

PAINTING DIRECTLY IN THE MOLD.

DISCOVER OUR UNIQUE COLORFORM
ONE-SHOT PROCESS

KraussMaffei

Pioneering Plastics



FACTS AND FIGURES ABOUT COLORFORM TECHNOLOGY



Automotive exteriors



Automotive interiors



Consumer goods



Electrical appliances

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	+	++

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

COLORFORM


A ONE-SHOT PROCESS FOR IDEAL SURFACE ENGINEERING

With system solutions from KraussMaffei, you can manufacture excellent components with high-quality surfaces and integrated functions in just a single process step. Subsequent painting is no longer necessary.

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 with a high-end appearance and 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
- Cost-effective system solutions



Injection molding machine: injection unit

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

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

Precision edge trimming, adapted to your requirements

Automation

A custom system solution for a one-shot process: Demolding, further processing and assembly steps, pick and place systems; can be flexibly employed for producing different parts

Part, mold technology

Complete solutions and expert support during the implementation of ColorForm

TRANSPARENT TECHNOLOGY

COLORFORM SYSTEMS ENGINEERING



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

Finest high-gloss surfaces in one process cycle

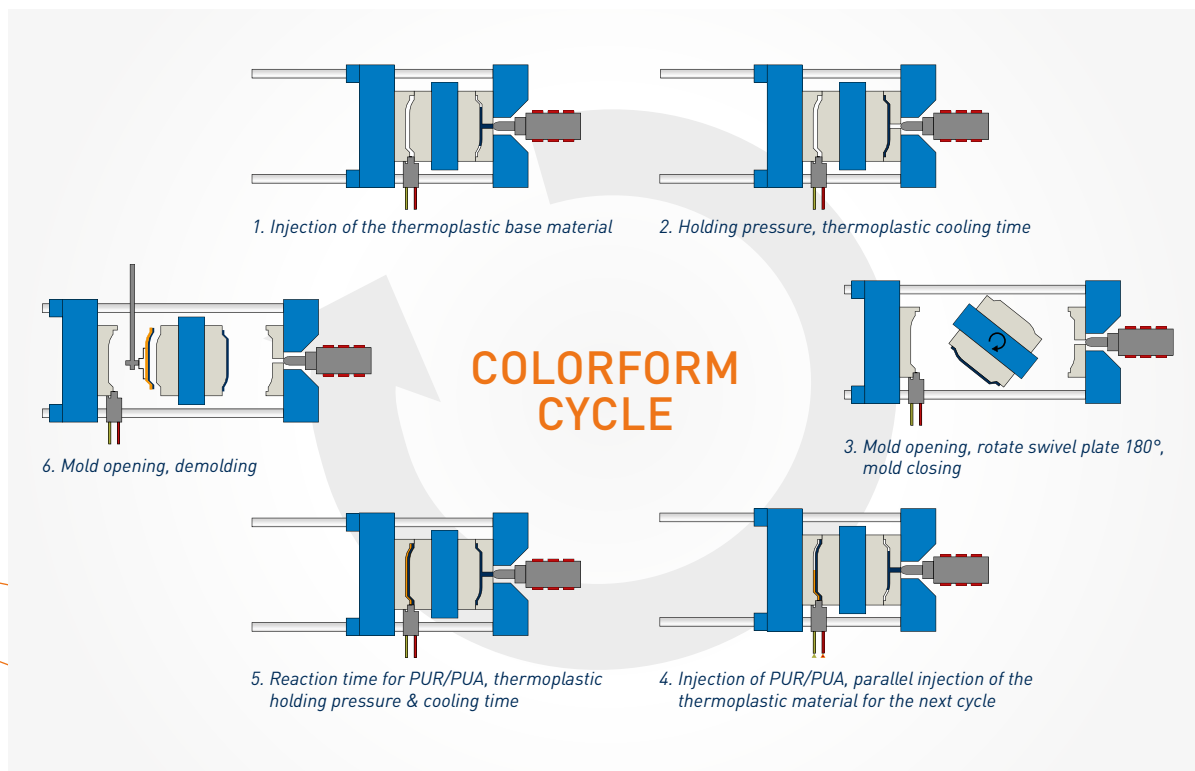
The ColorForm process is based on an intelligent combination of injection molding and polyurethane processing. The technology has been developed in collaboration with major industrial partners and is now ready for high-volume production.

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.





High-gloss in a one-step process

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

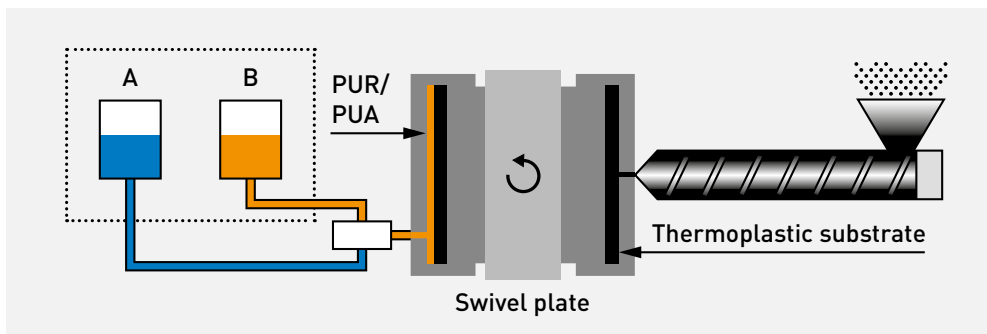


Diagram illustrating the PUR/PUA flow-coating process inside the mold

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.

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 creation of premium surfaces with new effects
- Classy appearance and easy enhancement of visible parts and covers
- Reduced production costs
- Increased yield of OK parts
- Quick and easy further processing
- Maximum efficiency in the production process

With just a single production step for innovative components

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 reliable one-step process and its high degree of automation provide you with more good parts that also no longer need to be cleaned and reworked separately.

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.



Seamless further processing

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.

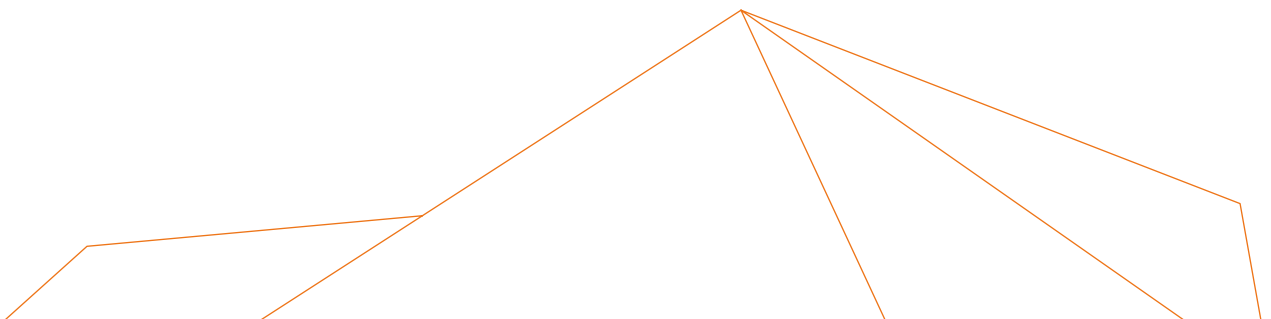
Integrated functions

Vehicles are evolving from a simple means of transportation to a multifunctional space where the driver and passengers spend time. Work, leisure, communication, and family life are increasingly taking place in the car, while the driver is supported in their tasks (and even, to a certain extent, relieved of them) by assistance systems. Accordingly, today's vehicle interiors are designed as living spaces. ColorForm technology adds value here by integrating functions such as lighting, sensors or warning elements in decorative components and through state-of-the-art design options such as 3D and depth effects and holograms.

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.





**Perfect union of design and function:
ColorForm components fashion the
modern car – inside and outside**

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



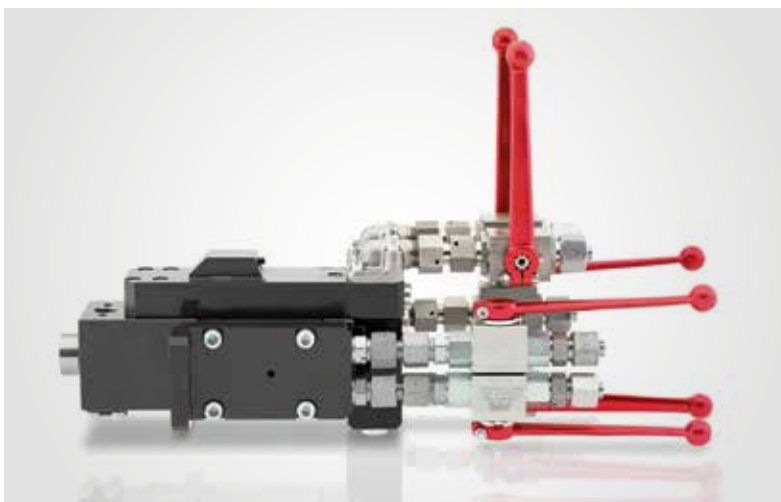
Paint nozzle

The quality solution for large ColorForm components

The MK8-2KV-CCM / ColorForm linear mixing head is the ideal mixing head for large-format contoured ColorForm parts in 2-component design. The development targets for this mixing head were short shot times and high component quality. Our many years of experience in CCM technology (CCM: Method for the transparent coating of wood trim components in the closed mold with PUR coating) make a critical contribution to reliability and durability of the design.

With a mixing chamber diameter of 8 mm, it is ideal for complex, large-volume and large-format component geometries and ensures the highest mixing quality. The high output capacity makes very short shot times

feasible and is the basis for the cost-effectiveness of the process. Adjustable component nozzles enable comfortable and continuous adjustment of the component pressure. Heatable component connection blocks and needle nozzles make starting up the system easy. Moreover, the pressure and temperature sensors are attached directly to the mixing head. This saves space and ensures outstanding reliability of measurement results, which, in turn, means high component quality and low scrap rates. The compact design and compatibility of the outlet pipe and drilling pattern to the MK5-2K make the MK8-MK-CCM an outstanding alternative for retrofitting on existing systems, for example when changing the production order.



MK8-2K-CCM/COLORFORM linear mixing head – ideal for large output capacity and large surfaces.

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



YOUR BENEFITS:

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

Precise, reliable, user-friendly and economical in operation

Intelligent color-metering systems

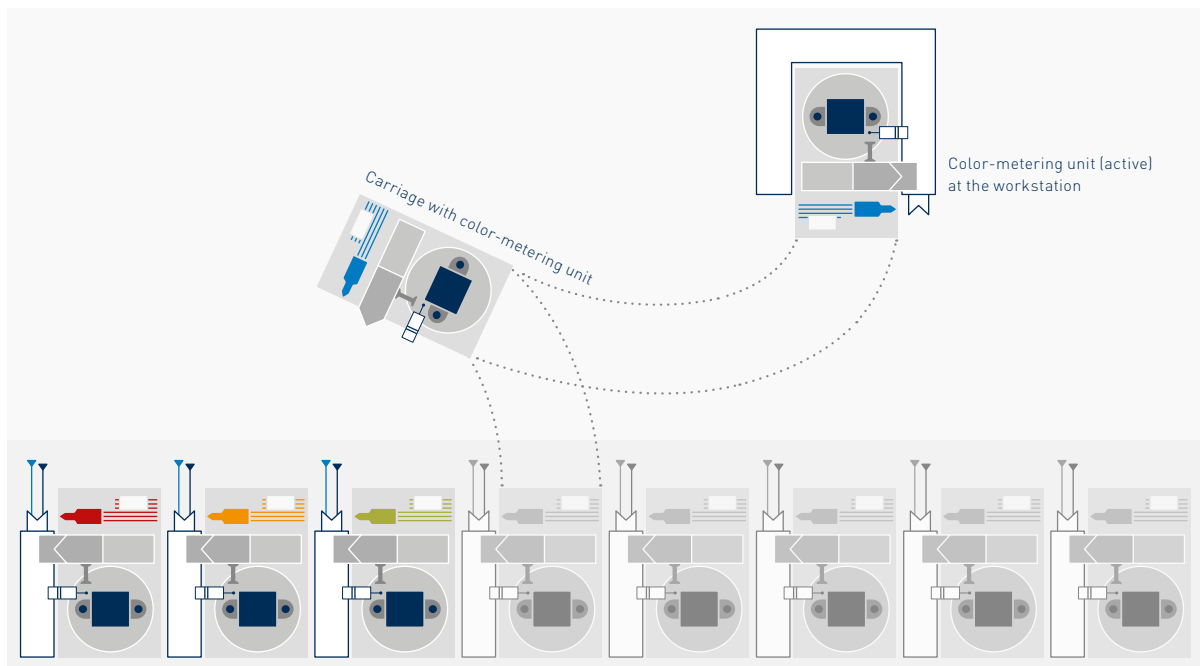
The innovative systems from KraussMaffei guarantee precise metering and thus excellent component quality – even for the smallest mass flow rates. With the compact frame concept, tailored solutions can be provided.

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 parts that come into contact with dye are integrated in one module. To change the dye, the module is swapped for a completely new one in just a few minutes.

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.



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

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

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.



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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