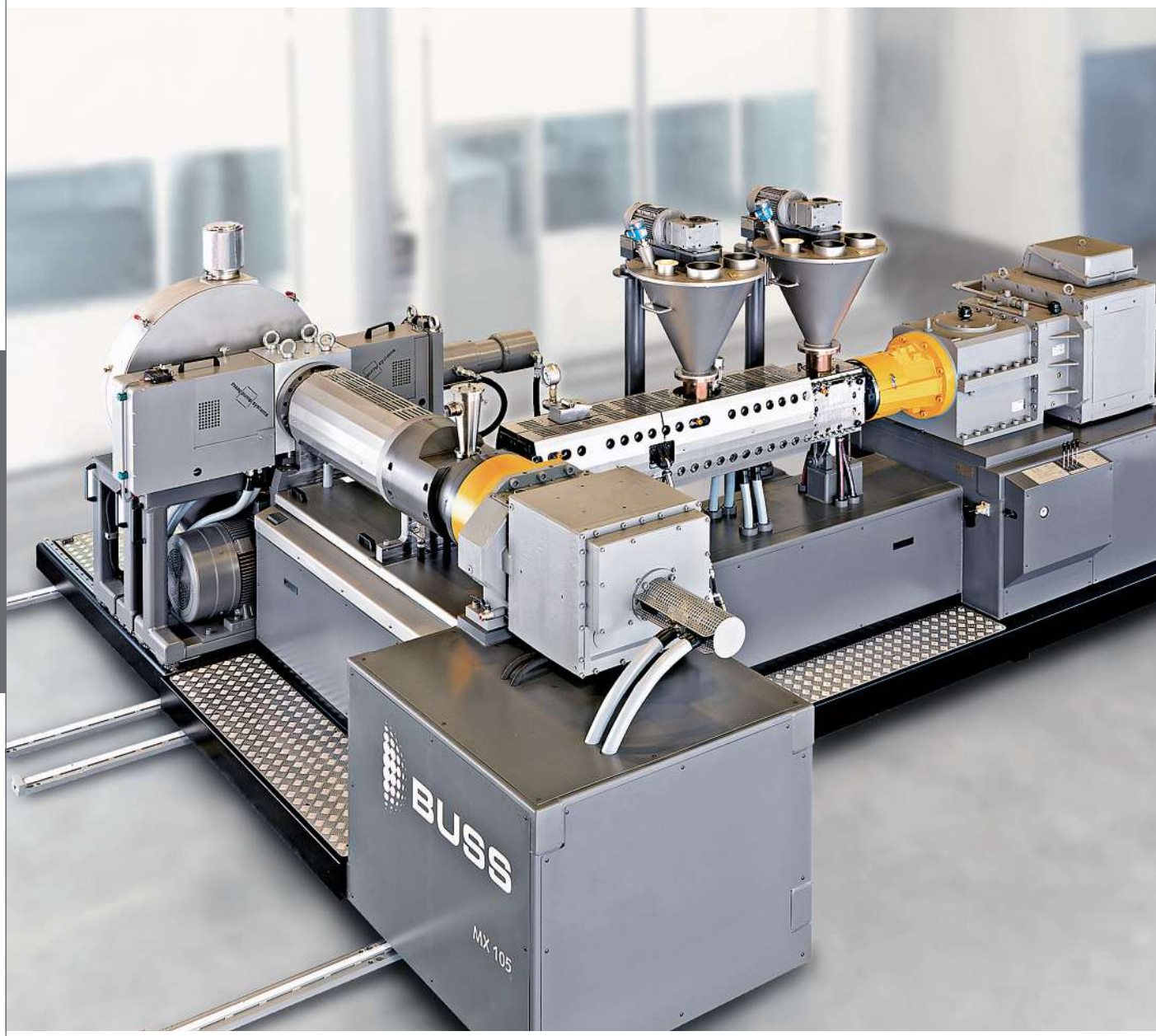
BUSS KNEADER TECHNOLOGY

BUSS Kneader Series MX

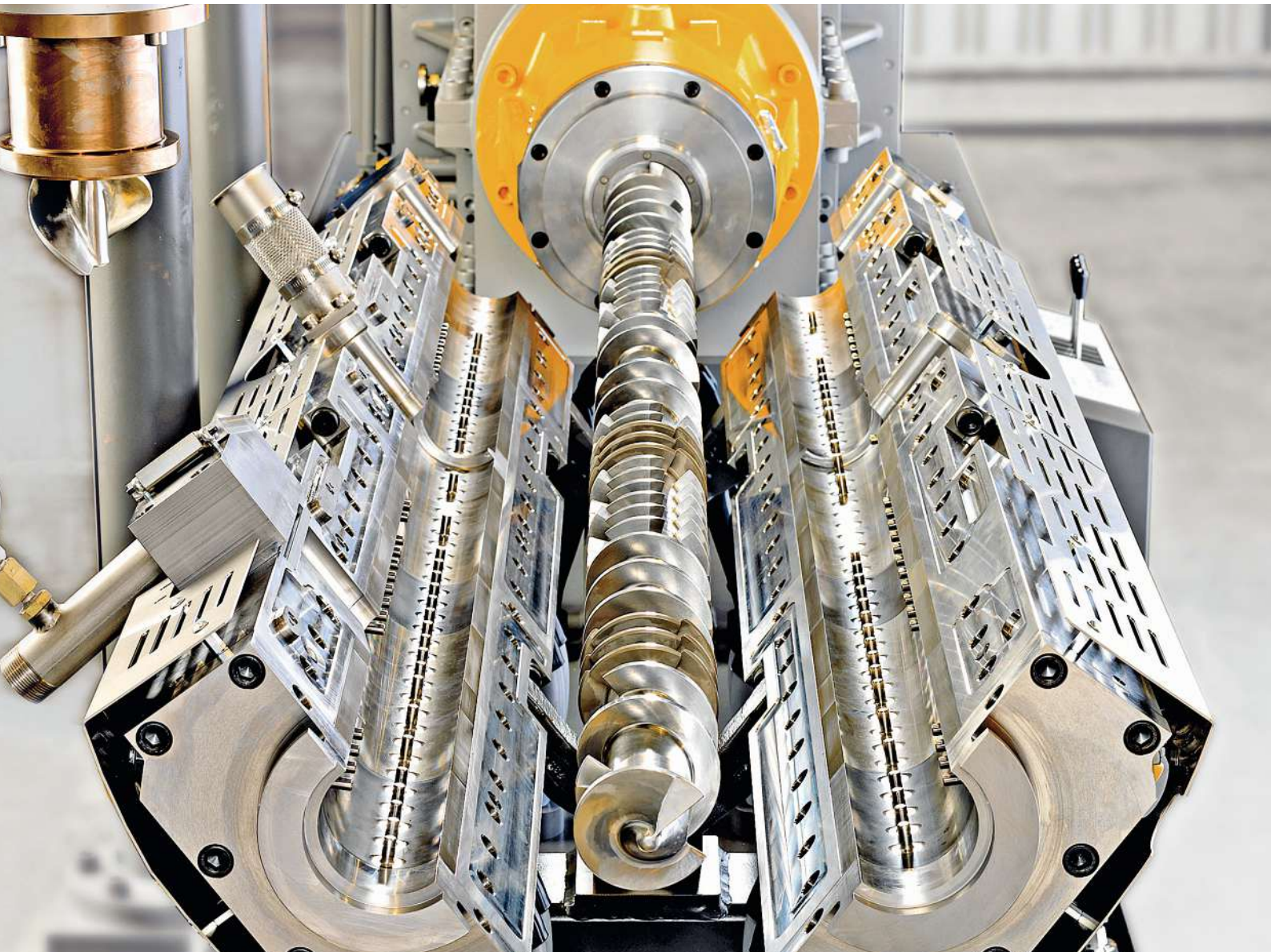
High-end compounding technology for high-grade cable compounds

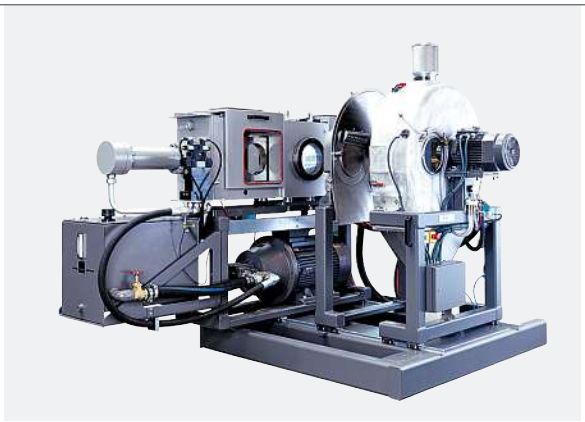


BUSS
excellence in compounding

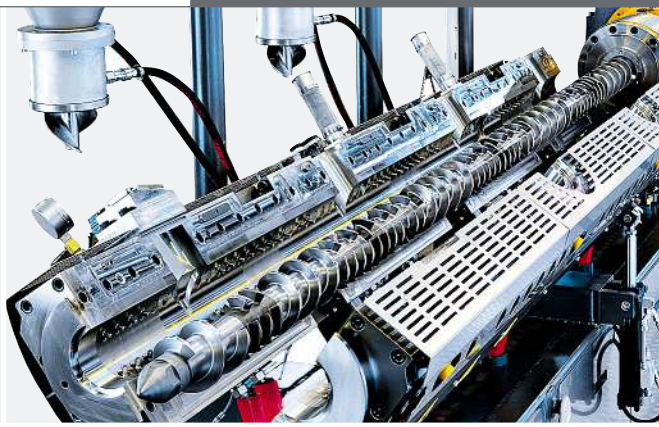
New MX Kneader generation revolutionizes high-grade cable compound processing

The new high-performance BUSS Kneader series MX represents an advanced version of the universally applicable MKS Kneaders. The innovative four-flight screw technology, already well proven in the **quan**tec® Kneader optimized for PVC compounding, has been further refined and implemented throughout the new series.





Modular EPX pelletizer with screen changer



MX process section

The MX Kneader generation was developed with a single target: to significantly improve high-grade compounding efficiency while at the same time enhancing product quality – for the benefit of BUSS customers. These goals have been fully reached, both from the process technology and cost-effectiveness points of view.

Throughput up to three times higher

By further refining and systematically implementing the well-proven four-flight screw technology, operating speeds up to 800 rpm are now possible without any significant temperature rise. The far greater throughput is largely due to the improved conveying stability of the MX screw elements, whose four flights overlap in individual zones.

Lower overall costs

The marked increase in throughput – without any size increase – reduces investment costs per rated capacity. Moreover the operating costs of an MX Kneader, one size smaller than a comparable BUSS Kneader of the previous generation, are lower, as are the maintenance costs. Furthermore, specific energy costs are about 15% less because of more efficient mixing, thanks to the new MX processing geometry.

Enhanced product quality

The ratio of outer to inner (root) diameter of the screw has been increased to give a larger processing chamber. Together with the optimized MX processing geometry, this intensifies the mixing effect and promotes the uniform dispersion of critical fillers, even at the highest throughputs. The result is a significant improvement in product quality and mechanical characteristics, even at the highest throughputs.

Volumetric scale-up

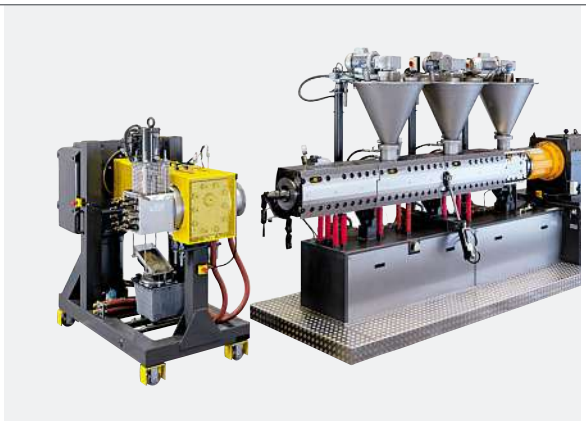
The conveying characteristics of the four-flight MX screw elements are extremely stable. This ensures a linear speed/throughput ratio that enables reliable volumetric scale-up.

Easy maintenance and fast product changes

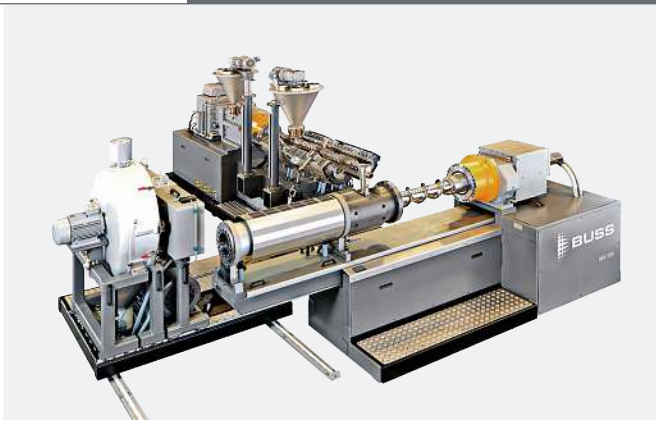
The discharge and pelletizing system of the MX Kneader is modular. All components can be linearly moved to provide optimal accessibility for rapid cleaning between frequent product changes. While the discharge screw is retractable by servomotor, the pelletizer and hood as well as any screen changer can be moved manually on two axes.

More ergonomic and user-friendly

The MX Kneader design incorporates the latest findings in ergonomics. For example: the user-friendly operating height, secure steps provided on the base frame and electro-hydraulic feed hopper actuation. Each individual half-housing can also be opened and closed electro-hydraulically. Particular attention has been paid to ergonomic layout of the temperature conditioning hoses, which in the MX series are completely integrated in the machine substructure.



MPX melt pump



Discharge extruder DSX

During MX Kneader development all modules were analyzed and systematically optimized for efficiency, economy and user-friendliness.

Raw materials feed

The ISX inlet screw with larger intake opening, optimized flight geometry and wiper blades ensures a uniform flow of material.

Processing section

In its standard version, the processing section of the MX Kneader has a length-to-diameter (L/D) ratio of 15:1 and a housing divided into three segments. For exceptional compounding requirements, the processing section length can be extended to 22 L/D.

The second feeding section is fitted with rearward venting to facilitate feeding of fillers with low bulk density.

The third zone of the Kneader processing section has a degassing dome for efficiently removing volatiles and moisture from the melt.

Patented processing section geometry

The innovative and well-proven four-flight technology has been significantly improved in MX Kneaders. This applies not only to the processing geometry but also to the application of free-form surface generation technology, which opens up completely new possibilities in screw element design (patented).

Modular discharge concept

To build up the pressure required for filtration and pelletizing, the melt is transferred to a discharge extruder or a gear pump, depending on the application.

Discharge extruder DSX

Melt is fed tangentially to the DSX discharge extruder, improving flow. Fluid temperature conditioning enables the individual conditioning of three independent temperature zones. The discharge extruder is designed for pressures up to 200 bar and protected by computer monitoring against excessive forces and pressures.

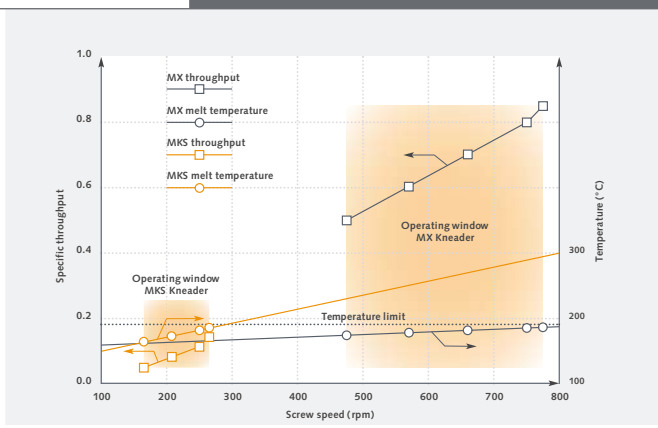
Eccentric air/water pelletizer EPX

Each component of the EPX pelletizer can be moved as necessary along two axes to enable optimal accessibility for cleaning and maintenance work.

The cutting rotor has been aerodynamically optimized. Noise is significantly reduced by the newly designed pelletizer hood in cast aluminium.

An automatic screen changer is optionally available. This fits seamlessly into the flexible MX concept and is hydraulically actuated.

Advanced four-flight geometry



Throughput/temperature diagram for HFFR compounds

A fundamentally new concept for the entire processing section provides the basis for the greatly improved performance and product quality of the MX Kneader series. Most decisive, however, is the transition to four-flight screw technology.

Larger processing chamber

The ratio D_o/D_i of outer to inner (root) diameter of the screw has been increased to give the MX Kneader a larger processing chamber. The ratio of stroke to outer diameter was also increased, permitting a higher screw pitch.

Four-flight screw

This enables considerably more freedom of design and optimization than with a three-flight screw. Flights with longer flanks improve the conveying characteristics and the flight geometry can be used to influence the mixing action in specific ways, both in terms of distributive and dispersive mixing.

Optimized processing zones

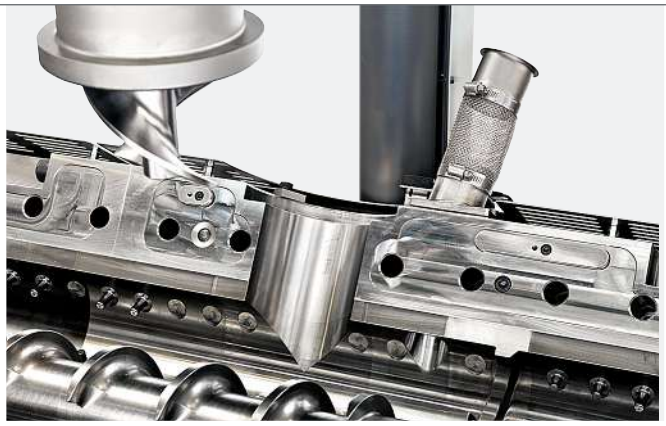
Within the processing section five functional regions can be identified. Each of these zones has been integrally evaluated and optimized using mathematical models, and confirmed by means of trials.

In this way, it was possible to lower the overall specific energy input – it is about 15% less in MX Kneaders than with the previous three-flight design – while simultaneously improving the mixing action.

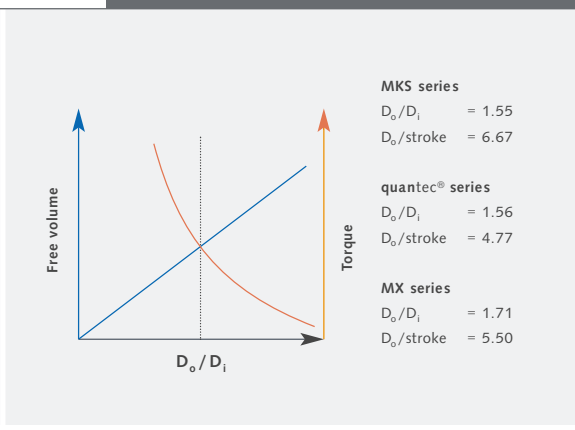
The improvements achieved with the new geometry of the MX processing section can be illustrated in a diagram showing the melt temperature and throughput versus the screw speed.

In the MX Kneader, the melt temperature increases with screw speed much more slowly (at about 3.5 K/100 rpm) than in the MKS Kneader (rate in excess of 20 K/100 rpm).

Only by gaining such complete control of the temperature rise in the processing section has it become possible to increase the operating speed of the MX Kneader to as high as 800 rpm, while simultaneously maintaining a temperature limit of e.g. 190°C when compounding halogen-free flame-retardant (HFFR) cable compounds.



Rearward venting



Optimally balanced torque and volume

All the necessary compounding steps are optimally implemented in the individual processing zones of the MX Kneader.

Polymers, additives and fillers infeed

The new feed module design enables all kinds of bulk solids to be fed in with enhanced precision. Liquid components are injected directly into the melt through a hollow kneading tooth.

Melting with dissipative energy input

The energy required for polymer melting is dissipated almost entirely by the screw as shear energy.

High fillers infeed

The new design of the second feed section, which is optimized for fillers, makes it possible for the air entrained during infeed of material to escape largely by rearward venting.

Mixing and conveying with minimal energy input

When the remaining fillers are added to the now molten material, the resultant cooling of the melt contributes significantly to keeping the stock temperature in MX Kneaders very low. The four-flight MX mixing elements also contribute thereto, by efficiently homogenizing the melt without any unnecessary energy input.

For particularly critical compounding requirements, a second mixing and homogenizing zone can be added.

Degassing and transfer to a high-efficiency pressurizing module

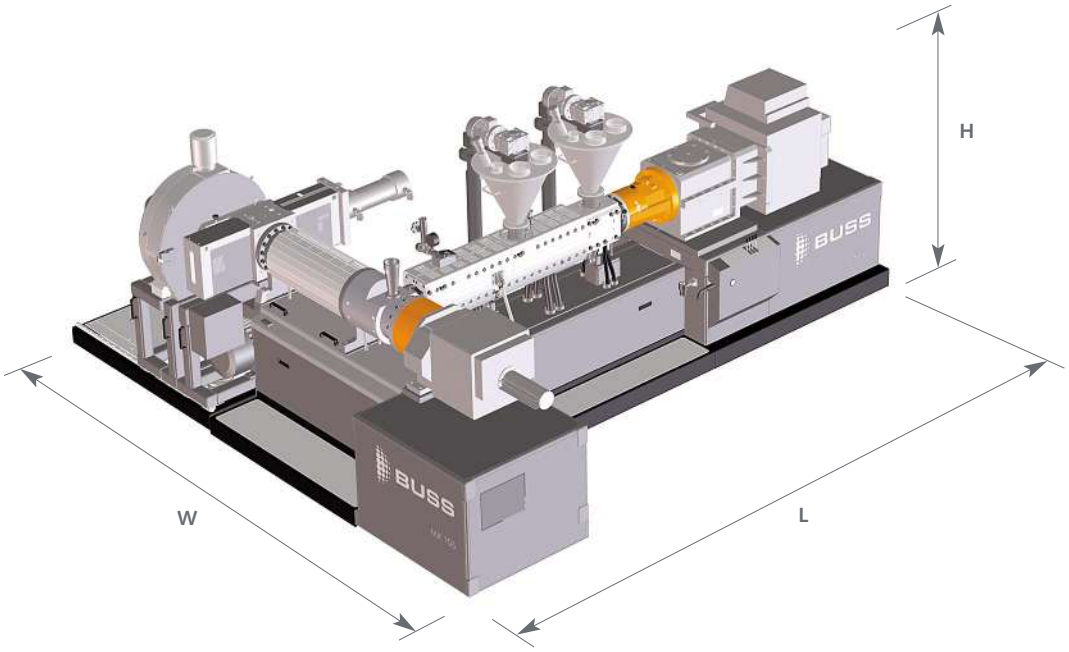
The final zone of the Kneader processing section has a degassing port for dependably removing volatiles and moisture from the melt before it is transferred to the pressurizing module.

Pressure build-up for filtration and pelletizing

A single-flight discharge screw or a gear pump, flange-mounted directly to the MX Kneader, efficiently builds up the pressure required for melt filtration and pelletizing. The discharge screw is equipped with an additional venting/degassing port.

The systematic two-stage arrangement of BUSS Kneader systems enables independent optimization of the processing and pressurizing sections. This ensures flexible adaptation to customized requirements.

Air/water or underwater pelletizing systems are available, according to requirements.



Technical data

	BUSS Kneader				Discharge extruder		Overall dimensions		
	Screw diameter mm	Process length L/D	Max. speed rpm	Max. drive power kw	Screw diameter mm	Process length L/D	Length L mm	Width W mm	Height H mm
MX 30	30	22	800	11	40	6	2200	1050	1600
MX 58	58	15 or 22	800	70	110	6	4600	3600	1700
MX 85	85	15 or 22	800	230	140	6	5200	4000	2000
MX 105	105	15 or 22	750	350	200	6	7700	5100	2200
MX 125	125	15 or 22	750	630	250	6	8900	6700	2500
MX 140	140	15 or 22	750	980	280	6	9500	8400	2600

Output, kg/h

	HFFR	Semiconductives	Sioplas	Black-jacketing	Masterbatches
MX 30	5 – 25	5 – 25	5 – 25	5 – 25	5 – 25
MX 58	180 – 250	180 – 250	180 – 250	250 – 350	250 – 350
MX 85	550 – 750	600 – 750	600 – 750	700 – 950	700 – 950
MX 105	1000 – 1400	1000 – 1400	1100 – 1500	1300 – 1900	1300 – 1900
MX 125	1800 – 2500	1800 – 2500	1800 – 2600	2200 – 3200	2200 – 3200
MX 140	2500 – 3500	2500 – 3500	2500 – 3600	3200 – 4500	3200 – 4500

Typical configurations

	Inlet screws	BUSS Kneader 15 L/D	BUSS Kneader 22 L/D	Discharge extruder 6 L/D	Discharge extruder 8 L/D	Melt pump	Screen changer	Air/water pelletizer	Underwater pelletizer
HFFR	2	•	–	•	(•)	–	(•)	•	–
Semiconductives	2 (3)	•	(•)	–	–	•	(•)	–	•
Sioplas	1	•	–	–	–	•	(•)	–	•
Black-jacketing	2	•	–	–	–	•	–	–	•
Masterbatch	2 (3)	•	(•)	–	–	•	(•)	–	•

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