CORRUGATOR BELTS

Custom solutions for smooth operation of your production processes
Mühlen Sohn corrugator belts are specially developed for use in the heating and tracking section of corrugators. Their four tasks are smooth transport, straight running characteristics, pressure and contact with the heating plates and best possible drying of the corrugated board.

The belts are exposed to considerable stress in the form of temperature, ballast system pressure, friction, tension and moisture. Mühlen Sohn corrugator belts consist of high-tensile, heat and abrasion-resistant fibers that give the belts excellent pulling and transport characteristics. This guarantees safety and reliability during your production process.

Mühlen Sohn corrugator belts are universally applicable – on all machine types known to us worldwide! They are used particularly successfully on modern high-performance corrugators. Moreover, our corrugator belts were developed specially for machines with balast rolls, air hoods or surface pressure loading systems. No matter what your production requires – Mühlen Sohn offers the suitable product for every application.

**YOUR ADVANTAGES DURING THE CORRUGATED BOARD PRODUCTION PROCESS**

- Insensitivity to external influences
- Enhanced moisture regulation thanks to high moisture absorption and moisture evaporation capability due to the use of hygroscopic fibers
- High coefficient of friction = excellent board pull
- Better and evenly spread bonding of the corrugated board
- Good straight running characteristics
- Good running smoothness – less noise
- Universal application options
- Reparable in case of damage
- Less edge trimming
- Higher speeds
- For every product mix
- Up to 50 % less waste
Our customers can always rely on Mühlen Sohn’s quality management. We own a comprehensive quality management system in all company divisions and were certified according to the internationally recognized ISO 9001:2015 quality standard since 1995. Mühlen Sohn – this is quality with a seal of approval.

We use exclusively high-grade materials in accordance with the DIN 60910 standard, which we import from all renowned quality manufacturers worldwide in addition to the domestic market. The raw materials always undergo an incoming inspection, directly followed by a quality inspection. All tests are performed using the latest measuring equipment.

Mühlen Sohn was founded in 1880, and our benefit is many years of experience. Our machinery is among the most modern in the world, and it is operated exclusively by qualified staff with long professional experience. Continuity in our production is one of our objectives. Our unique weaving process, continuous monitoring and documentation of our production and periodic quality checks assure the high quality of our products.

Many further developments and patented inventions from our company contributed to make us the market leader. Ongoing innovations secure this position. Accompany Mühlen Sohn into a successful future.

TRADITION, INNOVATION & QUALITY

MÜHLEN SOHN – SINCE 1880

Founded in 1880, Mühlen Sohn has been making technical advances in product development for well over a century. Today we develop, produce and sell high-quality heavy-duty fabrics for technically demanding applications. We see ourselves primarily as a manufacturer but also as a skilled and innovative development and service (OEM) partner in mechanical and plant engineering. Our combination of tradition and innovation is the key to our success. We have been bringing new momentum to our sector ever since the company was first established. In today’s highly competitive mechanical and plant engineering market this makes us not only a constant presence but synonymous with quality and technology leadership.
CUSTOMER-FOCUSED PRODUCTION & EXCELLENT SERVICE

As the technological market leader for corrugator belts and fluidizing fabrics, Mühlen Sohn stands not only for innovative products of the highest quality. Our flexibility in development and production allows us to expand the existing product range by special products according to customer requirements.

In addition to ongoing further development and enhancement of our product range in our in-house research and development department, tailored solutions to suit your needs are the focus of our work. We believe in constant dialog, and close cooperation. Our customers’ requirements are also always incorporated into the development of our products. Furthermore, we are the technological partner of all important machine manufacturers.

Our representatives in more than 100 countries worldwide – and our branches in the USA and China – ensure direct contact with you.

Customer-focused performance is incidentally one of our most important corporate principles – from the very beginning. From the initial contact to comprehensive after-sales service. A short response time, 24-hour service and multilingual employees at the branches are a matter of course for Mühlen Sohn.

Our many years of activity in the corrugated board sector also allow us to support our customers with advice. For example, we can provide valuable assistance in case of quality problems in production and use our expertise to support customers in the ideal design of the heat and traction sections.

CORRUGATOR BELTS – TO YOUR ADVANTAGE

- Maximum quality
- High durability
- Optimal moisture regulation
- Maximum flexibility
- Customer-specific solutions
- Worldwide availability
- Accessories
- Expert consultation
SERVICE HOTLINE: +49 175 2909 745

24 hours a day, 365 days a year – you can always reach us, and a fast reaction time is guaranteed.

Localized organization of service engineers ensures that we react to customer queries and send engineers within the shortest time.
PRODUCT RANGE

BELTS FOR UNIVERSAL USAGE

AQUA PULL S
- Bottom Belt
- Universal usage
- Suitable for all pressure systems
- Especially developed for double backers

Advantages
- Excellent moisture management
- Optimal board transport
- Long lifetime

AQUA PULL AE
- Top Belt
- Universal usage
- Special hybrid aramid edges - combination of moisture management and heat as well as abrasion resistance at the edges

Advantages
- Excellent moisture management and evenly bonding over the entire belt width, also at the edges
- Extreme long lifetime due to special hybrid aramid edges

BELTS FOR HIGH SPEED CORRUGATORS

AQUA ULTRA AE
- Top belt
- Particularly for high speed corrugating machines (maximum speed possible)
- Especially recommended for fine and micro flutes
- Open weaving structure for steam evaporation
- In-woven armoured edges for more robustness

Advantages
- Used to increase productivity (higher speed)
- Excellent moisture management also with high speeds
- Higher temperature and abrasion resistance at the edges
- Extreme long lifetime due to aramid edges

AQUA RUN AE
- Top belt
- For highest production speeds
- Especially recommended for heavy boards, double and triple wall, but also suitable for fine and micro flutes
- Open weaving structure for steam evaporation
- In-woven armoured edges for more robustness

Advantages
- Used to increase productivity (higher speed)
- Excellent moisture management also with high speeds
- Higher temperature and abrasion resistance at the edges
- Extreme long lifetime due to aramid edges
COATED BELTS FOR HIGH PAPER TRACTION

MAX PULL S
- Bottom Belt
- Also for the use in semibeltless systems as bottom and top belt
- With a high-grip traction layer of silicone on the paper side
- Particularly for heavy or smooth boards and rough paper surfaces

Advantages
- Safe and slip-free transport due to silicone coating
  (high coefficient of friction of the belt surface)
- Uniform and evenly spread bonding of the corrugated board
  over the complete belt width

MAX PULL Antistatic*
- Bottom Belt
- Also for the use in semibeltless systems as bottom and top belt
- With a high-grip traction layer of silicone on the paper side
- Safe discharge of electrostatic charges over the entire
  lifetime of the belt
- Especially developed combination of antistatic yarns

Advantages
- Increased work safety – no flying sparks
- Safe and slip-free transport due to silicone coating
- Reduced waste – no adhesion of the board

BELTS FOR DISCHARGING ELECTROSTATIC CHARGES

AQUA PULL Antistatic
- Bottom Belt
- Generally suitable for all pressure systems
  (including pressure systems with weight rollers)
- Safe discharge of electrostatic charges over the entire
  lifetime of the belt
- Especially developed combination of antistatic yarns

Advantages
- Increased work safety – no flying sparks
- Reduced waste – no adhesion of the board
- Reduced use of resources – no need for additional components

MAX PULL Antistatic*
- Bottom Belt
- Also for the use in semibeltless systems as bottom and top belt
- With a high-grip traction layer of silicone on the paper side
- Safe discharge of electrostatic charges over the entire
  lifetime of the belt
- Especially developed combination of antistatic yarns

Advantages
- Increased work safety – no flying sparks
- Safe and slip-free transport due to silicone coating
- Reduced waste – no adhesion of the board
- Reduced use of resources – no need for additional components

* MAX PULL Antistatic is a coated belt as well as an antistatic belt.
PRODUCT OVERVIEW & TECHNICAL FEATURES

<table>
<thead>
<tr>
<th>Product name</th>
<th>Material</th>
<th>Thickness</th>
<th>Temperature resistance</th>
<th>Width</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>approx.</strong></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>a), b), c)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>a) Continuous load</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>b) Brief load</td>
<td></td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>c) Melting point / decomposition point</td>
<td></td>
</tr>
</tbody>
</table>

### ALLROUNDER BELTS

<table>
<thead>
<tr>
<th>Product name</th>
<th>Material</th>
<th>Thickness</th>
<th>Temperature resistance</th>
<th>Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>AQUA PULL S</td>
<td>100 % synthetic</td>
<td>8.5 mm</td>
<td>a) up to 150 °C</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>b) 200 °C</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>c) 254 °C</td>
<td></td>
</tr>
<tr>
<td>AQUA PULL S</td>
<td>100 % synthetic</td>
<td>10 mm</td>
<td>a) up to 150 °C(250 °C)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>b) 200 °C(350 °C)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>c) 254 °C(450 °C)</td>
<td></td>
</tr>
<tr>
<td>AQUA PULL AE</td>
<td>100 % synthetic, aramid</td>
<td>8.5 mm</td>
<td>a) up to 150 °C(250 °C)</td>
<td>1,800 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>b) 200 °C(350 °C)</td>
<td>3,500 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>c) 254 °C(450 °C)</td>
<td></td>
</tr>
<tr>
<td>AQUA PULL AE</td>
<td>100 % synthetic, aramid</td>
<td>10 mm</td>
<td>a) up to 150 °C(250 °C)</td>
<td>1,800 mm</td>
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<tr>
<td></td>
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<td></td>
<td>b) 200 °C(350 °C)</td>
<td>3,500 mm</td>
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<td></td>
<td></td>
<td></td>
<td>c) 254 °C(450 °C)</td>
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</tbody>
</table>

### BELTS FOR HIGH SPEED CORRUGATORS

<table>
<thead>
<tr>
<th>Product name</th>
<th>Material</th>
<th>Thickness</th>
<th>Temperature resistance</th>
<th>Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>AQUA ULTRA AE</td>
<td>100 % synthetic, aramid</td>
<td>7 mm</td>
<td>a) up to 150 °C(250 °C)</td>
<td>1,800 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>b) 200 °C(350 °C)</td>
<td>3,500 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>c) 254 °C(450 °C)</td>
<td></td>
</tr>
<tr>
<td>AQUA RUN AE</td>
<td>100 % synthetic, aramid</td>
<td>8 mm</td>
<td>a) up to 150 °C(250 °C)</td>
<td>1,800 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>b) 200 °C(350 °C)</td>
<td>3,500 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>c) 254 °C(450 °C)</td>
<td></td>
</tr>
</tbody>
</table>

### COATED BELTS FOR HIGH PAPER TRACTION

<table>
<thead>
<tr>
<th>Product name</th>
<th>Material</th>
<th>Thickness</th>
<th>Temperature resistance</th>
<th>Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAX PULL S</td>
<td>100 % synthetic, silicone</td>
<td>9.3 mm</td>
<td>a) up to 150 °C</td>
<td>1,800 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>b) 200 °C</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>c) 254 °C</td>
<td></td>
</tr>
<tr>
<td>MAX PULL Antistatic</td>
<td>100 % synthetic, antistatic yarns</td>
<td>8 mm</td>
<td>a) up to 150 °C</td>
<td>1,800 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>b) 200 °C</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>c) 254 °C</td>
<td></td>
</tr>
</tbody>
</table>

### BELTS FOR DISCHARGING ELECTROSTATIC CHARGES

<table>
<thead>
<tr>
<th>Product name</th>
<th>Material</th>
<th>Thickness</th>
<th>Temperature resistance</th>
<th>Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>AQUA PULL Antistatic</td>
<td>100 % synthetic, antistatic yarns</td>
<td>8 mm</td>
<td>a) up to 150 °C</td>
<td>1,800 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>b) 200 °C</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>c) 254 °C</td>
<td></td>
</tr>
<tr>
<td>MAX PULL Antistatic</td>
<td>100 % synthetic, silicone, antistatic yarns</td>
<td>8 mm</td>
<td>a) up to 150 °C</td>
<td>1,800 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>b) 200 °C</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>c) 254 °C</td>
<td></td>
</tr>
</tbody>
</table>

1 Based on DIN EN ISO 5084. For tolerances and more technical data, please see data sheet.
2 In dry heat conditions.
3 Up to max. 1% shrinkage - from experience 0.5%.
4 Less than 1,800 mm on request.
5 Edge reinforcement of aramid.
6 MAX PULL Antistatic is a coated belt as well as an antistatic belt.
**DRUM LAGGING, ARAMID REINFORCEMENT & BELT LACING**

**SUPER GRIP DRUM LAGGING**
Thickness: 8 mm  
Consists of high-tenacity PES fabrics with silicone coating on the top and rubber coating on the bottom. High temperature resistance (260 °C) and high coefficient of friction, good chemical resistance.

**SUPER WRAP LAG DRUM LAGGING**
Thickness: 7.3 mm  
Consists of high-tenacity PES fabrics with silicone coating on the top and a self-adhesive layer on the bottom. High temperature resistance (260 °C) and high coefficient of friction, good chemical resistance.

**HOT JAW LACING with flocking**  
Patented lacing method with flocking for marking-free production.
- No contact of the hooks with the corrugated board, heating plates or pressure loading system thanks to special press-in technique
- Flocking protects the corrugated board from marks or blistering
- No weakening of the fabric, because no cutting is required
- Smooth pass-through of all rolls
- Less noise emission
- Adequate breathability
- High durable and repairable in the field
- Suitable for all pressure loading systems and corrugators

**IN-WOVEN ARMoured EDGES**
- In-woven armoured edges for more robustness and a longer lifetime
- Higher temperature and abrasion resistance at the edges
- For production with  
  - frequently changing paper widths  
  - many order changes  
  - high temperature of heating plates
TEST RESULTS – ABRASION TEST

The abrasion test is a measure of the abrasion resistance and thus for the service life of materials. Mühlen Sohn corrugator belts possess a verifiably higher life time under identical production conditions.

Implementation conditions:
Textile abrasion testing in accordance with DIN 53863 using the “FRANK” abrasion tester type 666.

<table>
<thead>
<tr>
<th>Load</th>
<th>1.0 kp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abrasion agent</td>
<td>“FRANK” abrasion paper, grain size 280</td>
</tr>
<tr>
<td>Number of rubs</td>
<td>10,000</td>
</tr>
</tbody>
</table>

4.7% AQUA PULL AE with inwoven edge protection

6.7% AQUA PULL S

17.0% NEEDLED FELT

The AQUA PULL S has triple the abrasion resistance of needled felt materials.

LIFE EXPECTANCY OF THE CORRUGATOR BELTS

Ø life expectancy identified in practice.
MOISTURE/VAPOR ABSORPTION AND RELEASE

Evaluation of the moisture absorption and release capacity of various belt media under the following assumed production conditions:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top-belt length</td>
<td>39.00 m</td>
</tr>
<tr>
<td>Top-belt width</td>
<td>2,500 mm</td>
</tr>
<tr>
<td>Belt surface</td>
<td>97.5 m²</td>
</tr>
<tr>
<td>Ø production speed</td>
<td>~ 250 m/min</td>
</tr>
<tr>
<td>Shifts/production time</td>
<td>2 shifts = 16 hours</td>
</tr>
<tr>
<td>Forward feed (belt contacts board)</td>
<td>4 sec.</td>
</tr>
<tr>
<td>Return (vapor release)</td>
<td>6 sec.</td>
</tr>
<tr>
<td>Total cycle</td>
<td>10 sec.</td>
</tr>
</tbody>
</table>

Water quantity in liters (l) in 16 hours

- 12,000 for AQUA PULL AE / AQUA PULL S
- 10,000 for COTTON BELT
- 8,000 for NEEDLED FELT
- 6,000 for COATED NEEDLED FELT
- 4,000 for WINNENFELT
- 2,000 for BURANET

- Good steam penetration from the corrugated board into the belt
- The used felt can absorb no more moisture = highest electrostatic charges
- The corrugated board remains wet, specially in the edges = The drying process is not yet completed / the starch is not cured completely
- Poor penetration of steam off the board into the felt, the felt gets hot
- Poor edge bonding
- Warp
- Uneven moisture profile
- More edge trimming

MOISTURE/VAPOR ABSORPTION & RELEASE

- WOVEN MÜHLEN SOHN BELT
  - The belt absorbs the moisture better
  - Better moisture regulation
  - Drier edges of the corrugated board
  - Uniform moisture profile

- NEEDLED FELT
  - The used felt can absorb no more moisture = highest electrostatic charges
  - The corrugated board remains wet, specially in the edges = The drying process is not yet completed / the starch is not cured completely
  - Poor edge bonding
  - Warp
  - Uneven moisture profile
  - More edge trimming
TRANSPORT CHARACTERISTICS

To transport the corrugated board through the heating and tracking unit of a corrugator, the necessary tractive force must be transferred from the belt to the corrugated board. This is regulated by the loading system via the belt. The type of loading system (roller or pressure loading system) does not play a role here. The loading system ensures reliable transport at low belt coefficient of friction to avoid slipping.

EXAMPLE:
A tractive force of 3,000 kg is to be generated by the friction force between the belt and the corrugated board. The AQUA PULL S corrugator belt has a coefficient of friction of 0.42 µ and consequently must be loaded with approx. 7,100 kg. The coefficient of friction of needled felt materials is 0.33 µ, requiring a load of approx. 9,100 kg. The higher the load, the higher the friction between the belt and the press system. This results in higher energy consumption, with this effect occurring particularly in the case of surface pressure systems.

- **AQUA PULL S**
  - Friction Coefficient: 0.42 µ
  - Load: 7,100 kg
  - Ttractive Force: 3,000 kg

- **Needled Felt**
  - Friction Coefficient: 0.33 µ
  - Load: 9,100 kg
  - Ttractive Force: 3,000 kg

**MS Corrugator Belt**
- Strong belt material distributes the roller contact pressure over a large area
  - Smoother adhesion/higher quality
  - Stiffer and drier board
  - Less warp
  - Less wear of the heating plates
  - Higher temperature transfer
  - Higher speed

**Needled Felt**
- Soft felt material leads to highly localized pressure due to load rollers on the felt via the corrugated board on the heating plates
  - Insufficient heat/temperature transfer and therefore poorer bonding
  - Poorer quality – can result in squeezed corrugated board
  - Only low speeds possible
  - Originally developed only for paper machines
  - Heavily worn heating plates
ECONOMY – LESS EDGE TRIMMING

Lack of adhesion – as is frequently seen with needled felt materials – is the most common cause of waste.

Less edge trimming with the AQUA PULL AE thanks to reliable bonding in the edge area by the patented edge protection, which ensures uniform thickness reduction of the corrugator belt across the whole width of the belt and over the entire life and thereby reduces waste by up to 50%.

**TEMPERATURE PROFILE IN CORRUGATOR BELTS**

Corrugators are usually operated with different paper widths. With small paper widths, the temperature rises significantly at the belt edges. This leads to an extreme temperature and friction load and to higher abrasion at the edges of PES and cotton belts and thereby also to a significantly shorter service life. The inwoven edge reinforcement of aramid fibers used e.g. in the AQUA PULL AE withstands the high loads and guarantees a production output of 60 to 80 million running meters or more.