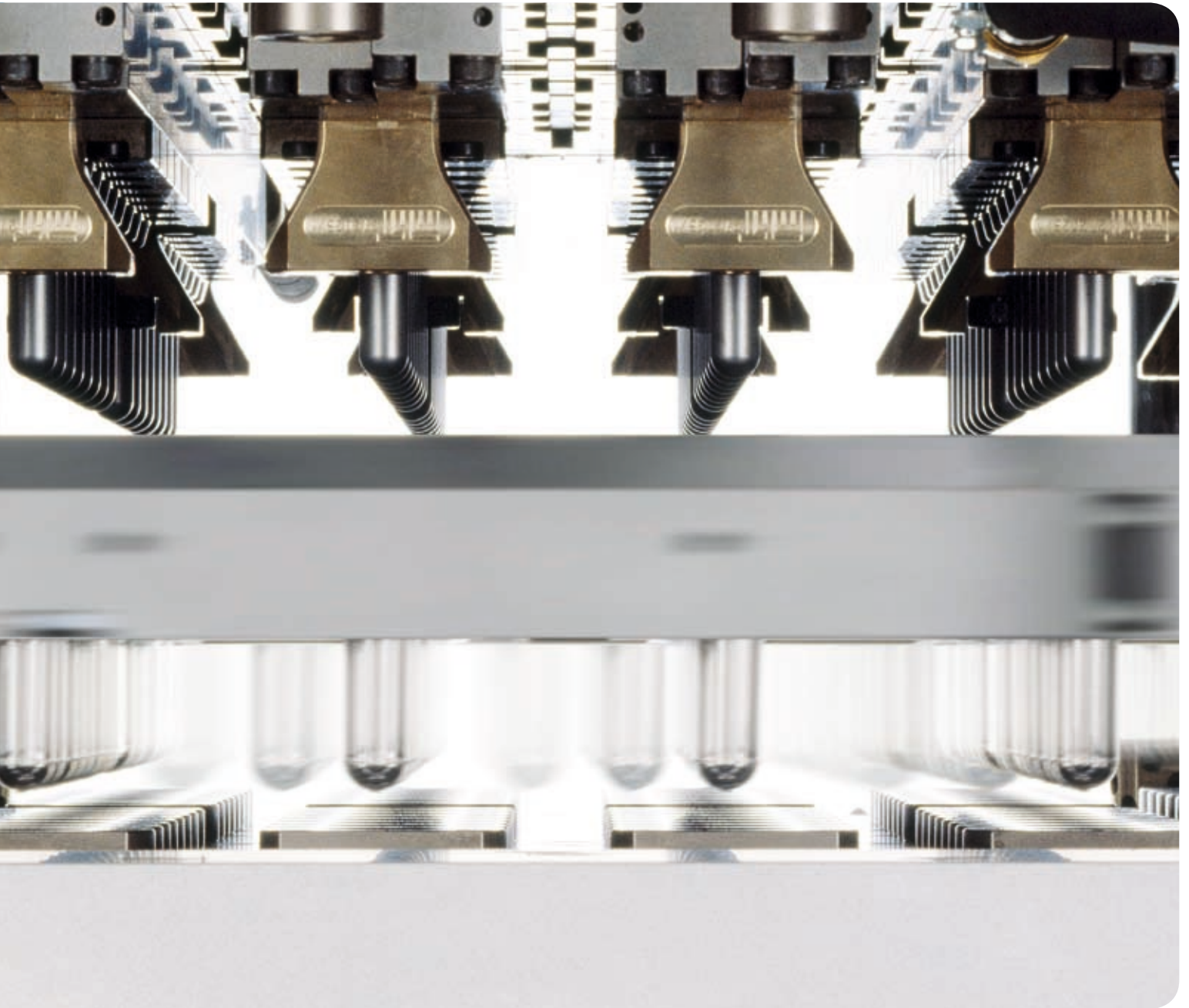


KraussMaffei

PEOPLE FOR PLASTICS



PERFORMANCE AND PRODUCTIVITY WITH VERTICAL TECHNOLOGY

PETForm production cells for preforms

IN PARTNERSHIP WITH INDUSTRY

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



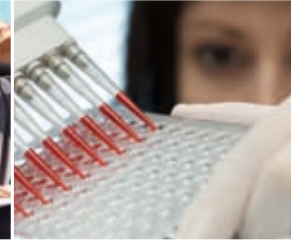
Automotive



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 Moulding 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 moulds, 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 over 3,000 people worldwide. Our sales and service network keeps us close to all our customers around the world.

PETForm is an efficient, high-performance, modular platform for manufacturing PET preforms



Packaging

PETForm systems are available in the clamp force range from 175 to 320 t. KraussMaffei configures your system from PETForm modules so that you can run moulds from 24 to 96 cavities on the lowest and most economical tonnage machines. The perfect balance between machine performance and low preform unit costs pays off through increased system efficiency.

KraussMaffei's vertical clamp is the basis for production cells that are highly productive and flexible, with an excellent track record for high availability.

TRANSPARENT TECHNOLOGY

Meet the machine:
take a tour of a PETForm system solution

4-level post-mould cooling
Efficient preform cooling even
with very short cycle times

Compact production cell
Small footprint thanks to the
vertical clamp concept

Ultra grippers
Ultra-light, fast-
change gripper
system





Turnkey system

Optimal match for your requirements – including moulds and complete downstream

All-electric injection unit

With special HPX screws for high throughput and lowest power consumption

Vertical clamp

Highly dynamic, minimizes mould wear, lubricant-free

DETAILED PRODUCT INFORMATION

Vertical clamp – high productivity, high machine availability

The vertical clamp is the most immediately noticeable feature of PETForm systems. Designing it, our engineers worked on the ‘keep-it-simple’ principle. With a vertical clamp, preforms drop in freefall from the mould cavities into a lightweight, contoured gripper and are then immediately transferred into a separate post-mould cooling station. The benefits of the vertical clamp range from more efficient stripping to higher system availability.

Short dry cycle times

A vertical system uses gravity to strip preforms. This has made gripper engineering simpler. There is no need for complicated demoulding mechanisms. Preforms can be demoulded earlier, because there’s no risk of damaging them. Because of its light weight, only a relatively small motor is needed to move the gripper rapidly into and out of the mould. This means faster stripping and shorter cycles.

Quick and easy mould changing

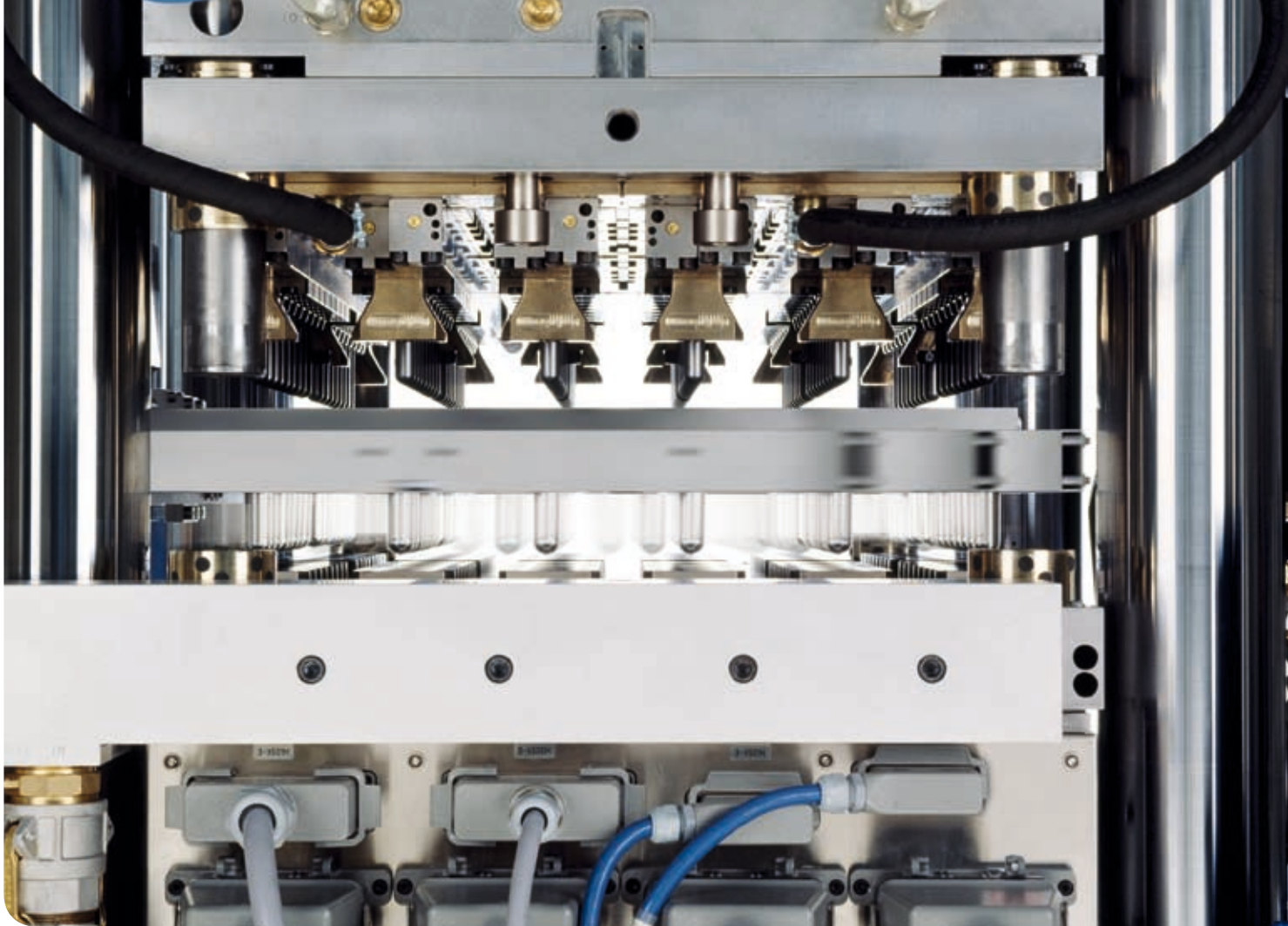
The vertical clamp makes for fast and easy mould changing. Moulds can be raised by hand with the aid of lifting rails and pushed out of the clamp area – by one person – with no risk of damaging the tiebars. Two people can carry out a complete mould change within three hours. This increases productive uptime for the machine.

Long mould service life

The vertical clamp also guarantees outstanding platen parallelism. The moving platen, guided by the tiebars, ensures precise, tiltfree closing and opening movements, even with heavy, multiple-cavity moulds. This protects the critical thread and cone areas and minimizes wear on the mould. Moulds used in PETForm systems are capable of running over 15,000,000 cycles without the shaping components needing refurbishing.

Uniform temperature spread in the mould

Temperature spread in vertical hotrunner moulds is inherently uniform, because the heat dissipates evenly upwards. Chimney effects, typical of moulds in horizontal clamps, do not occur. This is why PETForm moulds can operate without a separate needle valve control for each cavity; these moulds can simply use temperature control zones – with the same high precision as systems with needle valve control.



Striking features of the vertical PETForm clamp are quick and simple preform demoulding, short dry cycle times and extended mould life.



Hotfill preforms – long-term high precision with the vertical clamp

The necks of hotfill PET preforms are crystallized post-mould. Shrinkage during crystallization means that the tolerances for hotfill preform necks are very tight.

With KraussMaffei's vertical clamp machines, perfect hotfill preforms can be produced without a complicated temperature control system. Hotfill applications up to 96 cavities have been running on PETForm systems, using moulds without individual needle controls, for many years. In this whole time – thanks to the high-precision mould movements – the moulds have not needed refurbishing.

DETAILED PRODUCT INFORMATION

Post-mould cooling – effective cooling and short cycle times for all types of preform

Preforms are cooled in a separate 4-stage post-mould cooling station engineered by KraussMaffei. The preforms are held in individual, contoured tubes in the cooling plates and cooled by water at 7 °C. The cooling station's modular design combined with fast stripping by the highspeed handling system makes it possible to produce perfect preforms with very short cycle times.

Highly dynamic with excellent cooling performance

The cooling station's performance means that 85% of the required cooling time can be implemented outside the mould. In other words, the mould is available faster for the next injection cycle and the whole processing window becomes wider. At the same time, preform quality remains consistently high.

The complete post-mould handling system, including the gripper and cooling station, are engineered as compact units with a small footprint. All traverses are short and direct. Servo drives on all axes and rugged mechanical systems are typical of KraussMaffei quality and ensure that the whole system is highly dynamic.

Efficient cooling for any type of preform

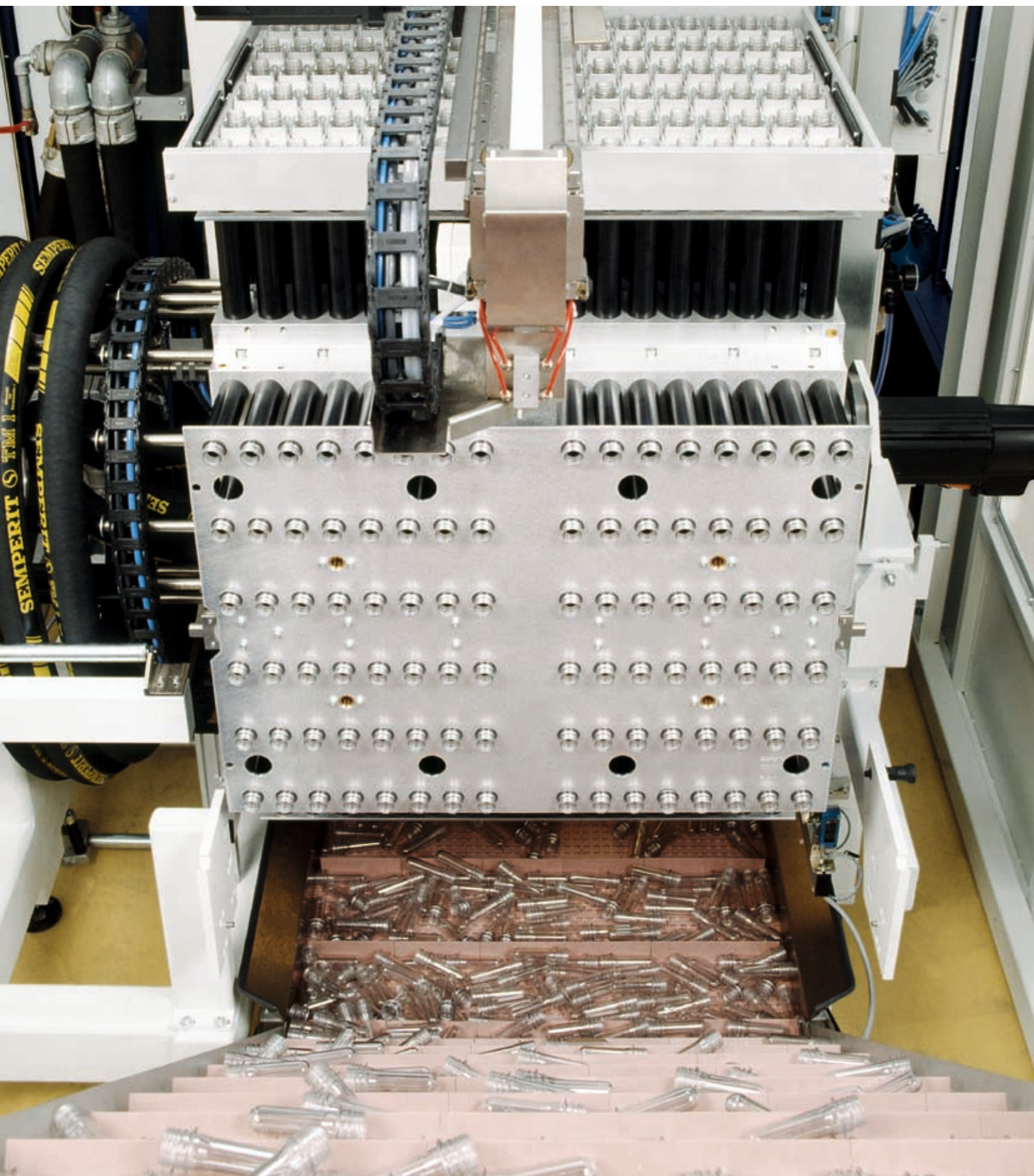
The straightforward stripping process and easy-swap cooling plates mean that widely differing preform designs can be produced efficiently on the same machine. This includes special shapes such as wide-neck or pharmaceutical preforms. All that has to be done for a new preform shape is to swap the gripper and the cooling plates. No time-consuming modifications to the cooling unit are required. For very thick-walled preforms, KraussMaffei offer the option of an additional neck cooling system in the mould or incorporated in the post-mould cooling unit.

Preforms for the pharmaceuticals sector: efficient cooling – big or small, wide or narrow, with or without a support ring

Pharmaceutical preforms are often designed without a support ring to save weight and material costs.

In a PETForm system, special preforms such as wide-neck or pharmaceutical preforms are stripped in exactly the same way as standard preforms. Changing cooling plates and the gripper is fast and easy – each cooling plate is fixed by only 4 screws. There's no need for extra fixtures to demould special preforms. The outcome is constantly good product quality, consistent machine operation and maintenance for any type of preform, no need for expensive system modifications.





The separate 4-stage cooling station guarantees fast, energy-efficient preform cooling – whether preforms are special shapes or standard like the 0.5 l PCO preforms shown here.

DETAILED PRODUCT INFORMATION

Electric injection units and special screws – high output plus low power consumption

Melt quality is a decisive factor in the quality of PET preforms. The hybrid injection units used in PETForm machines systems deliver consistently high melt quality and very high throughput, combined with lower power consumption (measured as kW/kg/h).

Direct drives for precision and energy efficiency

An electric, direct-drive plasticizing unit guarantees a high-precision plastification process. A spur gear transmits the rotary motion directly without frictional losses. Precise movements mean high repeatability and shot weights that are precise within very close tolerances. Water cooling ensures that the gear operates effectively even under full load. Efficiency gains make it feasible to use smaller motors for a lower connected load and lower power consumption.

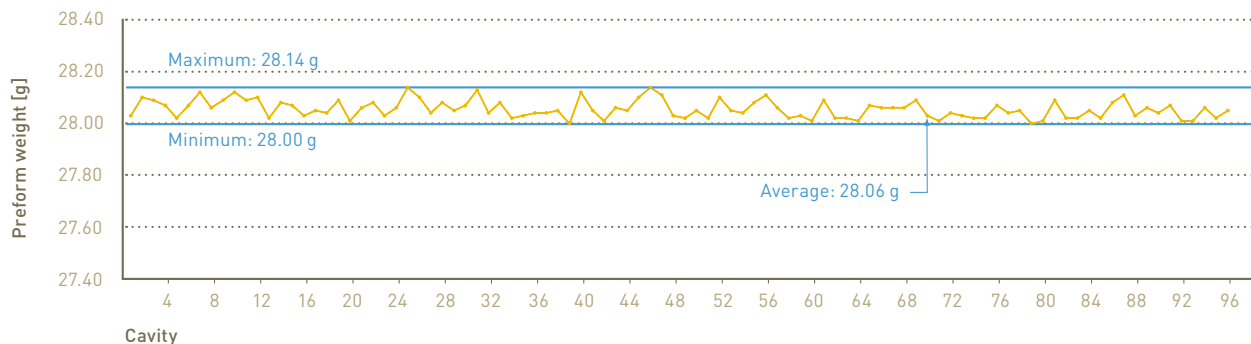
High-performance screws for a perfect melt

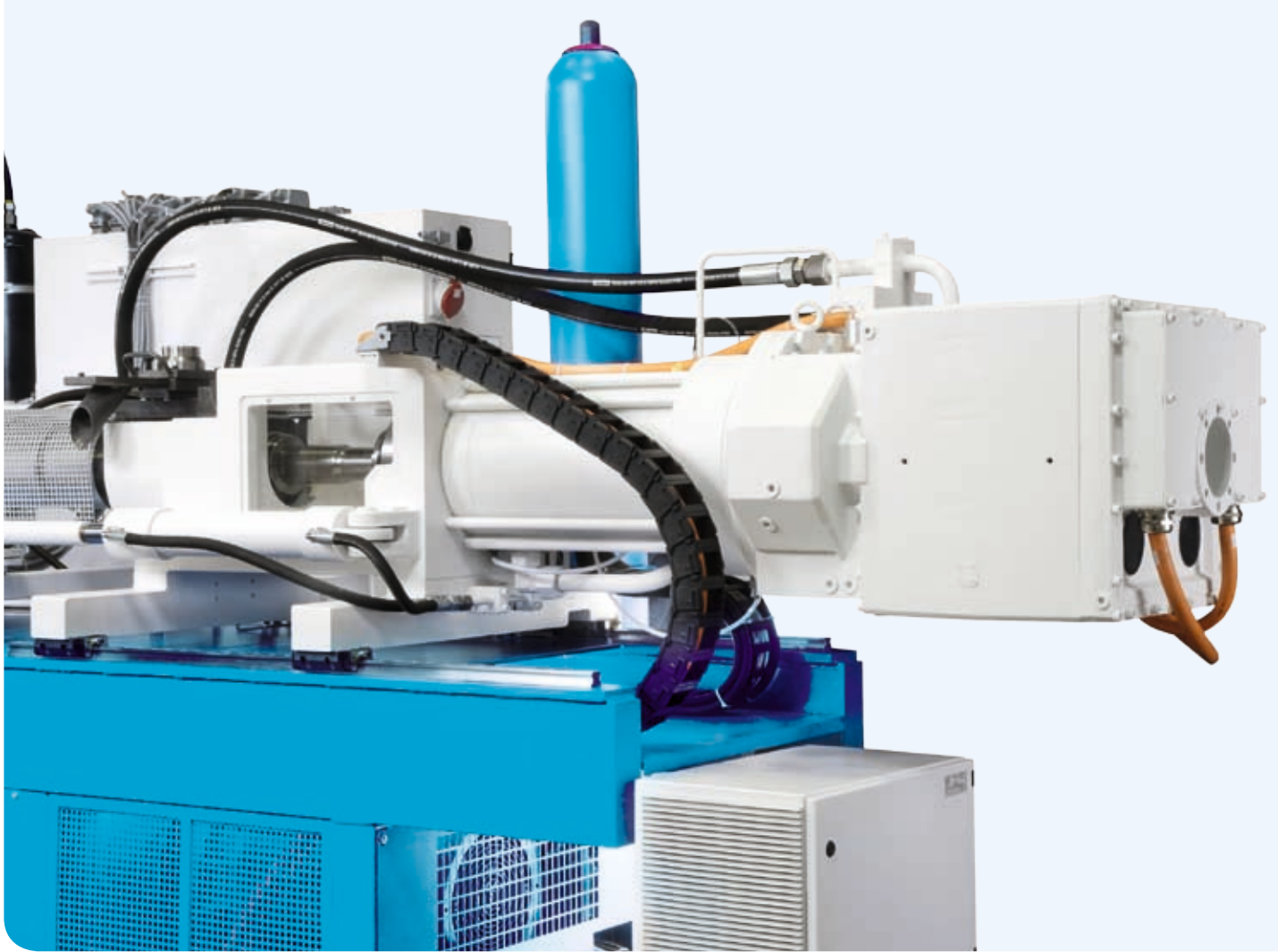
We drew on our many years of expertise in this field when we engineered the special high-performance (HPX) screws for our PETForm systems. The screw geometry has been designed to ensure that the resin is plasticized rapidly, so that pigments, AA scavengers and other blends are mixed in homogeneously without subjecting the melt to unnecessary shear forces. Colour changes can be made very quickly: for instance, from clear to deep blue in 5 shots – and even more important – deep blue to glass clear in only 10 – 15.

Low acetaldehyde values with HPX

Our HPX high-performance screws rotate more slowly than conventional PET screws for the same throughput. The result is very gentle processing and low acetaldehyde (AA) concentrations – even when throughput is high.

Highly consistent shot weights, uniformly spread over all cavities: shot spread for a KM 320-3500 CV running a 96-cavity mould for 28.1 g preforms for 0.5 l softdrink bottles.





The direct-drive injection unit, teamed with a KraussMaffei HPX screw, delivers premium melt quality and high throughput.



**Preforms for fast-cycling applications like water bottles –
low acetaldehyde and high productivity**

Preforms for still water are a typical fast-cycling application. Acetaldehyde (AA) limits are especially important for these applications.

KraussMaffei's HPX screws ensure high specification plasticizing with the minimum of stress on the melt. This makes it possible to achieve extremely low AA concentrations without using scavengers. Thanks to the plasticizing unit's direct electric drive, energy costs for the system, especially in high-throughput applications, will set new standards for energy efficiency.

ADDITIONAL PRODUCT INFORMATION

Solutions plus support – adding value to machinery

We partner with you throughout a project to deliver exactly the solution that suits your business. We offer support right through, from preform design and sampling to planning peripherals and on-site production support.

Preform design – fast time-to-market with our industry networks

Preform design is of critical importance in beverage packaging. Every gram saved will deliver a long-term reduction in production costs. Then again, designing complete preform families that share design features while covering a range of container sizes will reduce the cost of mould conversion kits. In addition to our in-house expertise, KraussMaffei has built up networks of experts across the industry. As your supply partner, we can coordinate material suppliers, mouldmakers and blow moulding machine manufacturers in order to minimize ‘frictional losses’ that could slow time-to-market for your project. We can also coordinate trial runs using test moulds for test production. KraussMaffei is far more than a machine supplier – our expert support will get your project off to a flying start.

You can have your preforms tested in our Munich labs as part of preacceptance testing – we’ll supply a full report covering all quality-critical values, including acetaldehyde levels.

Help with planning – for a compact and effective production plant

With years of experience in the field, KraussMaffei engineers can give you competent advice on factory planning, for example, on supply and environmental aspects of infrastructure planning, or how to site your production cell to make the most of space savings from the vertical clamp design.

Wide choice of options – from remote control to an uninterruptible power system

We offer preform manufacturers a number of options aimed at securing uninterrupted production, even under difficult conditions. These include linking the injection moulding machine into your existing IT landscape, eg, for production scheduling, and an internet-based link to KraussMaffei for remote fault diagnosis.





On request, KraussMaffei will run sector-specific workshops on PET preform production.

In regions where voltage fluctuations are a problem, our optional Power Backup Unit in conjunction with an uninterruptible power system will help to keep your production running smoothly. It ensures that the PETForm system will always complete the current production step before stopping due to a power failure. This eliminates the problem of resin congealing in the mould due to an unscheduled stoppage. This saves the time and effort spent chipping away congealed resin from partially-filled cavities. Not only do you eliminate the risk of damaging the mould, you also increase the availability of your production system.

Assistance with quality testing

Most of your major customers will insist on full documentation of preform quality. KraussMaffei experts can advise you on the equipment you'll need for testing; we can also source the instruments for you – from basic test equipment to AA or viscosity meters – subject to constraints imposed by trade agreements.

Alternatively, you can choose to have your product undergo full initial quality testing in our in-house labs. We operate a fully-equipped testing lab in our main plant in Munich, Germany, which can provide a full product quality report.

Training and production support

The skills of your operators and service technicians are a key factor in your business success. KraussMaffei will provide expert training for your staff, either in our Munich Training Center, or at your factory. Our flexible training builds on the existing know-how of your staff, aiming to increase their effectiveness and productivity.

If you opt for production support at your factory, our application engineers will benchmark your production cell, advise on any adjustments and work with your staff to optimize your production.





Our customers are our benchmark

Around 90% of KraussMaffei PETForm customers are repurchasers – like Mr. Somsak Sutharoskajornchai, managing director of Precision Plastics Co., Ltd. in Thailand.

Founded in 1996, Precision Plastics Co., Ltd. is a modern and rapidly growing plastic packaging company. Today the company is recognized as the leading converter specialized in the manufacture of preforms and plastics packaging for the food and beverage industries in Thailand and the ASEAN countries.

Dialogue with our customers – for example, Mr. Somsak Sutharoskajornchai – is very important to us. Their feedback provides us with the data we need to continuously improve our PETForm systems.

BENEFITS

PETForm solutions deliver technical gains and cost benefits for a strong competitive advantage

KraussMaffei's PETForm production cell is the ideal system for manufacturing PET preforms for the beverage industry. The benefits of the vertical clamp design are reinforced by the advantages of a highly modular system.

High productivity from a highly dynamic system

The fast, precise movements of the vertical clamp and the high-speed stripper result in extremely short dry cycle times. In combination with the high throughput of HPX high performance screws and the extremely effective 4-stage cooling station, this adds up to short cycle times and excellent productivity.

Long mould service life cuts unit costs

PETForm moulds have run up to 15,000,000 cycles without the shaping components needing refurbishing – thanks mainly to high-precision mould movements and ultra-sensitive mould locking systems. Over the years, this significantly reduces mould maintenance costs compared with competitor systems. Lower costs in this area feed into lower unit costs.

High availability of a flexible module platform

The vertical clamp design and the speed and ease with which gripper and cooling plates can be changed mean that the changeover to a new product requires only minimal modifications to the machine. The vertical clamp also makes for fast and easy mould changing. This is a bonus for preform converters with a constantly changing product portfolio, because machine availability remains very high.

Brilliant product quality

The electric plasticizing unit and the outstanding plasticizing performance of the HPX screws together guarantee consistent melt quality and lower power consumption – even at very high production rates. If hot runners are used at all, the technology can be very simple – a PETForm system inherently has a good temperature spread and as a result, consistent shrinkage behaviour across all the mould cavities. High dimensional stability within tight tolerances and very low acetaldehyde concentrations are the result. The yield of good parts rises.



Preform production in China. The production cells were planned and configured by KraussMaffei engineers exactly to customer specifications.

Key benefits of KraussMaffei's PETForm system:

- Increased productivity of the vertical-clamp system.
- Excellent return on investment thanks to building-block design with efficient modules.
- Built-in protection for your investment. Mould life up to 15,000,000 cycles.
- High uptime thanks to rugged mechanical systems and modular design.
- Constant premium product quality for virtually any preform variants.
- System partnership – from preform design to turnkey production system.



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 Moulding Machinery 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 moulding 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.



At your service worldwide



How to contact us

Apart from email you can contact us on the service hotline or by post at this address:

Hotline

Phone: +49 89 8899-3300

Fax: +49 89 8899-153300

Injection Moulding Service

KraussMaffei Technologies GmbH

Krauss-Maffei-Str. 2

80997 Munich

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.

PETForm is an efficient, high-performance, modular platform for manufacturing PET preforms. The vertical clamp plus an electric drive for the plasticizing unit make KraussMaffei PETForm production cells highly productive and flexible, with an excellent track record for high availability. The proof is in the low unit cost of preforms made on our systems and documented mould life of over 15,000,000 cycles. This makes PETForm systems low-budget, high-performance production cells – a solution the beverage industry can rely on.

KraussMaffei Technologies GmbH

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