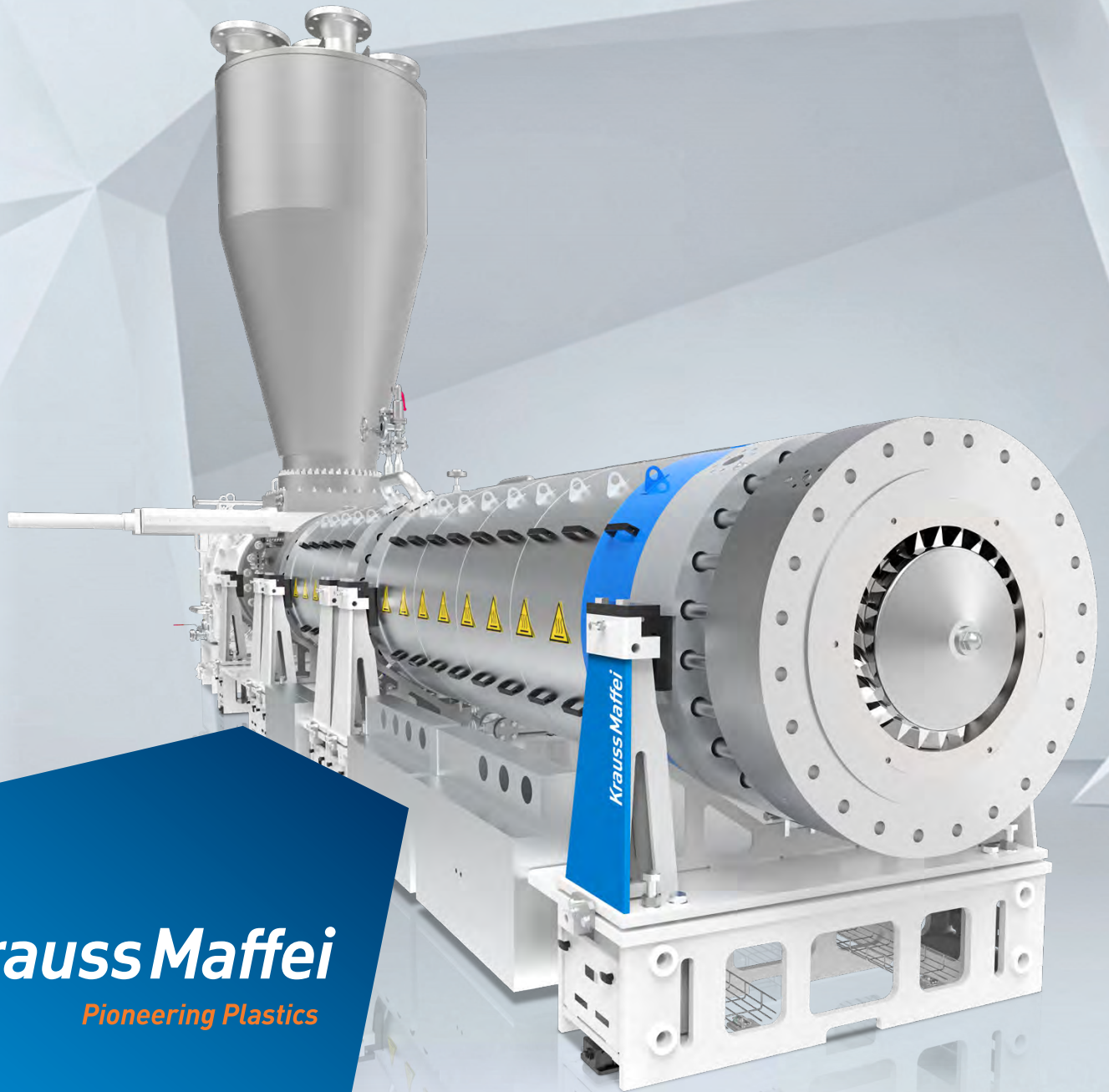


MELT-TO-PELLET CONVERSION

DISCOVER OUR KE SINGLE-SCREW
EXTRUDERS



Krauss Maffei
Pioneering Plastics

PRACTICAL EXAMPLES HIGH-QUALITY PRODUCTS FOR VARIOUS PROCESSING TECHNOLOGIES



Virgin pellets

KE SINGLE-SCREW EXTRUDERS LONG OPERATIONAL LIFE, SAFE OPERATION AND MINIMAL DOWNTIME

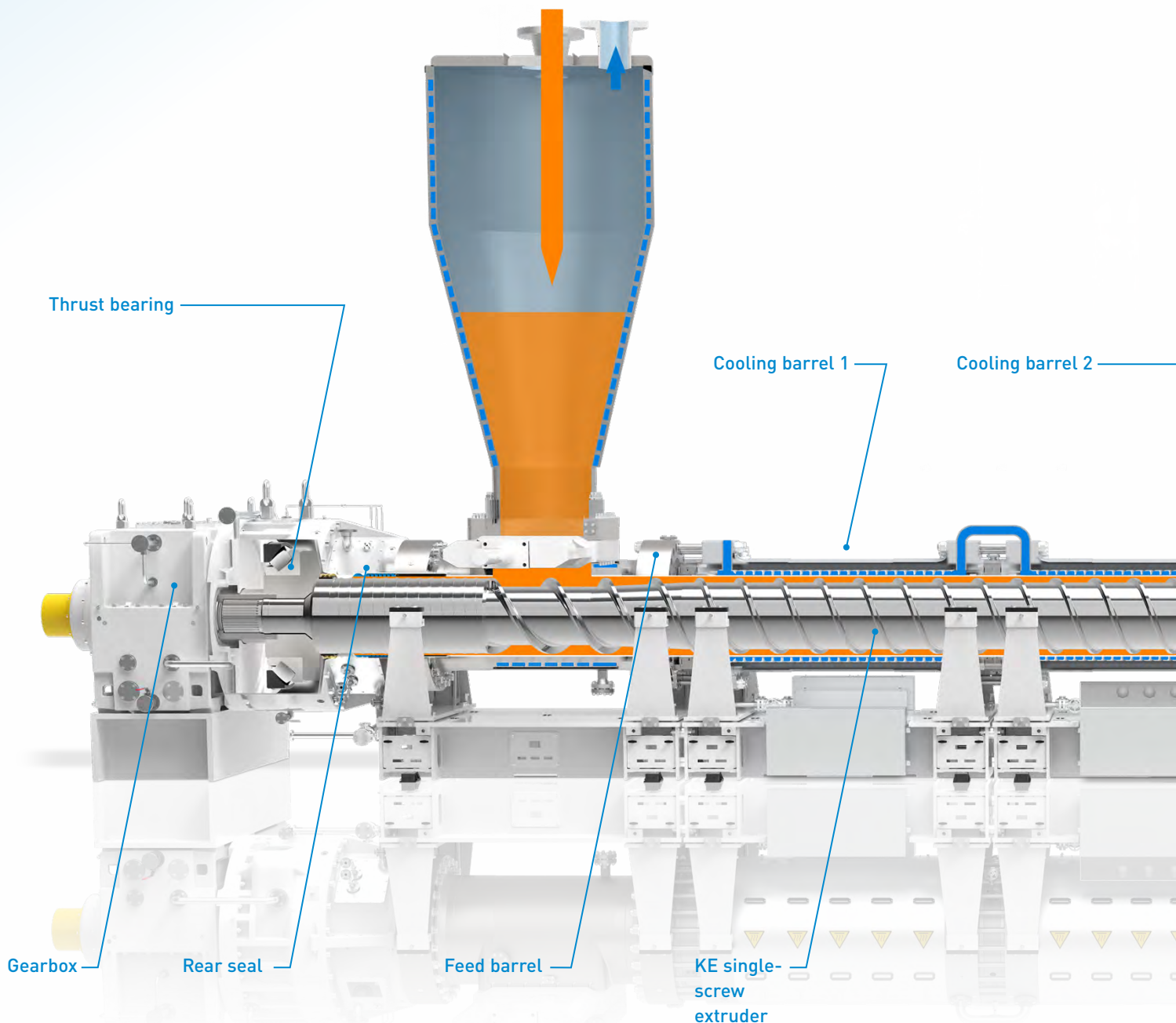
Your advantages at a glance:

- Throughputs of up to 74 t/h for melt feeding applications (e.g. LDPE; EVA; POE; acrylic copolymers)
- High cooling performance realized by “wet” liners, pressurized water and optimized screw profiles
- Highly efficient melt degassing for removing residuals and monomers from melt with or without the use of stripping agent
- Unique pelletizer concept (cutting gap, two-stage water chamber) with optimized die plates for excellent pellet quality
- Modular extruder design for fast on-site installation, simplified foundation work and flexible configuration of the processing section
- Design, delivery and installation of complete extruder packages including auxiliary- and downstream equipment (e.g. dryer, pressurized water system, classifier)

TYPICAL BENEFITS

KE SINGLE-SCREW EXTRUDERS – RELIABLE PRESSURE BUILD-UP

KraussMaffei KE single-screw extruders perform numerous tasks in the processing of thermoplastics. They are very often employed in a pumping function to build up pressure for pelletizing. For this, the KE offers a major advantage over other methods, due to its high pumping capability combined with comparatively small loss of energy due to melt heating.

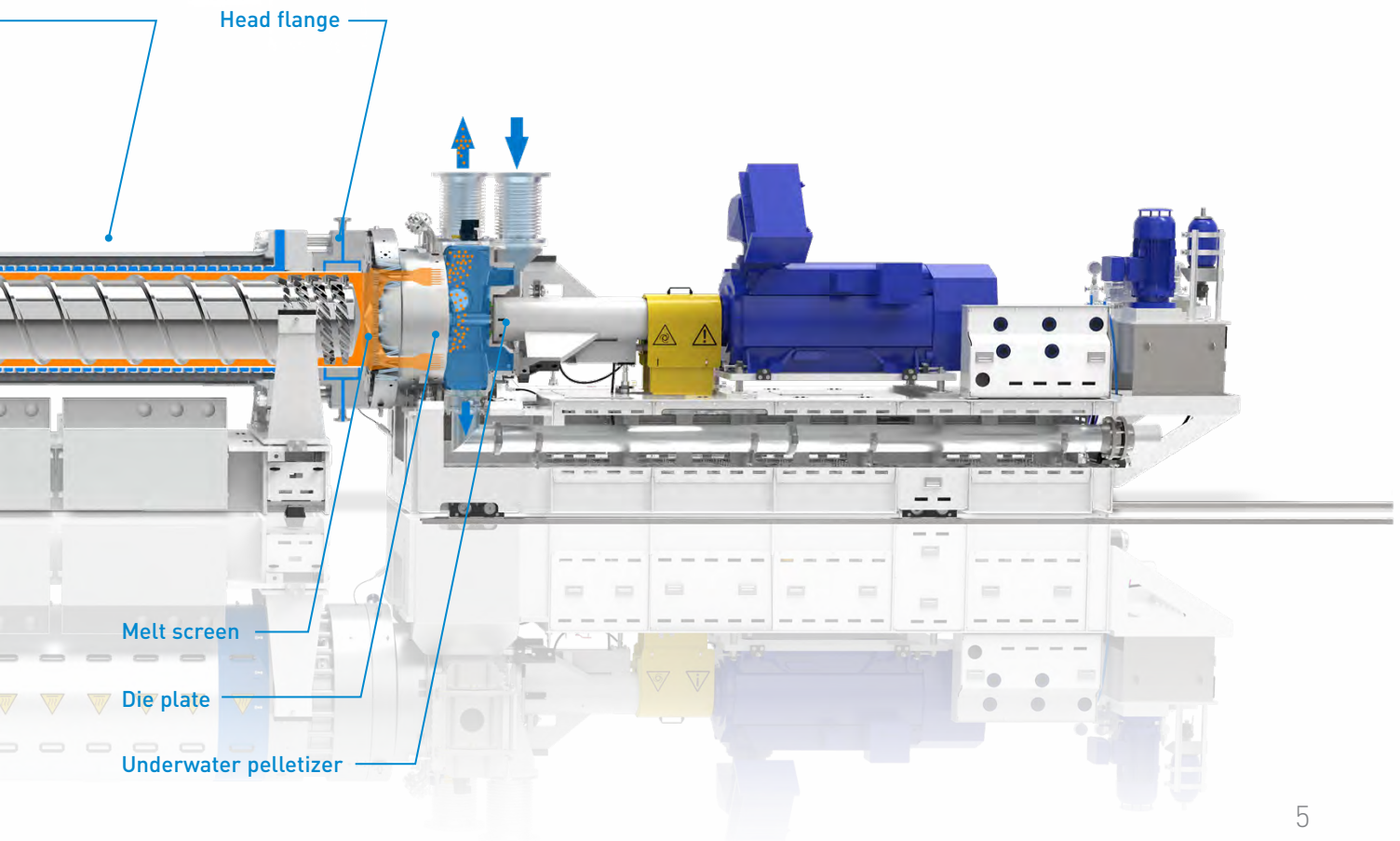
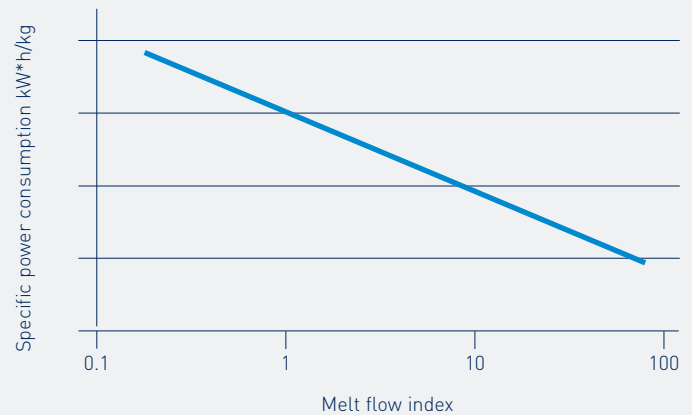


Optimized design to meet your needs

KE single-screw extruders are characterized by

- simple and robust design;
- low maintenance needs;
- practically limitless torque;
- free choice of variable/tailor made screw channel depth, screw pitch and number of flights.

In the discharge extruder, stabilizing additives can be homogeneously incorporated. In addition, undesirable heating of the melt can, to a certain extent, be compensated for by controlling the temperature of the barrel. Particular requirements regarding temperature control, homogeneity, mixing-in of additional components as well as degassing of volatiles can be accomplished through the modular design of the KE single-screw extruder, tailored to the process requirements and built in process stages.



BEST MELT TEMPERATURE DEPENDABLE MELT COOLING

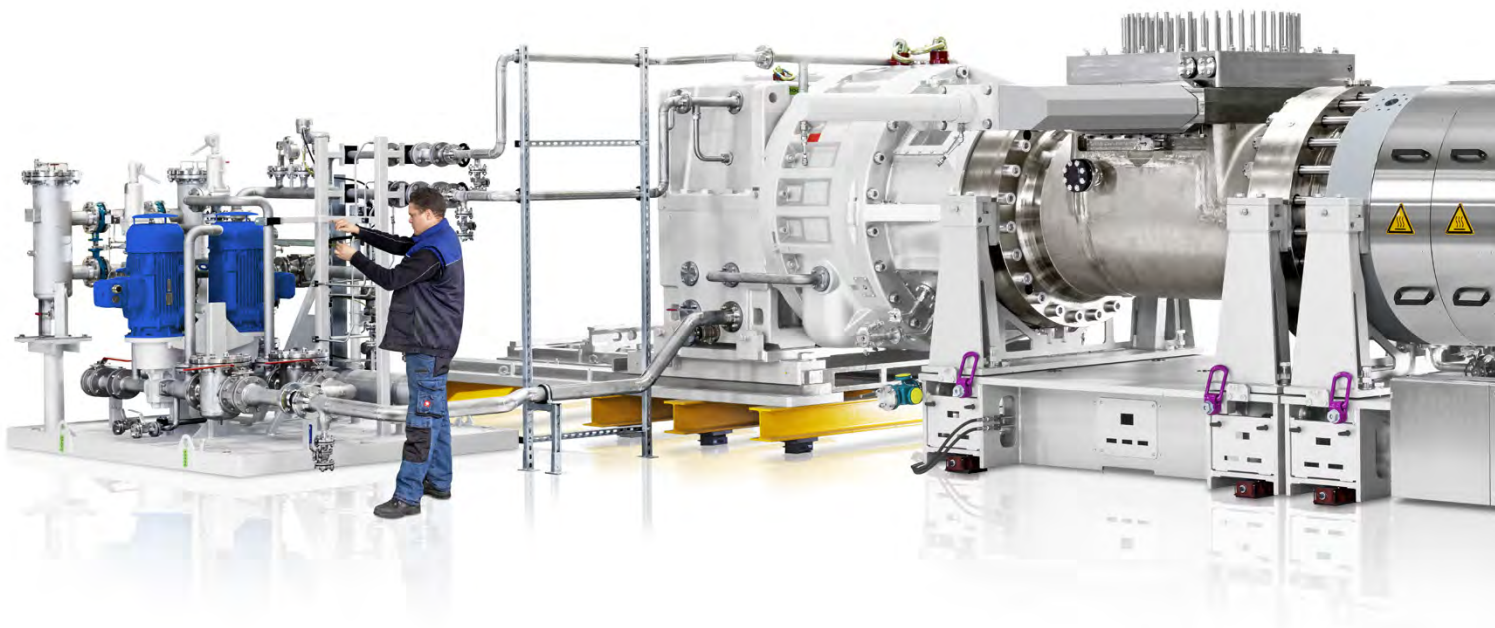
High quality pellet production demands close control of melt temperatures which, in turn, requires effective and reliable cooling methods in the extruder. Our barrels and 'wet' liners represent the optimum system and provide increased efficiency to remove more heat energy from the melt than competing approaches.

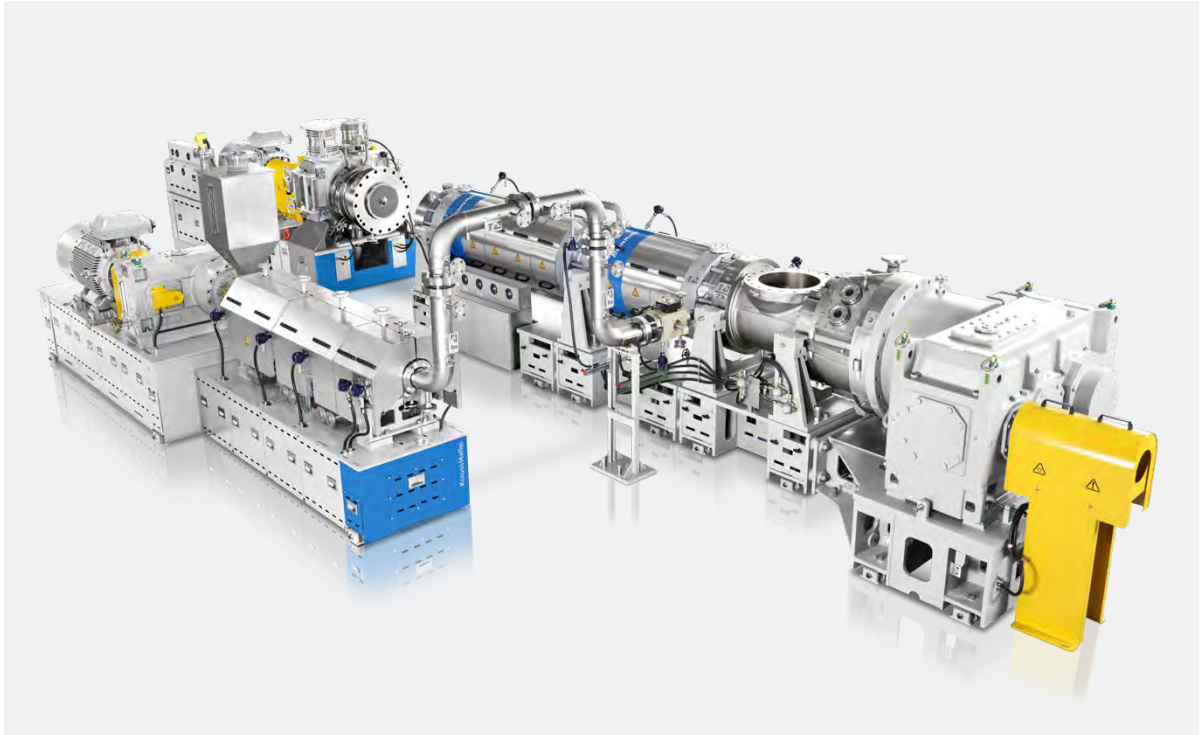
Maximum cooling rates are made possible by

- pressurized water;
- wet liners;
- matched screw profile.

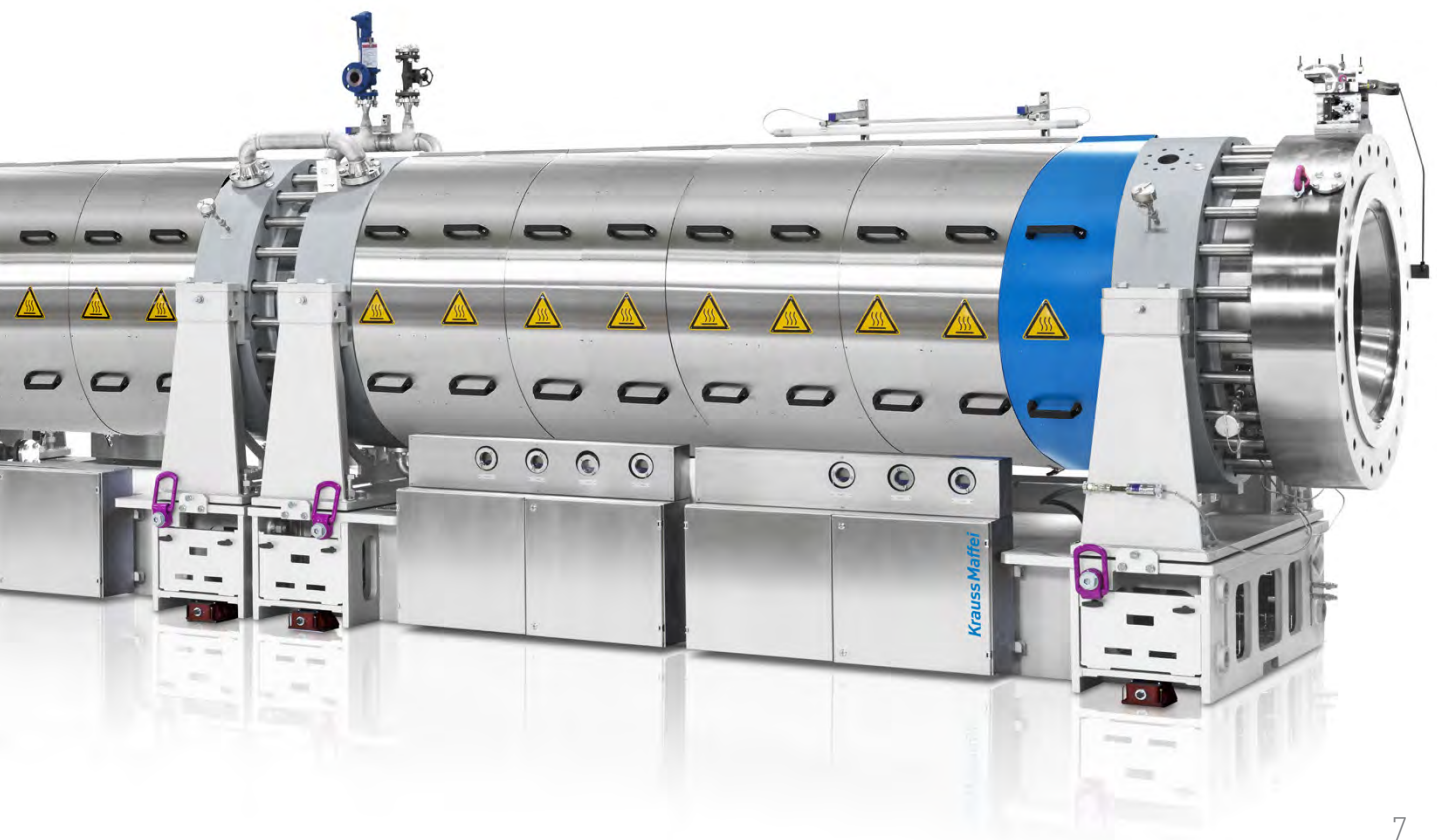
Some typical applications for intensive melt cooling:

- before pelletizing low-viscous PE copolymers, the melt has to be cooled to its pelletizing temperature;
- in melt homogenization, the melt temperature has to be limited to accomplish high shear stresses.



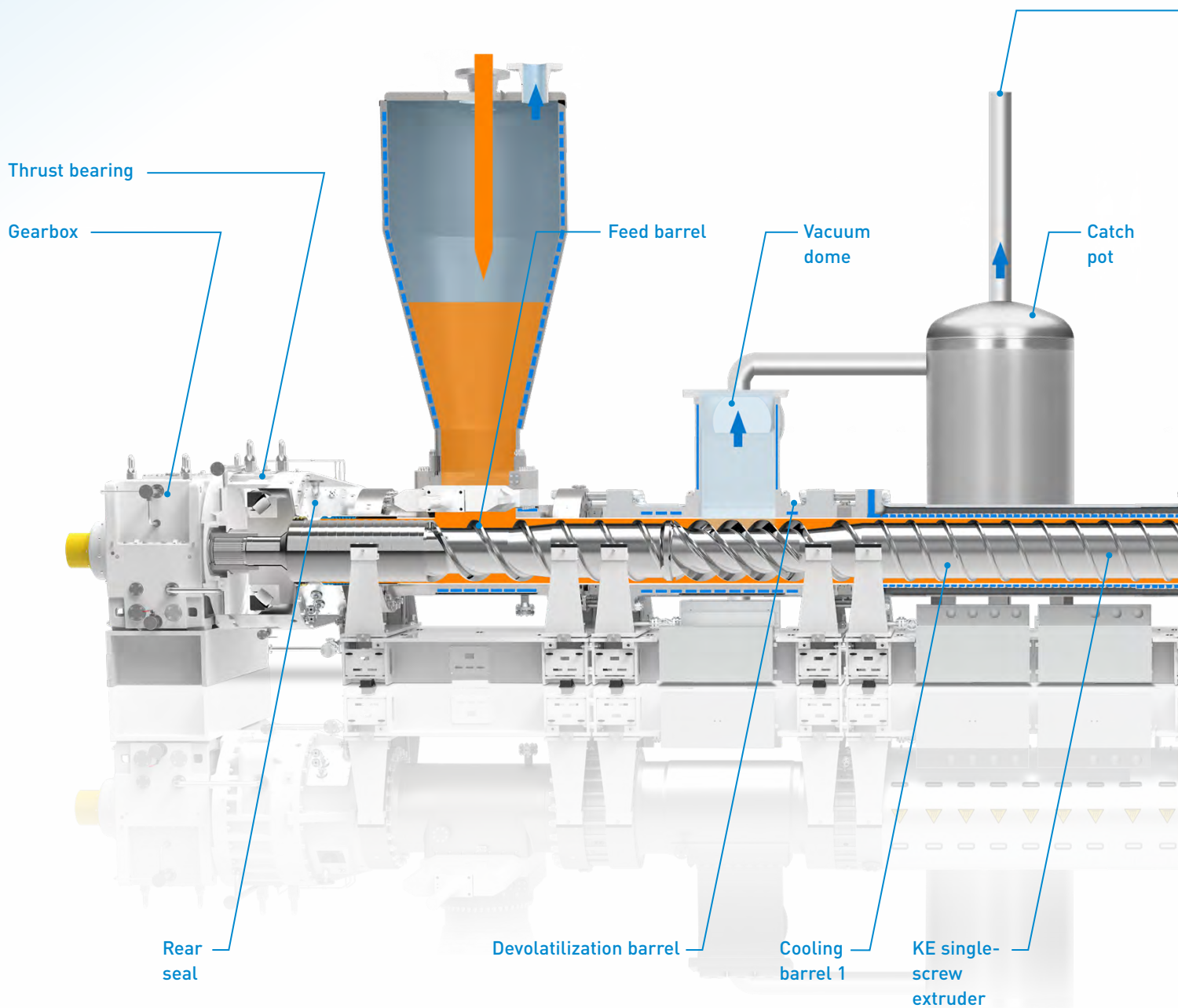


Hot-melt extruder with pelletizer and side-arm extruder



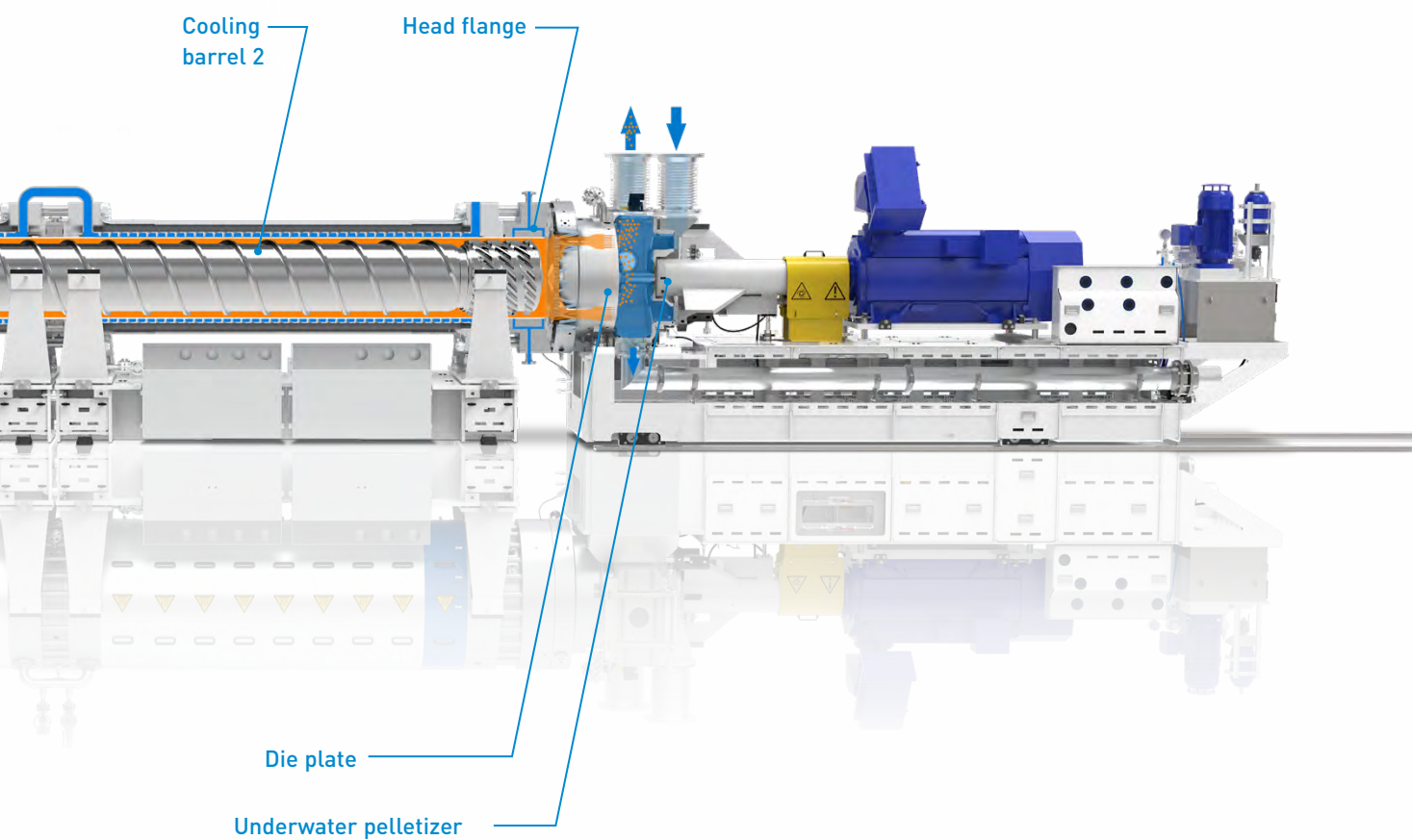
OPTIMUM MELT DEGASSING RELIABLE MELT DEVOLATILIZATION

When leaving the reactor, the polymers produced contain volatile matter, which can be environmentally harmful, affect product properties and endanger health.

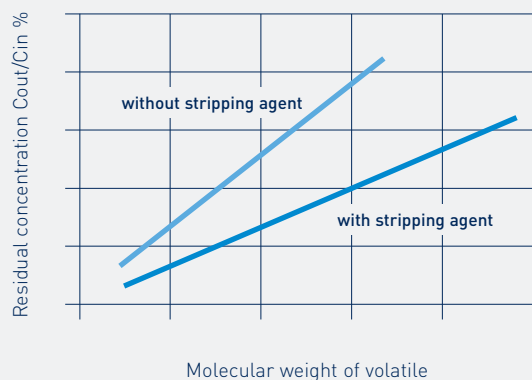




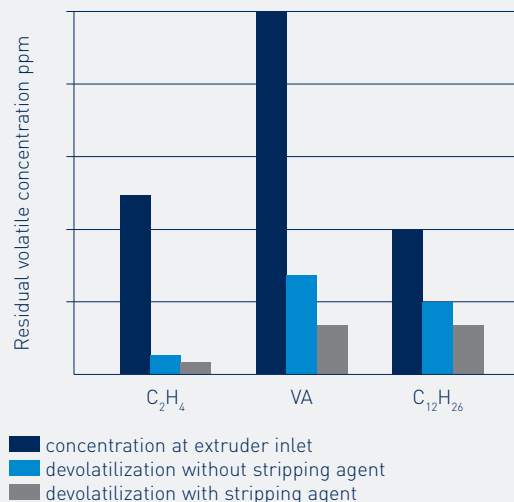
— To vacuum system



Devolatilization efficiency for LDPE and PE copolymers



Devolatilization of copolymer



Effective with vacuum...

In order to remove the volatile substances from the polymer melt, KraussMaffei employs the most effective systems, working under vacuum.

The advantages of extruder devolatilization are realized in the production of polyethylene, homo- und copolymers. Higher molecular weight substances can be removed from the melt more efficiently than using silo devolatilization, leading to benefits in post-processing and maintaining product properties. It is especially advantageous to avoid silo devolatilization when rubber-like and sticky polymers are processed.

...and even more effective with stripping agent

Devolatilization performance is dependent on the vacuum level. It can, however, be enhanced by the use of water or nitrogen to decrease the partial pressure and increase the effective free devolatilization surface of the melt.

High product quality

In EVA production, the melt arrives at the extruder containing high levels of ethylene, vinyl acetate and catalyst carrier. By using KE devolatilization technology at pressures as low as 20 mbar(a) and using nitrogen as stripping agent, the volatiles content in the melt can be substantially reduced.

Devolatilization at its best

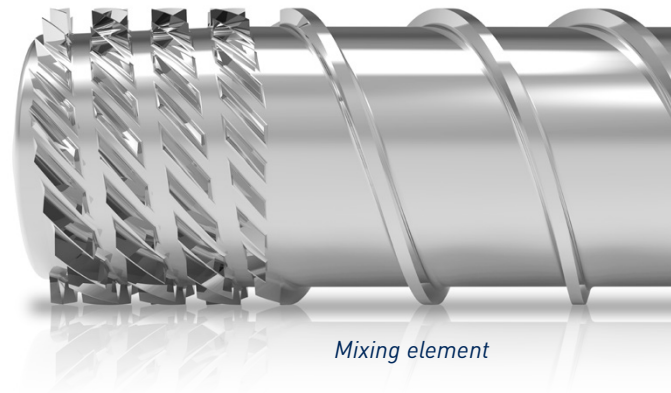
Devolatilization is influenced by rates of diffusion, which in turn depend on the melt viscosity. When processing high-viscous polymers, the use of stripping agents is indispensable.

Optimal and reliable operation

KraussMaffei KE single-screw degassing extruders are designed to match the particular requirements of melt devolatilization. Trouble-free operation is assured by

- nitrogen blanketing of seals in the vacuum area to avoid oxygen ingress;
- avoidance of melt entry and elimination of foaming into the vacuum dome by correct design measures and optimized operating conditions;
- accurate control of the melt flow and minimizing of back-pressure in the extruder head, to avoid flooding of vent dome and pumping section;
- optimized screw geometry for the devolatilization application.

BEST HOMOGENEITY OPTIMAL MIXING



Mixing element

Product quality and investment costs are measures of productivity. Here, quality is achieved by distribution and dispersion of additives and the increase of melt homogeneity. In this sense, the effective employment of mixing and shearing elements is a prerequisite for optimizing productivity. In KE single-screw extruders, such elements are used to provide the conditions for optimum productivity.

Perfect distribution with mixing elements

Mixing elements are employed to

- equalize the melt temperature;
- mix in liquid additives;
- add color through masterbatches;
- achieve the best distribution of stripping agents for degassing.

Mixing elements work by

- continuous surface renewal by rotation;
- recombination of surfaces;
- interruption of flow streams.

The distinguishing features of our mixing elements are active conveying ability, minimum loss of performance by melt temperature increase and complete cleaning of the barrel wall.

Local size reduction with shear elements

Shear elements are used in processes where

- additive agglomerates are to be dispersed;
- high molecular weight gels and/or cross-linked particles need to be dissipated.

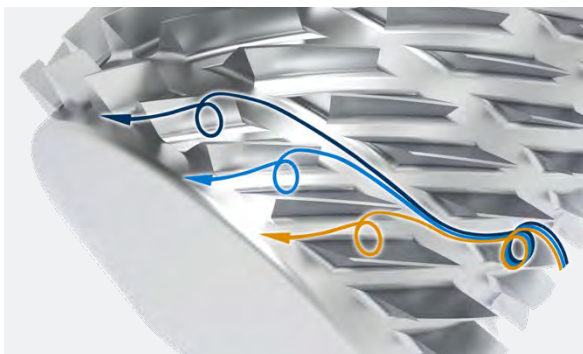
Shear elements are also used in combination with mixing elements to optimize fine distribution by dispersion.

The principle of the shear element is to produce high shear forces in narrow gaps, which are sufficient to overcome the surface tension of the particles.

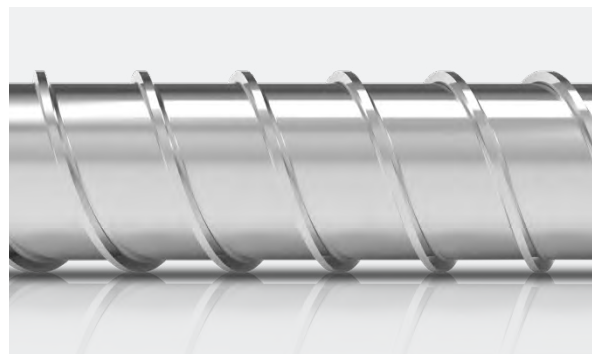
KraussMaffei KE single-screw extruders are characterized by individual shearing of every particle that passes through the element and by the active conveying action of the screw elements. It is possible for the shear elements to operate in a pressure-neutral fashion. The effective barrel cooling ensures that the thermal energy introduced into the melt by the shearing elements can be removed, so that the temperature of the melt is maintained at a constant level.

Tailored solutions

Productivity can only be assured by the correct and suitable use of these screw elements. In this way, KraussMaffei is able to work out and offer combinations of mixing and shearing elements, designed exactly for your quality-oriented polymer processing.



Melt flow in a mixing element



Transport element

SUPERIOR PRODUCTIVITY

THE KE RANGE

The KE single-screw extruder series comprises seven different sizes with diameters of 250, 300, 400, 500, 600, 700 and 800 mm. The screw diameter as well as the screw length from 9 to 48D is chosen to assure the maximum output for a particular process to be handled. The barrel sections typically have lengths of 4 and 6 L/D, so that all necessary barrel configurations can be accomplished. Other lengths and specifications can be supplied if required.

Typical extruder lengths are:

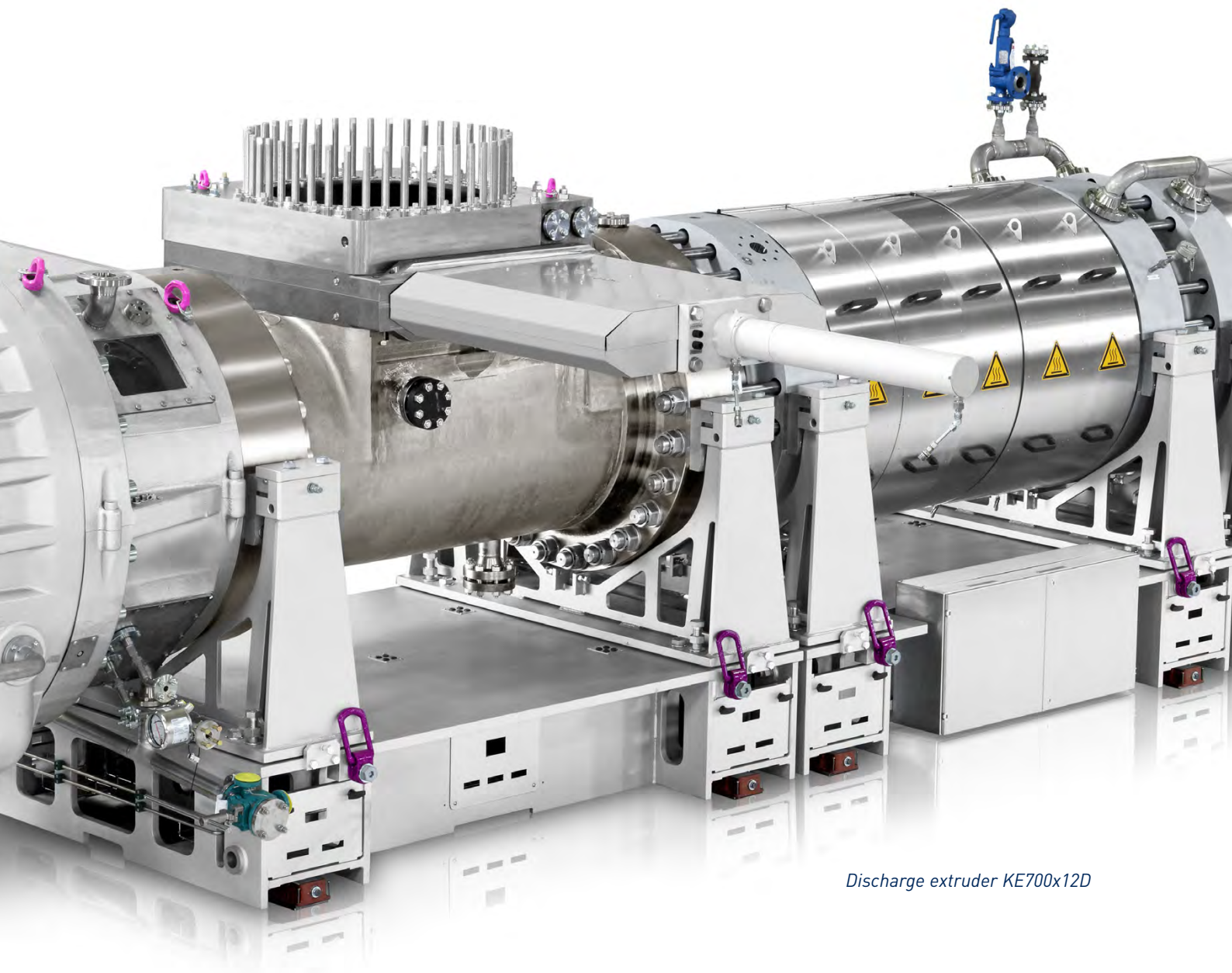
- discharge extruders 12 D
- devolatilization discharge extruders 18 D
- devolatilization discharge extruders using stripping agent 24 D

KE single-screw discharge extruder

		KE 250x12D	KE 300x12D	KE 400x12D	KE 500x12D	KE 600x12D	KE 700x12D	KE 800x12D
Throughput t/h	MI = 0.3	5.0	7.4	13.6	23.6	34.0	46.6	60.6
	MI = 2.0	5.6	8.2	15.2	26.4	37.8	51.6	67.2
	MI = 20	6.2	9.2	16.8	29.0	41.6	56.6	74.0
Screw speed max.	rpm	220	160	150	120	110	100	90

KE single-screw devolatilization extruder

		KE 250x18D	KE 300x18D	KE 400x18D	KE 500x18D	KE 600x18D	KE 700x18D	KE 800x18D
Throughput t/h	MI = 0.3	4.2	6.2	11.4	20.2	30.2	41.8	55.4
	MI = 2.0	4.6	6.8	12.8	22.4	33.6	46.4	61.4
	MI = 20	4.8	7.2	13.4	23.6	35.4	49.0	64.8
Screw speed max.	rpm	250	180	170	140	130	115	105



Discharge extruder KE700x12D

PERFECTLY HARMONIZED OUTSTANDING EQUIPMENT

Drives

KraussMaffei offers a choice of AC motor / VSD combinations (drives) to drive the KE single-screw extruders. Mainly, motors with a speed range of 10:1 are used. If required, a drive with a maximum torque limit can be employed.

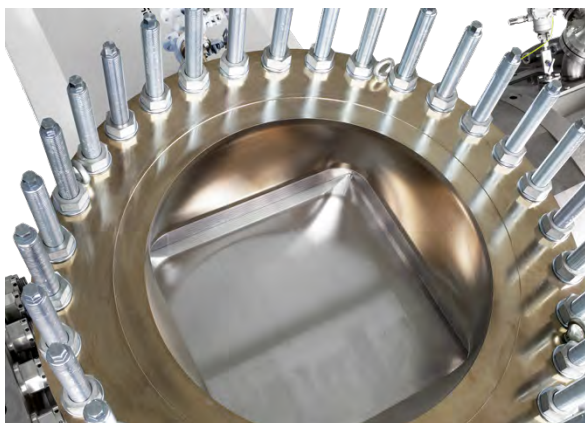
Bearings

The axial forces generated by the screw are taken up by an axial spherical roller bearing that is designed for 40,000 operating hours at maximum pressure and maximum screw speed.

An independent lubrication system, mainly consisting of an oil cooler, pumps and a filter unit, ensures a reliable oil supply to all gears and bearings. If required, the system can be designed with standby pump and filter.

Screws

The extruder screws are given a profile matched to the application in question. Screw materials are either nitrided steel or tempered and surface-hardened steel. Where the melt to be processed contains corrosive elements, the screw can either be nickel-plated or made entirely from corrosion resistant stainless steel.



Feed zone inlet

Feed zone

The KraussMaffei KE feed zone design provides a generous opening, so that the polymer melt, coming from the separator vessel can flow into the KE extruder with minimal pressure drop. The feed zone has supports on either side, so that the weight of the vessel arranged above the extruder is amply supported. This makes external separator supports and a compensator unnecessary. If required, a slide valve can be fitted between the separator and the feed zone, to completely close off the melt flow to the extruder.

The feed zone is connected to the gearbox through the thrust bearing housing by an absolutely leak-proof seal to avoid environmental contamination. Gas leakages are totally avoided.

Barrels

The extruder barrels consist of a pressure-containing outer body with pressed-in 'wet' liners. For more demanding applications, these can be executed as bi-metallic liners with a wear and/or corrosion-resistant lining. For temperature control, water is the proven medium, but oil can also be used.

Even in the most exceptional conditions, where extreme variations in pressure and temperature occur, KraussMaffei KE single-screw extruder barrels are absolutely leak-proof.

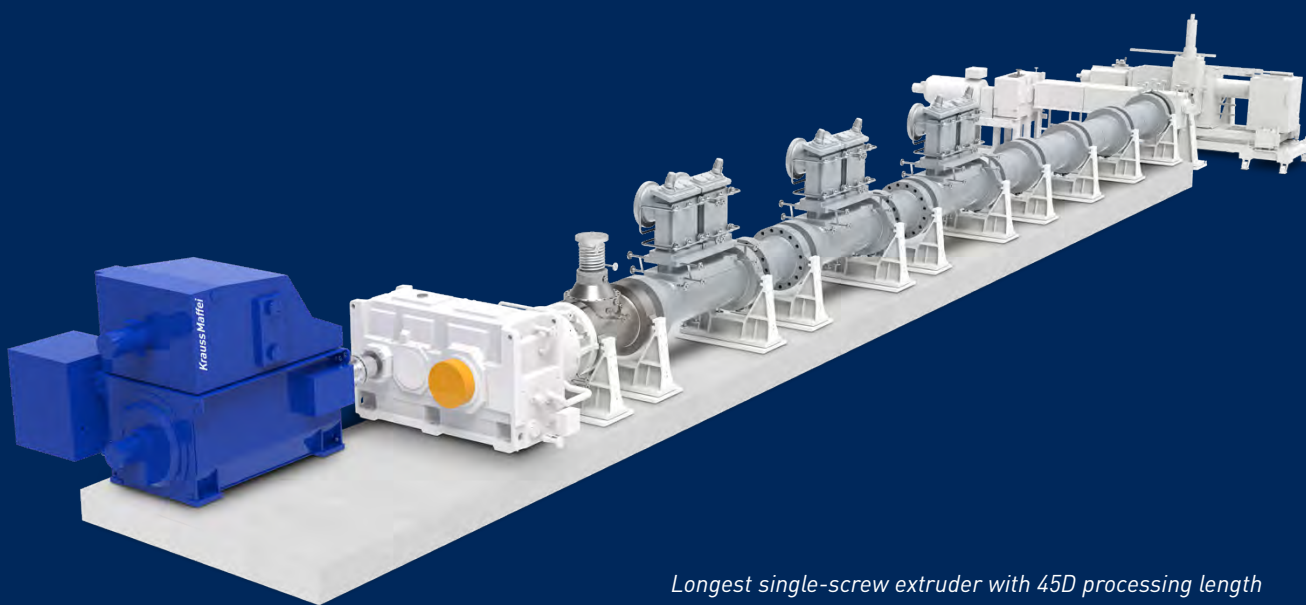
Benefits from A to Z

The design of our KE single-screw extruder controls guarantee

- high operating availability;
- safe shutdown in case of problems, integration into overall control systems;
- suitability for specific local conditions (e.g., explosion protection);
- monitoring of product quality (rheometry, melt temperature measurement);
- incorporation of specific requirements.

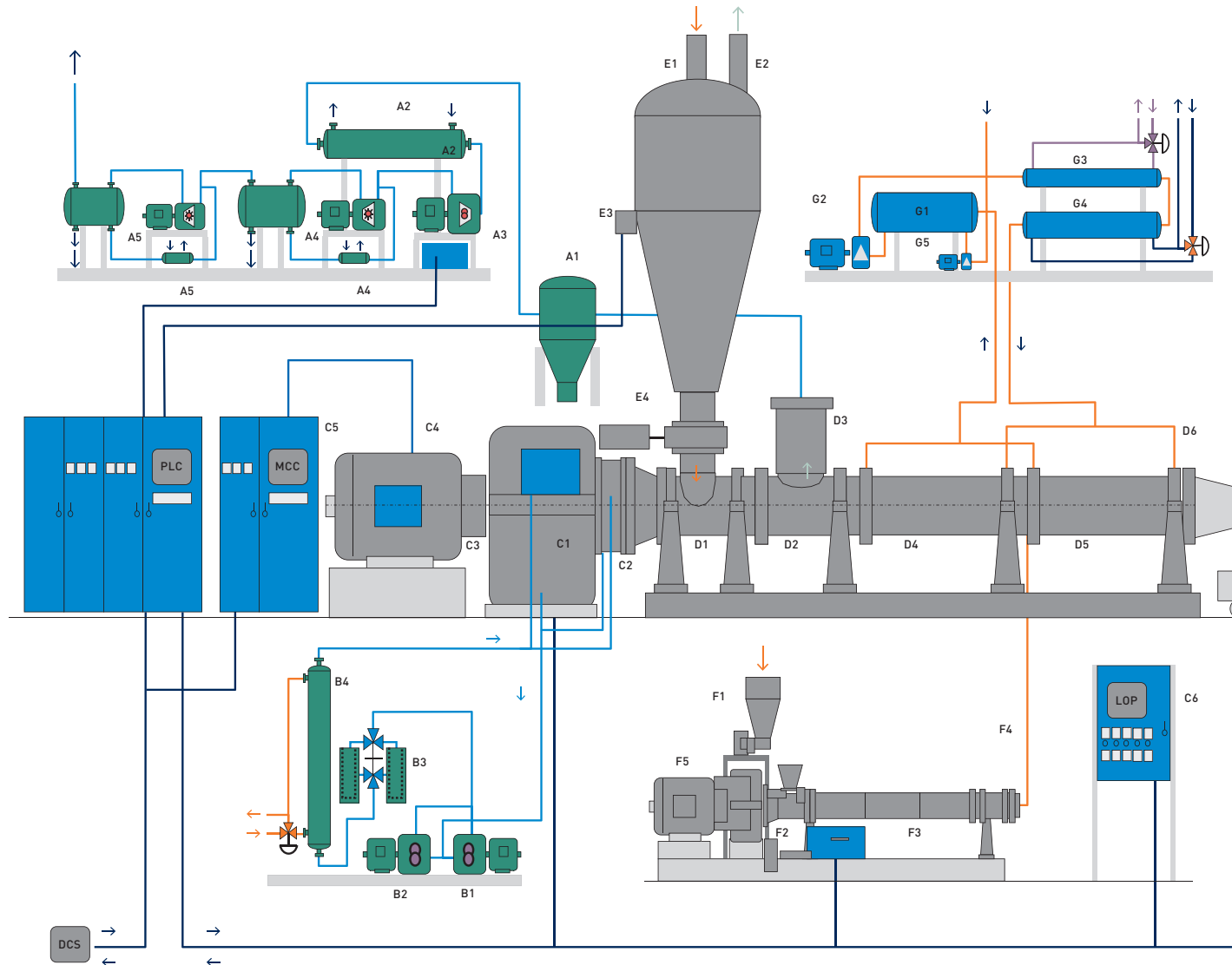


Largest single-screw extruder with 800 mm screw diameter



Longest single-screw extruder with 45D processing length

PERFECTLY FITTING TAILOR-MADE TOTAL PLANTS



A Vacuum unit

- 1 Catchpot
- 2 Heat exchanger
- 3 Roots blower
- 4 Liquid ring pump
- 5 Compressor

B Lubrication unit

- 1 Gear pump 1
- 2 Gear pump 2
- 3 Double filter
- 4 Tube-type cooler

C Extruder drive

- 1 Gearbox
- 2 Thrust bearing
- 3 Coupling
- 4 Main motor
- 5 Motor control
- 6 Local panel

D Devolatilization extruder

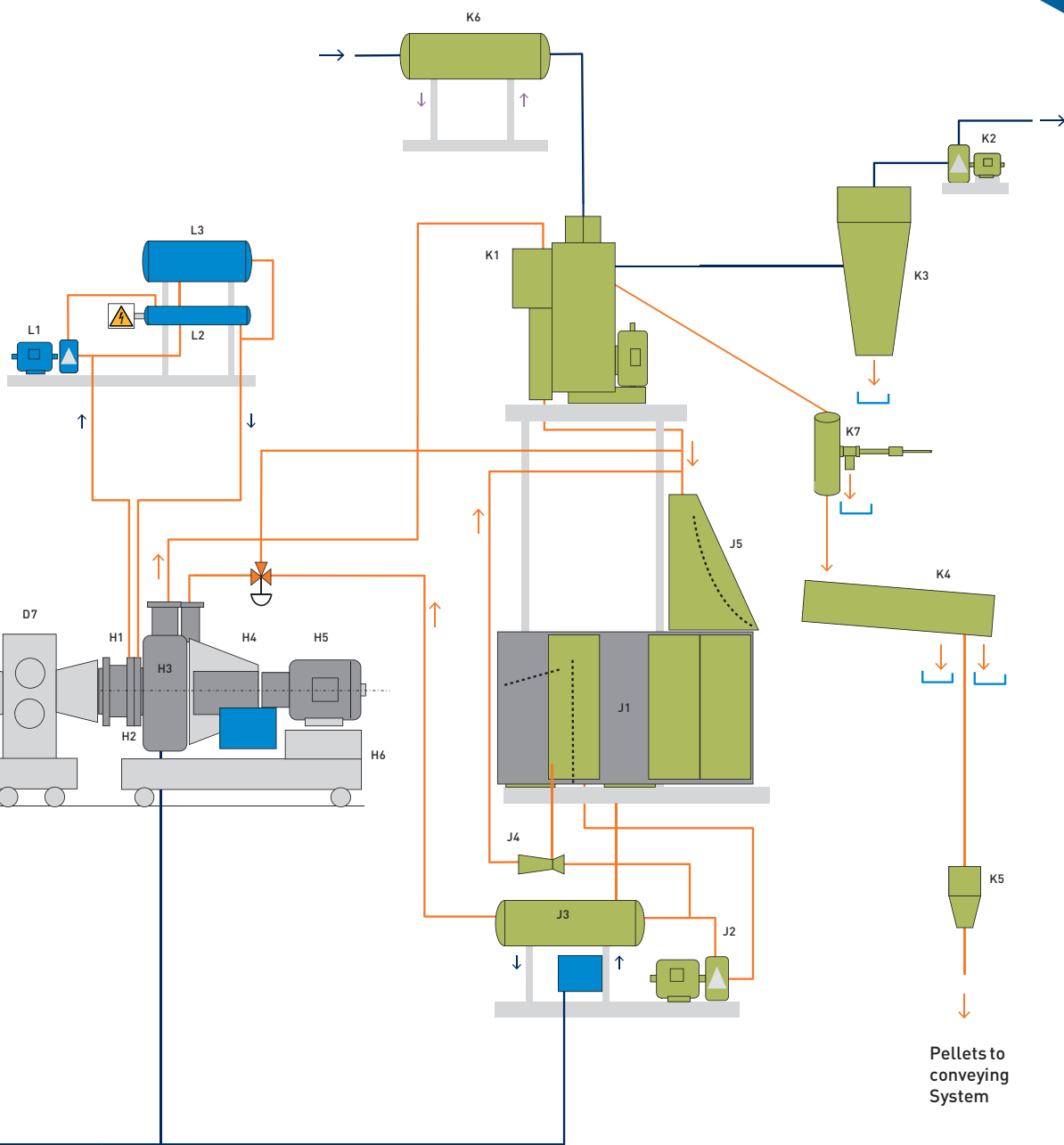
- 1 Feed barrel
- 2 Devolatilization barrel
- 3 Vacuum dome
- 4 Cooling barrel 1
- 5 Cooling barrel 2
- 6 Head flange
- 7 Screen changer

E Extruder hopper

- 1 Melt inlet
- 2 Gas outlet
- 3 Level monitoring
- 4 Slide valve

F Masterbatch extruder

- 1 Feeder
- 2 Feed zone
- 3 Barrel
- 4 Melt pipe
- 5 Extruder drive



G Hot-water system

- 1 Tank
- 2 Circuit pump
- 3 Tube heater
- 4 Tube cooler
- 5 Pressurizing pump

H Underwater pelletizer

- 1 Die flange
- 2 Die plate
- 3 Water housing
- 4 Knife bearing neck shaft
- 5 Pelletizer motor
- 6 Carriage

J Pellet water system

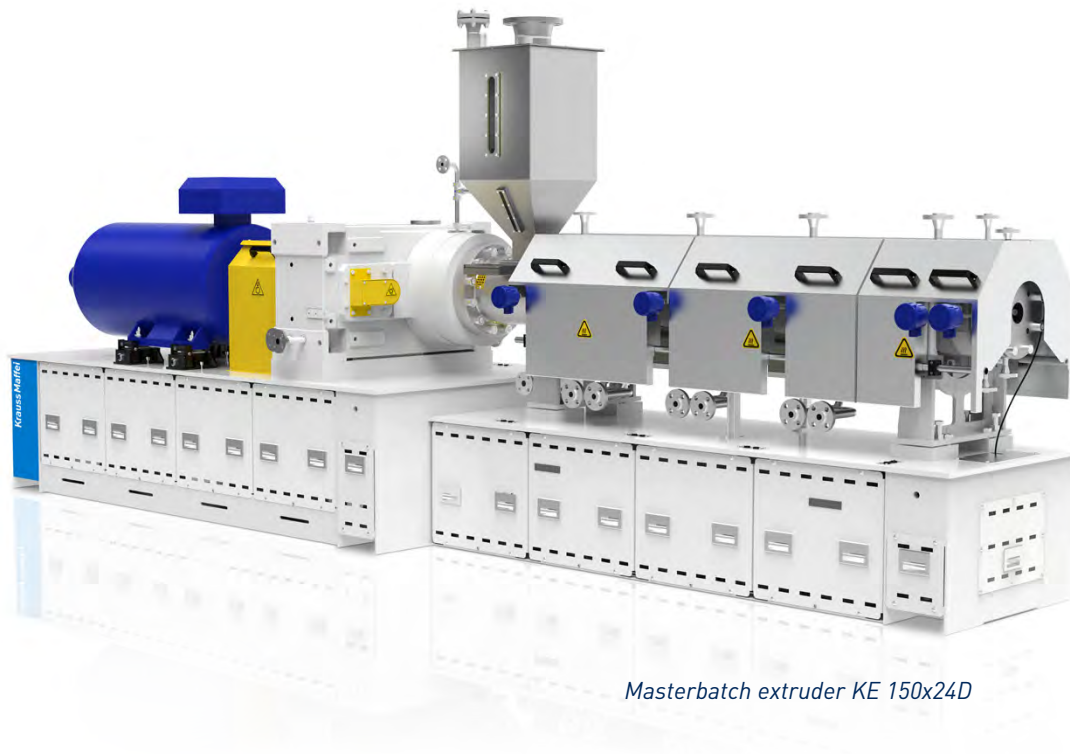
- 1 PCW storage/skim tank
- 2 Main pump
- 3 Water cooler
- 4 Skim pump
- 5 Parabolic screen

K Pellet handling system

- 1 Centrifugal dryer
- 2 Exhaust fan
- 3 Exhaust cyclone
- 4 Pellet classifier
- 5 Pellet mass flow meter
- 6 Air pre-heater
- 7 Pellet sampling device

L Hot-oil system

- 1 Circuit pump
- 2 Oil heater
- 3 Tank



Masterbatch extruder KE 150x24D

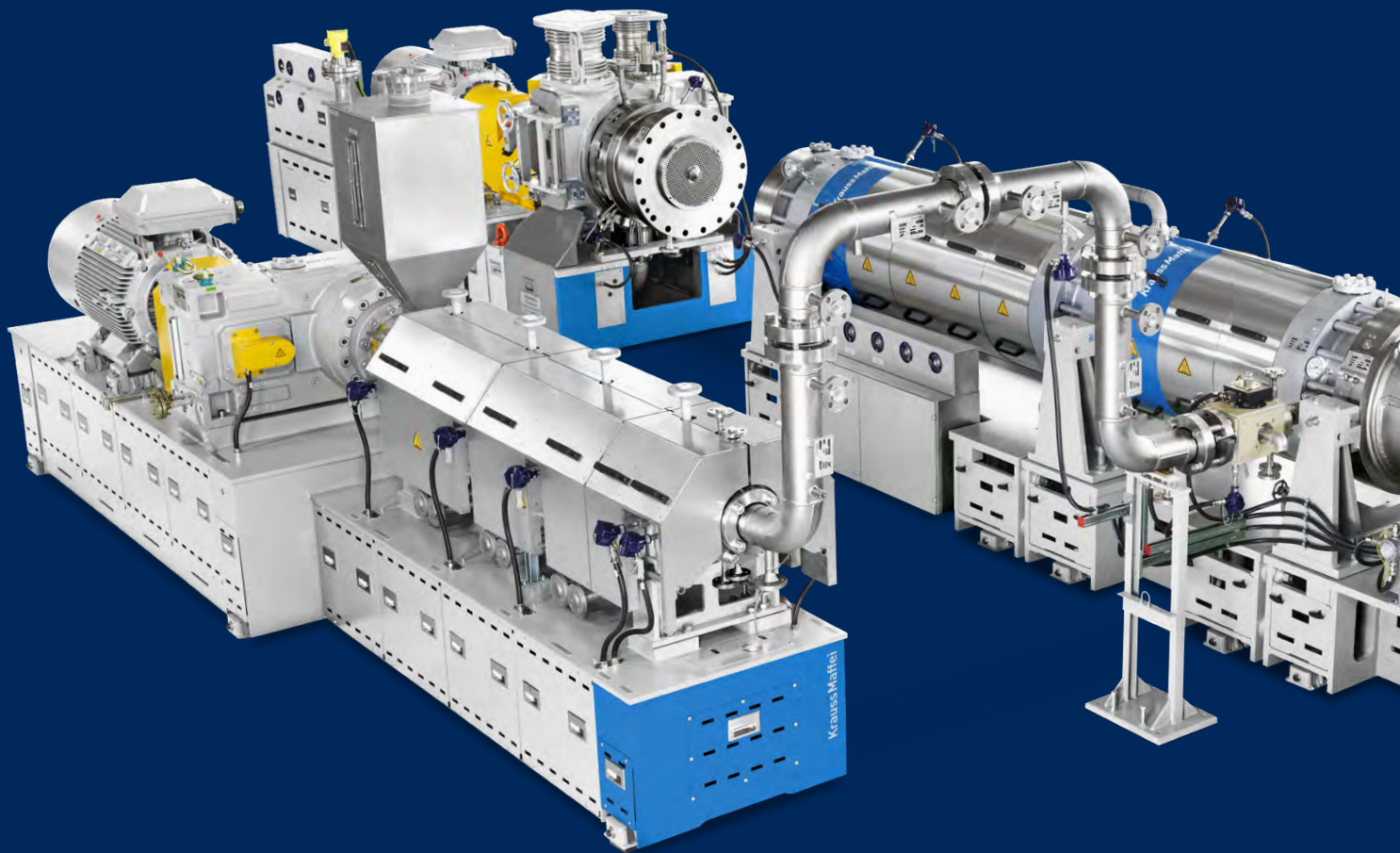
RELIABLE SOLUTIONS MELTING EXTRUDERS FOR MASTERBATCH MELTING

KE single-screw extruders

During reaction, additives such as processing lubricants, stabilizers and antiblock agents are introduced into the main polymer stream and homogeneously mixed in. Our KE single-screw extruders are also perfectly suited for the melting of masterbatches, which are delivered to the main melt stream via a heated melt pipe and a 3-way valve.

KE single-screw discharge extruder

		KE 90x24D	KE 120x24D	KE 150x24D
Throughput	kg/h	325	600	1,000
Screw speed max.	rpm	160	150	140



HIGHEST EFFICIENCY AND MAXIMUM PRODUCTIVITY UNDERWATER PELLETIZERS

Compact and highly efficient KraussMaffei underwater pelletizers are arranged downstream from the extruder. In combination with single-screw extruders, such as our KE machines, they make up a system which guarantees reliable, high-quality production. Our UWG underwater pelletizers are primarily employed in LDPE homopolymer and copolymer plants.

In an underwater pelletizer, the polymer melt exits the extruder through die holes, arranged circularly on a die plate and is cut under water by rotating knives. The resulting pellets are simultaneously cooled and conveyed by the water to the dryer.

Connected for precision

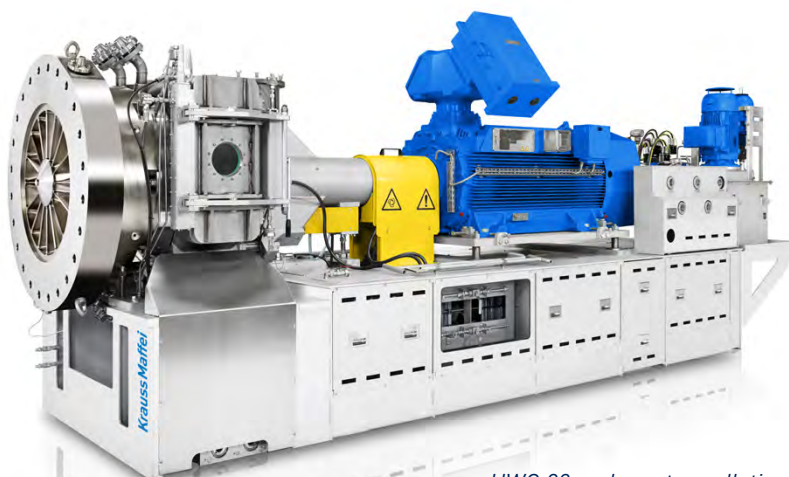
- The knife head is pneumatically or hydraulically secured in the cutting position. Cutting is done with a gap, which is continuously displayed, so that it can be adjusted to the right conditions for a good pellet cut.
- The die plate is held in centric position on a rigid solid die flange. This virtually eliminates any distortion of the die plate.
- The water chamber is mounted centric position relative to the die plate. Easy access to the cutting chamber for adjustment or cleaning is provided by large doors on either side of the unit. The need to move the pelletizer backwards away from the extruder is limited to die plate changes.



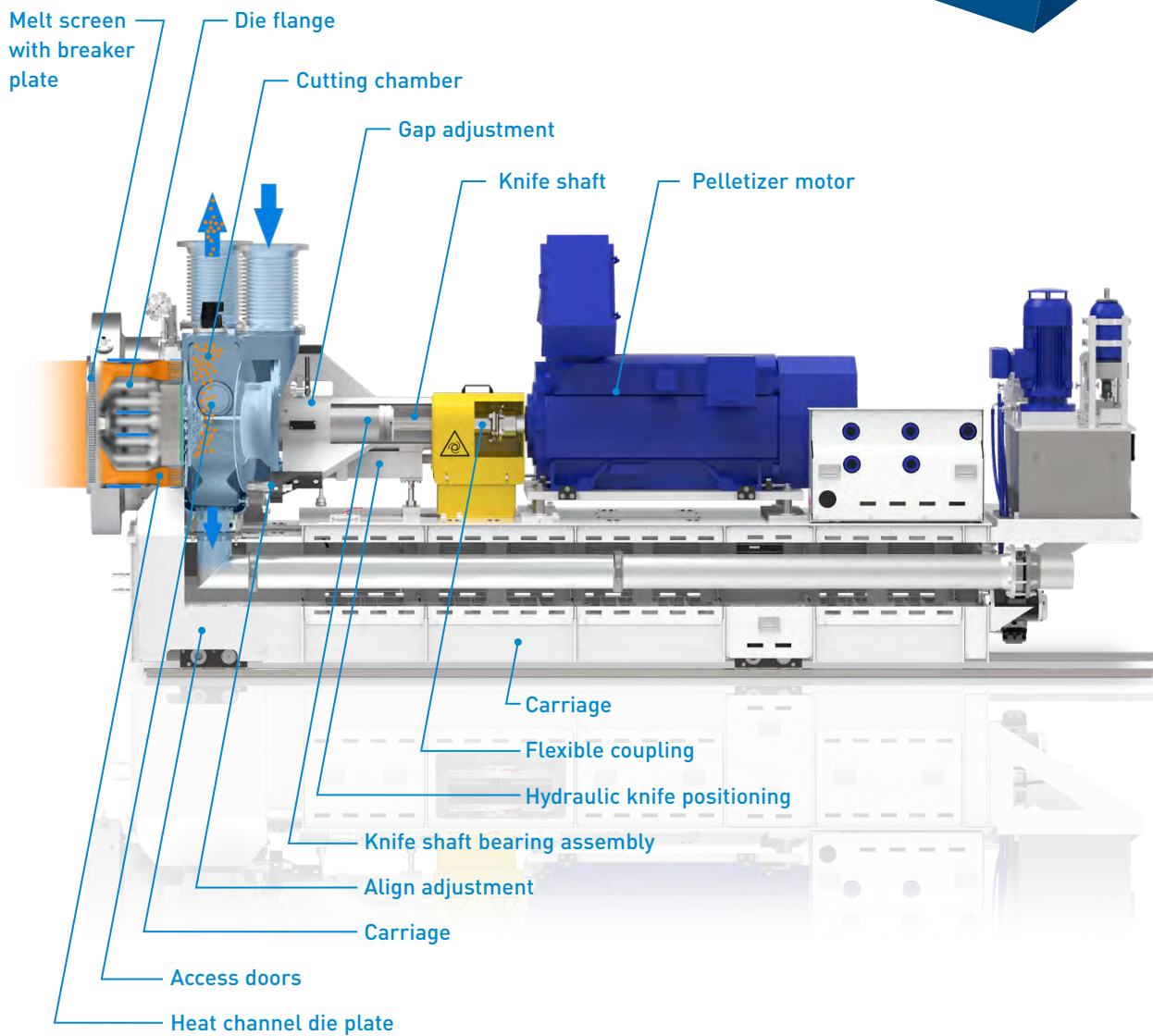
Knife head in cutting position



Polymer flange



UWG 80 underwater pelletizer



Technical specifications

		UWG 30	UWG 40	UWG 50	UWG 60	UWG 70	UWG 80	UWG 90
Average throughput*	t/h	8	15	21	26	36	48	74
Knife speed	rpm	1,050	1,050	800	650	550	550	400
Motor power	kW	45	55	75	100	120	200	250

* based on die plate hole numbers and process conditions



OUR WORLDWIDE EXPERTISE IS YOUR ADVANTAGE **DIGITAL & SERVICE SOLUTIONS**

With your KraussMaffei machine, you have chosen a product that delivers the highest levels of productivity and reliability. In addition to our range of machinery, KraussMaffei focuses on comprehensive and future-oriented solutions, innovative business models and a selected portfolio of digital products.

Customer service at the touch of a button

The process of digital transformation is becoming faster and easier than ever for the customer. Our Digital & Service Solutions unit make your production chain even more flexible and efficient with future-oriented solutions. KraussMaffei thus globally provides an all-inclusive customer service package and networks machines and processes with each other. Our global support offers a sound basis for your local long-term success.

Individual challenges in mechanical engineering call for intelligent solutions

With our services portfolio, we support you throughout your machine's lifecycle with a strong focus on your specific needs. In order to satisfy your wishes, we offer you a wide range of solutions in order to ensure maximum availability and optimum productivity of your machines.

Technology³ as a unique selling proposition

KraussMaffei is the only supplier in the world with a product range comprising the most important machine technologies for plastic and rubber processing: injection molding machinery, automation, reaction process machinery and extrusion technology. KraussMaffei is represented worldwide with more than 30 subsidiaries and over 10 production plants as well as about 570 commercial and service partners. Working together with our customers and partners, we are thus in a position to offer vast and unique expertise in the industry.

You can find further information at:
www.kraussmaffei.com



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EXTRUDERS.



[kraussmaffe.com](https://www.kraussmaffe.com)