sandwich components, in honeycomb
- Directly wetting fibers ensures optimal adhesion between the polyurethane matrix and the reinforcing fibers
- Local fiber content and fiber length can be varied within the part
- High level of automation and a high return on your investment
- Cost-effective production of high-strength lightweight components

#### Sectional drawing of LFI process mixing head



Mixing head LFI MK 30/36-12P-2K

## Spray mixing heads Rugged and reliable

KraussMaffei has developed spray mixing heads for many different spray applications with enhanced design freedom.

### Outstanding mixing quality with mixing heads MK10-2K-F-S and MK10-3K-F-S

The spray mixing heads are characterized by a high degree of process reliability, long service life and high mixing quality, even on highly-filled systems. They are available in three different versions, depending on the application.

- Mixing head MK10-2K-F-S is used for classic 2-component spray applications such as spraying glass fiber mats.
- The MK10-2KT-F-S with proven KraussMaffei T-injection principle achieves an excellent mixing quality, even in highly-filled systems.

- The MK10-3K-F-S is the right choice for 3-component spray applications such as processing compact or foaming spray systems in a plant.

They can be optionally equipped with:

- Flat-fan nozzle for creating a fan-type flat jet for large-surface application of the polyurethane mixture on relatively flat, large-surface components such as sandwich elements or structural components, e.g. luggage compartment covers in the automotive sector. Depending on the nozzle used and the distance between mixing head and component, the width of the jet can vary with clearly defined spray limits and minimal overspray.
- Air-supported round spray nozzle for creating a finer spray. This nozzle type is mainly used for components with complex geometries.

### Benefits of the MK10-2K-F-S and MK10-3K-F-S:

- Compact design of the mixing head
- Suitable for round or flat-fan nozzle
- Depending on material properties, cleaning is only possible with air
- Lower tooling costs
- Optionally fitted with spring-loaded or Vario nozzles for applications with volume adjustment

### Extremely robust: mixing head MK 10-2KT-F-S

The most robust of the spray mixing heads was developed for processing highly-filled PUR systems. A large quantity of highly abrasive BaSO<sub>4</sub> is added to the polyol specially for acoustic absorption. The armor-plated mixing head also makes it possible to spray such systems. During the processing sequence, the mixture is sprayed onto the component in one or more layers depending on the required properties. Such components are found, among other things, in engine hood insulation and floor mats in the automotive sector.

### Benefits of the MK 10-2KT-F-S:

- Excellent mixing quality even under extreme mixing conditions
- Low level of overspray, clearly defined spray limits
- Material savings thanks to optimized material application
- Flexible and cost-competitive component production



Mixing head MK 10P-2KT-F-S



Mixing head MK 2.0-2K-S-L

**Flexible, even for three-dimensional solutions: mixing head MK 2.0-2K-S-L**

The mixing head for three-dimensional applications has a streamlined design and is fitted with a lance for spraying into narrow gaps and complicated geometries. The mixing head was specially developed for thin-walled spray skins and can process aliphatic and aromatic systems.

**Your benefits:**

- Optimal material distribution for constant spraying thicknesses
- Less maintenance: the KraussMaffei mixing principle means that the static mixer in the lance is omitted
- Additional mixing elements not required
- Minimal wear
- Long service life

## Filler mixing heads For abrasive PUR systems

KraussMaffei offers armored transfer or linear mixing heads for processing abrasive fillers.

This armor-plated filler mixing head is a modified version of the linear and transfer mixing head, specially developed for processing PUR systems with abrasive fillers, as is necessary for example in RRIM techniques.

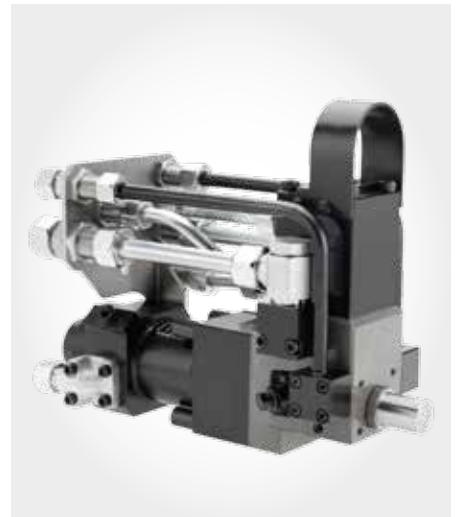
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### Your benefits:

- Outstanding processing for a very wide range of polyurethane/filler formulations using e.g. glass fiber, mineral fibers, flakes, glass pearls, calcium carbonate, barium sulphate, flame retardants and graphites
  - Very good homogeneous mixing
  - Extremely stable process
  - Long service lives
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Mixing head MK 25P-5K-F



Mixing head MK 8/12-2K-F

## Mixing heads for white goods and rigid foam processing

### Special solutions

The KraussMaffei high-pressure mixing heads are engineered to be the perfect answer for your production tasks. They promise a high return on investment, extreme reliability and minimal costs. Furthermore, they have been optimized for specific production processes. In particular, we have developed two specific types for the white goods sector.

#### MKE-3B mixing head for a particularly laminar PUR flow

KraussMaffei mixing heads, operating according to the B principle are considered the first choice for foaming out refrigerator appliances. For thermal insulation of refrigerator doors, a high-performance PUR insulating layer is applied in an open pouring technique, whereby the polyurethane mixture is poured into an open mold.

##### Benefits of the MKE-3B:

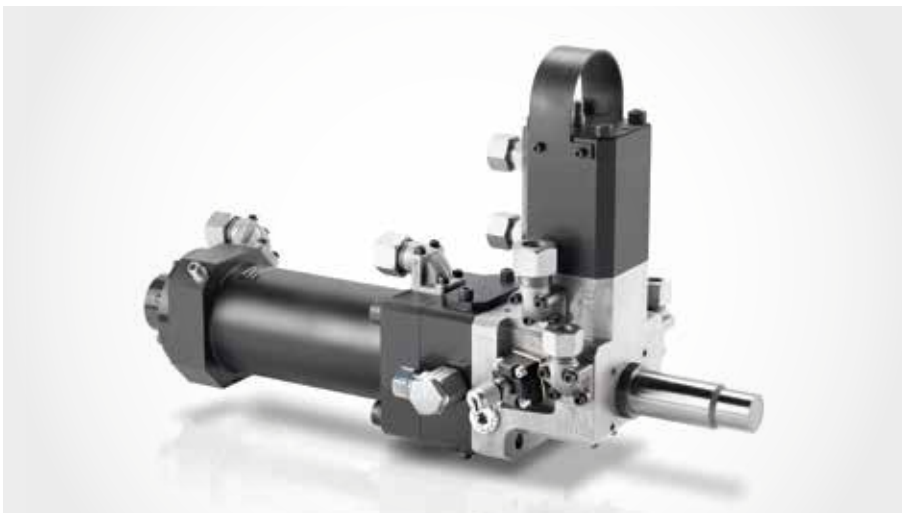
- Absolutely laminar and splash-free pouring for the entire pouring time
- Good PU distribution in the open mold
- Particularly homogeneous foam structure
- High production flexibility

#### PUR rigid foam processing: High output rates and long outlet tube for housing production

KraussMaffei developed the MK UL-2K\_I mixing head to meet the special challenges of applying rigid insulating foam to refrigerator cabinets.

##### Benefits of the MK UL-2K-I:

- High output
- Nitrogen flushing can be integrated directly at the mixing head



Mixing head MK 16-25 ULP-2KW-120



Mixing head MKE-3B

## Mixing heads for HP-RTM (high-pressure resin transfer molding) Fast and precise



Mixing head MK 10-2K-RTM

The RTM process uses a high-pressure mixture to process fast resin systems that are suitable for epoxy, PUR and PA. This achieves short cycle times.

The process is characterized by simple handling. A blank usually preformed and made from dry endless fibers is placed in the mold. The mold closes, the liquid epoxy resin is injected under pressure and allowed to cure under holding pressure and heat. Resin and hardener are metered separately as individual components and mixed in a high-pressure process immediately before the mix is injected into the closed mold. This is implemented by the compact and simple, but highly efficient mixing head system including linear mixing head. In conjunc-

tion with the dosing technology developed by KraussMaffei, the HP-RTM process is suitable for the production of light and high-strength components in large series production.

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### Benefits of HP-RTM mixing heads:

- Rapid mold filling and infiltration of the fiber blank reduces cycle times
  - Production of high-strength, lightweight components in high unit counts with excellent surface quality
  - High degree of process reliability and repeatability
  - Self-cleaning mixing head – release agent dosing possible at the mixing head as an option
  - Possibility of building up high internal pressure in the cavity to soak long flow paths and complex 3D geometries
  - Can be used at high mold temperatures
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Release agent module

### Flexible release agent modules for precision dosing

This module is used wherever release agents are added directly at the mixing head.

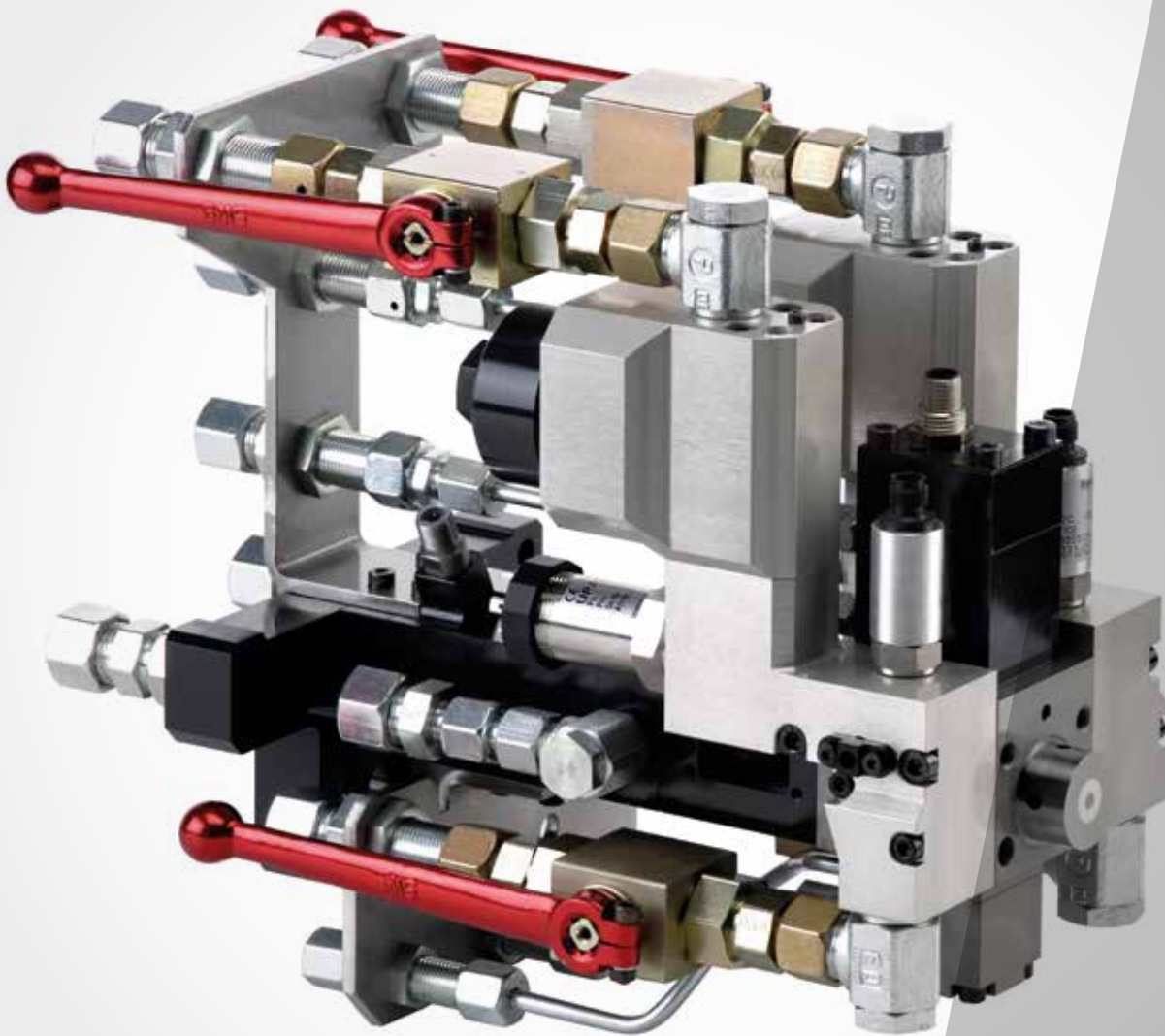
Transfer molding (RTM) and wet molding both with epoxy as well as with PUR systems. The module is used to dose the volume of release agent required for the A-component directly at the mixing head and only during a shot. The A-component therefore does not have to be mixed with release agent in advance in the tank.

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### Benefits of release agent modules:

- Shorter cycle times because the release agent does not have to be applied externally to the mold surface in an additional process step
  - Variable release agent share in the resin from shot to shot
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Mixing head 3.5 UL-2KVV CCM

## CCM mixing heads (Clear Coat Molding) Real wood veneer coating for a refined finish

Fine wood trim is an important element for underscoring the premium-quality look of a vehicle's interior.

The CCM (Clear Cold Molding) process developed by KraussMaffei enhances such components with a light-fast scratch-resistant coating in a single work step. The automated process coats the wood very thinly with a clear two-component PU system. KraussMaffei's patented cavity pressure regulation compensates for the

volume fluctuations caused by the natural structure of the material. As a result, the cavity is always optimally filled. Even when processing small output quantities, these mixing heads guarantee an outstanding mixing quality and homogeneous pouring. Even very small PU volumes are mixed perfectly and poured without bubbles into the mold cavity.

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### Your benefits:

- Scratch and UV-resistant coating of real wood veneer
  - Premium-quality coatings in a short amount of time
  - Meets high requirements for the visual quality of components
  - Direct heating for the integrated high pressure filter
  - High repeatability
-

## Mixing heads for wet molding

### Wet-embedded fibers

Wet molding is a pioneering technology from KraussMaffei for manufacturing high-performance components based on carbon-fiber reinforced plastic (CFRP).

In comparison to classic RTM processes (resin transfer molding) like HP-RTM (high-pressure RTM) and C-RTM (compression RTM), wet molding is characterized by a simpler process chain in which the preform process is omitted completely. For this reason, wet molding is a cost-effective alternative for manufacturing new lightweight components in vehicle manufacturing.

#### Large-format application

During wet molding, resin (usually epoxy resin) is poured outside the mold onto the fiber mat either centrally or according to a fixed pouring plan. The mixing head is frequently used with a flat sheet die or other distribution system for large-format application onto the flat semi-finished fiber product. Then the pre-soaked semi-finished component is inserted in the lower mold cavity and hardens in the press under pressure at a high temperature. This process has two decisive advantages.

It saves valuable cycle time, because the resin can be applied to one component while the other is simultaneously curing in the mold. Furthermore, it is possible to process systems with a high reactivity because the material is not poured into a heated mold. These two factors save time, leading to shorter cycle times. It is also possible to use recycled fibers. This makes wet molding an excellent option for industrial processing of recycled fibers in the RTM process.

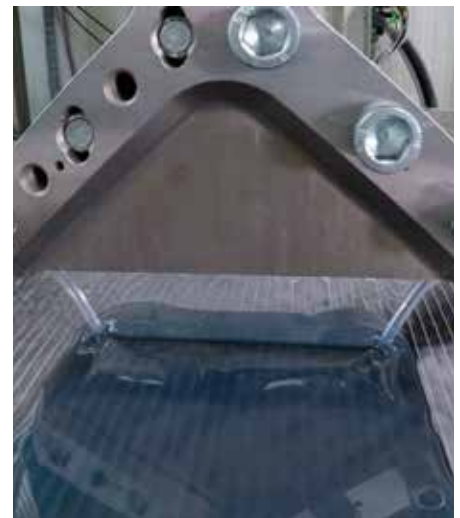
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#### Your benefits:

- Processing highly reactive resin
  - No pre-forming required
  - Cost-effective molds
  - Short cycle times and high degree of automation
  - Low internal mold pressures
  - Low clamping forces
- 



MK10-2K-RTM with flat sheet die



Flat sheet die: for both large-format and laminar application

## Mixing heads for ColorForm Compact sizes and easy color changes

Developed by KraussMaffei, ColorForm is based on the principle of multi-component injection molding, which has been proven for many years. The notable aspect here is that the thermoplastic base body is flow-coated with polyurethane (PU) or polyurea (PUA) as a surface material in the second cycle after the injection molding process.

This provides an exceptionally high-quality, scratch-resistant surface. The RimStar Flex ColorForm reaction process machine, which has been specially developed for this technology, and the mixing head inject the surface material (PUR/PUA) directly into the cavity.

### Innovative mixing head for multi-component parts

The most striking feature of this mixing head is the innovative paint nozzle, which can be changed in an instant.

The compact design of the mixing head makes it easy to integrate in the mold and simple to attach in easily accessible positions around the closing area of the injection molding machine. Media is supplied centrally with an outstanding mixing quality, while the temperature is controlled constantly.

### Your benefits:

- Compact size
- Simple mold integration
- Central media supply
- Rapid color changes without cleaning
- Processing media with abrasive fillers



Mixing head MK 5-2K+1



Paint nozzle

## Mixing heads for caprolactam processing PA grouting and thermoplastic RTM (T-RTM)



MK 10P-2K-NBC

This KraussMaffei mixing head was designed specially for processing caprolactam into polyamide, whereby the solid raw material is melted and the fluid material is mixed in the mixing head and then injected into the mold. The mixing head must meet special requirements due to the high processing temperature and the extreme fluidity of the raw material.

The mixing head is controlled by nozzles, i.e. the mixing head also circulates the material during the circuit phase to guar-

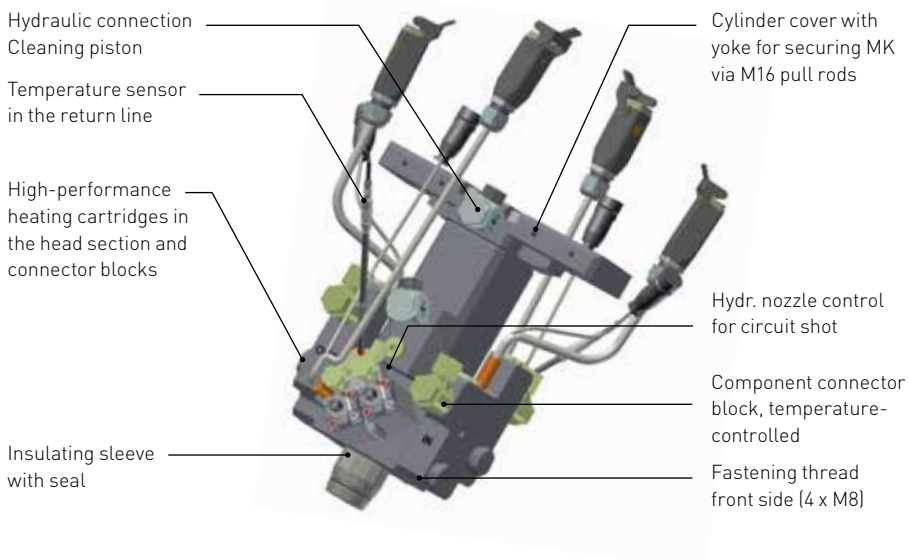
antee a constant operating temperature. Up to four heating cartridges can be integrated to ensure that the caprolactam melts rapidly in the mixing head during the plant start-up phase. The output tube on the mixing head can be fitted with an adapter flange. Apart from insulating against the mold, it is also compatible for molds with a fixture for the RTM mixing head manufactured by KraussMaffei. Maximum processing temperatures of 160 °C are also possible.

**The mixing head for PA grouting is available in two sizes:**

- MK 10 for a range of 20-200 g/s
- MK 20 for a range of 50-500 g/s

A selection of nozzles and nozzle needles can be fitted to the mixing head to produce a perfect mixture, even at low pressures.

### MK10-2K-NBC



### Your benefits:

- Compact design
- Short heat-up time
- Temperature recorded in the return line
- Self-cleaning



## Vario nozzle add-on unit For perfect pressure values

The new KraussMaffei Vario nozzle is designed for systems with volume adjustment and is an alternative to the spring-loaded nozzle.

The Vario nozzle operates with a pressure pad that counteracts the component pressure. It operates without moving seals in the nozzle system and thus prevents the well-known slip-stick effect (static friction).

Benefit from a high mixing quality over a wide output rate range combined with increased production reliability.

### Your benefits:

- Maximum pressure and volume consistency during the shot
- Excellent repeatability
- Very high pressure consistency with volume change up to 5:1
- Compatible with existing KraussMaffei nozzle systems
- High mixing quality
- Low maintenance costs



Vario nozzles

## Further information which might also interest you



Are you looking for a suitable solution to your production tasks?

**You can read more here:**

- RIMStar (dosing technology)
- Mold carrier and conveying concepts (system technology)
- Foam molds
- Cutting technology

You can find our brochures and flyers on other topics online at: [www.kraussmaffei.com](http://www.kraussmaffei.com). On request, we would also be happy to send you 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.

You can find additional information about KraussMaffei at: [www.kraussmaffeigroup.com](http://www.kraussmaffeigroup.com)

## KraussMaffei Group

### Comprehensive expertise

#### Unique selling proposition Technology<sup>3</sup>

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](http://www.kraussmaffeigroup.com)



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.

# The right high-pressure mixing head for every production task

The tailored linear and transfer mixing heads from KraussMaffei with variable output rates provide the right solution for every production requirement. The nozzle elements of the 2- to 6-component versions are customized to the production requirements and processing parameters.

High-pressure mixing heads from KraussMaffei are very user-friendly and durable and guarantee you the highest degree of cost-efficiency and reliability.