

Krauss Maffei

PEOPLE FOR PLASTICS



ALL-ELECTRIC MACHINE CONCEPT - HIGHLY PRODUCTIVE, CLEAN AND PRECISE

EX series injection molding machines

IN PARTNERSHIP WITH INDUSTRY

KraussMaffei is a premium partner for the plastics and rubber processing industries worldwide



Automotive



White Goods



Construction



Life Sciences



Electrical/Electronics

Whatever you aim to achieve in plastics or rubber processing, KraussMaffei is your partner. We are the only company with intensive expertise across the three main engineering fields. And we have a strong track record in integrating this expertise to develop new processes and systems.

Ready for any challenge

Our **Injection Molding Machinery Division** supplies machinery and systems from 35 to 4,000 tonnes for standard applications and for all processing variants, together with fully automated solutions. We have a strong customer base in all the relevant industries worldwide.

Our **Reaction Process Machinery Division** supplies machines and complete systems for processing polyurethanes and other reactive materials.

Completing our product portfolio, **Automotive Component Systems** supplies foam molds, cutters and routers. Our customer base is wide, with a focus on the automotive, construction and white appliances industries.

Our **Extrusion Technology Division** supplies machinery and systems for compounding, for pipe, profile and sheet extrusion, physical foaming, and the production of technical rubbers and intermediates for tire production. Machinery from the company's range – from single extruders to

complete extrusion lines – is used in many industries, including chemicals, pharmaceuticals, automotive, construction, furniture and packaging.

People for Plastics

We are the “people for plastics”. We are your partners from the first exploratory discussion, through development to commissioning, servicing and operating your system, and final disposal. At all times, you are assured of outstanding competence in planning and engineering, as well as reliable and fast spare parts, service and support.

Adding value for customers

We put our expertise to work for your success. With machine ranges engineered for modularity, we can deliver application-specific solutions based on our wide range of standard modules and specially engineered solutions. This strategy offers customers technical and cost advantages.

Close to customers around the world

As an international company, KraussMaffei has a presence in all the major markets for the plastics and rubber processing industries and employs around 3,000 people worldwide. Our sales and service network keeps us close to all our customers around the world.

EX injection molding machines – combining fastest dry cycle times, outstanding precision and cleanliness.



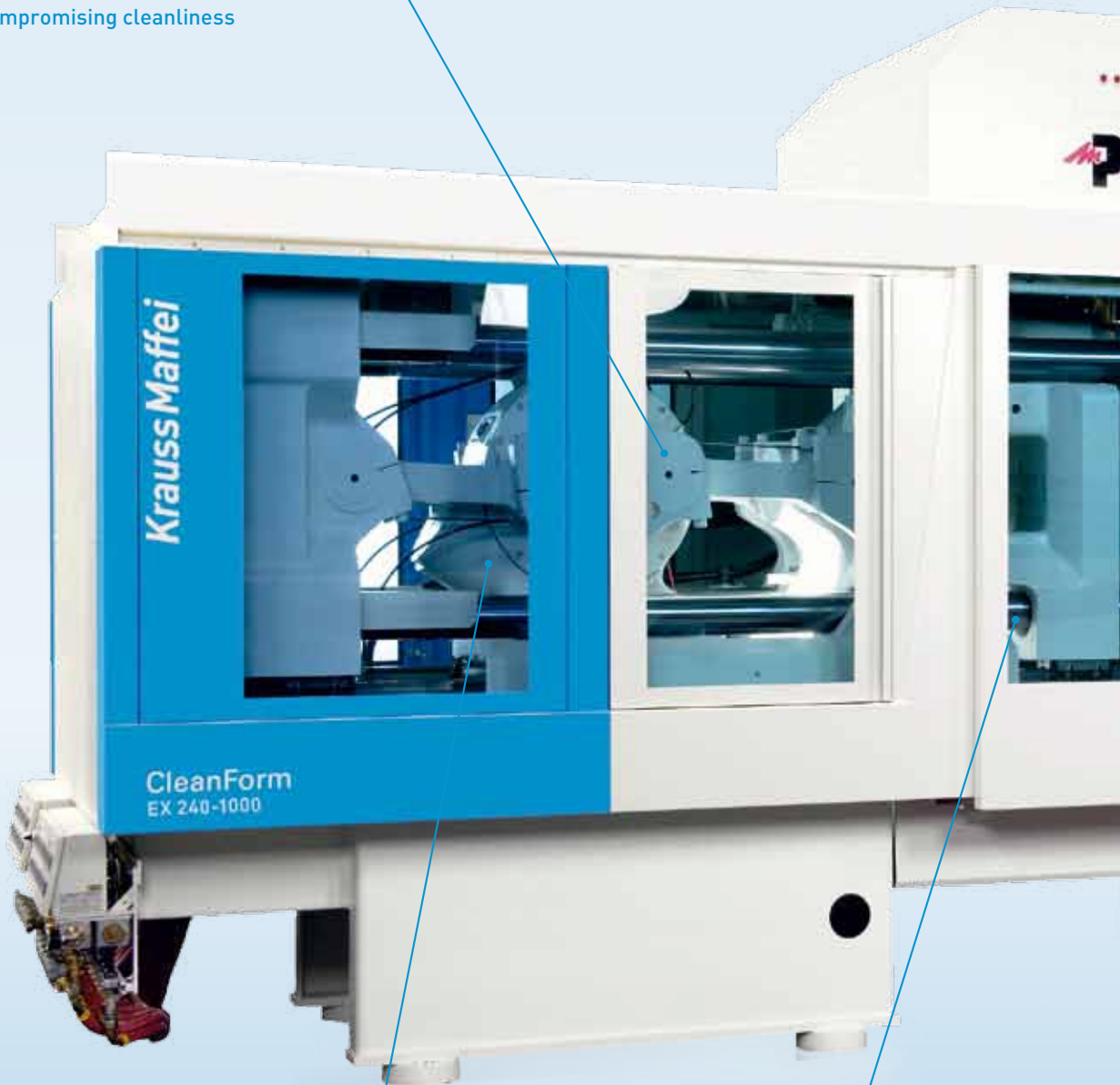
Packaging

KraussMaffei's EX series is an all-electric machine concept. Key characteristics are high performance, high precision and the fastest dry cycle times in the industry. Chiefly responsible for delivering the speed and performance is the unique Z toggle – it's at the heart of the EX machine. Together with a direct-driven electric injection unit, this engineering concept guarantees outstanding precision, ultra-fast responses and absolute cleanliness.

TRANSPARENT TECHNOLOGY

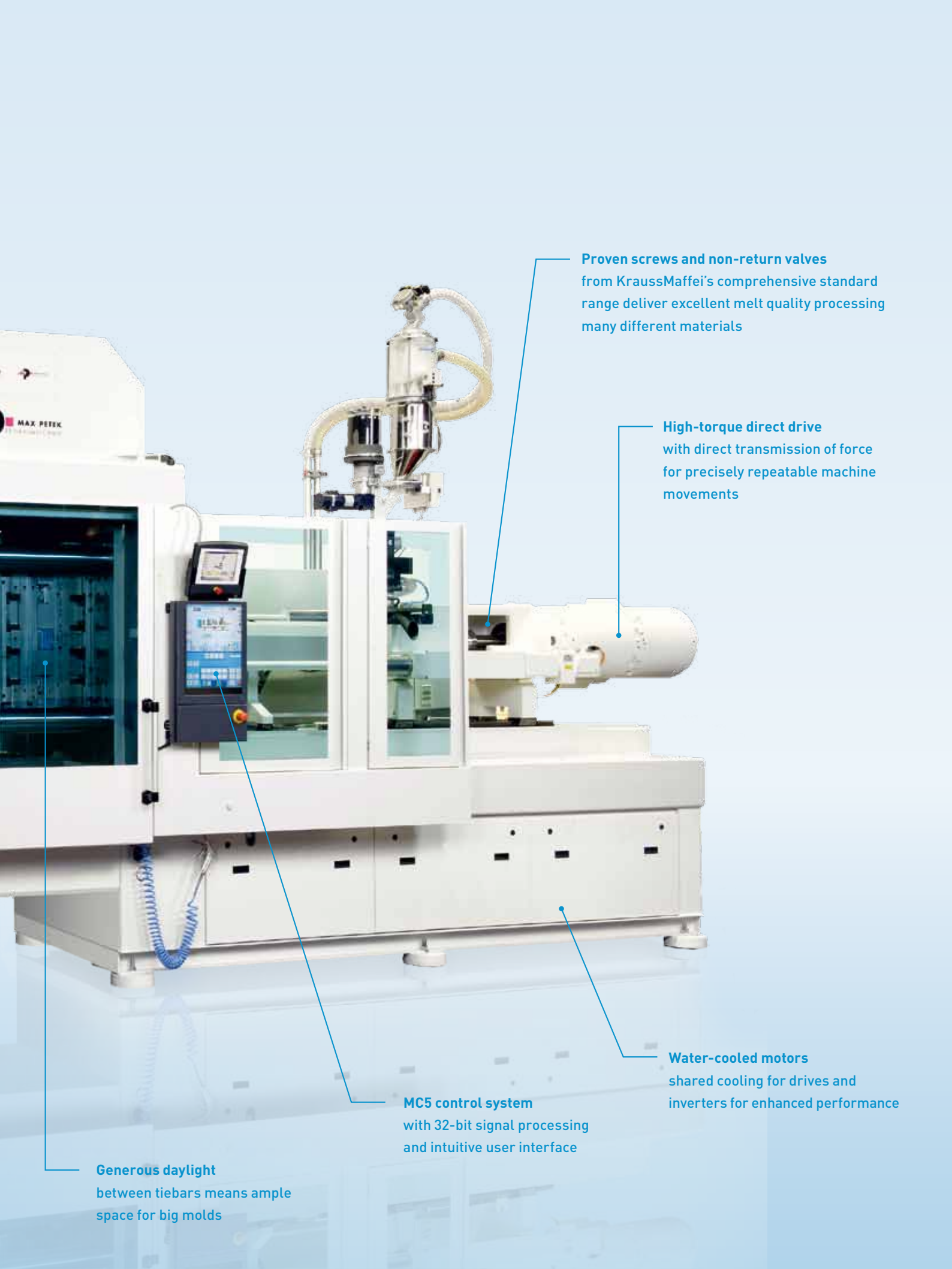
Meet the machine: take a tour of an EX injection molding machine

Unique Z toggle clamp concept
for very fast dry cycle times, high precision
and uncompromising cleanliness



Fully encapsulated clamp elements
absolutely greasefree lubrication helps
to keep the mold zone clean

Electric drives for all machine axes
highest efficiency and outstanding precision



Proven screws and non-return valves from KraussMaffei's comprehensive standard range deliver excellent melt quality processing many different materials

High-torque direct drive with direct transmission of force for precisely repeatable machine movements

Generous daylight between tiebars means ample space for big molds

MC5 control system with 32-bit signal processing and intuitive user interface

Water-cooled motors shared cooling for drives and inverters for enhanced performance

DETAILED PRODUCT INFORMATION

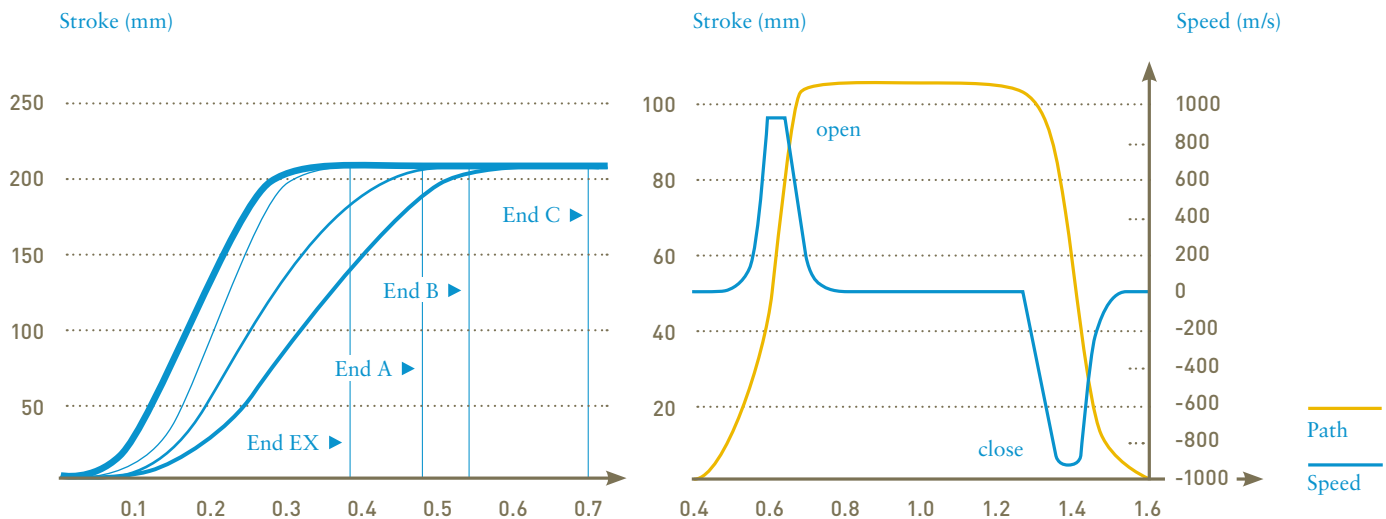
The EX clamping concept – unparallelled dynamics

KraussMaffei supplies EX injection molding machines in clamp sizes ranging from 50 to 240 tonnes that set new standards in every way. EX all-electric machines achieve extremely fast dry cycle times and deliver peak performance.

The innovative Z toggle – short strokes, large forces

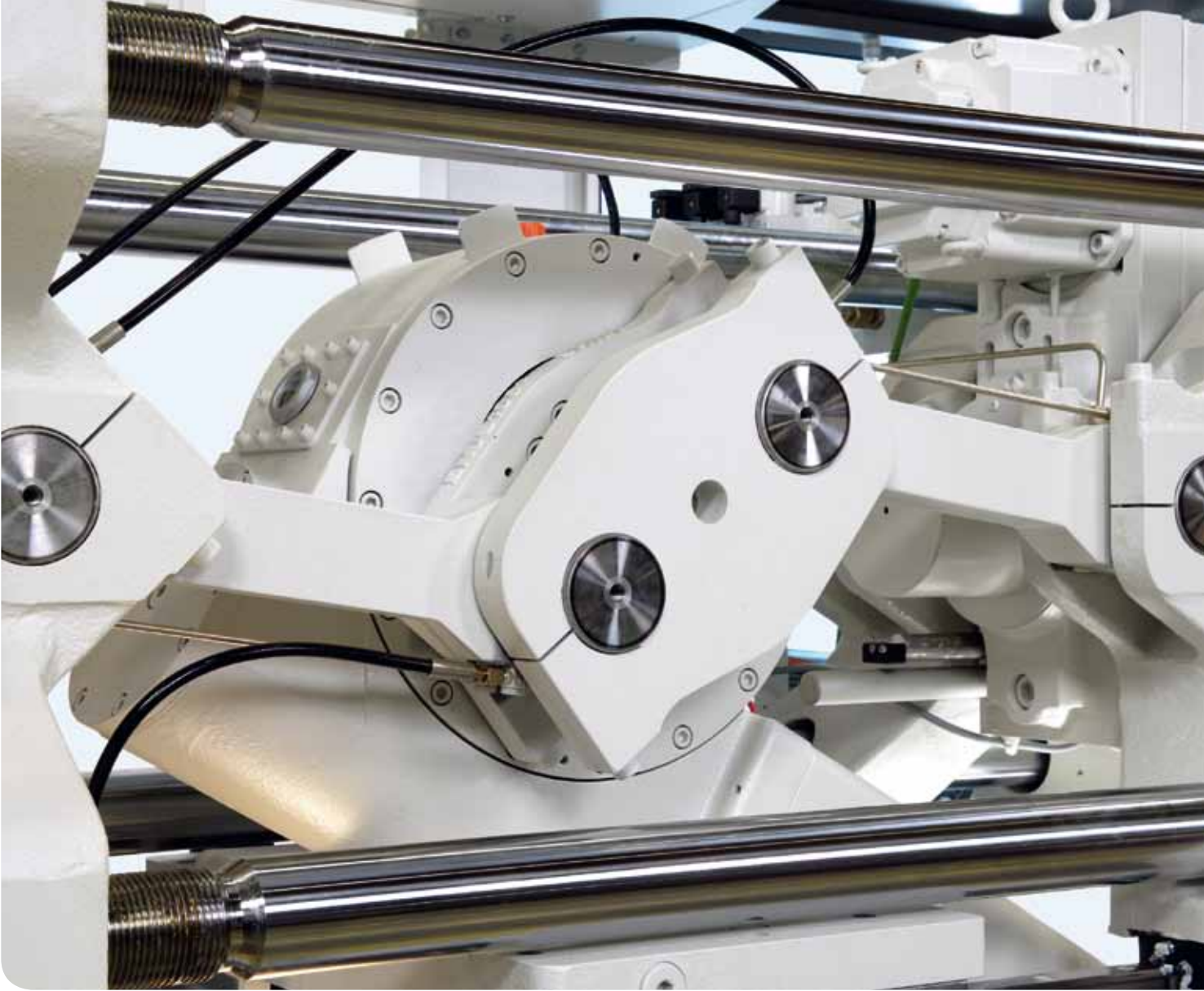
The patented Z toggle clamp converts motor power directly and with great precision into

mold movements via a worm gear. Rapid movements and ultra-fast clamp force build-up and release are the result. The kinematics of the Z toggle therefore deliver a clamp-speed profile that is close to optimal for demolding. EX dry cycle times rank among the fastest on the market.



A highly dynamic machine for extremely short dry cycle times

Speed profile and stroke executed in a dry cycle



Thanks to the Z toggle, EX machines offer extreme speed, precision and cleanliness.

Z toggle precision

The Z toggle ensures that clamp movements are precision controlled, even at peak operating speeds. The platens have been designed by the finite elements method (FEM) so that large and small molds alike apply force optimally with minimal deformation. Platen deflection has been minimized. The result is a movement profile with very tight tolerances. Generous daylight between

the tiebars makes even very large molds easy to install. Furthermore, an extremely sensitive safety mechanism prolongs mold life while ensuring consistently high demolding precision.

DETAILED PRODUCT INFORMATION

Direct force transmission for extreme precision

The injection unit is one of the key factors governing product quality. Its fitness for purpose is measured in terms of gentle melt preparation and consistent shot weights. And these are precisely the strengths of the EX series.

High-torque direct drive – centralized force application

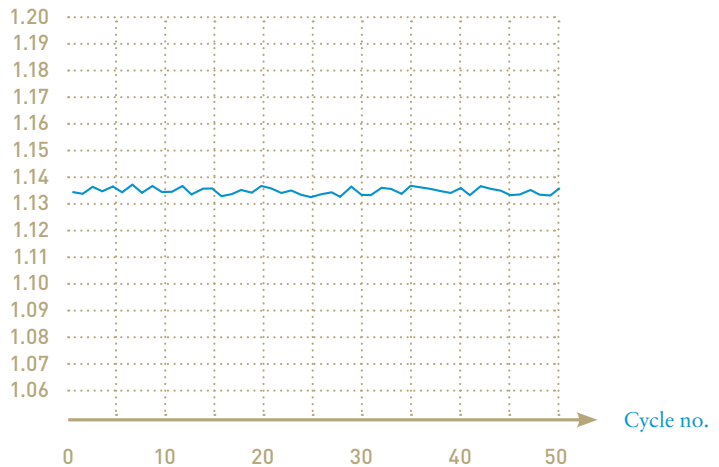
Plasticizing and injection are driven by two coupled direct drives on the same axis with no gearing. Consequently, forces are transmitted directly to the screw in the direction of travel. This eliminates the play and resultant lateral forces that arise from force application in a direction contrary to the set direction of movement.

Peerless precision

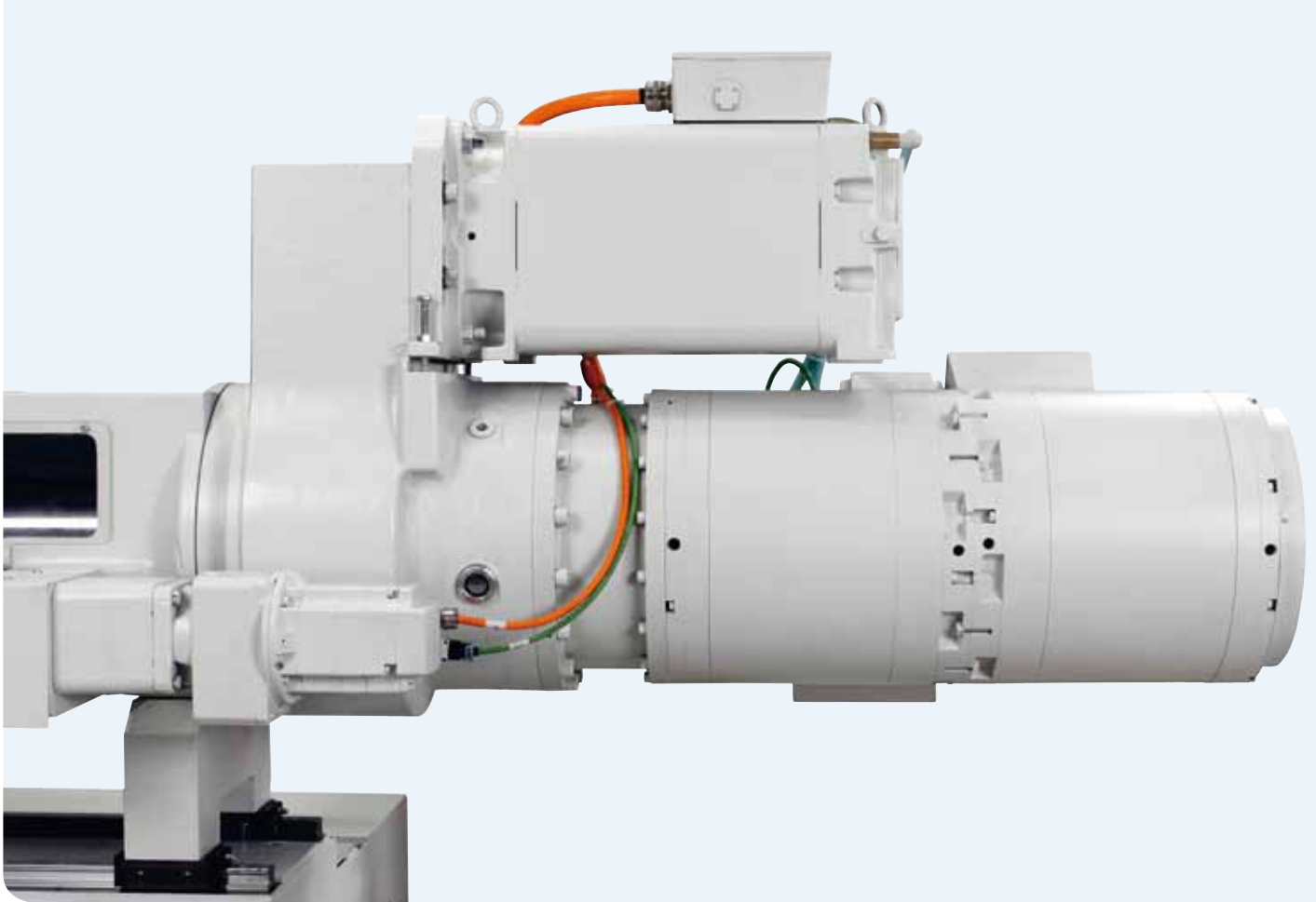
Machine movements are calculated with high-resolution precision and scanned 500 times a second by the MC5 microprocessor control system. The control cycles are very short thanks to the rapid response of the electric drives. The electric drives combine with the MC5 microcontroller to provide high resolution control for precise mold traversing to set positions. The outcome is faithful reproduction of the process steps, even at fast cycles, and minimal shot weight variations of as little as 0.05%.



Shot weight (g)



The high-torque direct drive for the electric injection unit ensures that shot weights are extremely consistent.



“Ultra” injection units have two connected direct drives that can deliver maximum injection speeds, even for large screw diameters.

“Ultra” injection unit – twice the drive for double the performance

The “Ultra” injection unit was developed for applications requiring extremely fast injection. This variant for high-spec injection molding uses two coupled direct drives to exclusively power injection unit movements. Plasticizing is performed by a

third motor. The unit’s drive system can thus reach extraordinary injection speeds – even for large-diameter screws. For example, an Ultra unit injects at up to 800 mm/s, without sacrificing precision.

A CLOSER LOOK AT THE EX MACHINE CONCEPT

Uncompromising cleanliness – designed in as standard

The EX series was engineered from the start to be used even in high-spec cleanrooms. The result is a machine that sets new standards for cleanroom production.

Less is more:

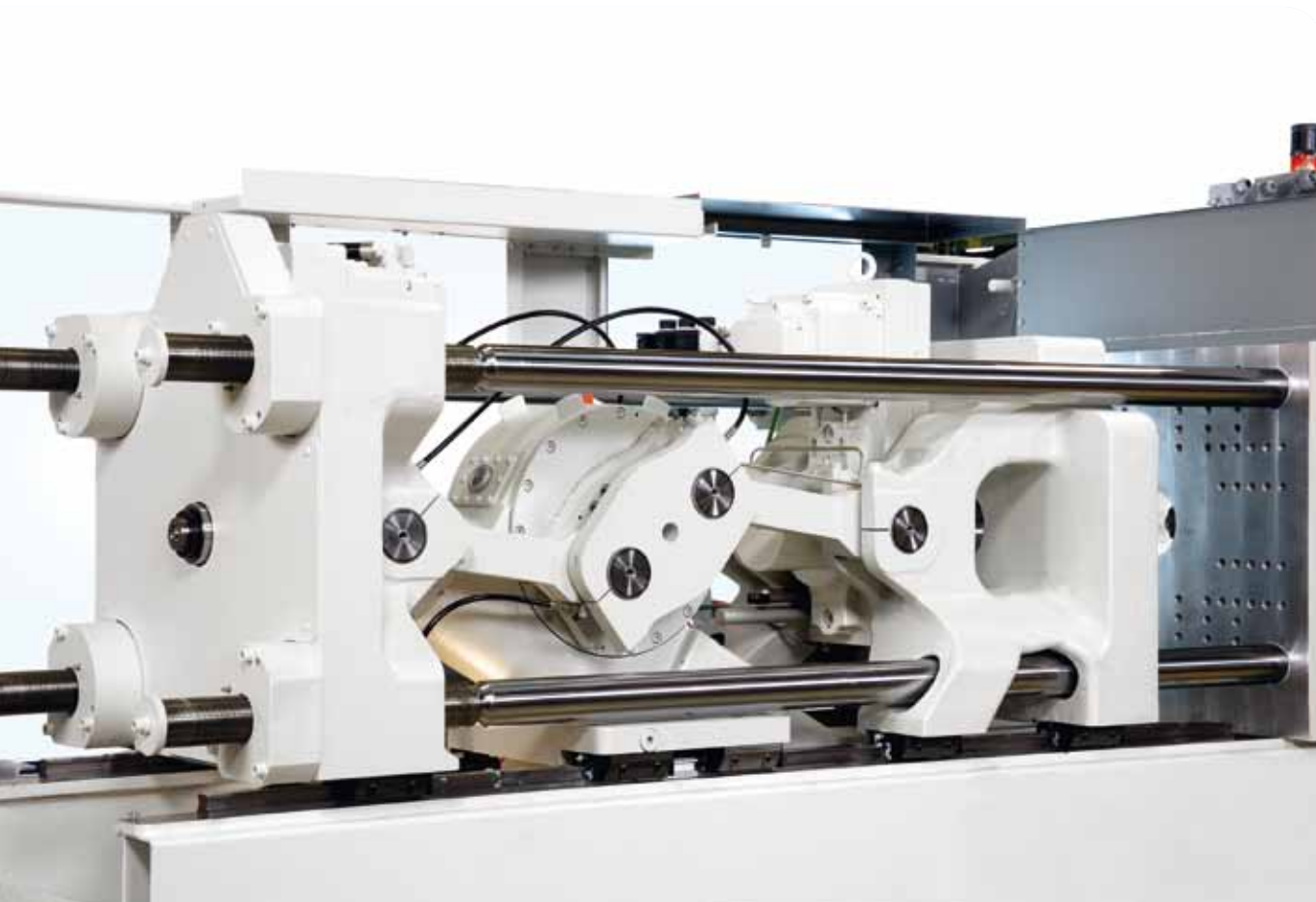
the Z toggle with only eight pivot points

The Z toggle has only eight pivot points. A conventional toggle system, by comparison, has more than twice as many moving elements. Reducing the number of moving parts significantly reduces friction and the number of lubrication points. The lubrication points form a closed system –

they are completely encapsulated, with circulating oil lubrication. There is absolutely no risk of the production area being contaminated with lubricant.

Lubricant-free tiebars

The moving platen is guided not on the tiebars, but on four precision linear guides. This means that the tiebars are always entirely lubricant-free. The mold area is thus clean by design.



The EX clamp concept sets new standards for cleanliness.



Especially in molding for medical and pharmaceutical applications, absolute cleanliness is a must. EX machines have been explicitly engineered for cleanroom production.

Injection unit with direct drives and no belts

“Less is more” also applies to the injection unit. With the drive motors directly coupled, there is no need for belts. This completely eliminates a wear part and potential source of contamination.

Water cooling significantly reduces waste heat

Conventional systems operate with air-cooled drives. By contrast, all main drives on KraussMaffei's EX machines are water cooled. Water cooling ensures heat is removed directly and effectively; this reduces thermal stress in the production environment.



EX series machines are also used for all variants of multicomponent injection molding.

ADD-ONS AND OPTIONS

EXtra versatility – production cells for every application

What makes the EX series unique and yet typically KraussMaffei is the clamp design. The EX platform boasts an extensive range of add-on modules that allow users to adapt the machines to their own production needs.

Multicomponent molding – all-electric and all variants

Whether L, V or Z configuration (piggyback), anything is possible with the EX series. All the benefits of all-electric machines – performance, precision and cleanliness – are thus wholly transferable to 2- and 3-component applications.



Fully automated cell for manufacturing syringe barrels under cleanroom conditions and comprising EX injection molding machine, SR side-removal robot and integrated quality control.

An unbeatable duo: EX machines and KM robots

Upgrading an EX machine to an automated production cell is a cinch. Not only can our robots be fully integrated without the need for interfaces, but only one controller is needed for the machine and the robot – transforming two separate entities into a single unit. Naturally, the entire system is CE compliant as standard. KraussMaffei robots have proved to be extremely successful stand-alone solutions down the years, whether performing

standard automated tasks or highly complex downstream operations. No matter what the configuration, the robots have stable and vibration-free axes and traverse to set positions with great precision, even at high speeds. Potential sources of contamination have been consistently eliminated across the entire robot range, to the extent that fully automated, fast-cycling production can be performed without further modifications in high-spec cleanrooms.



APPLICATIONS AND PRODUCTS

EX machines are used when there's no room for compromise

The strengths of the EX machines really come to the fore wherever compromises are unacceptable: primarily in the medical technology, electronics and packaging sectors.

Applications requiring maximum cleanliness

EX injection molding machines are ideal in any application where even the slightest contamination would lead to high reject rates and push up production costs, eg, products for the medical sector. Because the pivot, points of the EX series are totally encapsulated, the risk of contamination by lubricants is eliminated from the outset. What's more, the water-cooling system ensures that the heat is carried away directly, thereby reducing thermal load on the production environment.

The direct drives are virtually maintenance free and thus make an essential contribution to the high technical availability of the production cell.

Applications with high precision and repeatability

EX series machines are the perfect solution for countless other applications – when very small shot weight variations lead to flawed parts, eg, roller bearings and other technical parts; and when extreme manufacturing precision is called for and top product quality is a must, such as silicone rubber seals. In these applications, exact positioning of the clamp is closely monitored to ensure fast, reliable parts removal.

APPLICATIONS ACROSS INDUSTRY

Sector-specific products produced on EX machines



Medical technology

Respiratory diseases require the use of medical-grade inhalers – the EX machines guarantee a highly stable and reliable process.



Cosmetics industry

The cosmetics industry relies on convenient flip-top closures made using 2-component technology – EX machines slash the cost of production.



Technical parts

LSR seals are found in myriad technical parts – EX machines boast the requisite precision to produce seals that meet performance criteria.



Engineering

Axial cages for roller bearings must possess high dimensional stability and be cheap to make – EX machines are the right solution.



Automotive

Clips and tie-downs are used to simplify the challenge of varying the design of automotive seat covers – the EX series offers the necessary versatility for ensuring a snug fit.



Packaging

For thin-walled parts, such as IML food-packaging containers, high productivity and excellent optics are key – look no further than the outstanding performance of EX machines.

CUSTOMER BENEFITS

Technical and economic benefits are built in – it's over to you to exploit them

The EX series of injection molding machines epitomizes efficiency, long service life and exemplary environmental protection.

Excellent performance

A key performance feature of the EX series is their minimal dry cycle times, the result of KraussMaffei's dynamic clamping. The electric drives move the different units in parallel, thereby cutting cycle times and boosting output.

Exemplary cleanliness

The EX series sails through all the requirements of cleanroom manufacturing. The unique Z toggle and the direct drives reduce particulate emissions compared to belt drive systems, while water-cooling for the inverters minimizes heat dissipation to the production environment.

Great efficiency

With their electric drives, the EX machines are far more efficient than hydraulic machines. These optimized motors also convert braking energy back into electricity – ensuring up to 50% lower energy consumption than their hydraulic counterparts, and lower unit manufacturing costs.

Peerless precision

The combination of high-resolution electric drives and control unit ensures outstanding process repeatability – at fast cycles, too – and leads to extremely consistent shot weights, with variations under 0.05%.

Optimum availability

The unique Z toggle is a rugged mechanism which is virtually maintenance free. Direct transmission of force means that wear parts have been systematically eliminated, leading to high process stability and increased productivity. Combined with a robot, an EX machine can produce highly complex components at maximum output, so that EX production cells deliver high performance levels for high-spec applications.

Benefits for your business:

- Fast, dynamic responses and the fastest dry cycle times in the industry
- Outstanding precision, with shot weight variations under 0.05%
- Cleanliness and easy maintenance making the EX optimal for cleanroom production
- Low energy consumption, up to 50% lower than hydraulic machines
- KraussMaffei's hallmark flexibility makes sure you'll always get an optimal, customized solution for your manufacturing challenges
- Outstanding flexibility: ready for almost any production technology



High performance²: a manufacturing cell consisting of an EX plus a high-speed KraussMaffei robot is also ideal for fast-cycling applications, such as making thin-wall IML containers. EX injection molding machines are the leading lights of any business focused on manufacturing to the highest quality standards.



SERVICE WORLDWIDE

Service, support and spare parts – when you need them, where you need them

Rely on us for a fast and competent response to all your service needs anywhere in the world. Whatever you need – from troubleshooting and training to spares or repairs – we're on the job.

We're dedicated to supplying service quality on a par with the outstanding quality of our machines and systems. We offer far more than spare parts and hotlines. We'll work with you to choose the best and most cost-effective solution for your operation. We'll help you test new applications and we'll plan customized service packages.

All-round service

Our service offering is broad. We'll configure your system, install and commission it, train your staff, plan measures to minimize your downtime risk and maximize productivity, and carry out maintenance, repairs and upgrades. You'll find us fast, reliable and competent. Our hotline is manned by highly-trained and experienced service technicians. If necessary, we'll get a technician to you quickly. Remote diagnosis, interfacing directly with your machine's control system, can be a practical alternative. Spares for all important wear parts are available at short notice. We're continuously expanding our service network to speed up spare parts shipment. Talk to us about the right service solution for your business.

Customer trials and prototyping in our test lab

The Injection Molding Division operates a test lab fitted with the latest machinery and equipment. We can run trials, produce prototype parts and fine-tune processes on your behalf. We can work with you to test and evaluate processes, machines and equipment in order to identify the best approach for a particular project. Our highly-qualified application engineers are there to help you.

Training with high hands-on content

Courses are held in our lab and training centre, or, optionally, on your premises. We offer clearly-structured basic and advanced training in operation, process control and maintenance for KraussMaffei injection molding machinery. On request, we'll plan and hold special courses on topics of your choice. All participants spend a high proportion of their training working hands-on with original KraussMaffei machines. A well-structured training program produces skilled operators and technicians, which will positively impact your up-time and productivity.

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At your service worldwide



How to contact us

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Germany

KraussMaffei is a premium partner for the plastics and rubber processing industries worldwide. KraussMaffei machines and systems are used wherever plastics and rubber are converted into products. As a knowledge-driven technology company, we build on many decades of experience and a strong commitment to research and development.

KraussMaffei's EX series is an all-electric machine concept. The unique Z toggle is the key to highly dynamic plastics processing combined with extreme precision and absolute cleanliness. EX machines are a reliable solution, for example, for applications in packaging, medical technology and electronics – where the priorities are excellent product quality and highest productivity.

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