BUSS Kneader Series MX
High-end compounding technology for high-grade cable compounds
The MX Kneader generation revolutionizes high-grade cable compound processing

The proven 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 quantec® Kneader optimized for PVC compounding, has been further refined and implemented throughout the new series.

MX 105 process section
Modular EPX pelletizer with screen changer

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 pelleting 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 pelleting 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.
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.
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.
Rearward venting Optimally balanced torque and volume

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

<table>
<thead>
<tr>
<th>BUSS Kneader</th>
<th>Discharge extruder</th>
<th>Overall dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Screw diameter mm</strong></td>
<td><strong>Process length L/D</strong></td>
<td><strong>Max. speed rpm</strong></td>
</tr>
<tr>
<td><strong>MX 30</strong></td>
<td>30</td>
<td>22</td>
</tr>
<tr>
<td><strong>MX 85</strong></td>
<td>85</td>
<td>15 or 22</td>
</tr>
<tr>
<td><strong>MX 105</strong></td>
<td>105</td>
<td>15 or 22</td>
</tr>
<tr>
<td><strong>MX 125</strong></td>
<td>125</td>
<td>15 or 22</td>
</tr>
<tr>
<td><strong>MX 140</strong></td>
<td>140</td>
<td>15 or 22</td>
</tr>
</tbody>
</table>

### Output, kg/h

<table>
<thead>
<tr>
<th>HFFR</th>
<th>Semiconductives</th>
<th>Sioplas</th>
<th>Black-jacketing</th>
<th>Masterbatches</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MX 30</strong></td>
<td>5 – 25</td>
<td>5 – 25</td>
<td>5 – 25</td>
<td>5 – 25</td>
</tr>
<tr>
<td><strong>MX 85</strong></td>
<td>550 – 750</td>
<td>600 – 750</td>
<td>600 – 750</td>
<td>700 – 950</td>
</tr>
<tr>
<td><strong>MX 105</strong></td>
<td>1000 – 1400</td>
<td>1000 – 1400</td>
<td>1100 – 1500</td>
<td>1300 – 1900</td>
</tr>
<tr>
<td><strong>MX 125</strong></td>
<td>1800 – 2500</td>
<td>1800 – 2500</td>
<td>1800 – 2600</td>
<td>2200 – 3200</td>
</tr>
<tr>
<td><strong>MX 140</strong></td>
<td>2500 – 3500</td>
<td>2500 – 3500</td>
<td>2500 – 3600</td>
<td>3200 – 4500</td>
</tr>
</tbody>
</table>

### Typical configurations

<table>
<thead>
<tr>
<th>Inlet screws</th>
<th>BUSS Kneader 15 L/D</th>
<th>Discharge extruder</th>
<th>Melt pump</th>
<th>Screen changer</th>
<th>Air/water pelletizer</th>
<th>Underwater pelletizer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HFFR</strong></td>
<td>2</td>
<td>•</td>
<td>–</td>
<td>–</td>
<td>(+)</td>
<td>–</td>
</tr>
<tr>
<td><strong>Semiconductives</strong></td>
<td>2 (3)</td>
<td>•</td>
<td>–</td>
<td>–</td>
<td>(+)</td>
<td>–</td>
</tr>
<tr>
<td><strong>Sioplas</strong></td>
<td>1</td>
<td>•</td>
<td>–</td>
<td>–</td>
<td>(+)</td>
<td>–</td>
</tr>
<tr>
<td><strong>Black-jacketing</strong></td>
<td>2</td>
<td>•</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td><strong>Masterbatch</strong></td>
<td>2 (3)</td>
<td>•</td>
<td>(+)</td>
<td>–</td>
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