

CUSTOMIZED.
USER-FRIENDLY.
DURABLE.

DISCOVER OUR HIGH-PRESSURE
MIXING HEADS



KraussMaffei
Pioneering Plastics

AREAS OF APPLICATION FOR THE MIXING HEADS



Automotive



Commercial vehicles



Major appliances



Medical



Consumer goods



Lightweight construction



Pultrusion

Mixing head types process matrix

Mixing head type	Processes	Rigid foam and thermal insulation	Flexible foam processing	R-RIM	RTM fiber composite	Fiber-reinforced lightweight construction	Sandwich pane components	Surfaces	Multicomponents	Pultrusion
Transfer mixing heads <i>page 6</i>	●	●	●	●	●	●		●	●	
Linear mixing heads <i>page 7</i>			●	●	●			●	●	
MKE-3B mixing heads <i>page 8</i>	●	●	●							
Multicomponent CN transfer mixing heads <i>page 9</i>			●						●	
LFI process mixing head <i>page 11</i>						●	●			
Spray mixing heads <i>page 12</i>						●	●	●		
Filler mixing heads <i>page 14</i>				●		●				
Mixing heads for major appliances <i>page 15</i>	●	●								
Mixing heads for HP-RTM <i>page 16</i>					●	●				
CCM mixing heads <i>page 17</i>								●		
Mixing heads for wetmolding <i>page 18</i>					●	●				
Mixing heads for ColorForm <i>page 19</i>								●		
Mixing heads for caprolactam processing <i>page 20</i>					●	●				
Low-pressure mixing heads										●
Additives										
Cleaning piston positioning <i>page 10</i>		●								
Flexible release agent modules <i>page 16</i>					●	●				
Optional upgrade, Vario nozzle <i>page 21</i>	●	●			●	●			●	

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 specifically adapted to the production requirements and processing parameters of each customer.

The highlights of the mixing heads at a glance:

Customized by means of:

- Comprehensive 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 12/18 ULP-4K MIXING HEAD

Finely tuned nozzle range for high production flexibility

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

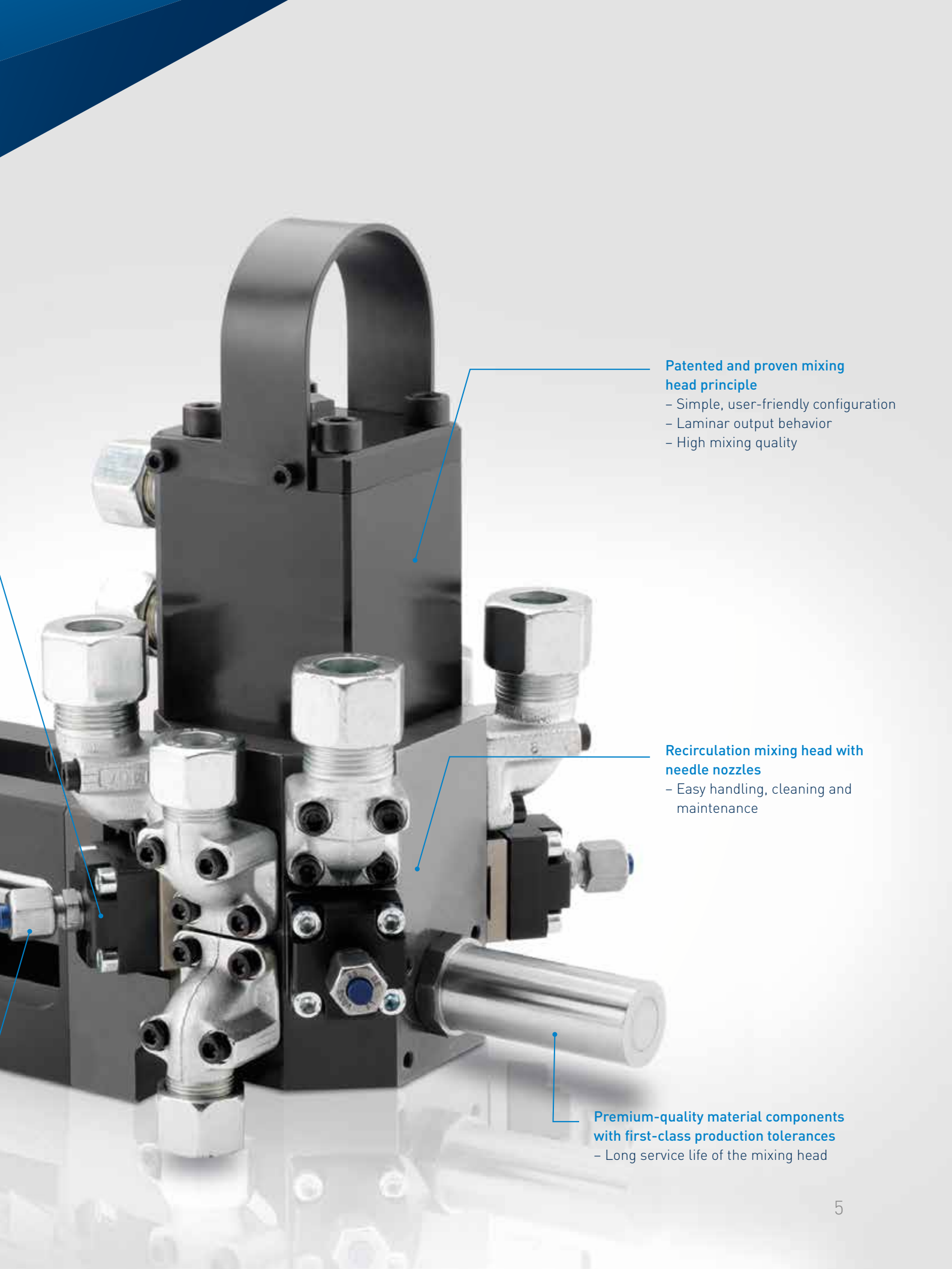
Mixing head available as a bell head, partly with foam blocker technology

- 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

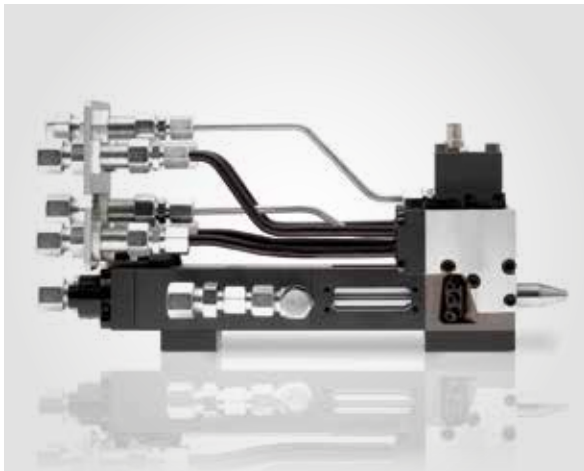
- Easy handling, cleaning and maintenance

Premium-quality material components with first-class production tolerances

- Long service life of the mixing head

TRANSFER MIXING HEADS FOR HIGH STANDARDS FOR SOPHISTICATED SYSTEMS AND LAMINAR POURING

For processing demanding systems and for laminar mixture pouring into open molds, KraussMaffei offers the proven transfer mixing head in the 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°. Components are recirculated at high pressure before each shot in a proven recirculation groove system.

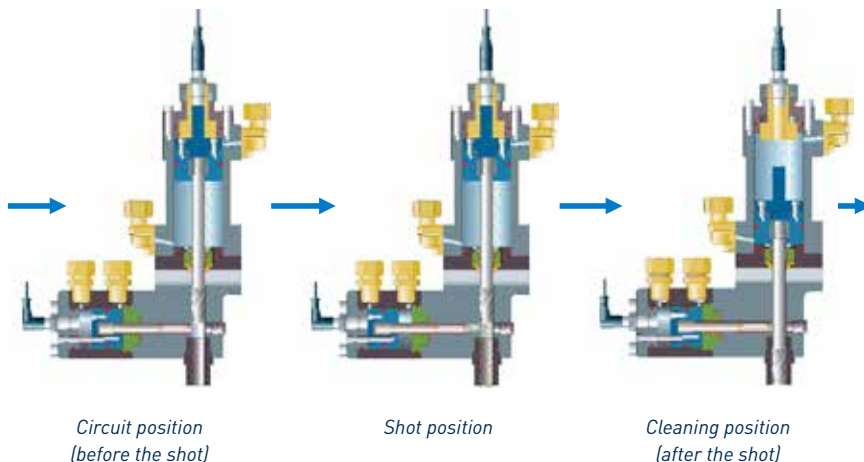
The positioning of the cleaning piston in the outlet tube influences the mixing quality and the discharge behavior of the mixture. Transfer mixing heads are available for 2 to 6 components. They work cost-effectively and reliably with long service lives and high availability.

MK 3.5 UL-2KVV mixing head

YOUR BENEFITS:

- Laminar, homogeneous pouring into open molds
- Outstanding, highly reproducible mixing quality at different output rates
- Flexible processing of different material systems

Transfer mixing head: Shot cycle sequence



LINEAR MIXING HEADS FOR INSTANT PRECISION 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.



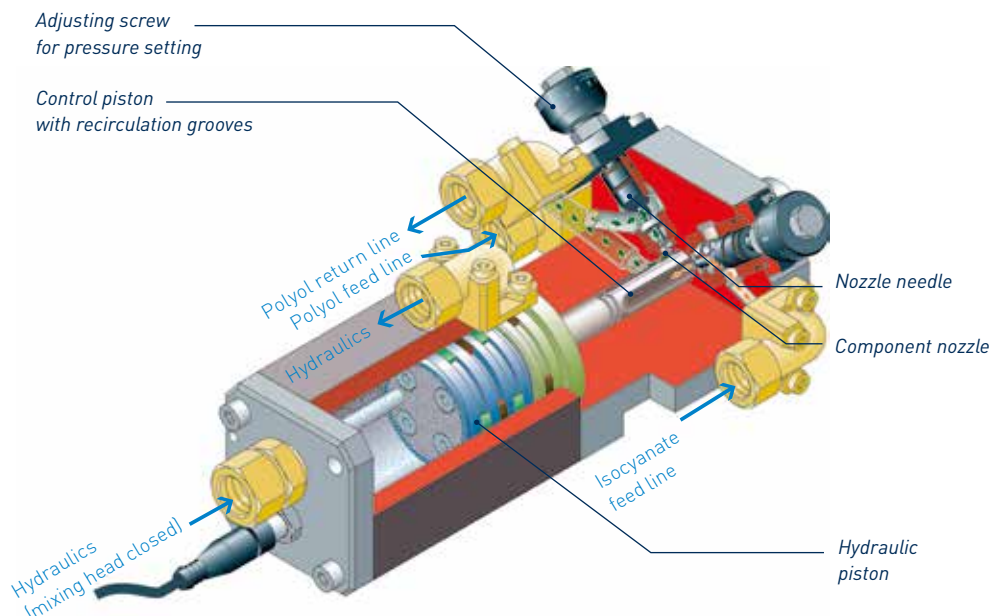
MK 5-2K-RTM mixing head

Linear mixing heads are relatively lightweight and are available in 2-, 3-, 4- or 5-component versions. These are KraussMaffei standard mixing heads and they have proved 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:

- Cost-effective investment
- Small size
- Light weight
- High reliability
- Low maintenance

Configuration of a linear mixing head



MKE-3B MIXING HEADS

COST-EFFECTIVE ALTERNATIVE TO LAMINAR POURING OF THE MIXTURE

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

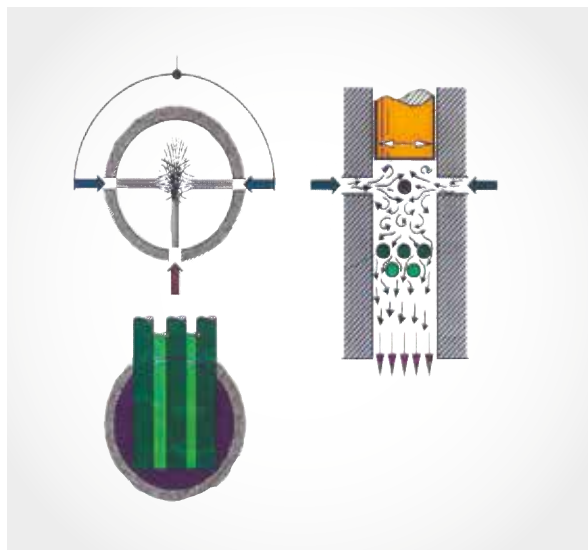
T-mixing is highly efficient because the dual mixing fronts make sure injection energy translates into excellent mixing quality. It ensures balanced, well-centered conditions in the mixing chamber, so that virtually no turbulence occurs outside of the mixing mid-point. B pins ensure non-turbulent flow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

YOUR BENEFITS:

- Laminar, splash-free pouring due to B-pin damping in mixing head
- Rapid shot sequences—opening and closing in under 0.5 s
- Simple, reliable hydraulic positive action control
- Cost-effective investment



MKE-3B mixing head



T-injection results in two mixing fronts



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

YOUR BENEFITS:

- Extremely short shot sequence of 0.8 s with cleaning stroke and complete formulation adjustment
- High mixing quality thanks to excellent nozzle geometry and variable cleaning piston positioning
- Adjustment of pour rate via new Vario nozzle in the range 1:5

MULTICOMPONENT CN TRANSFER MIXING HEADS FAST AND PRECISE

Multicomponent mixing heads play an important role in the production of PUR 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 changeover 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.

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.

YOUR BENEFITS:

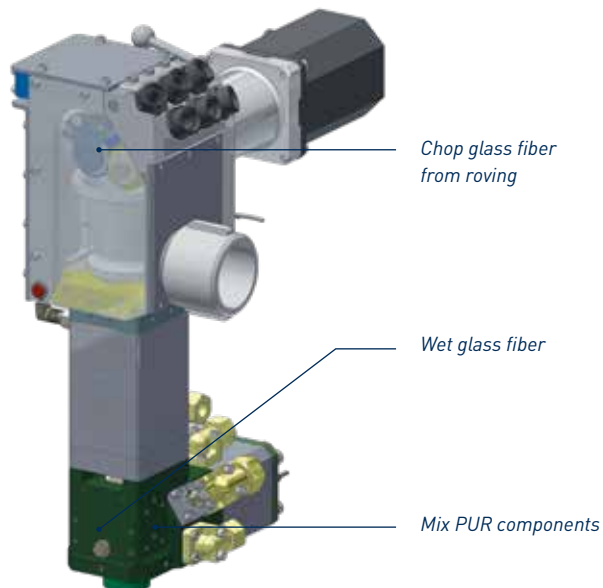
- Wide variety of applications, including instrument panel supports, interior components and, in combination with sandwich pane components, in honeycomb
- Wetting fibers directly ensures optimal adhesion between the polyurethane matrix and the reinforcing fibers
- Local fiber content and fiber length can be varied within the part
- High level of automation and cost-efficiency

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, counterflow 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 unit, 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.

Sectional drawing of LFI process mixing head



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

SPRAY MIXING HEADS

RUGGED AND RELIABLE

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

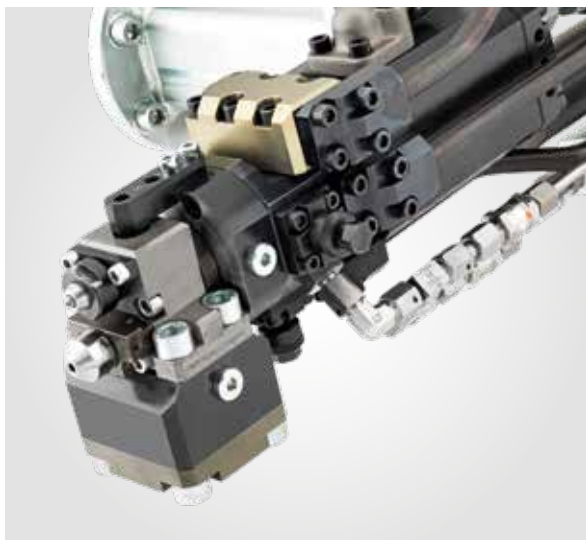
Excellent mixing quality with MK10-2K-S and MK10-3K-S mixing heads

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.

- The MK10-2K-S is used for classic 2-component spray applications such as spraying glass fiber mats.
- The MK10-2KT-S incorporating the proven KraussMaffei T-mixing principle achieves excellent mixing quality, even in highly-filled systems.
- The MK10-3K-S is the right choice for 3-component spray applications such as processing compact or foaming spray systems in a plant.

The mixing heads can be optionally equipped with:

- Flat-fan nozzles 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.
- An air-supported round spray nozzle for creating a finer spray. This nozzle type is mainly used for components with complex geometries.
- A toggle module for toggling between the flat fan and circular jet nozzle for full flexibility and significant reduction of the cycle times.



MK 10P-2KT-S mixing head with toggle module

YOUR BENEFITS

FROM THE MK10-2K-S
AND MK10-3K-S:

- Suitable for circular-jet and flat-fan nozzles as well as toggle module
- Depending on material properties, cleaning is only possible with air
- 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 BaSO₄ 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, for example, in engine hood insulation and floor mats in the automotive sector.

YOUR BENEFITS **FROM THE MMK 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



MK 10-2KT-F-S mixing head



MK 2.0-2K-S-L
mixing head

**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 FROM
THE MK 2.0-2K-S-L:**

- Optimum material distribution for constant spraying thicknesses
- Less maintenance—the KraussMaffei mixing principle means that there is no need for a static mixer in the lance
- 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 technology.

YOUR BENEFITS:

- Outstanding processing for a range of polyurethane/filler formulations using glass fiber, mineral fibers, flakes, glass pearls, calcium carbonates, barium sulfates, flame retardants and graphites
- Excellent homogeneous mixing
- Extremely stable process
- Lowest wear rates



MK 25P-5K-F mixing head



MK 8/12-2K-F mixing head

MIXING HEADS FOR MAJOR APPLIANCES 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 major appliances 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 the manufacture of 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.

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 PUR rigid insulating foam to refrigerator cabinets.

YOUR BENEFITS FROM THE MKE-3B AND MK UL-2K-I:

- 100% laminar and splash-free pouring for the entire pouring time
- Particularly homogeneous foam structure
- High production flexibility
- Nitrogen purging can be integrated directly at the mixing head



MKE-3B mixing head



MK 16/25 ULP-2KV-120 mixing head

FAST AND PRECISE MIXING HEADS FOR HP-RTM (HIGH-PRESSURE RESIN TRANSFER MOLDING)

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 semi-finished product, which is usually preformed and made from dry endless fiber, 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 conjunction with the metering technology developed by KraussMaffei, the HP-RTM process is suitable for the production of lightweight and high-strength components in large-scale production.

Flexible release agent modules for precision metering

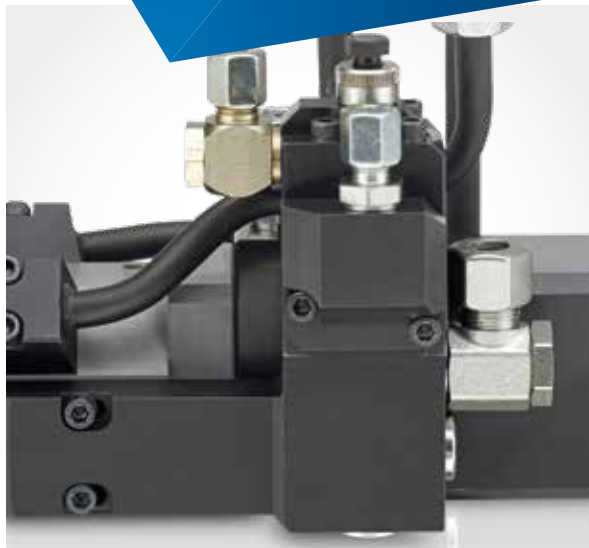
This module is used wherever release agents are added directly at the mixing head: transfer molding (RTM) and wetmolding both with epoxy as well as with PUR systems. The module is used to dose the volume of release agent required for the A-component directly at the mixing head and only during a shot.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

YOUR BENEFITS:

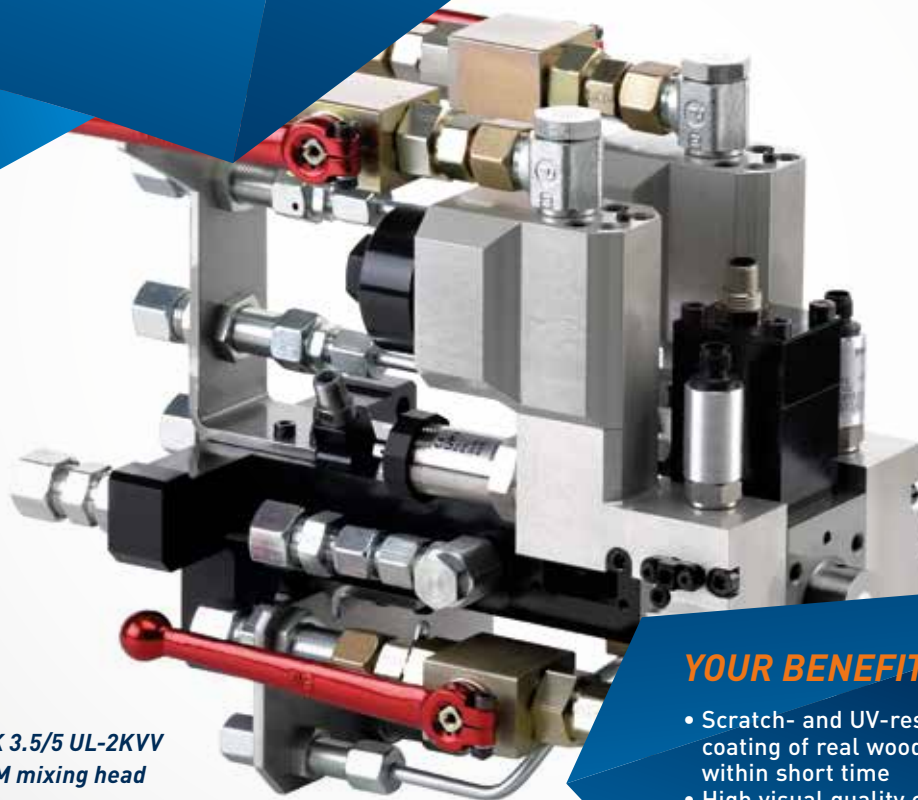
- Rapid mold charging and infiltration of the fiber semi-finished product reduces cycle times
- Additional metering of release agent at the mixing head is optionally possible
- High cavity pressure is possible to enable the generation of longer flow paths and more complex 3D geometries
- Variable release agent share in the resin from shot to shot



MK 10-2K-RTM mixing head



Release agent module



MK 3.5/5 UL-2KVV
CCM mixing head

YOUR BENEFITS:

- Scratch- and UV-resistant coating of real wood veneer within short time
- High visual quality of the components
- Direct heating
- High reproducibility

CCM MIXING HEADS

COATING OF REAL WOOD VENEERS

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

The CCM (Clear Coat 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 PUR system. KraussMaffei's patented cavity pressure regulation compensates for the volume fluctuations caused by the natural structure of the material. Thus, the cavity is always charged optimally. Even when processing small output rates, these mixing heads guarantee outstanding mixing quality and homogeneous pouring. Output rates are mixed perfectly and poured without bubbles into the mold cavity.



MK 5/8UL-2KVV mixing head

MIXING HEADS FOR WETMOLDING WET-EMBEDDED FIBERS

Wetmolding 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), wetmolding is characterized by a simpler process chain in which the preform process is omitted completely. For this reason, wetmolding is a cost-effective alternative for manufacturing new light-weight components in vehicle manufacturing.

Large-format application

During wetmolding, 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 pro-

cess has two decisive benefits. 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 wetmolding an excellent option for industrial processing of recycled fibers in the RTM process.

YOUR BENEFITS:

- Processing highly reactive resins
- No pre-forming required
- Cost-effective molds
- Short cycle times and high degree of automation
- Low mold cavity pressures



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 (PUR) 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. Using the RimStar Flex ColorForm reaction process machine—which has been specially developed for this process—and the mixing head, the surface material (PUR/PUA) is injected 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 outstanding mixing quality, while the temperature is controlled constantly.

YOUR BENEFITS:

- Compact design
- 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)

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 guarantee 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, the flange is thus 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.

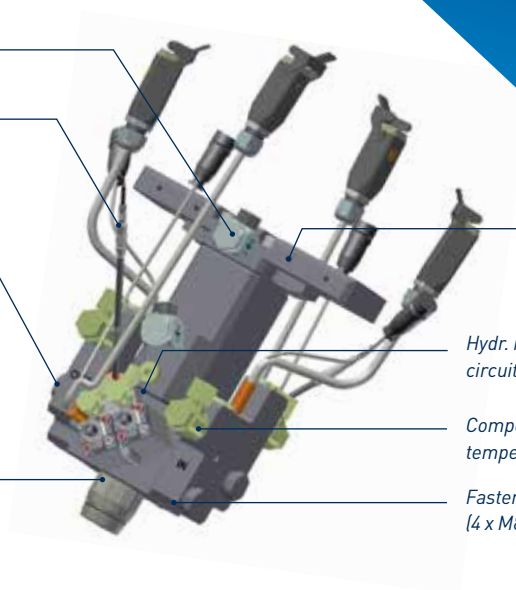
MK10-2K-NBC

Cleaning piston
hydraulic connection

Temperature
sensor in the
return line

High-performance
heating cartridges in
the head section and
connector blocks

Insulating sleeve
with seal



YOUR BENEFITS:

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

VARIO NOZZLE ADD-ON UNIT FOR OPTIMUM 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). You thus get high mixing quality over a wide output rate range combined with increased production reliability.

YOUR BENEFITS:

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



CN Vario nozzle



Vario nozzles



OUR WORLDWIDE EXPERTISE IS YOUR ADVANTAGE **DIGITAL & SERVICE SOLUTIONS**

With your KraussMaffei machine, you have chosen a product that delivers the highest levels of productivity and reliability. In addition to our range of machinery, KraussMaffei focuses on comprehensive and future-oriented solutions, innovative business models and an innovative portfolio of digital products.

Customer service at the touch of a button

The process of digital transformation is becoming faster and easier than ever for the customer. Our Digital & Service Solutions unit makes your production chain even more flexible and efficient with future-oriented solutions. KraussMaffei thus globally provides an all-inclusive customer service package and networks machines and processes with each other. Our global support offers a sound basis for your local long-term success.

Individual challenges in mechanical engineering call for intelligent solutions

With our services portfolio, we support you throughout your machine's lifecycle with a strong focus on your specific needs. In order to satisfy your wishes, we offer you a wide range of solutions in order to ensure maximum availability and optimum productivity of your machines.

Technology³ as a unique selling proposition

KraussMaffei is the only supplier in the world with a product range comprising the most important machine technologies for plastic and rubber processing: injection molding machinery, automation, reaction process machinery and extrusion technology. KraussMaffei is represented worldwide with more than 30 subsidiaries and over 10 production plants as well as about 570 commercial and service partners. Working together with our customers and partners, we are thus in a position to offer vast and unique expertise in the industry.

You can find further information at:
www.kraussmaffei.com

KRAUSSMAFFEI – PIONEERING PLASTICS



Extensive expertise from a single supplier

KraussMaffei is one of the world's leading manufacturers of machinery and systems for producing and processing plastics and rubber. Our brand has been synonymous with cutting-edge technology for over 180 years. Our product range includes all technologies in injection molding, extrusion and reaction process machinery. KraussMaffei has a unique selling proposition in the industry as a result. By drawing on our proven innovative capacity, we can guarantee our customers sustained additional value over their entire value-adding chain through our standardized and individual product, process, digital and service solutions. The range of our products and services allows us to serve customers in

many sectors including the automotive, packaging, medical and construction industries. We also supply manufacturers of electrical and electronic products and household appliances.

At your service all over the world

KraussMaffei is represented all over the world. Subsidiaries provide you with support in the countries shown in light blue. Our sales and service partners take care of you in the regions shown in white.

You can find all contact information at
www.kraussmaffei.com

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