



**ColorForm –  
Unique one-shot process  
Painting directly in the mold**

*Engineering Passion*

***Krauss Maffei***

# Facts and figures about ColorForm technology

## Areas of application



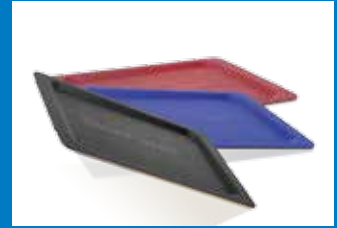
Automotive exteriors



Automotive interiors



Consumer goods



Household

## Process/application matrix

Application	ColorForm colored	ColorForm transparent
Leather-like feel	+	+
Soft-touch finish on the part	+	+
Partial soft-touch finish	+	+
Scratch resistance/abrasion resistance	++	++
High-gloss surfaces	++	++
Partial coating	++	++
Transparent coating (varnish/depth effect)	–	++
Piano black	++	+
Free from release agent	+	+
Changes in wall thickness in decor	0	0
Complex, highly three-dimensional surfaces with radii	++	++
No distortion of decor/texture	++	++
Automotive interior	++	+
Automotive exterior	+	0

++ = excellent, + = good, 0 = possible to a certain extent/under certain circumstances, – = not possible

## **ColorForm**

### **A one-shot process for ideal surface engineering**

With intelligent system solutions from KraussMaffei, you can manufacture excellent components with soft-touch effects without secondary painting in just a single process step.

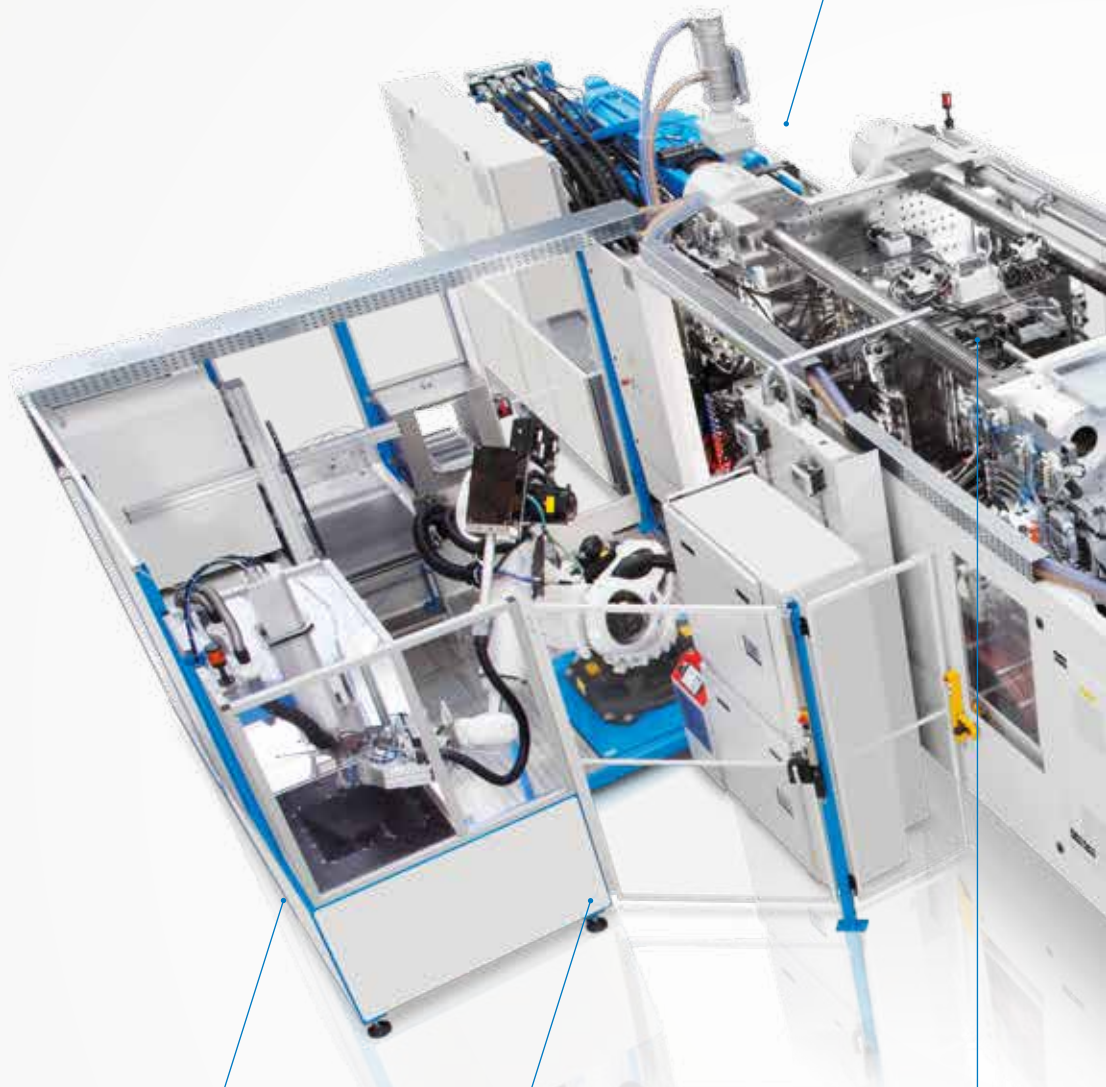
ColorForm by KraussMaffei combines the process engineering and benefits of injection molding technology and reaction process machinery in an ideal manner. Complex thermoplastic parts with a custom, high-quality polyurethane or polyurea surface for a leather-like feel, a particular look or for high scratch resistance can be manufactured in just one process step that is both reproducible and cost-effective.

#### **Your benefits:**

- Elegant surface aesthetics with ColorForm
- Parts can be produced that perform new functions
- One-shot process in a single step
- Individualized surface feel
- Cost-effective system solutions

# Transparent technology

## ColorForm systems engineering



### Post-mold processing by punching, laser cutting and milling:

Precision edge trimming, adapted to your requirements

### Automation

Individualized system solution for a one-shot process: Demolding, further processing and assembly steps, storage systems, all while being flexible for the production of different components

### Part, mold technology

Complete solutions and expert support during the implementation of ColorForm

**Injection molding machine: injection unit**

Allows a high level of reproducibility and high throughput for compounding thermoplastics

**Swivel-plate unit from the multi-component series**

Patented splitter/spin unit with optional centered mold fixing platen, based on a proven modular construction system

**Reaction process machinery:  
PUR/PUA metering technology**

Customized mixing and metering machine compatible with the injection molding machine

**Optional: Flexible dye modules**

Flexible 3-component systems engineering for quick and easy dye change





## ColorForm signifies the fusion of expertise The outcome: The finest high-gloss surfaces in a single step

High-gloss in a one-step process



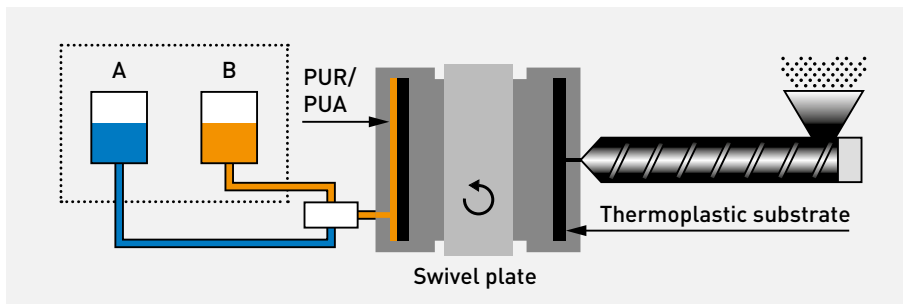
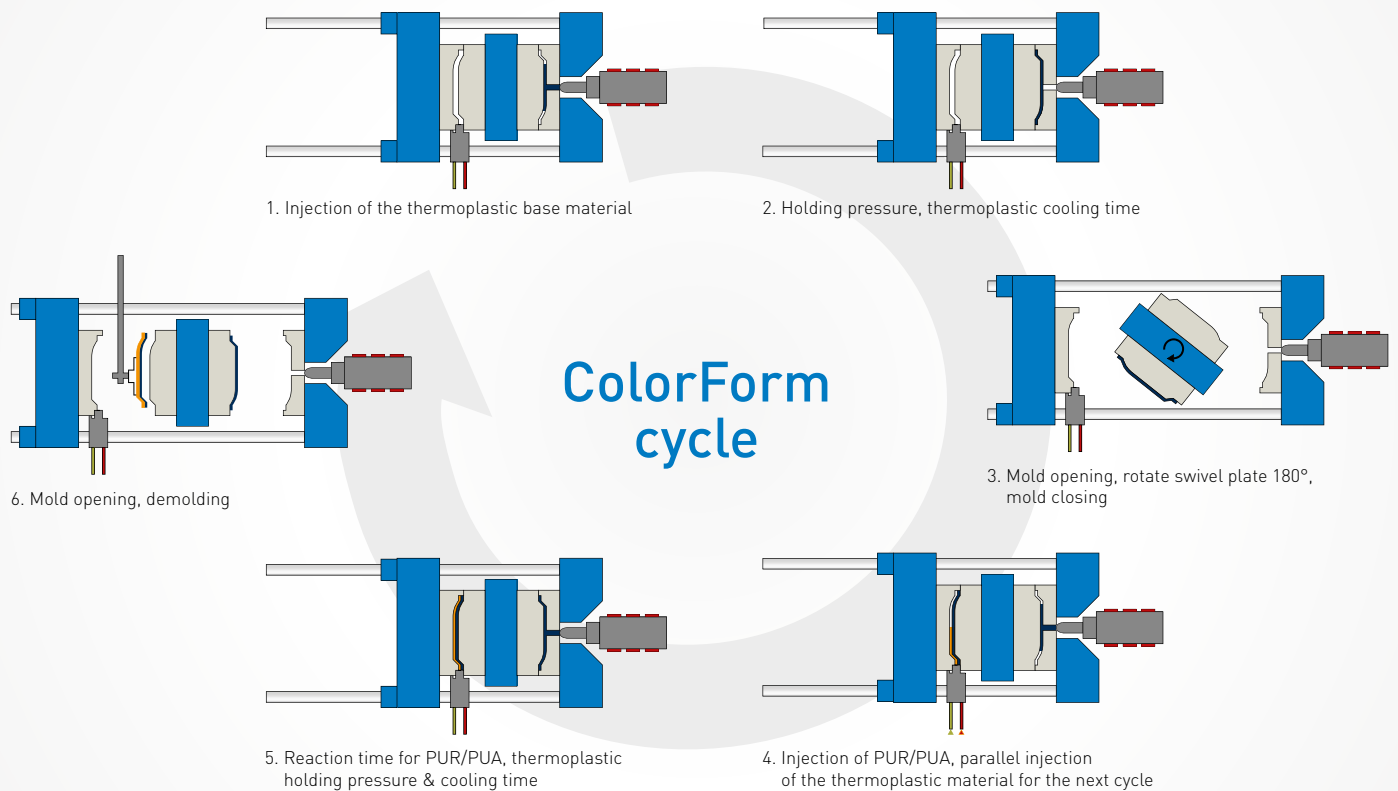
The ColorForm process is based on an intelligent combination of injection molding and polyurethane processing. The technology has been developed in collaboration with major industrial partners and is now ready for high-volume production.

### **Innovative production concept for multi-component parts**

ColorForm is based on the principle of multi-component injection molding, which has been proven for many years. The special characteristic here is the fact that the process does not use a second thermoplastic injection unit once the basic thermoplastic body has been injection molded. Instead, the second stage involves flow-coating the substrate of the basic body with polyurethane (PUR) or polyurea (PUA).

### **Intelligent combination of injection molding and PUR/PUA processing**

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. RimStar Flex systems are specifically designed for metering small volumes and have a very small footprint.



#### Your benefits:

- Space-saving concept
- Surface material is injected directly into the cavity
- High gloss directly out of the mold entirely without follow-up polishing
- No need to clean the mold, meaning longer maintenance intervals

Diagram illustrating the PUR/PUA flow-coating process inside the mold

# The plastics painting technology of the future

## More design for less cost

Creating injection molded parts with a high-gloss hard-paint finish, refined depth effects or haptically impressive structured surfaces in a one-shot process is no longer a vision. With ColorForm, such requirements can be implemented cost-effectively.

### High gloss completely without release agent

These days, only the very best quality is good enough in every branch of industry. As an innovative technology, ColorForm fully satisfies this demand, making it possible to create colored or transparent high-gloss surfaces of just a few tenths of a millimeter in thickness. Its unique characteristic is a combination of thermoplastics and PUR/PUA paint that does not require a release agent.

### New design freedom

Individuality is becoming increasingly important for consumers—they want less mass production and greater exclusivity. To meet this demand, designers always have to be creating new effects. ColorForm gives you completely new options. For example, this includes elements such as design lines, lettering, symbols, high gloss directly alongside matte effects, depth effects and various structures.

### One-step manufacturing process

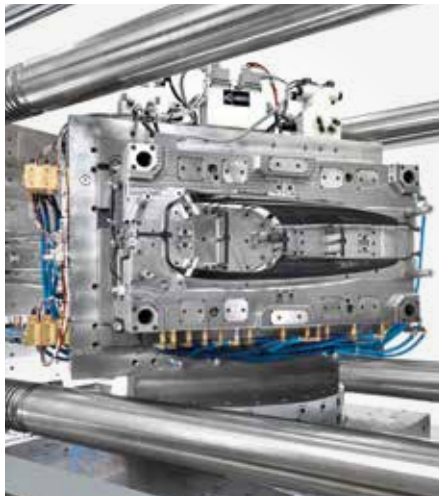
Injection. Painting. Curing. With ColorForm, all that can be performed in just a single production step. This process entirely replaces the typical painting steps and all upstream and downstream working steps. You get ready-refined parts with finest high-gloss surface finish straight from your production system.

### High yield of good parts

With ColorForm, rejects can be reduced in several process steps. Firstly during painting, secondly due to the single-stage process and thirdly due to the extremely robust surface finish. High scrap rates in the painting process are now a thing of the past. The process-reliable one-step process and its high degree of automation provide you with more good parts that also no longer need to be cleaned separately.



Virtually limitless options:  
Various surface structures on a single component with individualized design solutions



With just a single production step for innovative components



Seamless further processing





#### Robustness in further processing

Thanks to the excellent bonding of the PU/PUA paint with the thermoplastic part, the manufactured part that is created is extremely robust. It is insensitive to UV light and extremely scratch-resistant, as proven by industry-standard tests. The short curing times ensure quick further processing, resulting in significantly reduced logistic costs and scrap rates.

---

#### Your benefits:

- High gloss directly out of the mold entirely without follow-up polishing
  - No need to clean the mold, meaning longer maintenance intervals
  - Cost-effective implementation of premium surfaces with new effects
  - Classy appearance and easy enhancement of visible parts and covers
  - Reduced manufacturing costs
  - Increased yield of good parts
  - Quick and easy further processing
  - Maximum efficiency in the production process
-

## Cost-effective synthesis of design and function ColorForm creates leeway in automotive production

### Details captivate customers

Today, the automobile reflects the owner's lifestyle and attitude towards life. The interior and exterior must be coherent down to the greatest detail, corresponding to one another in terms of significance and function. Customers have a sharp eye for accents such as trim elements as well as side and front paneling. These decor panels, trim strips and the design of the center console create an essential impression of the look and feel in the interior and have the capability of triggering the crucial impulse to purchase.

### Integrated production

In the automotive sector, haptics, surface aesthetics and function must all meet the highest standards—all while underbidding challenging cost targets in manufacturing to the extent possible. The key to success here is the reduction of production steps.

In such an environment, ColorForm technology provides leeway for premium quality design at low manufacturing costs and without lowering the bar on component function. This lets you create a composition that skillfully unites form, feel and function in every detail at a marketable price.

**Design and function optimally combined:**  
ColorForm components fashion the modern car – inside and outside





## Compact sizes and easy dye change: Mixing heads for ColorForm

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.



Paint nozzle

With ColorForm, the result is 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.

### 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

### Innovative mixing head for fast dye changes

The special feature of the MK 5-2K+1 is the innovative feed color masterbatch. This has the advantage that the dye nozzle can be replaced without color carryover. Thanks to its compact design, the mixing head is easy to integrate into the mold and simple to attach to readily

accessible positions in the clamping unit area of the injection molding machine. The central media supply is heated in order to ensure a consistent temperature control for the components. The mixing head is available in a special wear-protected design for abrasive dye.

Mixing head nominal size	Total output g/s
MK 5-2+1K	16-45
MK 3.5/5UL-2KVV	6-35
MK 5/8UL-2KVV	30-80



MK 3.5/5UL-2KVV mixing head

#### The expert for small output capacities

For 2-component small-quantity ColorForm applications, the MK 3.5/5UL-2KVV-ColorForm with laminar outlet is the expert for excellent mixing quality, especially at small output capacities. It is based on the MK 3.5/5UL-2KVV, the small volume expert that is in successful production use worldwide in manufacturing small parts of flexible foam, bonding applications and CCM technology, and

has been ideally adapted for ColorForm applications. Heatable component connection blocks with bypass function ensure easy handling of the mixing head while offering the option to integrate sensors in the direct proximity of the mixing head. This mixing head is available in a special wear-protected model for easily abrasive components.



MK 5/8UL-2KVV mixing head

#### The solution for large ColorForm components

The MK 5/8UL-2KVV-ColorForm is the ideal mixing head for large-format contoured ColorForm parts in 2-component design. It is based on the MK 5/8UL-2KVV-CCM, the market leader in CCM technology (CCM: Method for the transparent coating of wood trim components in the closed mold with PUR coating), successfully used by over 200 industrial manufacturers in production use. With its laminar outlet, it is ideal for complex,

large-volume component geometries and ensures the highest mixing quality. Heatable component connection blocks with bypass function ensure easy system start-up while offering the option to integrate sensors in the direct proximity of the mixing head. The mixing head is available in a special wear-protected model for abrasive components.





MicroDos: Money- and time-saving color management with exchangeable color module

# Precise, reliable, user-friendly and economical in operation

## Intelligent color-metering systems

The innovative systems from KraussMaffei guarantee precise metering and thus excellent component quality—even for the smallest mass flow rates. With the compact frame concept, tailored solutions can be provided.

### Fast dye changes

Certain applications require using several dyes that are to be changed frequently. The MicroDos color-metering

system allows for fast and cost-effective color management without needing to be cleaned. All elements in contact with the dye are integrated in a module that is completely replaced within minutes when the dye is changed.

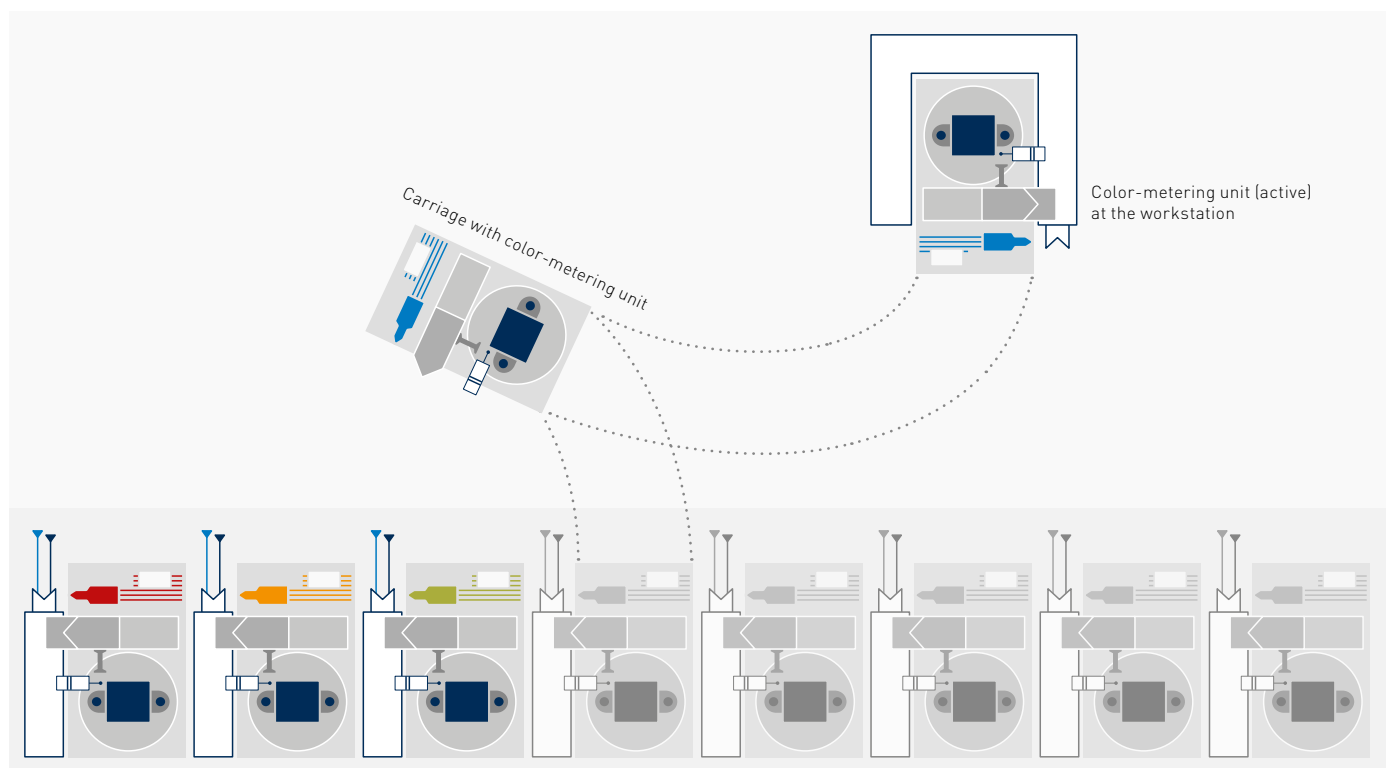
### Innovative color-metering systems

With the hydraulic or servo-electric CD piston metering system, high-viscosity and abrasive dyes can be processed. The FD color-metering system, featuring a frequency regulated metering pump, is designated for the processing of non-abrasive dyes. Both systems offer you the most innovative solutions from both

worlds with their closed-loop control system and double-walled agitator tanks for uniform color component temperature. In addition, a central supply for several mixing and metering machines is possible (multi-point metering), with a large selection of multi-color mixing heads.

### Your benefits:

- High process reliability
- Fast dye changes
- Maximum reliability and availability
- Easy to operate and maintain
- Space-saving



Successful as a result of flexible series production: Flexible color management thanks to optionally expandable parking stations for each color

# An intuitive user interface for the ColorForm process MC6 Multitouch

## Overview page

The most important functions, parameters and system states at a glance



## Complete integration of the reaction system on the user interface

Switch between injection molding machine, reaction system and view of automation system quickly and easily



## Coherently designed integration

The operating buttons of the reaction process machinery functions are arranged similarly to the injection molding machinery operating buttons



#### Uniform user interface

Entry of all process-relevant reaction process machinery setting parameters via MC6 by means of structured function screens



#### Recipe calculator

Full control over mixture ratio and recipe parameters

With the new MC6 Multitouch control system featuring a high-resolution 24-inch capacitive display, the Multitouch principle is setting new standards in clarity, individualization and user-friendliness, making it unrivaled in this size and design. Thanks to capacitive display technology, the operator is able to control multiple actions simultaneously, maintaining the overview at all times.

The operator can now control complex production processes with the ease of operating a smartphone using swipe techniques. The SlideX guiding line engraved in the glass enables the operator to control all axes haptically without looking at the console. As a result, the user obtains a perfect feel for the axis movements and can configure them intuitively. Activation of the display can also be personalized using an RFID chip. Thanks to the XtraScreen function and split-screen, the user interface is individually configurable, creating maximum ease of use and process transparency.

The thermoplastic substrates are produced with precision using the support of the optional APC Plus machine function. APC Plus directly registers the melt viscosity during injection and corrects deviations by making changeover point and holding pressure adjustments in the same shot. The preform quality is improved. The positive result is enhanced process stability and low scrap rates during flow-coating.

#### Your benefits:

- Uniform, simple and central operating concept on the injection molding system panel
- Joint component data log of the injection molding system and reaction process machine
- It is possible to evaluate the reaction process machinery parameters in the comprehensive MC6 analysis tool
- Display of the graph data in the MC6's graph display

## 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 features an extensive range of injection molding machines. Find out about our hydraulic CX, GX and MX series or our all-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.



### Or would you like to know more about the KraussMaffei reaction process machinery product range?

KraussMaffei PUR systems can be used to manufacture fiber-reinforced structural components, as well as car seats, interior parts and shoe soles. KraussMaffei has this area covered too, with made-to-measure solutions for your production task.

### Request information about the following, for instance:

- The right high-pressure mixing head for every production task
- Mixing and metering machines – Outstanding product quality in PUR processing
- Flexible tools for productive automation
  - Industrial robots in the IR Series
- Multinject technology
- Our service expertise is the key to your production efficiency – Service & Solutions

You can find our brochures and flyers with further information online at [www.kraussmaffei.com](http://www.kraussmaffei.com). Upon request, we would 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.

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

## ColorForm

# A one-shot process for ideal surface engineering

With intelligent system solutions from KraussMaffei, you can manufacture excellent components with soft-touch effects without secondary painting in just a single process step.

ColorForm by KraussMaffei combines the process engineering and benefits of injection molding technology and reaction process machinery in an ideal manner. Complex thermoplastic parts with a custom, high-quality polyurethane or polyurea surface for a leather-like feel, a particular look or for high scratch resistance can be manufactured in just one process step that is both reproducible and cost-effective.