ColorForm and SkinForm
A one-shot process for surface engineering perfection

Engineering Passion

KraussMaffei

Facts and figures regarding ColorForm and SkinForm technologies

Applications

Automotive industry

Consumer goods

Automotive industry

Consumer goods

Hand tools

Process/application matrix

Application	SkinForm	ColorForm colored	ColorForm transparent
Leather-like feel	++	0	0
Soft-touch finish on the part	++	–	–
Partial soft-touch finish	++	–	–
Scratch resistance/abrasion resistance	++	++	++
High-gloss surfaces	0	++	++
Partial coating	–	++	++
Transparent coating (varnish/deep action)	–	–	++
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 passenger compartment parts	++	++	++
Parts for automotive body exteriors	–	+	0

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

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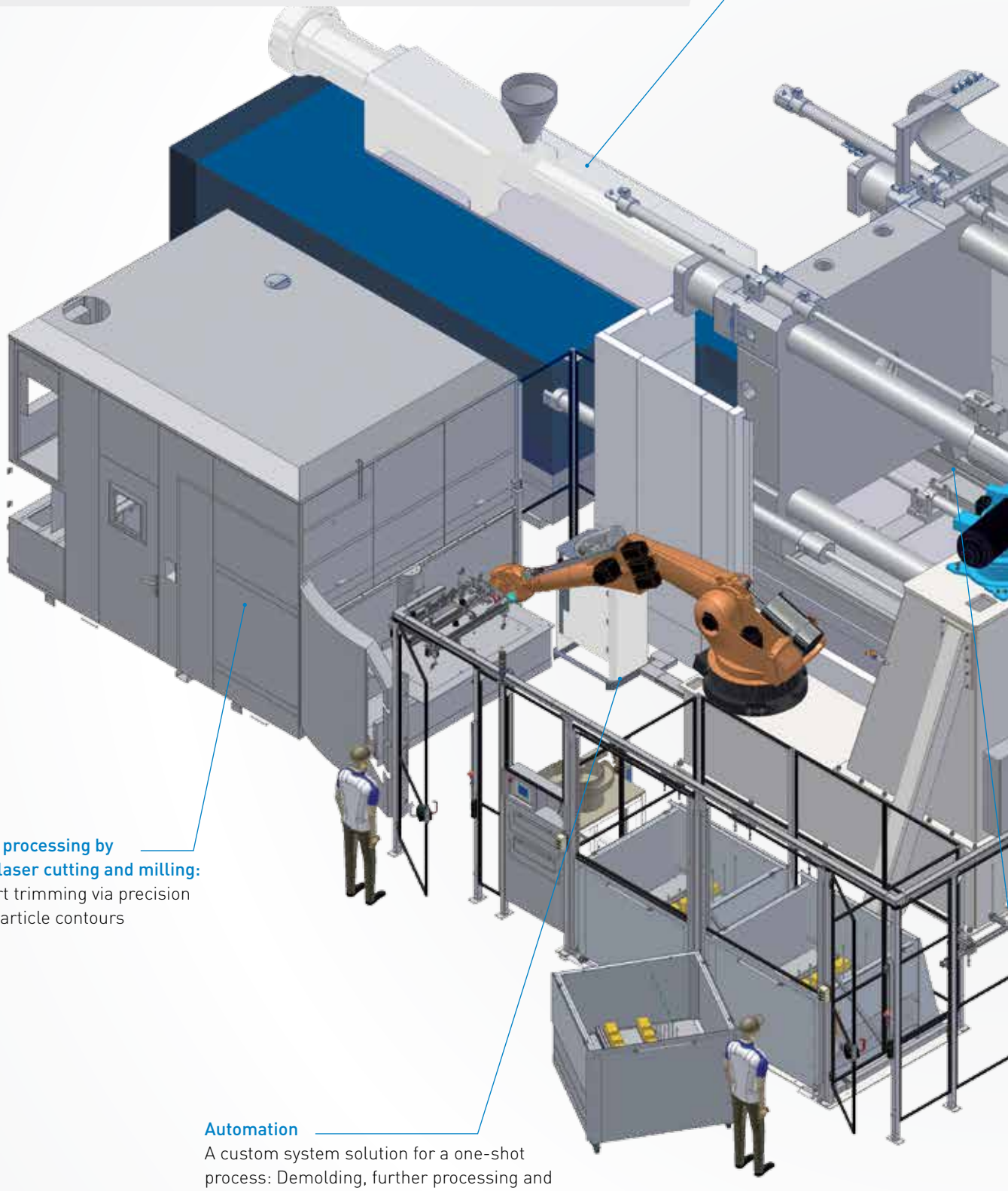
These clever system solutions from KraussMaffei can be used to manufacture attractive parts with a high-quality surface coating, a soft-touch finish or special acoustic or damping properties, in a single process step and without the need for post-mold processing. ColorForm and SkinForm perfectly combine the advantages of injection molding technology and reaction process machinery. 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. KraussMaffei unites the two processing technologies under one roof and is your expert contact for integrating thermoplastic and polyurethane/polyurea processing, injection molding technology and reaction process machinery for manufacturing premium quality injection-molded parts with unique surface properties.

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

Transparent technology
ColorForm and SkinForm technologies



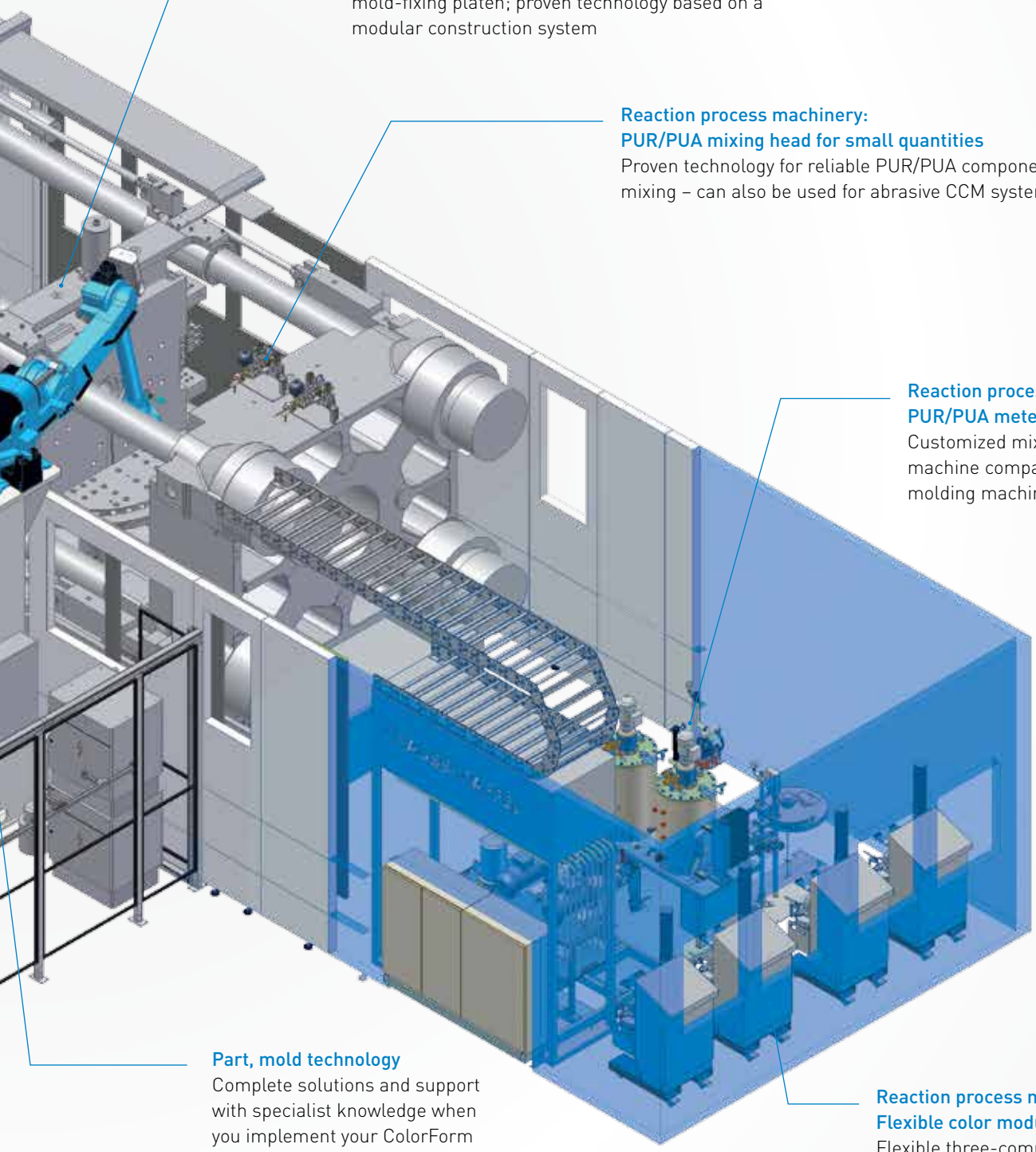
Post-mold processing by punching, laser cutting and milling:
Molded part trimming via precision cuts along article contours

Automation
A custom system solution for a one-shot process: Demolding, further processing and assembly steps, pick and place systems, introducing release agent; nonetheless, this is a solution that can be flexibly employed for producing various different parts

Injection unit for the injection molding machine
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 option for central mold-fixing platen; proven technology based on a modular construction system

Reaction process machinery: PUR/PUA mixing head for small quantities
Proven technology for reliable PUR/PUA component mixing – can also be used for abrasive CCM systems



Reaction process machinery: PUR/PUA metering technology
Customized mixing and metering machine compatible with the injection molding machine

Part, mold technology
Complete solutions and support with specialist knowledge when you implement your ColorForm or SkinForm systems

Reaction process machinery: Flexible color modules
Flexible three-component system technology for fast and easy color changes

Innovative production concepts for multi-component parts with special surfaces
A brief introduction to ColorForm and SkinForm

Decorated trays, two-tone cases, imitation leather armrests, structured inner door or pillar trims for fitting out car interiors – a wide variety of parts for everyday and automotive applications can be manufactured relatively cost-effectively using either of the two innovative processes, ColorForm and SkinForm.

This is because the combination of injection molding technology and reaction process machinery is virtually unparalleled in terms of the number of possible configurations and the extent to which the process can be customized. Using either ColorForm or SkinForm, complex, functional and three-dimensional thermoplastic parts can be combined with visual, haptic and mechanical properties of polyurethanes/polyurea in a single process.

Proven machine technology

Both the ColorForm and the SkinForm process are based on multi-component injection molding. They use the same, well-known machine solutions and tool concepts as swivel plates, turntables and sliding tables. The essential difference lies in the fact that the process does not use a second thermoplastics injection unit once the basic thermoplastic body has been injection molded. The second stage involves flow-coating the surface of the basic body with polyurethane or polyurea. A reaction process machine and the mixing head work to introduce this directly into the mold cavity. Both areas of expertise – injection molding technology and reaction process machinery – come together under one roof at KraussMaffei, who can always offer you the optimal solution tailored to your product.

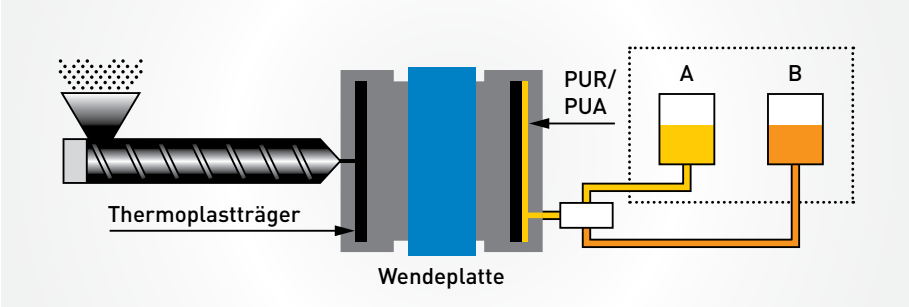


Diagram illustrating the PUR/PUA flow-coating process inside the mold

ColorForm and SkinForm features

ColorForm	SkinForm
Specifically designed for coated surfaces	Specifically designed for soft-touch surfaces
Compact polyurethane or polyurea coating systems	Compact or foamed polyurethane systems
High-gloss surfaces	Matt, textured surfaces
Colored or transparent coatings	Perfect reproduction of the mold structure
A wide variety of possible thermoplastic substrates	A wide variety of possible thermoplastic substrates
Largely free from release agent	Release agent generally required
Layer thicknesses of 0.3–2 mm possible	Layer thicknesses of up to 15 mm normal
Sprue and overflow regions on the part	Sprue and overflow regions on the part
Run-out and long flow paths possible	Run-out and long flow paths possible

ColorForm for pleasing surface aesthetics

High-gloss surfaces, whether multi-colored or transparent, can be applied easily and quickly to thermoplastic base bodies using the ColorForm process. Layers are generally between 0.3 and 1 mm thick. In contrast to the SkinForm process, the ColorForm process operates largely without the need for release agent.

SkinForm for surfaces that are pleasant to the touch

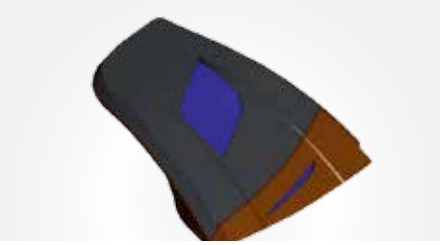
Textured, imitation leather surfaces or surfaces with a soft-touch finish can be applied to basic thermoplastic bodies using the SkinForm process. The nature of this process is such that the polyurethane layer can either be compact or foamed and of varying thickness. Areas may be produced with a soft-touch finish over only part of their surface, and surfaces to which more than one color is to be applied benefit from short color changeover times.

Your benefits:

- Maximum design freedom
- Premium quality, enhanced surfaces
- Proven machine technology from a single source
- Short cycle times as a result of the one-shot process
- Fully integrated and fully automated process
- Exact impression of the mold surface

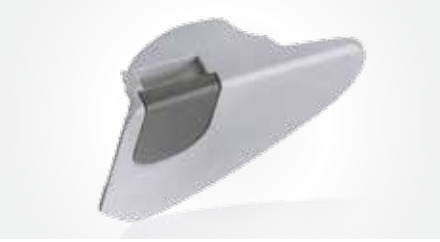
Toolbox with three different surfaces and integrated functional features

Armrest with soft-touch finish



ColorForm demonstrator with two painted surfaces of different color

A large-format, contoured tray with a high-quality surface finish



Seatbelt buckle cover with leather-like feel and areas with a soft-touch finish over only part of their surface

Imitation leather headrest cover manufactured using the SkinForm process

Hammer drill handle with good grip and optimal damping properties

WEIDMANN automotive interior trim strip using ColorForm technology

Founded on proven injection molding systems

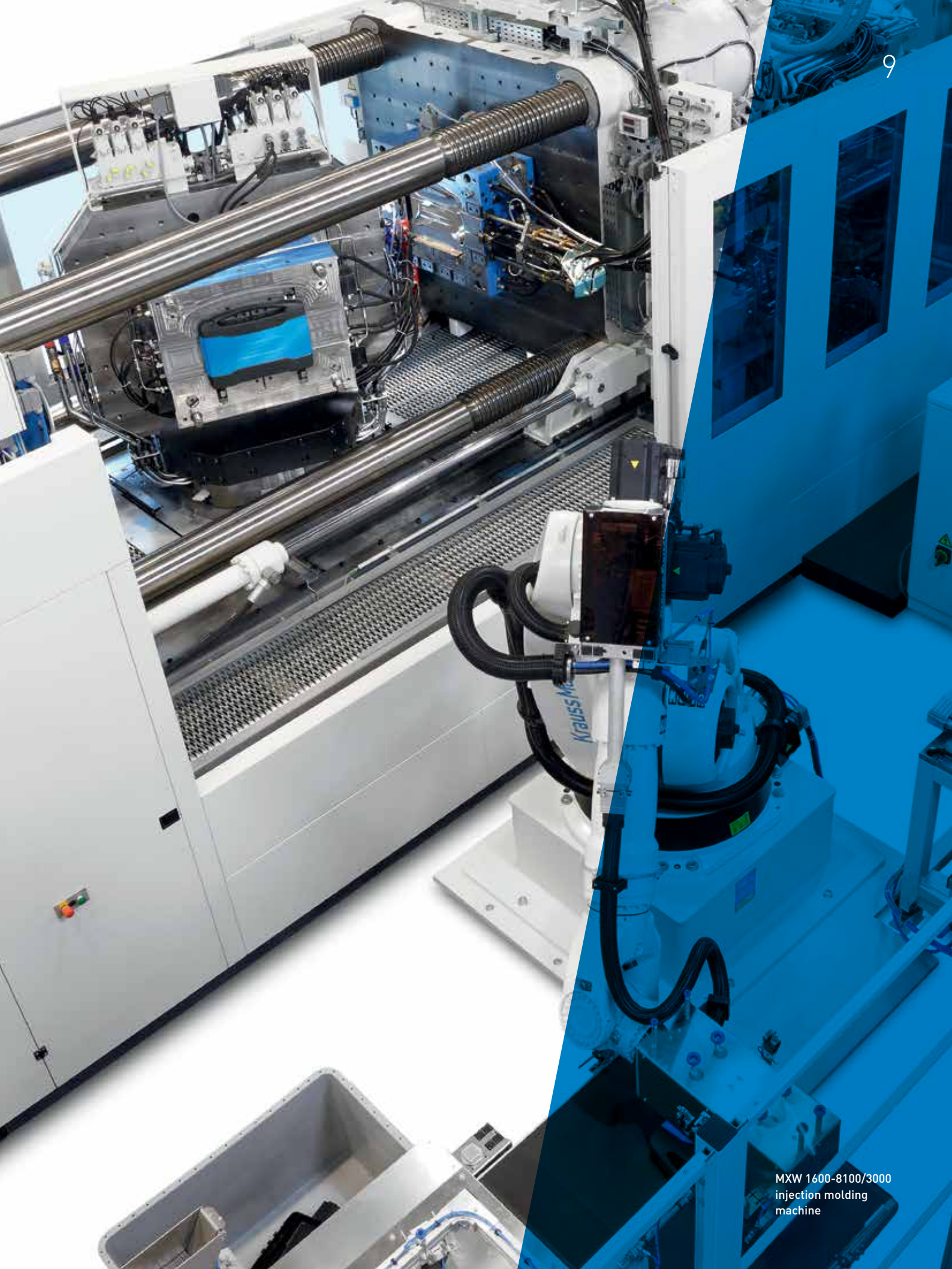
With an incredibly broad range of machinery, including hydraulic or electric drive units, high-performance injection units and comprehensive automation solutions, KraussMaffei is one of the world's leading suppliers of complete solutions for the plastics industry. The modular injection molding system can perform each individual processing task, whether it involves simple or complex process sequences. For this purpose, the basic version of all injection molding machines is equipped with many "highlights".

Compact two-platen technology

All of KraussMaffei's injection molding machines are designed to include an advantageous two-platen clamping unit. Unlike conventional three-platen technology, products manufactured using two-platen technology are around 30% shorter, which translates to an enormous saving on space. In addition, the clamping unit's precise platen parallelism is impressive, as are the incredibly low quantities of scrap it produces and its low maintenance requirements. It can be easily adapted for swivel plate solutions by replacing the ejector on a standard machine with a second injection unit.

Plasticizing as you like it

Since plasticizing systems are one of KraussMaffei's specialties, you will find a plasticizing unit to meet your every need: A plasticizing unit tailored to the kind of material you wish to use and the methods with which you wish to process it. The enormous machine portfolio offers such great choice that the optimal combination of clamping and injection units can be selected every time for individual processing tasks. High throughput rates, excellent reproducibility and short cycle times ensure a high level of production efficiency. Low-impact material compounding ensures that parts are produced with consistently high quality.



MXW 1600-8100/3000
injection molding
machine

Flexible machine adaptation and a vast number of mold connections for customer-specific solutions

Energy-saving drive unit concepts perfectly controlled

Energy-saving drive unit concepts

The drive unit concept is of modular design and combines a high performance level with low energy consumption. Precisely the right amount of oil is supplied, at the right pressure, at every working point. The system can be easily adapted for every multi-component ColorForm or SkinForm solution.

Flexible microprocessor control system

All machines are equipped as standard with the easy-to-operate MC6 microprocessor control system. The essential information is displayed on the screen in a way that is clear and easy to understand. Numerous functions governing the machine's movements, as well as monitoring and evaluation programs, allow for a high level of flexibility in production along with simple operation, even for complex processes.

Your benefits:

- Complete machine portfolio
- Proven plasticizing systems
- Numerous options and mold interfaces
- Extensive mold and process expertise
- Energy-saving drive unit concepts
- Flexible MC6 microprocessor control system – reliable and easy to operate
- Multinject for multi-component parts

Multinject technology for injecting multiple components

KraussMaffei boasts a complete Multinject technology machine portfolio for multi-component applications on small and large machines. It is the product alone that dictates the system solution to be used, chosen from the comprehensive service catalog. Thus for ColorForm and SkinForm processes, the well-known sliding table or turntable, index or SpinForm technologies, for instance, can be adapted for the combined processing of thermoplastics and polyurethane/polyurea. Whatever your requirement, there is a way.

Metering and mixing technology makes all the difference

The RimStar Nano metering systems are specifically designed for metering small volumes.

As with injection molding machines, KraussMaffei offers modular and flexible machine concepts for polyurethane processing too. For each individual production requirement, the RimStar Series offers the optimal mixing and metering machines for a vast range of tasks.

Space-saving metering technology

The RimStar Nano metering systems are specifically designed for metering small volumes. Their volumetric and working capacity also allow several injection molding machines to be operated in one regular production cycle. The RimStar Nano 4/4 ColorForm requires around a third less space. Its operation is optimized specifically for the ColorForm and SkinForm processes.

Modules for rapid color changes

The MicroDos color metering system – or what is known as a three-component system – allows colors to be changed within just a few minutes, with very little flushing required. All parts that come into contact with color are integrated in one module. To change the color, this module is swapped for a completely new one. This effectively prevents contamination of the paint by different colors, and virtually precludes the need for cleaning the system components wetted with color, which would not be the case had the same module been used. MicroDos and three-component systems therefore allow for time-saving color management.

RimStar Nano 4/4 metering system for reactive materials such as PUR

MK 3.4/5 UL 2KVV high-pressure transfer mixing head

Established mixing head model

Unlike thermoplastic processing, the reaction that takes place in polyurethane processing between the starting materials polyol and isocyanate to produce polyurethane does not take place until these materials are in the mold. The starting components must therefore be stored, conditioned, metered and mixed and poured into the mold in highly repeatable shots. It is the mixing head that mixes and pours the starting components. For this purpose, the transfer mixing head has been designed with recirculation grooves. KraussMaffei supplies various mixing head models with different pouring rates and suitable for different materials.

Self-cleaning high-pressure mixing head

The mixing heads used for ColorForm and SkinForm processes are high-pressure mixing heads which, because they are self-cleaning, do not have to be cleaned separately. They can be flexibly adapted to work with the injection mold used. Multi-color mixing heads are recommended for manufacturing parts in different colors. Pigments are always added directly to the mixing chamber so that only the amount of material that is to be processed is dyed.

Production is able to continue uninterrupted as there is no need for cleaning. Proven systems composed of modules produced by Krauss Maffei ensure reliably high quality and consistent processes.

Your benefits:

- A broad range of machinery for polyurethane processing
- Other reactive mixtures, such as polyurea, can also be processed
- Self-cleaning mixing heads
- Color changes without cleaning
- Space-saving RimStar Nano 4/4 ColorForm

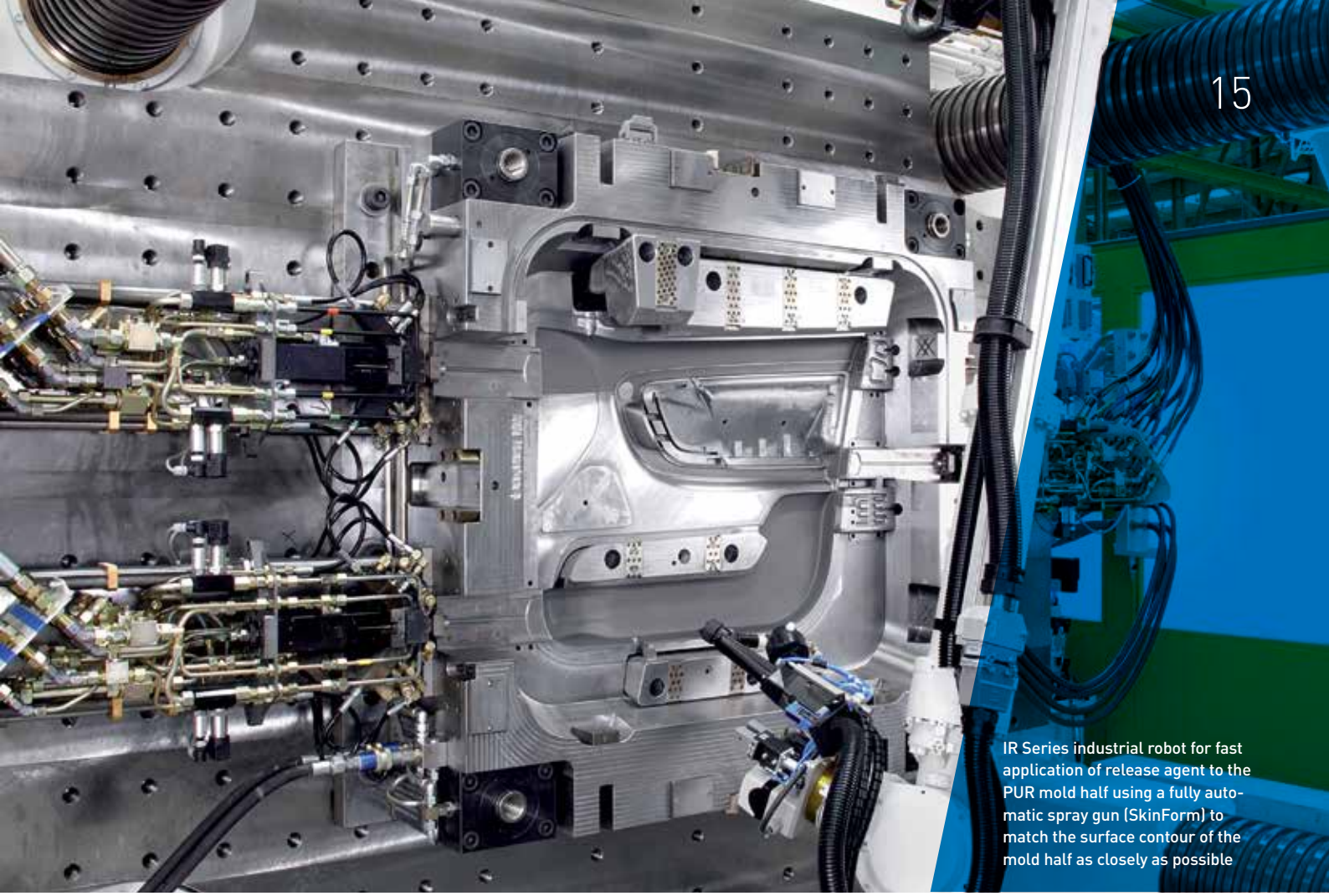
Turnkey solutions from a single source
Automation enhances production stability

ColorForm production cell based on the MXW Series with industrial robot

Yet another string to your bow: In addition to the flexible, modular machine ranges for injection molding and polyurethane processing, KraussMaffei can offer you complete automation and post-mold processing technologies.

From advising you on project engineering, commissioning your system and providing you with after-sales service, KraussMaffei offers everything from a single source. The portfolio includes LRX/LRX-S Series linear robots for standard tasks, industrial robots (IR) for complex requirements, and side-entry robots (SR) for high-speed applications.

The ensure high levels of productivity, top quality products and a trouble-free process. Foam molds, part trimming technology, as well as punch tools and milling cutters, complete the machine range.



IR Series industrial robot for fast application of release agent to the PUR mold half using a fully automatic spray gun (SkinForm) to match the surface contour of the mold half as closely as possible

Linear robots for standard tasks

Linear robots that can move in three main axes and three linear axes are used for assembly, sorting and transportation. A range of axis versions, axis extensions and wrist axis combinations make the linear robots extremely agile. A possible 500 different combinations mean the robots can move around quickly in large working areas.

Industrial robots for complex tasks

Where speed and path accuracy are of the essence, using industrial robots or six-arm robots makes sense. Their freely programmable axes confer maximum flexibility, enabling them to fulfill any complex demolding or automated task. IRs can be fitted on a console, on the floor, on the wall or inside the machine housing, and are almost as versatile in operation as the human hand, but with the added benefit that they do not tire.

Easy to operate without prior knowledge

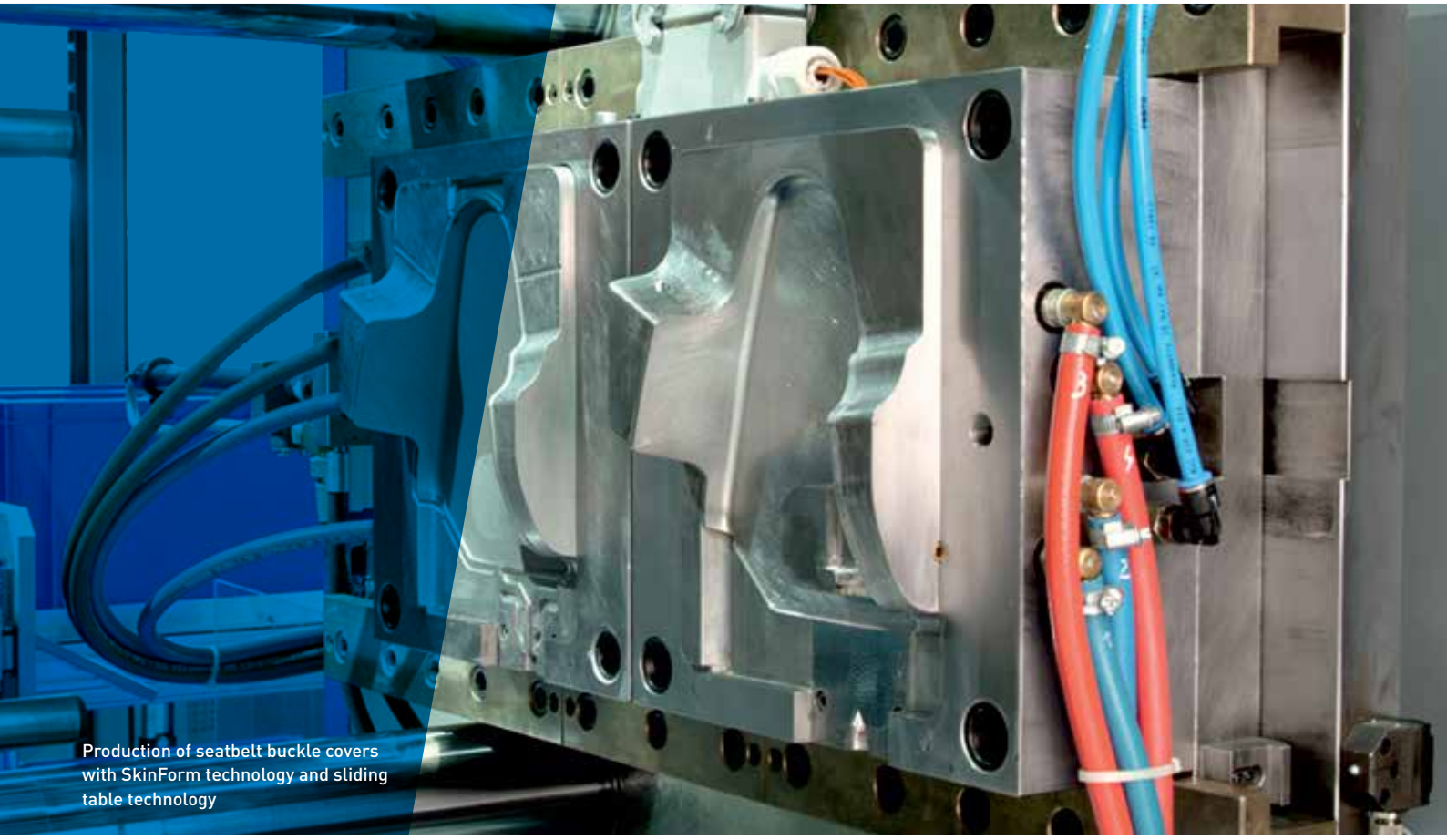
Machine and robot form a functional unit. The joint MC6 control system allows both devices to be controlled from any control panel. The MC6 features an improved man-machine interface which makes it much easier to program linear and six-arm robots. Thanks to software modules (WizardX, VisuX) from a program library, machine operators can now also program the devices via the graphic user interface without the need for in-depth programming knowledge. This successfully supports fast commissioning and trouble-free production.

Laser cutting, punching or milling

The sprue and overflow regions on the part that are necessary in the ColorForm and SkinForm processes are removed directly in the system. Laser cutting systems have proved to be the perfect solution for this: In addition to excellent flexibility, they provide outstanding cutting edge quality. This step is fully integrated using the robots, so that a finished part exits the system.

In addition to special foam molds, KraussMaffei also offers punch tools and milling cutters for removing sprue. Punching processes have impressively short cycle times, and benefit from high system capacity and excellent part cutting quality, along with low operating costs. The RoutingStar robot milling cell is a highly flexible solution, ensuring high cut repeatability and short cycle times. The RoutingStar is characterized by a high level of process reliability, low cleaning and maintenance requirements and optimal waste management.

Fit for the future
It all hinges on the right combination



Production of seatbelt buckle covers with SkinForm technology and sliding table technology

Ideally equipped for the future

ColorForm and SkinForm are one-shot processes with huge potential. For plastics extrusion shops making a foray into a new market and initially wanting to only produce small numbers of thermoplastic PUR parts, a good starting point would be to equip a standard injection molding machine with a sliding table mold and a RimStar machine for polyurethane processing.

A fully integrated, complete solution comprising a swivel plate injection molding machine, RimStar and automation, allows for high-volume, cost-effective series production of ColorForm and SkinForm parts. With this solution, you are flexibly equipped for both current and future requirements.

Your benefits:

- Ready-to-install parts produced with a single system
- Reduced space and energy requirements, streamlined logistics
- Enhanced surface feel, gloss and scratch-resistant properties compared to thermoplastic parts
- Partial coating possible
- Sophisticated machine technology and process management throughout the entire production cycle

Coating as part of the injection molding process
Fully automated production efficiency over a small area

ColorForm and SkinForm offer streamlined logistics and fewer intermediate steps for parts with premium quality surfaces

Reduced staffing and maintenance costs

Aside from the small set-up area required and the reduced production overhead costs this entails, there are additional benefits to an integrated ColorForm or SkinForm solution: The one-shot process eliminates the need for both intermediate storage and intermediate transportation – an obvious plus from a logistical point of view. Similarly, staffing costs are significantly reduced thanks to process integration and the redundancy of post-mold processing steps.

Low scrap costs

Consistent processes with consistent cycle times and durations ensure a high level of reproducibility when manufacturing the substrate and the surface layer. This increases the yield of parts that meet your specifications and prevents rejects. There is no risk of exposure to contamination or other negative influences that may otherwise occur during intermediate storage or transportation.

Over and above the technical advantages, the cost efficiency of the fully integrated ColorForm and SkinForm processes makes them a convincing alternative to conventional processes.

Further information which might also interest you

Are you looking for detailed information about the right injection molding machine and automated solution for your application?
KraussMaffei boasts an extensive range of injection molding machines. Find out about our hydraulic CX, GX and MX Series or our fully electric AX and EX Series. We can offer you the right robot for every production task. You can also choose special tool 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.

Obtain information about the following, for example:
- The right high-pressure mixing head for every production task
- Mixing and metering machines – outstanding product quality in PU 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 on other topics online at: www.kraussmaffei.com. On request, we would also be happy 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.

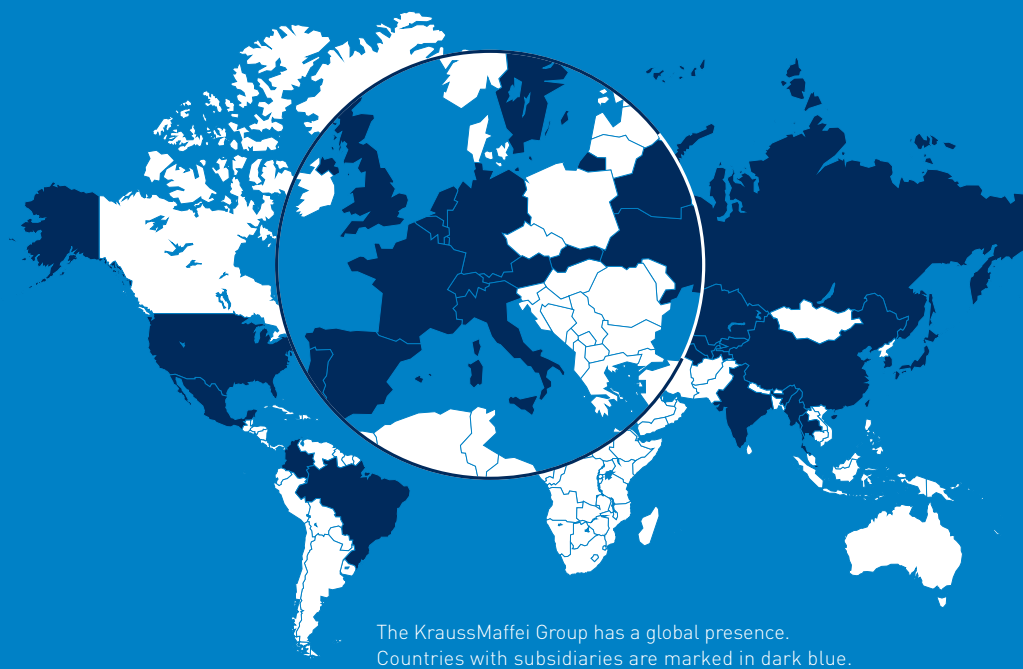
You can find additional information about KraussMaffei at: www.kraussmaffei.com

KraussMaffei Group
Comprehensive expertise

Unique selling proposition Technology[3]
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



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.

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