Maximum Flexibility, high Product Quality, optimum cost effectiveness

ZE twin-screw extruders

Engineering Value

KraussMaffei
Berstorff
Maximum flexibility combined with outstanding availability in plastics processing

Bank on KraussMaffei Berstorff’s excellent plant engineering competence in plastics processing: optimize your production and sharpen your competitive edge by complete system solutions, turnkey production lines and customized services.

Base your planning on extruder concepts that:
– easily provide the uncompromising flexibility required for state-of-the-art production of the most varied products
– ensure high availability throughout the entire service life
– convince by their unparalleled productivity and cost-effectiveness
Technical data
Specialized machinery for special tasks:
12 sizes with particular benefits

Six of the 12 ZE machine sizes – the ZE 25 UTX up to the ZE 75 UTX – are designed as UTX models. This design concept is distinguished by its particularly compact layout and the very high degree of operator friendliness and ease of maintenance. The ZE UTX laboratory and small batch extruder is available in A and R versions as well as in an A/R combination and in Ultra Glide version. The Ultra Glide has a drive unit, which enables the whole extruder drive unit with both screws to be moved backwards, leaving the processing section in place. This is done in less than one minute and makes it possible to carry out a rapid and precise visual inspection of the current state of the process.
1 Drive train

2 Barrel cooling and heating

3 8-shaped barrel bore
Technology made transparent
First encounter: take a closer look at the ZE UTX twin-screw extruder

1 Drive train
Our ZE extruders are characterized by above-average torque obtained by a special power branching system in the gear unit. Application of the latest in modern gearing technology has resulted in a very compact design and extremely low noise levels. A combined dip and pressure lubrication system protects the bearings and gears. If an overload occurs, a safety coupling instantaneously separates the drive from the extruder.

6 C-clamp barrel connectors
With the C-clamp connectors, changes to the barrel configuration can be performed up to 70% faster as compared to the conventional bolted flange method. Assembly and dismantling of the processing section can be carried out in segments, with no loss of tension. ZE extruders with C-clamp connectors are leak-tight up to 350 bar.

5 Base frame
The lubrication system, the temperature control unit and the electrical control equipment are all integrated into the extruder base frame. Wiring and pipework for the ancillary equipment is all done in the factory and checked before delivery, thus substantially reducing commissioning times on site. The floor space required is reduced to that required for the actual extruder and all sub-assemblies are easily accessible for service and maintenance.
2 Barrel cooling and heating
Barrel elements with a new type of heating and cooling system provide direct and intensive heat transfer and/or cooling. This allows the process in the extruder to be optimized by precise temperature control and dynamic control mode. Heating is done by high-power heating cartridges, which work faster and thus give more rapid start-up. The optimized layout and arrangement of the cooling bores provide high-efficiency counter-flow cooling with standard injection of high-pressure water or steam.

3 8-shaped bore
The 8-shaped ZE UTX barrel bore is induction hardened to provide the necessary resistance to wear. An induction coil is employed to ensure uniform protection of the inner surfaces of the barrel bore; expensive replaceable anti-wear liners are thus no longer required.

4 Side-feeders
The enlarged twin-screw side-feeder unit gives increased throughput of solid materials by reducing fluidization effects. In addition, the larger unit handles the product more gently.
4 Side-feeder

5 Base frame

6 C-clamp barrel connectors
Process implementation with utmost precision
The most precise way to run your process. Two concepts – one basis: 12 sizes each in two versions

24 extruder types in ZE-UTX/UT version
24 twin-screw extruders in two versions with 12 sizes each are available for performing the process steps involved in the manufacture of your products – efficiently and technically optimized. Both KraussMaffei Berstorff ZE-A and ZE-R extruder ranges present the same screw shaft center distance, making screws and barrels interchangeable when production conditions change.
D/d = 1.74

**ZE-A version**
The ZE-A range, with an outer/inner screw diameter ratio of D/d = 1.46, offers an optimal relationship between free volume and torque, high screw torque and the highest throughput capacity. The ZE-A is thus especially suitable for high-performance compounding, alloying, filling and reinforcing, master-batch production and the processing of powders or small-particle polymers.

**ZE-R version**
The ZE-R version has a big free volume. It features high residence times, high free volume with high torque, optimal melt surface renewal, low gas velocities and minimal shear energy input. Its strong points are the processing of extremely highly-filled materials, TPE compounding, reaction, concentrating and residual degassing. In this way, KraussMaffei Berstorff extruders are always the right choice when maximum flexibility is important. Because KraussMaffei Berstorff ZE twin-screw extruders are tailored to your specific products and process requirements.

**Operating principle of co-rotating twin-screw extruders**
Co-rotating twin-screw extruders provide helical material transport and continuous material transfer between the screws within the figure 8 shaped barrel bore. Closely intermeshing screw elements along the entire processing section ensure excellent self-wiping characteristics. In conjunction with the shear energy input, this operating principle guarantees optimum compounding results in terms of dispersion and distribution.
Two barrel section lengths for each screw diameter.
Barrel sections and screw elements are designed in strict accordance with the building block principle. With various types and different specifications that can all be combined with great versatility, there is virtually no limit to the barrel and screw configurations, which can be employed to meet your process requirements in the finest detail.

The patented hardening method (DE 101 122 95 B4) for the ZE UTX barrel bores is unparalleled worldwide. Induction hardening of the figure 8 bore provides excellent protection against abrasion and corrosion for different extruder applications and processing materials. Barrels made of composite materials are the ideal solution to satisfy the most stringent requirements in terms of wear protection. Where protection requirements are less severe, nitriding steel barrels are used. Costly anti-wear barrel liners are no longer required for the ZE UTX series.

4D and 6D modular barrel sections for the ZE UTX range

Closed barrels  Top-open barrels with 4D or 6D opening  Side-open and combination barrels  6D liquid injection barrels

Closed barrels for the ZE-UT range with 4D or 6D opening

Closed barrels  Top-open barrels with 4D or 6D opening  Side-open and combination barrels  Injection barrels
In the case of twin-screw extruders of the ZE UT series, wear protection for machine sizes ZE90 UT and larger is accomplished by using solid nitriding steel barrels, barrels with through-hardened CrMo liners or barrels made of composite materials. The selection of the type of wear protection depends on the application the extruder is used for and on the specific conditions of wear.

Barrel sections with an L/D ratio of 4 or 6 are available for the configuration of the modular processing section. These barrel sections are designed as
- open barrels for feed zones,
- open barrels equipped with inserts for degassing, metering, injection zones or with measuring elements,
- closed barrels,
- combined barrels for horizontal side feeding of additives and for vertical venting.

More than fifty screw element varieties for each extruder size.
KraussMaffei Berstorff screw element range:
- conveying elements with different lengths and pitches, multi-start, self-wiping, laterally sealing or with pushing flight profile with increased free screw volume
- mixing elements in different lengths
- kneading elements in different lengths, offsets and pitch angles
- barrier elements in the form of blister discs and back-pumping elements

KraussMaffei Berstorff ZE screw elements are designed in strict accordance with the building block principle. Different surface treatments and the various element varieties allow the screw configuration to be matched exactly to your process. And if this modular system is not sufficient to perfectly tailor the extruder to your product and process requirements – we are always open to special requests! After all, our focus is on your product!
Twin-screw laboratory extruders
Constant quality production – the fastest solution

ZE 25 UTX and ZE 26 Basic – the right choice for your laboratory
With KraussMaffei Berstorff you don’t have to rely on hypothesis when launching new products or introducing new processes. The ZE 25 UTX and ZE 26 Basic laboratory extruders offer all features of our production-scale extruders. The process parameters developed on these machines in the laboratory can directly be transferred to your production lines.

Ultra Glide – the drive train for immediate process evaluation
A further benefit of the KraussMaffei Berstorff laboratory extruder ZE 25 UTX is the possibility to pull out the filled screws partly or completely from the processing section by means of a separate electric drive. This is achieved in less than one minute and provides a “live” inspection of all stages of the compounding process – i.e. melting, mixing, coloring. Process changes can thus be carried out on the basis of a reliable evaluation.
Quality planning requires in-depth know-how
For your quality control – a wealth of experience gathered from almost 2,500 applications

To ensure the future success of your company, KraussMaffei Berstorff twin-screw extruders are tailored to the specific requirements of your products and processes. Based on our in-depth know-how in all plastics compounding and extrusion applications and our design skills as experienced machine engineering company, we supply extrusion lines that are perfectly suited to your recipes and production processes.

Benefit from KraussMaffei Berstorff’s process know-how.
ZE twin-screw extruders are successfully used for a multitude of different applications:
- incorporation of reinforcing agents and fillers such as glass fiber, talc, carbon fibers, calcium carbonate, barium sulphate, etc.
- coloring, stabilizing
- production of different plastics and thermoplastic/elastomer alloys (e.g. TPEs)
- production of masterbatch such as pigments, flame retardants, blowing agents and filler concentrates
- homogenizing of polymers with different viscosities
- modification of plastics by mixing in additives
- melting, homogenizing and pelletizing of powders with low bulk density, small particle size and low internal friction
- continuous synthesis of TPU
- removal of volatile matter such as water, monomers, oligomers, solvents, etc. (degassing)
- concentration of polymer solutions and reclaiming of solvents
- polymerization and post-condensation
- re-pelletizing of millbase, agglomerates and sheet and fiber scrap
1 Polymer
2 Fillers or reinforcing agents
3 Additives

4 Pigment
5 Twin-screw side-feeder
6 Twin-screw extruder

7 Vacuum degassing
8 Stripping agent injection
9 Water bath

Benefit from KraussMaffei Berstorff’s product knowledge
KraussMaffei Berstorff ZE twin-screw extruders successfully produce a wide range of polymers:

Standard plastics
- low density polyethylene (LDPE)
- linear low density polyethylene (LLDPE)
- high density polyethylene (HDPE)
- polypropylene (PP)
- polystyrene (PS)
- soft polyvinylchloride (PVC)

Engineering plastics
- styrene acrylnitile (SAN)
- acrylonitrile butadene styrene (ABS)
- polyamide (PA 6, PAhyl 6 6, PA 12)
- linear polyester (PET, PBT)
- polycarbonate
- polymethylmethacrylate (PMMA)
- polyoxymethylene (POM)

High performance plastics
- polyetheretherketone
- polyphenylene oxide (PPO)
- polysulfone
- polyimide
- liquid crystal polymers (LCP)

Other materials
- polyvinylbutyral (PVB)
- elastomer-modified thermoplastics (TPEs)
- elastomers e.g. SBR, EPDM, silicone rubber
- duroplastics, hardenable molding compounds, e.g. UP
- flooring materials
- powder coatings and toners
- ceramic and catalyst compounds
- pharmaceuticals and foodstuffs

Biopolymers
- biobased polymers
- natural fiber compounds
- biodegradable materials
The ZE Basic series
Basic extruder for basic processes: making production even cheaper

The KraussMaffei Berstorff ZE Basic series
All 4 extruders in the ZE Basic series are quality machines, designed, as the name suggests, for basic processes. More than 80% of all the plastifying, filling and reinforcing applications can be covered by the ZE Basic series to produce the highest quality products. In other words, machines for processes that can be carried out without the need for too many types of barrel elements and are thus more economical to purchase.

This makes the ZE Basic the lowest-price, best-value twin-screw extruder made by KraussMaffei Berstorff. To drive the ZE Basic, there is a choice of motors with 2 speed ranges, 600 and 900 rpm, to provide a high torque capacity. The special power divider system in the gearbox and the multi-spline shafts ensure that the torque is safely transferred to the screw elements giving output rates, dependent on the particular process, of up to 2,700 kg/h. If you want to optimize your production, it is not only the technical design that will decide you, but also the small space required by the extruders in the ZE Basic series.
Short delivery times
With KraussMaffei Berstorff ZE extruders you can rapidly benefit from rationalization effects, substantially save space, execute a new customer order within shortest time, modernize your machinery or get well prepared for the future. These extruders, built in strict compliance with the building block principle, require only minimum engineering times. Our innovative logistics system involving sub-suppliers and stocking of standard components make for rapid machine assembly and allowed the delivery time for the ZE Basic range to be reduced to just a few weeks.

This is due to the fact that the auxiliary equipment such as the temperature controller, the lubrication unit and the electrical equipment are all neatly integrated into the extruder base frame.

In addition to its competitive price, this KraussMaffei Berstorff product stands out for excellent performance. The ZE Basic extruder thus ensures rapid return on investment for standard compounding applications.

The convenient price of our ZE Basic series is, of course, combined with in-depth know-how and the extensive and competent service that only experts in extrusion technology can offer. This includes detailed engineering advice, the use of sophisticated testing facilities in our technical centers and 24-hour KraussMaffei Berstorff customer service.
Focus on cost reduction
ZE Basic – the cost-effective engineering concept for standard processes

The ZE Basic with its D/d ratio of 1.55 – the best solution to implement standard processes at convenient investment and operating costs.

Standard applications for the ZE Basic:
- plastifying and alloying of plastics
- incorporation of fillers
- incorporation of reinforcing and filler materials
- incorporation of natural materials
- production of additives or color masterbatch
- coloring of plastics
- manufacture of polymer blends

Plastifying and alloying
Masterbatch production
Reinforcing
Filling
The screw configuration tailored to your standard processes.

The newly developed ZE Basic barrel sections provide precise temperature control. By virtue of the inductive hardening process employed, the heating and cooling bores are positioned directly adjacent to the processing chambers. The cooling is by carried out by water injection, the heating by means of high-power electric heater cartridges, which ensures stable processing conditions. Nitriding steel or induction hardened CrMo barrels with an L/D ratio of 4, 8, 10, or 12 are used to ensure reliable wear protection according to the requirements of specific applications.

The different screw elements with D/d = 1.55 of the ZE Basic series complement each other in terms of function and are specially tailored to standard compounding applications. You can easily create the perfect screw configuration for your process requirements:
- conveying elements with different lengths and pitches, self-wiping
- mixing elements in different lengths
- kneading elements in different lengths, offsets and pitch angles
- barrier elements in the form of blister discs and returning elements.
- MP elements

The following barrel types are available for the configuration of the modular processing section:
- open barrel sections for the feed zone
- open barrel sections complete with special inserts for degassing, metering, liquid injection or measuring ports
- combi-barrel side feeding sections for horizontal material feed and vertical air removal

Modular barrel section for the ZE Basic series

8D closed barrel
8D and 10D combination barrel
8D and 10D top-open barrel
4D feed barrel
Process Control Advanced
Easy control and monitoring of processes and machine configurations

Central operation and visualization of the entire extrusion process
The intelligent process control system provides for cost-effective operation of the extrusion line. Peripheral systems and downstream equipment are integrated by standardized interfaces. All data can be accessed from the central control station and support the different functions of the visualization system.

The Process Control ADVANCED is a competitive alternative for simple machine configurations. More complex control systems are tailored to individual customer requirements and based on Siemens Simatic S7® and WinCC®. Control systems on different hardware platforms are available on request.

Operation and visualization
All line components and the relevant operating status are visualized on clearly structured screen pages.

Fault alarm system
The fault alarm system detects malfunctions at an early stage and thus avoids machine downtimes. Each alarm is displayed and archived with the corresponding status, time-stamp and plain text.

Trend data
Stored actual values can be displayed in any combination. The data can also easily be stored in an external data memory for quality documentation.

Recipe management
The recipe management comprises all process parameters. The values are loaded and stored during operation by means of the teach-in function of the recipe editor. Thanks to the download function, the values can be recalled at any time.
Configuring instead of programming
With the Process Control ADVANCED all control and visualization functions are integrated into a sophisticated process-control system that is flexible in scale and perfectly suited to the respective extruder.

The extended Process Control ADVANCED offers even more comfort:
- easy operation via touch screen and membrane keypad
- graphic and tabular display
- large display of selectable operating parameters
- trend display
- fault alarm system with optical display and logging
- language switching
- multi-stage log-in
- recipe management of all process parameters

Innovative and future-proof – the visualization software:
The process control system is tailored to the given process task and the extruder configuration. Functional groups of the machine are visually represented as automation objects. An internal database comprises all available configurations and options. This guarantees simple software adaptation and efficient maintenance when changing the configuration. Peripheral systems and downstream equipment can be integrated by standardized interfaces. KraussMaffei Berstorff offers extensive service and diagnostic support that can also be accessed via safe Internet connection.

Industry sets standards
Thanks to the innovative combination of touch screen and keypad, the terminal ensures clear and easy-to-understand operation with direct access to the process.

The flat machine panel without ventilator is designed to a high protection standard. Integrated USB service connections, e.g. for external keypads and memory sticks, are located at the rear side.

The panel is separated from the IPC and thus suitable for use in tough industrial environments. IPC and the control CPU to be located in a protected environment.
Implementing integrated concepts
Production at its best – with complete system solutions and turnkey production lines

Optimum coordination of all individual components
Based on the product to be manufactured, KraussMaffei Berstorff, as main contractor, offers all functions required to build a high-performance extrusion line: first-concept planning, materials procurement, basic and detail design, interface co-ordination with other suppliers, layout of laboratory and workshop, plant construction, training of operator personnel and commissioning. Along with all the economical benefits of complete solutions, you are guaranteed best possible matching of all individual components of the production line. Subsequent interface problems can thus be reliably avoided as early as in the initial project phase.

Extrusion – and more!
Benefit from KraussMaffei Berstorff’s comprehensive knowledge and many years of experience for your tailor-made system solution – for standard processes as well as specials. With perfectly matched ancillary equipment, made by KraussMaffei Berstorff or by selected suppliers, you obtain a one-stop solution in terms of design and control system.
KraussMaffei Berstorff trusts in system partnership. Focus is on processes for which KraussMaffei Berstorff supplies the core machine and the entire know-how – from the raw material up to the final product. KraussMaffei Berstorff is ideally equipped to handle projects of any size and type from single machines up to complete turnkey plants. System partnership, ensures maximum machine reliability thanks to:

- Innovative technical solutions for each individual application
- Adequate engineering resources
- Professional project management
- State-of-the-art project control instrumentation
- Qualified suppliers and partner companies

Service range
From advice on optimization of production processes, installation and commissioning of the plant, right through to start-up and fine-tuning KraussMaffei Berstorff is your system partner in all project stages.
- Plant engineering
- Plant logistics
- Basic building and infrastructure design
- Interface coordinating with third parties
- Project management
- Training, production supervision and maintenance
The KraussMaffei Berstorff modular concept

KraussMaffei Berstorff’s refined modular concept fulfills customers’ requirements at reasonable investment cost with a high degree of premanufacture and rapid commissioning.

The advantages:
- Significant reduction in project planning and execution with simultaneous engineering
- Better cost and quality control by extended pre-assembly
- Early recognition of possible weak points
- Comprehensive training of operators and maintenance personnel
- Simplified and safe transport: the steel frame serves as packing case
- Quicker on-site installation to no assembly of individual components
- Simply constructed production workshops – no mezzanine for additional steelwork required
- Substantially reduced total costs and closer control of cost and timing of the entire project

Scope of machinery

KraussMaffei Berstorff as your system partner, is not only a consultant, but also an engineer and manufacturer of all key components. Where else could you find this complete continuity from process solutions right through to design and manufacture of the machinery? One-stop shopping for in-line solutions – complex and complete. For pellet production:
- Raw material handling
- Feeding of the individual components
- Compounding
- Pelletizing
- Packaging and warehousing

- Or for film and sheet production
- Raw material handling
- Feeding of the individual components
- Compounding
- Sheet calibration by different smoothing roll technologies
- Winding
Feeding
Whether it is powder, fine particle, pellets or fibers, whether high-viscosity melt or low-viscosity wax or oil, feeding can be done gravimetrically or volumetrically. For the introduction of solids into the melt, KraussMaffei Berstorff offers a range of co-rotating twin-screw side-feeder units, matched to the ZE extruder range and used in a split-feed arrangement.

Melt filtering
Melt filtration is particularly important in today’s total process philosophy. In many process applications, the melt filter plays a decisive role in the determination of the final product quality, the security of the process and the plant availability. KraussMaffei Berstorff offers continuous and discontinuous systems for this purpose.

Pelletizing
For pelletizing, KraussMaffei Berstorff offers – according to the product and throughput rate – different systems such as strand, wetting, air-cooled and underwater pelletizers. All these units are designed for ease of operation and maintenance. Underwater pelletizers are usually employed for higher throughputs and for polymers with a tendency to smear and stick during pelletizing. The polymer melt is fed into the bores in the die plate, arranged in annular form and cut under water. The water cools the pellets and carries them away to the drying system. The spiral shape of the water stream on the pelletizer knives effectively avoids the formation of agglomerates.
Further information
This might also be of interest to you

You can find additional information on KraussMaffei Berstorff extrusion solutions in the following brochures:
- Plastics technology
- Twin-screw extruders
- Foam extrusion lines
- Film and sheet extrusion lines
- Pipe and profile extrusion lines
- Plastics calenders

Rubber technology
- Extruders and extrusion lines
- Rubber calenders
- Rubber and TPE profile production lines
- Rubber sheet lines
- Roll covering machinery

You will find our brochures and flyers on other topics online at: www.kraussmaffeiberstorff.com. On request, we will also be pleased to send you the information and technical specifications for our products free of charge.
KraussMaffei Berstorff
A strong brand in a unique global group

Value-proven extrusion technology solutions
Around the world, KraussMaffei Berstorff stands for reliable and value-proven solutions in extrusion technology. These range from using individual extruders for degassing in polymerization, compounding, pipe, profile, film and sheet extrusion, physical foaming and the manufacture of technical rubber articles and intermediates for tire production up to complete extrusion lines. All machines and systems from Krauss-Maffei Berstorff are custom-configured for the chemical, automotive, construction, packaging or pharmaceutical industries etc.

There for you around the world
KraussMaffei Berstorff is your partner – from the first planning meeting through development of the best possible technical and business solution up to set-up and start-up, servicing and production support. We guarantee high-quality advice, solution expertise, reliable spare parts logistics and fast-reacting service during each phase. Our goal is increasing your success.

Individualized service
Benefit from KraussMaffei Berstorff’s reliable service. Our customer service team and experienced fitters, technicians and engineers are there for you as quickly as possible and also provide on-site support to optimize your systems and processes and to minimize downtimes. Rely on our highly skilled repair and spare parts service.

KraussMaffei Group
Comprehensive expertise

Unique selling proposition – Technology³
With its KraussMaffei, KraussMaffei Berstorff and Netstal brands, the KraussMaffei Group is the only provider in the world to possess the essential machine technologies for plastics and rubber processing: 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 qualified 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 light blue.
Bank on KraussMaffei Berstorff’s excellent plant engineering competence in plastics processing: optimize your production and sharpen your competitive edge by complete system solutions, turnkey production lines and customized services. Benefit from extrusion concepts that easily provide the high flexibility needed for the manufacture of a multitude of products today. Base your planning on an extruder concept that guarantees high availability throughout the entire lifetime.

www.kraussmaffeiberstorff.com