Krauss Maffei

Pioneering Plastics

XE SCHAUMEX® AND SCHAUMTANDEX LINES

PRODUCTIVITY AND EFFICIENCY IN FOAM EXTRUSION

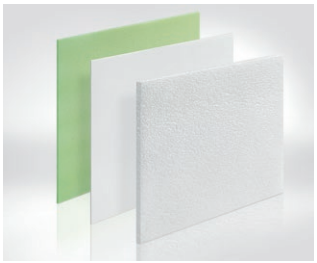
PRODUCTS

PRACTICAL EXAMPLES
HIGH-QUALITY PRODUCTS FOR THE MOST VARIED INDUSTRIES

Pressure and moisture resistant insulation boards

Food packagings made of expanded polystyrene

Tube insulation for heating and sanitary applications



Expanded film for the packaging and building industries

Screw cap seals

Decorative profiles

XPS boards for external insulation of basement walls

PET foam as core material for rotor blades

Insulated heating tubes

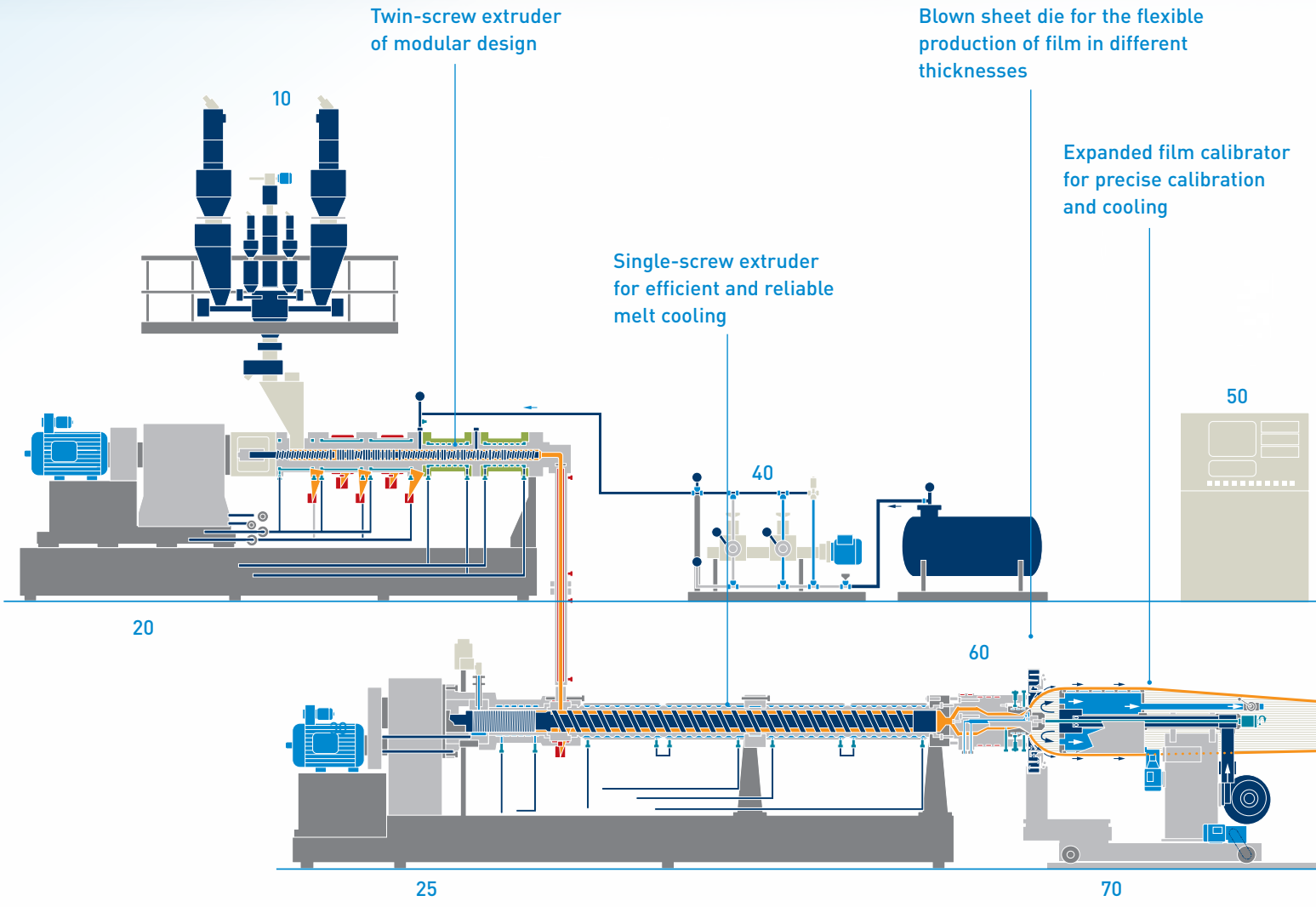
FOAM EXTRUSION LINES
UNPARALLELED PRODUCT QUALITY AND RELIABILITY

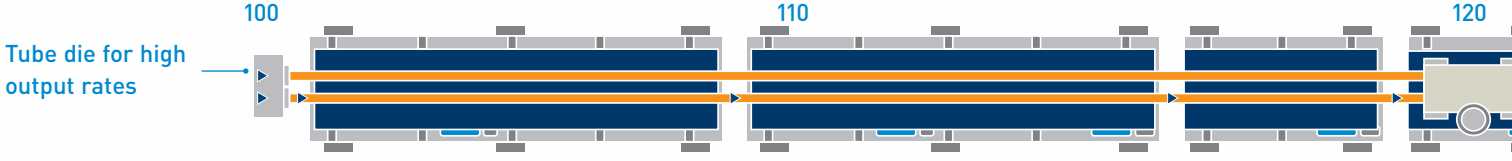
KraussMaffei provides reliable high-performance machines and lines along the entire value-adding chain in the production of physically foamed plastics film, sheets, pipes, profiles and boards. The machinery meets all requirements for an efficient extrusion process.

Benefits at a glance:

- Output rates of up to 2,800 kg/h in the production of XPS boards
- Broad processing range covering all standard plastics (PS, PE or PP) and many high-temperature plastics (PET, PEI and PES) up to a maximum temperature of 350°C
- Use of eco-friendly blowing agents
- Re-processing of start-up scrap, edge trims and web scrap
- Central line control system for intuitive and ergonomic operation
- Perfectly coordinated system components
- Fully equipped technical center for product development and process optimization

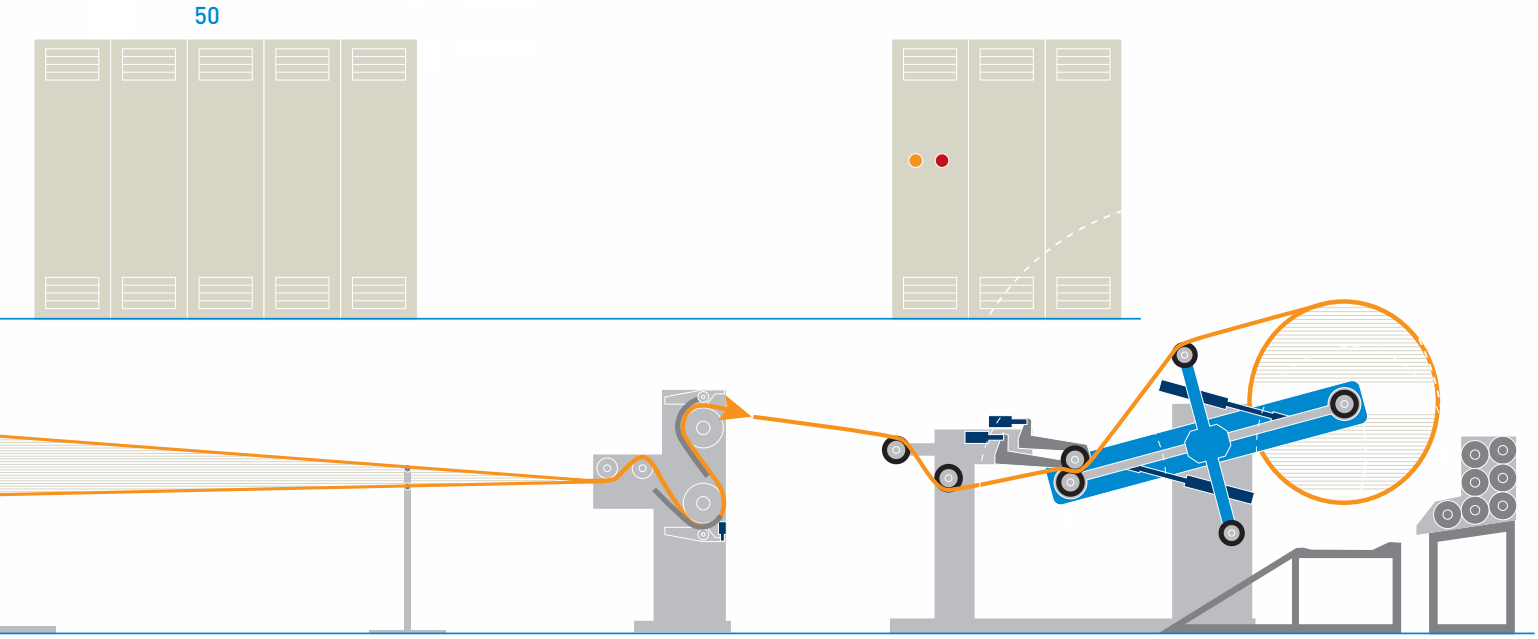
IMPRESSIVE ENCOUNTER:
TAKE A CLOSER LOOK AT A COMPLETE EXTRUSION LINE FOR THE PRODUCTION OF EXPANDED SHEETS OR TUBES





The layout shows the complete ZE60/KE150 Schaumtandex line comprising:

10 Gravimetric metering system with suction conveyor
20 ZE60Ax30D-UTX twin-screw extruder
25 KE150x30D single-screw extruder
30 Temperature control units (oil and water)
40 Blowing agent metering pump
50 Electrical control system
60 Blown sheet die with air cooling ring
70 Calibrator
80 S-wrap
90 Automatic double turret winder
100 Double tube die
110 Cooling unit
120 Take-off and cutting unit
130 Discharge system



EXPANDED SHEETS
EXCELLENT FILM QUALITY, UNPARALLELED OUTPUT RATES AND HIGH TECHNICAL RELIABILITY

KraussMaffei Schaumex® and Schaumtandex lines combine matured process expertise with pioneering technologies to innovative extrusion concepts.

High-quality expanded film and sheets for the most varied applications

There is a wide field of applications for foamed sheets – starting from cap seals and boxes up to rear parcel shelves. Our extrusion lines are designed for light and heavy foam sheets made of PS, PE, PP, PET and PLA. Thanks to the extremely precise temperature control, these lines ensure uncompromising sheet properties.

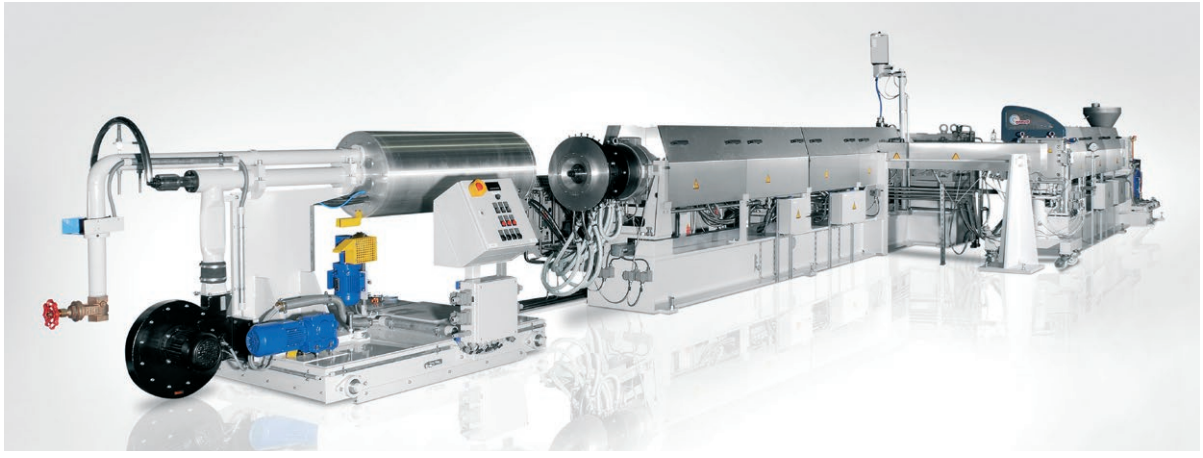
KraussMaffei offers tailor-made solutions for all process steps involved in expanded sheet extrusion – from metering and extrusion up to the winding of the finished film.

Schaumex® and Schaumtandex lines produce the right sheet for any application:

- in the packaging industry for food and electrical appliances, for cap seals;
- in the building industry, especially for impact sound insulation;
- for technical articles such as seals and edge protections;
- for roof and front hood linings, seals, rear parcel shelves etc. in the automotive industry
- and for countless other applications.

YOUR BENEFITS:

- In-depth process expertise
- Precise temperature control
- One-stop production lines



KE/KE ISO-PAC Schaumtandex line

TUBE AND PROFILE PRODUCTION LINES
PERFECT SYMBIOSIS OF INNOVATION AND TRADITION

ISO-TUBE Schaumex® and Schaumtandex lines meet the most exacting standards in terms of quality, productivity and reliability in the production of PE, PP and PE/EVA foam tubes or profiles.

This applies to the following machine configurations:
- Schaumex® line with single-screw extruder for low output rates,
- KE/KE Schaumtandex line with two single-screw extruders for medium output rates,
- ZE/KE Schaumtandex line composed of a twin-screw extruder and a single-screw extruder for maximum throughput rates.

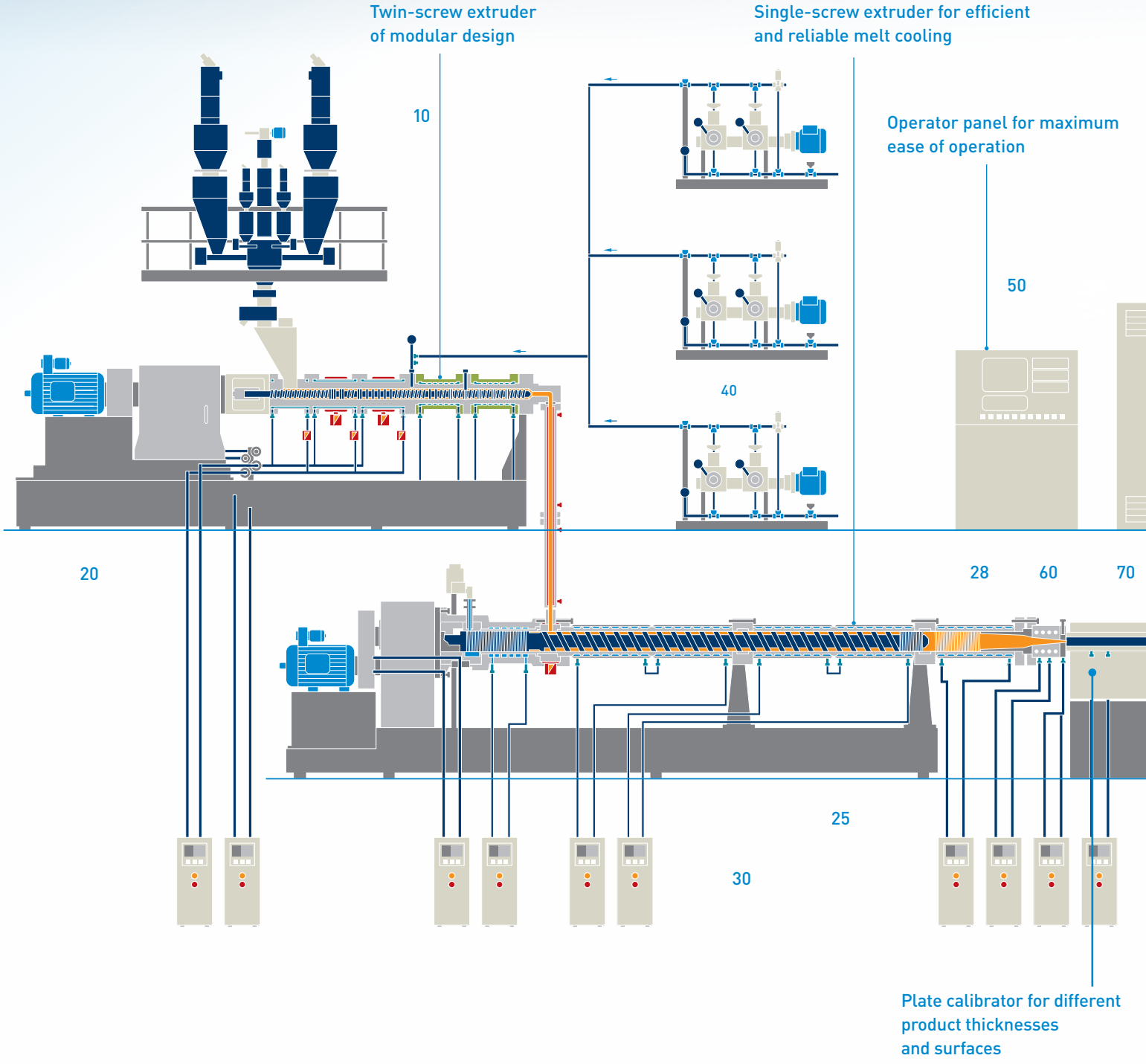
KraussMaffei has combined the different single process steps – i.e. metering, melting the plastics, blowing agent incorporation, foaming, cutting or stacking – to automatically controlled systems. The line concept features tailored solutions for any customer-specific application.

Foam insulation tubes made of PP, PE and PE/EVA have firmly established themselves in the field of heating, sanitary and air-conditioning systems. Foamed edge protections are widely used in the furniture industry. The same applies to expanded fun articles designed for swimming pools.

	Max. throughput capacity (kg/h)		**Expanded PE tubes and profiles:** tube insulation, edge protection profiles, fun articles	**Light PE foam:** impact sound insulation, packaging film	**Heavy PE foam:** cap seals for glass containers	**Expanded PS film and sheets:** food packaging containers, wall and ceiling insulation	**Expanded PP film and sheets:** automotive industry, food packagings
Machine size for film/sheets and tubes	**PE**	**PS**	**ISO-TUBE**	**ISO-PAC**			
Schaumex® 60	65	75					
Schaumex® 90	100	120	Density 25 g/l – 40 g/l Diameter 10 mm – 200 mm Blowing agent – butane	Density 20 g/l – 150 g/l Thickness 1.5 mm – 16 mm, Width max. 2,200 mm Blowing agent – butane	Density 250 g/l – 400 g/l Thickness 1 mm – 3 mm, Width approx. 1,000 mm Blowing agent CO_2	Density 60 g/l – 150 g/l Thickness 1.5 mm – 5.5 mm, Width max. 2,000 mm Blowing agent – butane	Density 50 g/l – 350 g/l Thickness 1.5 mm – 5 mm, Width approx. 1,500 mm Blowing agent – butane
Schaumex® 120	175	210					
Schaumex® 150	270	320					
Schaumtandex KE90/KE120	225	250					
Schaumtandex KE120/KE150	360	450					
Schaumtandex KE150/KE250	720	900					
Schaumtandex ZE50/KE120	225	250					
Schaumtandex ZE60/KE150	360	450					
Schaumtandex ZE75/KE250	720	900					

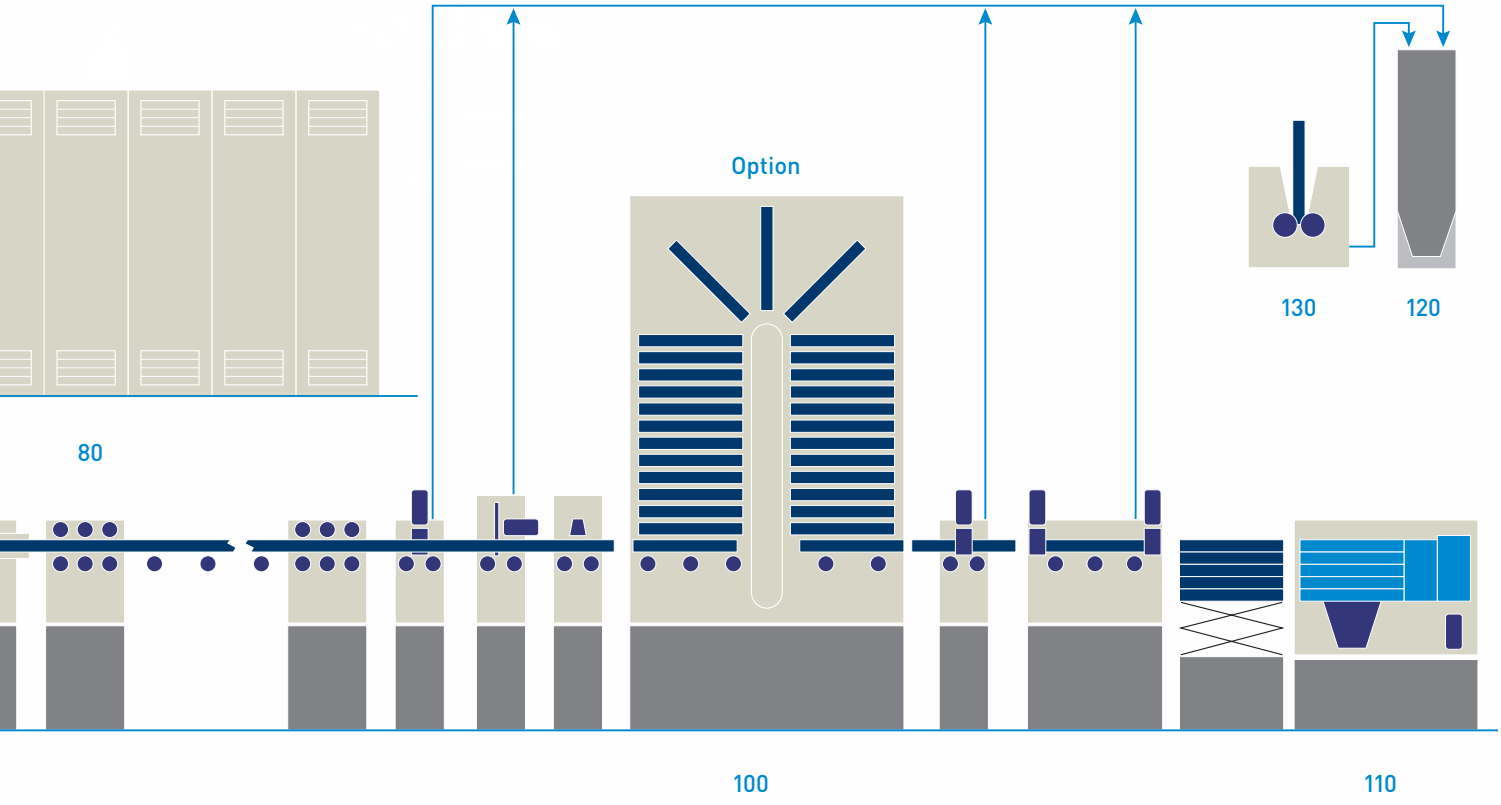
All product specifications may vary depending on machine size.

IMPRESSIVE ENCOUNTER:
TAKE A CLOSER LOOK AT A COMPLETE BOARD EXTRUSION LINE



The layout shows a ZE90/KE400 Schaumtandex line for an output rate of 800 kg/h composed of the following components:

10 Gravimetric metering system with suction conveyor
20 ZE75 x 30D extruder
25 KE400 x 30D extruder
28 Static mixer
30 Temperature control units (oil and water)
40 Blowing agent metering unit
50 Electrical control system
60 Slot die
70 Plate calibrator
80 Roller take-off unit
100 Board milling and stacking unit
110 Packaging system
120 Suction system with silo
130 Granulator



ISO-BOARD SCHAUMTANDEX LINES
PREMIUM TECHNOLOGY PROVIDES SUBSTANTIAL ADDED VALUE

ISO-Board Schaumtandex lines are the world's most successful systems for manufacturing XPS heat insulation boards. Amazing? Not really! KraussMaffei is well familiar with the challenging requirements that a Schaumtandex line must fulfill to create added value – both today and in the future!

ISO-BOARD Schaumtandex lines are the leading technology to enhance productivity and cost effectiveness in the production of XPS boards. In addition to the technical extruder layout, perfect coordination of the different line components is of decisive importance. Schaumtandex lines give excellent quality, uncompromising reliability and long durability.

We provide you with one-stop solutions – from the choice of the suitable equipment for your specific process task up to engineering and manufacturing tailored production lines, which ensures maximum safety. Thanks to our extensive know-how and longstanding experience, we are in a position to offer the expertise, technical competence, reliability and innovative capacity required for successful board production.

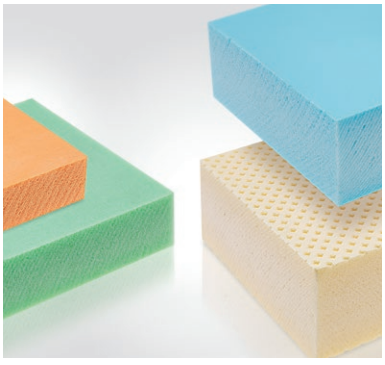
KraussMaffei develops all line components – from raw material handling, metering of individual formulation components, extrusion technology and board processing all the way to board packaging and storage – or designs the equipment in close cooperation with renowned suppliers. All ISO-BOARD Schaumtandex lines are suited for the use of eco-friendly blowing agents. Thanks to different line sizes, boards with a width ranging between 600 mm and 1,200 mm can be produced.

Parameter	Unit	Data
Board thickness	mm	30 – 200
Board width	mm	600 – 1,200
Density	kg/m³	30 – 45
Compressive strength	kPa	250 – 700
Thermal conductivity	W/mK	0.030 – 0.035

YOUR BENEFITS:

- **High productivity and efficiency**
- **Use of eco-friendly blowing agents**
- **Board thickness of up to 200 mm**

Plate calibrator of an ISO-BOARD Schaumtandex line



XPS insulating boards of different thicknesses

ZE/KE SCHAUMTANDEX LINES
THE DIRECT WAY TO SUCCESS – PROFITABLE SYMBIOSIS OF FLEXIBILITY AND PERFORMANCE

Innovative productivity enhancement based on a well-proven line concept – ZE/KE Schaumtandex lines combine the groundbreaking ZE twin-screw extruder technology with the efficient cooling properties of the KE single-screw extruder.

Throughput rates of up to 2,800 kg/h and the suitability for a wide range of different raw materials give enhanced productivity and uncompromising cost effectiveness. Versatile, highly productive and all-around profitable – the ZE/KE Schaumtandex sets new standards in physical foaming of plastics.

The technology concept of the ZE/KE Schaumtandex line with its unparalleled process flexibility is our future-oriented answer to ever-increasing market demands in terms of product quality. This line concept gives you the competitive edge to meet the most varied customer wishes. With its modular barrel and screw design, the ZE compounding extruder can be individually configured to process formulations with up to 8 different components.

Thanks to the specially designed single-screw extruder for melt cooling, the line achieves a consistently high product quality. Melting and cooling extruders are perfectly coordinated to optimize cooling effect and quality, even with maximum output rate, high blowing agent content or sophisticated formulations.

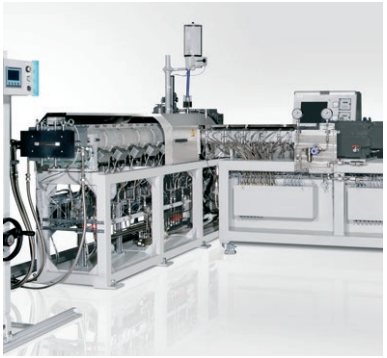
There is no line available on the market that achieves similar productivity! The highly effective cooling gives superior product quality.

As a pioneer in the field of eco-friendly plastics foaming, KraussMaffei developed a solution for the safe use of environmentally compatible blowing agents and the re-use of start-up scrap, edge trims and web scrap in the production process. This development substantially enhances environmental compatibility in physical foaming of plastics.

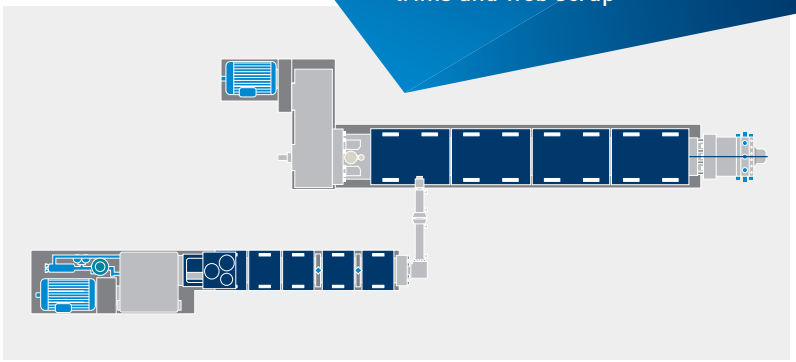
Depending on the specific requirements, ZE/KE Schaumtandex lines can be equipped with different dies – i.e. blown film die, four-die tube head or slot die. The result: tailor-made lines for maximum productivity!

YOUR BENEFITS:

- Unparalleled process flexibility
- Throughput rates of up to 2,800 kg/h
- Recycling of start-up scrap, edge trims and web scrap



Schaumtandex ZE30/KE60 ISO-BOARD



ZE/KE Schaumtandex lines: various formulation components and high blowing agent content for throughput rates of up to 2,800 kg/h

KE/KE SCHAUMTANDEX LINES
THE COST-EFFECTIVE SOLUTION FOR OUTPUT RATES OF UP TO 900 KG/H

Schaumtandex KE120/KE150 ISO-PAC

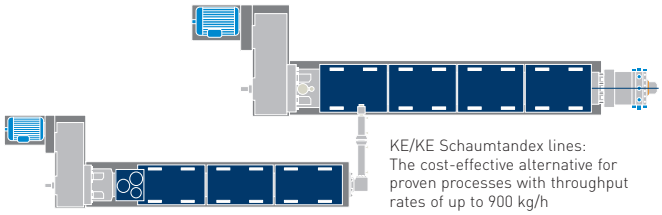
The KE/KE Schaumtandex line is the all-rounder for a wide variety of applications in physical foaming of plastics. It stands for high production reliability and maximum ease of operation at medium output rates of up to 900 kg/h. The advanced technology is suited for processing a broad spectrum of standard plastics.

Due to its special screw design, the single-screw extruder for plastics melting and mixing, which is unique in its class, provides for optimum melt homogeneity. Function and performance of the single-screw cooling extruder in this KraussMaffei line configuration are tailored to the specific application.

The result is a system that is easy to operate, offers proven technology at attractive conditions and contributes to success by means of efficient value creation. Thus plastics processors have the option of offering their customers a wide range of premium quality film, sheets, tubes or boards at the best prices.

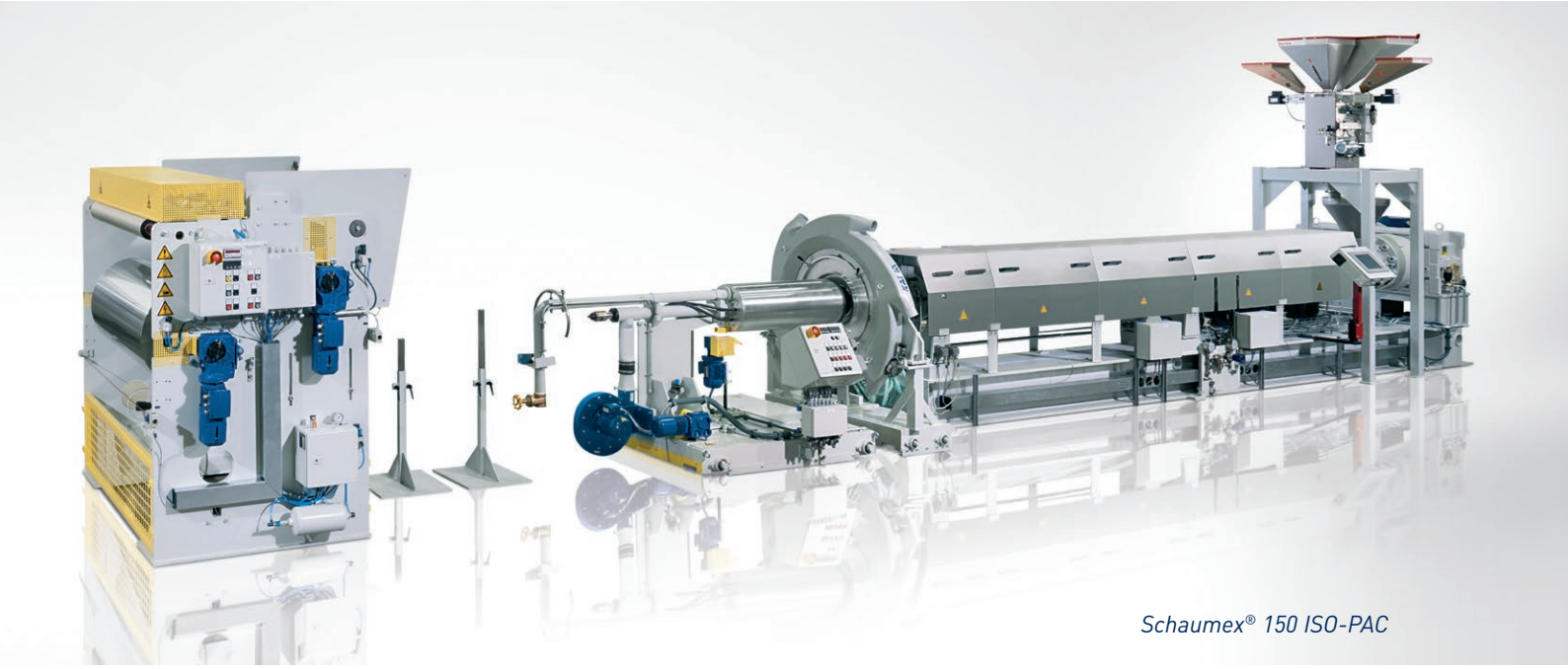
YOUR BENEFITS:

- Uncompromising production reliability
- Special screw geometries
- Easy operation



KE/KE Schaumtandex lines:
The cost-effective alternative for proven processes with throughput rates of up to 900 kg/h

SCHAUMEX® LINES
MAXIMUM PRODUCTIVITY COMBINED WITH MINIMUM SPACE REQUIREMENTS



Schaumex® 150 ISO-PAC

Schaumex® lines are the ideal solution for the production of high-quality foam products at output rates of up to 320 kg/h. The complete foaming process is performed in a single extruder – from polymer melting, blowing agent injection and incorporation up to melt cooling. Thanks to the compact design, the line needs only little space to develop its full potential. In addition, the high degree of automation ensures maximum ease of operation.

YOUR BENEFITS:

- High degree of automation
- Throughput rates of up to 320 kg/h
- Compact design

Schaumex® lines: Compact and sturdy machine design

KE COOLING EXTRUDER
ACTIVE MELT SEAL AND OPTIMIZED COOLING CAPACITY

Active melt seal

Schaumtandex extruders equipped with the patented active melt seal (ASD) set new standards of reliability for sealing the processing section at the gear box end. Sensitive foaming processes using liquid or gaseous blowing agents – sometimes in high concentrations – plus high system pressure call for constant operating conditions, which are ensured by the active melt seal.

Unparalleled cooling capacity

To ensure high melt quality, absolutely reliable temperature control is a must. This calls for efficient cooling of the melt in the extruder. With our barrel sections and "wet" liners we offer an optimum system that provides for high heat removal rates and maximum cost effectiveness.

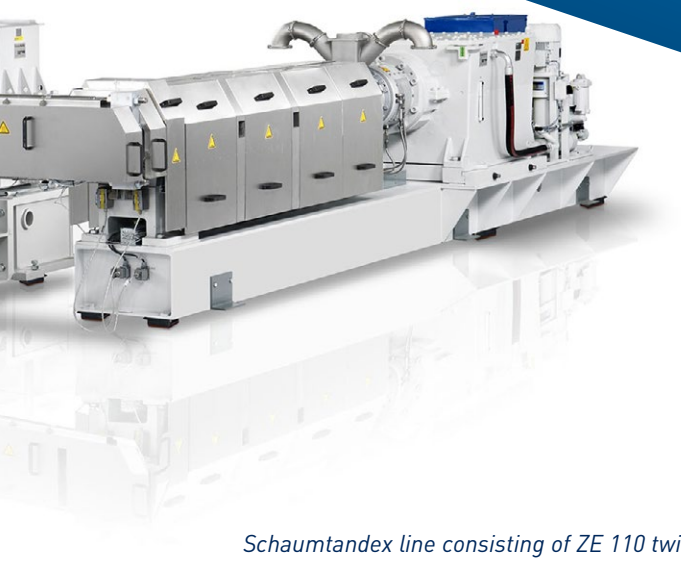
Cooling capacities of up to 110 kW/m^2 °K are achieved through the use of:
– pressurized water
– "wet" liners
– special screw profile

Cooling screw

Based on state-of-the-art calculation and simulation methods, the cooling screw design is tailored for specific cooling tasks. Thanks to the special screw geometry, high efficiency and perfect melt cooling are achieved at low drive power. This reduces the energy consumption by 30 to 40%.

As the screw features internal temperature control over the entire length, an extremely uniform melt cooling is ensured.

Active melt seal



Schaumtandex line consisting of ZE 110 twin-screw extruder and KE 500 cooling extruder

ZE TWIN-SCREW EXTRUDER
MODULAR DESIGN AND TAILORED PROCESSING SECTIONS

Modular design

ZE extruder screw elements and barrel sections are based on the building block principle. Thanks to different design and equipment, these components can be combined to an almost unlimited number of screw/barrel configurations and can thus be tailored to specific process requirements.

The right turn

Our range of screw elements comprises:

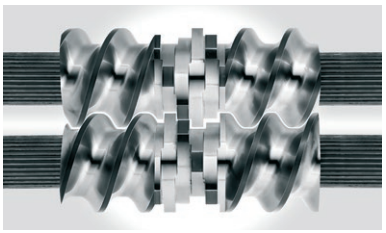
- Conveying elements in various lengths and pitches, multi-flighted, closely intermeshing with self-sealing profile or with flight edge profile and increased free screw volume
- Mixing elements in various lengths
- Kneading elements in various lengths and with kneading disks at various offset angles
- Blisters and returning elements

The optimum processing section

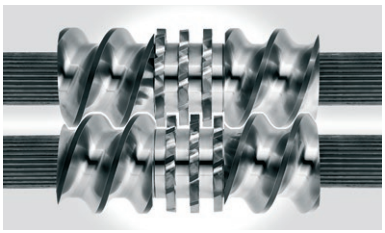
The processing section of our twin-screw extruder is configurable to match individual foaming processes. There are barrels in 4D and 6D lengths

- in open or closed design or
- designed as 4D side-feed barrels and 6D combined barrels.

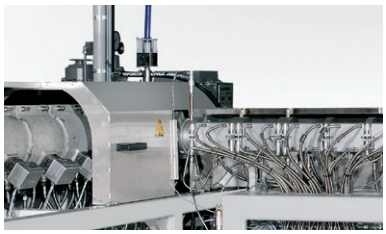
All barrels for foaming processes are gas-tight and can be fitted with spacer rings for injection of the blowing agent.



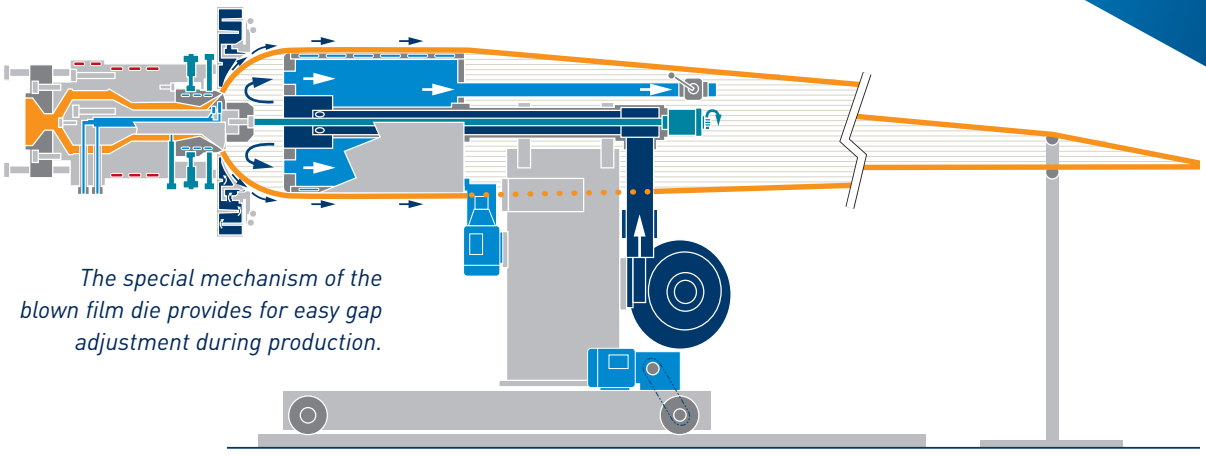
Kneading elements and kneading disks



Multi-spline shaft



Modular processing sections for maximum flexibility



The special mechanism of the blown film die provides for easy gap adjustment during production.

EXTRUDER DOWNSTREAM EQUIPMENT
SPECIAL DESIGN FOR OPTIMUM FILM, SHEET, TUBE OR PROFILE PRODUCTION

Customized ancillary equipment

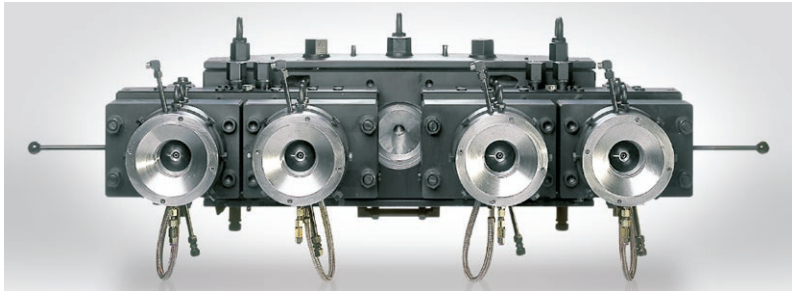
Our XE Schaumex® and Schaumtandex lines are complemented by ancillary equipment of tailor-made design that we either produce at our own facilities or subcontract to specialist suppliers.

Blown film die

Our blown film die provides high flexibility in the production of film with various thicknesses. A special mechanism allows the die gap to be easily adjusted during the production process. In addition, three independent oil units heat and cool the die, which gives extremely precise temperature control in the head up to the discharge from the die. This is particularly important for PP foam, since the processing parameters of PP are substantially limited as compared to other polymers.

Technical benefits of the ISO-Tube four-die head at a glance:

- Thanks to the reduced line speed at constant output rate, the cooling bath length can also be reduced.
- Die changes can be made without interrupting production, because the flow channels can be individually shut off using a directional valve.
- As die changes are simple and straightforward, the production of profiles and rods poses no problem.
- PP, PE and PE/EVA blends can also be extruded.
- The multiple-die heads boost productivity.



ISO-TUBE four-die head

Profile and rod production require a simple die change

Foam film calibrator

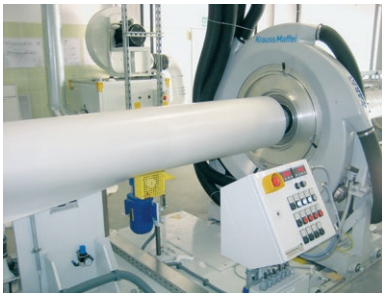
The motor-driven calibrators are designed for precise calibration and cooling of expanded sheets. The mandrel with fluid temperature control and the air cooling system are tailored to specific process requirements. The die gap can be adjusted during production. After the discharge from the dies, the foam hose is cut to a sheet using a circular knife. The calibrator is operated at the control panel arranged next to the system. To minimize downtimes, the calibrator is additionally equipped with a photoelectric scanner for tear-off monitoring.

Board calibrator

KraussMaffei board calibrators are designed for boards with a wide variety of thicknesses and surfaces. Using the infinitely adjustable preformer bars, the foam board thickness can be precisely adjusted during production.

Slot die

Slot dies are perfectly suited for Schaumtandex lines with high output rates of over 1,000 kg/h and board widths of up to 1,200 mm. The special flow channel geometry inside the die ensures even melt distribution over the entire width. The 4-zone oil temperature control system and additional cartridge heaters provide rapid and controlled heating or cooling of the slot die. Precise temperature control gives enhanced product quality and reduces the start-up time. An additional thermal insulation shell avoids external heat dissipation.



Foam sheet calibrator

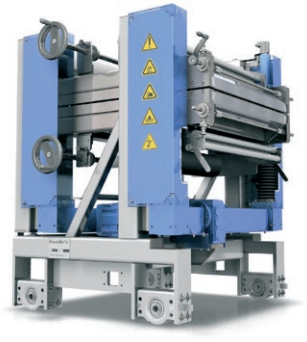


Plate calibrator

Customized slot die for board widths of up to 1,200 mm


Krauss Maffei

LABORATORY AND PILOT LINES
PROCESS OPTIMIZATION AND DEVELOPMENT OF NEW MATERIALS AND APPLICATIONS

The Schaumtandex lines are an excellent and unique machine combination for research institutes and R&D centers.

Designed for low output rates, the Schaumtandex line is suited for processing all standard plastics and a wide range of high-temperature plastics up to a maximum temperature of 350°C. The eco-friendly blowing agent is injected in liquid form through appropriate nozzles into the processing section of the twin-screw extruder and subsequently mixed in. Thanks to the extensive screw and barrel portfolio, the extruder can be retrofitted for new process applications at any time.

Various laboratory line configurations

Compounding extruders can be equipped with cooling extruders or static coolers designed for melt cooling.

- ZE 25 compounding extruder with static cooler
- ZE 30 compounding extruder with static cooler or with KE 60 cooling extruder
- ZE 40 compounding extruder with static cooler or with KE 90 cooling extruder

Reliable technology

In the standard version, the KE 60 single-screw extruder is equipped with the patent-registered "active melt seal" that prevents the blowing agent from leaking towards the gear unit. In the extruder, the melt provided with the blowing agent is cooled down to a temperature just above the solidification point.

The laboratory line is a downscaled version featuring all technical characteristics of a production line. All control and operating functions can be easily activated by simply pressing the corresponding button on the central touchscreen. The operating concept is clear and intuitive.

YOUR BENEFITS:

- Processing of all standard plastics
- Extensive screw and barrel portfolio
- Cooling extruder with "active melt seal"

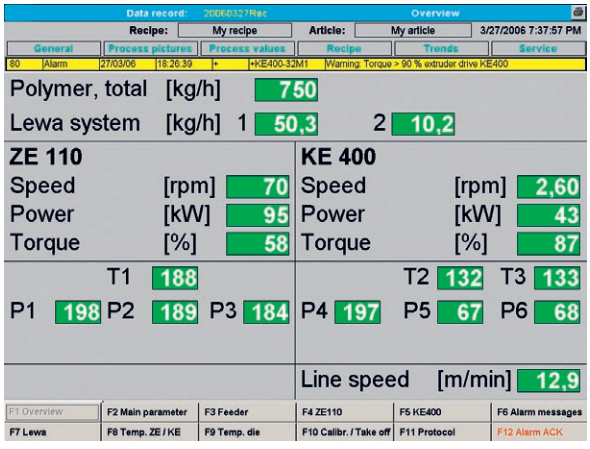
The entire laboratory-scale line is monitored and controlled from the central operator station.

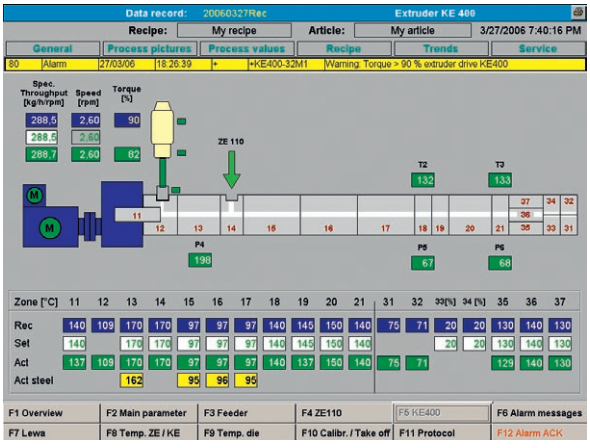
Operator panels for the most important functions are located directly at the line.

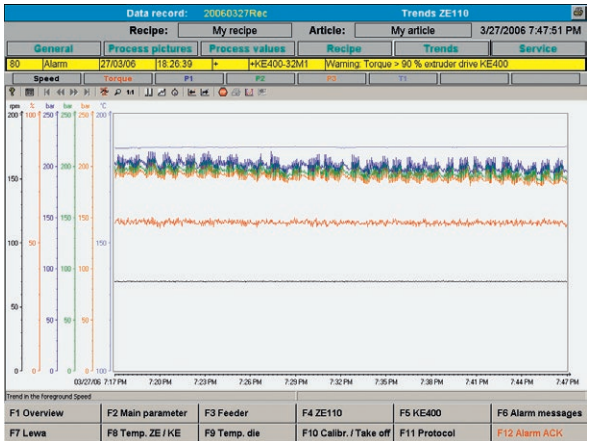
AUTOMATION AND CONTROL
MAXIMUM EASE OF OPERATION AND FLEXIBILITY

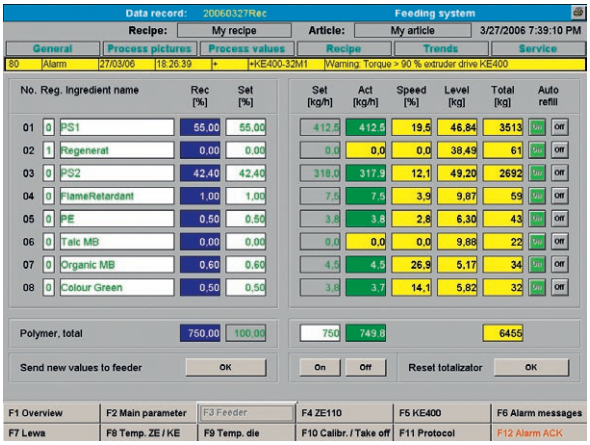
The process management systems employed by KraussMaffei are based on the Windows® operating system and provide the following features:

- Line visualization with fully graphical representation, input monitoring and data logging
- Long-term data filing system offering the possibility of external data storage (network, tape, CD-ROM,etc.)
- Trend display of recorded data in variable configuration
- Recipe management for all process data (upon request also in MS Access)
- Filing of fault and warning messages for subsequent fault visualization in the process images
- Full support of Windows® network functions
- Easy integration of standard software
- Optional production planning: several preset batches can be processed one after the other
- Optional computer coupling: recipe data, trend and production planning data can be converted and made available to other systems (network, control station), if required









The process management systems used are based on the Windows® operating system and provide a wide range of functions and additional options.

Well-structured central operator station

Practice-oriented control systems

The standard equipment comprises all control and visualization functions and features machine-specific flexible scaling:

– Process survey, large-scale display of key parameters
– Access via different authorization levels
– MDA (optional, on separate PC): Our Windows-based measuring data acquisition includes trend display, long-term data acquisition and recipe management.

PLC and process management system for unparalleled flexibility and ease of operation

Depending on process task and machine configuration, the control system is tailored to specific requirements. Only state-of-the-art PLC components are used for this purpose.

– Programming to IEC 1131-3
– Modular architecture
– Networking of peripheral equipment
– Coupling to the master control system
– Modem-based remote assistance

YOUR BENEFITS:

- **Maximum ease of operation**
- **Innovative and practice-oriented operator guidance**
- **Precise control**

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Schaumex® and Schaumtandex lines are the world's most successful systems to enhance productivity and cost effectiveness in foam extrusion. In addition to extrusion technology, process-engineering expertise and unparalleled plant engineering competence are crucial factors in the implementation of these solutions.

Premium quality and maximum reliability – to stand the test of time and to provide maximum business success, foam extrusion lines must meet the most challenging requirements. Based on the experience gathered with over several hundred Schaumex® and Schaumtandex lines delivered to customers all around the globe, KraussMaffei developed a concept that sets new standards in the production of foamed film, sheets, tubes, profiles and boards

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