Peak performance

Flexible covers for machine tools and linear guide systems
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The MöllerGroup

With international partners to world wide success.

The Kupferhammer in 1907 and 2010. Headquarters and main administration of the MöllerGroup.

The Company

The MöllerGroup is a company with tradition: Family owned since eight generations, it can look back on a history of more than 280 years. Since then the company has become an internationally successful production and service enterprise. Sectioned into two business sectors – plastics engineering and flexible structural components – the MöllerGroup today delivers peak performance products throughout the world.

The MöllerGroup world wide

As an international company, the MöllerGroup thinks and acts across frontiers. With own operative companies or joint ventures, we produce where our customers are. Thus customers throughout the world can rely on our know-how and on our competence on-site.
MöllerWerke is a competent development partner for the industry. Under the brand name of möllerbalg® flexible constructional components are developed and manufactured for a wide diversity of applications. In addition to machine tool construction, special vehicles and railway engineering, the products from MöllerWerke are utilised in hydraulic systems, pneumatic systems, electrical engineering, medical technology and in many other industrial fields.

Our customers profit from the direct consultory service on site as well as the long-term experience and the know-how of our sales engineers. The MöllerWerke offer optimally designed products, high economic efficiency, constant product quality and unrestricted service. The own materials development with corresponding released mixtures and material combinations can fulfil almost any technical requirements.

The close cooperation with our customers and the material and product development in the house of the MöllerWerke leads to new solutions and new products.
Materials: diversified and flexible

Our many years of material and product development experience as well as numerous special technical problem solutions constitute significant advantages for the benefit of our customers.

The following factors are decisive for the quality of our products:
- The particular application
- The boundary conditions
- The selection of materials
- The manufacturing method

We have our own test beds and a technology centre. In addition, we can access the laboratories of the MöllerGroup.

Coated technical fabrics:
- Polyester fabric coated with polyurethane, in various thicknesses
- Aramid fabric with and without coating
- Fabric with anti-adhesive coating
- Rubber coated fabric
- Hybrid fabric
- Tarpaulin material, Trevira high strength, coated with PVC on both sides
- Aluminium vapour deposited on fabric
- Polyester fabric

Elastomer types:
- CR chloroprene
- CSM hypalon
- NBR nitrile
- ECO epichlorhydrin
- ACM acrylate caoutchouc
- MVQ silicone
- FKM fluoro caoutchouc

Other materials:
- Leather
- Insulating materials (e.g. textured glass)
- Steels
- Aluminium
- molerit®
- PVC
- Polyamide
- Polypropylene
- And numerous other materials on inquiry.

Methods: individually planned and implemented

The MöllerWerke utilise a number of special production methods which have mostly been developed by us for industrial production of bellows. Machines, systems and production lines are special plants which have emerged in the course of numerous years of experience with bellows production. MöllerWerke owns international patents for many of these methods.

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- Polypropylene
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Production methods at MöllerWerke:
- welding automatons for way covers
- HF welding automatons for bellows
- dip moulding methods and dip automaton for molerit®
- radiation crosslinking
- CNC mould drawing
- manual mould drawing on special moulds
- automated scale production
- automated cutting on plotter, milling and water jet systems

MöllerWerke – ultra-modern production methods and production quality on the highest level.

Research and development at MöllerWerke

The market imposes continually growing demands on us and our products. Therefore we permanently monitor the market developments and devise corresponding innovative solutions on the sector of new products, materials and methods.

Modern research facilities are available to our chemists and engineers. Important CAD systems, innovative experimental technology and continuous online data exchange between the individual work groups produce efficient application-oriented results.
Standard way covers and folding aprons

You have the machine. We have the cover solution.

möllerbalg® way covers are carefully produced, quickly available for delivery, have high performance and are keenly priced. They convince with high quality materials, perfect workmanship and prevent ingress of chips, dust and liquids. The machine operates in the long run with undiminished precision, requires fewer replacement parts and suffers less downtime.

These covers afford best possible personnel protection against injury. Ultimately, they convince not only through their functionality, but also serve as visually attractive design elements.

möllerbalg® way covers

- protect employees against injury
- protect machines against wear caused by dirt
- combine design and functionality of your product
Structure of the möllerbalg® way covers

The product systematics developed by MöllerWerke and the production techniques based thereon permit economically efficient solutions tailored to suit the individual application.

The MöllerWerke® development department

- equipped with ultra-modern IT technology
- 2 and 3D CAD systems
- facility for FEM-analysis
- technology centre with universal test stand and latest laboratory technology
- innovative solutions for new products and application engineering improvements of existing products

Welded-in guide frames patented by MöllerWerke

- the cover follows the guide track with high accuracy
- long flanks do not kink
- homogeneous liquid-sealed connection to outer cover

New proven materials make possible

- high speeds and accelerations of the cover
- service life of up to 10 million cycles
- resistant to aggressive coolant-lubricants

The range of materials is continually updated, tested and adapted to the customer requirements.

Design of way covers, minimised collapsed dimension per fold

The most common geometric forms

<table>
<thead>
<tr>
<th>Folding aprons</th>
<th>Standard way covers</th>
<th>Combination folding walls</th>
</tr>
</thead>
<tbody>
<tr>
<td>standard</td>
<td>U-shape</td>
<td>folding wall</td>
</tr>
<tr>
<td>double pleat</td>
<td>U-shaped with rear grip</td>
<td>folding wall L-shaped</td>
</tr>
<tr>
<td></td>
<td>deck shape</td>
<td></td>
</tr>
<tr>
<td></td>
<td>roof shape</td>
<td></td>
</tr>
</tbody>
</table>

Constructional principle and designations

way cover – standard

Example of Lmin per fold in mm with a supporting frame thickness of 1 mm depending on the outer cover

<table>
<thead>
<tr>
<th>Folding aprons</th>
<th>Way covers standard</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Folding aprons</td>
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<tr>
<td></td>
<td>standard</td>
</tr>
<tr>
<td></td>
<td>PUR fabric</td>
</tr>
<tr>
<td></td>
<td>aramid fabric</td>
</tr>
<tr>
<td></td>
<td>fabric + Teflon</td>
</tr>
<tr>
<td></td>
<td>fabric + PUR</td>
</tr>
<tr>
<td></td>
<td>EM Meta aramid fabric</td>
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<tr>
<td></td>
<td>Pyresit-Plus</td>
</tr>
</tbody>
</table>

Length calculations

These formulae are intended as help for the length calculation of möllerbalg® way covers. The results are approximations. In most cases desired deviations therefrom can be realised. Please contact our application engineers.

www.moellerwerke.de
## Material matrix

<table>
<thead>
<tr>
<th>No.</th>
<th>material type</th>
<th>utilisation</th>
<th>thickness</th>
<th>base material</th>
<th>bottom side coating</th>
<th>top side coating</th>
<th>colour</th>
<th>dust protection</th>
<th>impermeable to liquids</th>
<th>water resistant</th>
<th>cooling resistant</th>
<th>resistant to chemicals</th>
<th>flame retarding</th>
<th>weld spattering resistant</th>
<th>chip resistant</th>
<th>max. cont. operating temp. °C(*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FR 1</td>
<td>PUR polyester fabric black RAL 9001</td>
<td>Standard quality with long service life with regard to cyclic flexural stress, impervious to liquids, resistant to cooling emulsions as well as oil and grease for smaller size slide track protections or folding aprons with smaller fold depths</td>
<td>0.2</td>
<td>PES</td>
<td>PU</td>
<td>PU</td>
<td>black</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-20 to +100</td>
</tr>
<tr>
<td>FR 2</td>
<td>PUR polyester fabric black RAL 9001</td>
<td>Standard quality with regard to media like position 1</td>
<td>0.4</td>
<td>PES</td>
<td>PU</td>
<td>PU</td>
<td>black</td>
<td></td>
<td></td>
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<td></td>
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<td>-20 to +100</td>
</tr>
<tr>
<td>FR 3</td>
<td>PUR polyester fabric coated with PTFE RAL 9011</td>
<td>For stress with aggressive media, anti-adhesive (e.g. utilisation for grinding machines)</td>
<td>0.3</td>
<td>PES</td>
<td>PTFE</td>
<td>black</td>
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<td></td>
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<td></td>
<td>-20 to +100</td>
</tr>
<tr>
<td>FR 4</td>
<td>PUR polyester fabric coated with PTFE RAL 9011</td>
<td>For stress with aggressive media, anti-adhesive (e.g. utilisation for grinding machines)</td>
<td>0.5</td>
<td>PES</td>
<td>PTFE</td>
<td>black</td>
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<td></td>
<td>-20 to +100</td>
</tr>
<tr>
<td>FR 5</td>
<td>PUR-coated fabric, black RAL 9011 Laserflex 2</td>
<td>High flame protection. Complies with the American standard UL 94 HB (utilised, e.g., for laser beam guides)</td>
<td>0.3</td>
<td>e.g. Nomex</td>
<td>PU</td>
<td>PU</td>
<td>black</td>
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<tr>
<td>FR 6</td>
<td>para-aramid fabric(*) one-sided metallic silver colour</td>
<td>for radiant heat</td>
<td>0.5</td>
<td>e.g. Nomex</td>
<td>– PET-Alu</td>
<td>silver</td>
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<td>-20 to +100</td>
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<tr>
<td>FR 7</td>
<td>para-aramid fabric(*) two-sided metallic silver colour</td>
<td>for radiant heat, metallic silver colour</td>
<td>0.8</td>
<td>e.g. Nomex</td>
<td>Alu</td>
<td>Alu</td>
<td>silver</td>
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<tr>
<td>FR 8</td>
<td>pyroflex plus</td>
<td>Mixed Fibre Pyroflex/pura-aramid with flame-protected PUR outer coating. Application: for protection against slag spatter</td>
<td>0.4</td>
<td>Pires/ пара-aramid</td>
<td>– PU</td>
<td>black</td>
<td></td>
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<td>-20 to +170</td>
</tr>
<tr>
<td>F 1</td>
<td>PUR polyester fabric super black RAL 9011</td>
<td>Material with long service life with regard to cyclic bending, utilised for linear guides</td>
<td>0.2</td>
<td>PES</td>
<td>PU</td>
<td>black</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>-20 to +100</td>
</tr>
<tr>
<td>F 2</td>
<td>PUR polyester fabric white RAL 9011</td>
<td>Same as FR 2, but colour grey-white</td>
<td>0.4</td>
<td>PES</td>
<td>PU</td>
<td>grey-white</td>
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<td></td>
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<td>-20 to +100</td>
</tr>
<tr>
<td>F 3</td>
<td>PUR polyester fabric one-sided HT black RAL 9011</td>
<td>Base fabric like position 1, but on one side open fabric structure (HAT = high temperature dyed), PUR coated. Utilisation for measuring machines, small end forces.</td>
<td>0.2</td>
<td>PES</td>
<td>HT coloured</td>
<td>black</td>
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<td></td>
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<td>-20 to +100</td>
</tr>
<tr>
<td>F 6</td>
<td>PUR polyester fabric with PUR film black</td>
<td>Material like position 1, but coated internally with PUR film. Utilisation for grinding machines when perfect confinement is required</td>
<td>0.3</td>
<td>PES</td>
<td>TPU film</td>
<td>black</td>
<td></td>
<td></td>
<td></td>
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<td>-20 to +100</td>
</tr>
<tr>
<td>F 8</td>
<td>PUR SL 5 RAL 9011</td>
<td>F2 with coated on TPU film (air wave protection layer in the case of severe exposure to chips, very resistant to abrasion and wear</td>
<td>0.6</td>
<td>PES</td>
<td>TPU/Al</td>
<td>cream white</td>
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<td>-20 to +100</td>
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<tr>
<td>F 10</td>
<td>Laserflex 3</td>
<td>Flame retardant self-extinguishing utilised, e.g. for laser beam-guides</td>
<td>0.27</td>
<td>PES</td>
<td>PU</td>
<td>black</td>
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<td>-20 to +100</td>
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<tr>
<td>F 11</td>
<td>Laserflex 4</td>
<td>Flame retardant self-extinguishing utilised, e.g. for laser beam-guides</td>
<td>0.33</td>
<td>PES</td>
<td>PU</td>
<td>black</td>
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<td></td>
<td></td>
<td>-20 to +100</td>
</tr>
<tr>
<td>F 12</td>
<td>Longlife L3</td>
<td>Significantly improved self-extinguishing for use in milling, turning and grinding machines.</td>
<td>0.3</td>
<td>PES</td>
<td>PU</td>
<td>black</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>-20 to +100</td>
</tr>
</tbody>
</table>

(*) = maximum temperature applies to the material. Depending on the guide frame materials used, the admissible temperature for the overall way cover can be lower.

### Attachment/mounting

Several possibilities exist for attaching the way covers to machines or devices:

**End flanges:**
- steel sheet, powder-coated
- stainless steel
- plastic
- special materials

**Mounting possibilities:**
- standard
- front mounted
- projecting

End flanges are delivered with stipulated drilled holes pattern or without drilled holes. If absolute sealing between the cover/end flange and the machine is demanded, we deliver corresponding reliable variants.

The alternative: Quick mounting with cleat fastener.

The cleat strip is attached captive on the way cover, the opposite strip is bonded directly to the degreased machine surface.

### Advantages:

- quick mounting and dismounting
- secure attachment at temperatures in the range from -20°C to 80°C.
- many mounting and dismounting cycles without performance deterioration of the cleat strip connection
Order your individual product solution now.

Please send your fax to: MöllerWerke GmbH
Kupferhammer • 33649 Bielefeld • Fax No.: +49 (0) 521-44 77 333

<table>
<thead>
<tr>
<th>Inquiry/order</th>
<th>order No.</th>
<th>date</th>
<th>signature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

your company

your name

your fax No.

your phone No.

**Geometric form of the cover** please mark the relevant items

- [ ] Folding aprons
- [ ] Standard way cover
- [ ] Combination folding wall
- [ ] U-shape
- [ ] U-shape with rear grip
- [ ] Desk shape
- [ ] Combination folding wall L-shape
- [ ] Roof shape
- [ ] Combination folding wall Z-shape

**Desired cover specifications**

Please fill in measurements in mm

<table>
<thead>
<tr>
<th>Feature</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry processing</td>
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<tr>
<td>Wet processing</td>
<td></td>
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<tr>
<td>Back width</td>
<td></td>
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<tr>
<td>Leg height</td>
<td></td>
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<tr>
<td>Rear grip</td>
<td></td>
</tr>
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<td>Stroke</td>
<td></td>
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<tr>
<td>Lmax</td>
<td></td>
</tr>
<tr>
<td>Lmin</td>
<td></td>
</tr>
<tr>
<td>Fold depth</td>
<td></td>
</tr>
<tr>
<td>Attachment type</td>
<td></td>
</tr>
</tbody>
</table>

**Attachment type** please mark

- [ ] Quick mounting with cleat fastener
- [ ] Support frame
- [ ] Outer shell
- [ ] End flange
- [ ] Standard
- [ ] Front mounted
- [ ] Projecting

end frame of the covering – cleat strip felt
machine face/device surface – cleat strip felt
Large way covers and very large way covers

With us you are the greatest.

Very large way covers

MöllerWerke GmbH devises economically efficient solutions appropriate for the particular machine due to a comprehensive know-how. In close cooperation with our customers we constantly supplement our knowledge.

MöllerWerke produces covers which can completely seal off the processing compartment of the machines. This means that no chip or coolant lubricant can penetrate to the sensitive parts of the machine. The guide elements as well as the electric and electronic parts of the machine are reliably protected. This is also true in particular for very large travel stand machines, portal milling machines and processing centres. Large way covers having a height greater than 4 m and an extension of 25 m are among our proven products.

For the design criteria and materials, please see the tables in the front section.

Large bellows on a portal machine

Large bellows are convincing

- high stability achieved by crimping and/or with reinforces supporting frames
- uniform extension with scissor elements or special damping systems
- lightweight moving systems permit high speeds and large accelerations with low friction and little noise production
- stabilising and damping elements ensure parallel extension with low wear
- long service live with maintenance-free operation
Combination folding walls

möllerbalg® combination folding walls are special cover systems from the MöllerWerke, which are assembled from large bellows and other bellows. They can serve as wall covers for the rear part of the machine or as a roof cover. Thus a hermetically enclosed working compartment can be achieved without requiring particularly great effort for designing the machine housing. With the help of special safety systems these bellows systems can also be made puncture-proof. In the case of a tool breakage, the kinetic energy of the ejected fragment is dissipated without endangering persons or systems in the environment.

The new guide frames guarantee special form stability. By consistent weight optimisation and utilisation of lightweight moving systems, möllerbalg® combination folding walls achieve high travel speeds and accelerations.

Because of their dead weight very large combination folding walls are always a challenge for the constructional design with respect to the desired running characteristics. The inertial forces produced by the large dead weight in response to the required accelerations must be skilfully diverted or dissipated to keep the mechanical stress to which the components are subjected as small as possible.

In order to achieve a safe and functional solution, new large combination folding walls are tested on our own linear motor test stand. Thus the customer can be sure that a proven system is delivered for his machine.
Equipment with scales

Protective shield against hot and sharp chips.

For further improvement of the resistance with respect to hot and aggressive chips, small as well as large way covers can be equipped additionally with metal scales. The scales can be mounted partially or on all sides. Even the most difficult geometries are possible with Flexecke scales developed and patented by the MöllerWerke.

The advantages of metal scales

- less accelerated mass than with telescopic steel covers
- low vibration travel of the cover without impacts
- almost totally closed surface
For every application the right scale

Spring steel scale
Permanent pre-tensioned surface, low weight, for high travel speeds and accelerations, low mounting height due to the flat scale geometry, particularly suitable for vertical and overhead mounting as well as for covering large areas.

Niro scale
Robust, impact tolerant, acid resistant, bare or brushed surface, can be folded open.

Aluminium scale
Low weight, can be folded open, welding sputter does not adhere.

3-sided scale
This alternative for the telescopic steel cover, with all advantages of the spring steel scale protects the guide track on all accessible sides and is impervious to liquids.

Flexecke
The Flexecke developed and patented by the MöllerWerke pioneers a quite new application field. Every conceivable geometry can be covered with the help of the Flexecke.

<table>
<thead>
<tr>
<th>Ft</th>
<th>scale width</th>
<th>Lmax</th>
<th>scale width</th>
<th>Lmax</th>
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Length calculations
These formulae are intended as help for the length calculation of for möllerbalg® way covers with spring steel scales. The results are approximations. In most cases desired deviations therefrom can be realised. Please contact our application engineers.
Ultra-modern engineering achieves high speeds and accelerations in machine tools, entailing mechanic stress magnitudes at the absolute limit or beyond the capabilities of conventional cover systems. Thus there is a demand for solutions with maximised wear resistance and minimised mass combined with extremely steady travel behaviour. The reply to this challenge is Stahlflex®.

This innovative cover system from the MöllerWerke in lightweight construction consists of metal and plastic connecting elements. The low mass of the cover permits very high travel speeds and accelerations. The mechanical stress of the components and the machine is thus small, achieving steady uniform motion. The almost closed metal surface of the cover, whose elements show a wiping action, to protect the machine against hot sharp-edged chips.

Our new covering system is maintenance-free, long-lived and attractively priced. Individual elements that have been damaged can be easily replaced due to the modular design. Furthermore, with the help of a plugging system patented by the MöllerWerke, existing covers can be complemented with additional covers in almost any spatial orientation. These properties make Stahlflex® the optimum solution for modern machine tools.

The advantages at a glance
• suitable for large accelerations
• suitable for high speeds
• small mass
• resistant to chips
• maintenance-free
• possible with various geometries
• practice-proven protection system
• cost favourable for procurement and maintenance
• long service life
• can easily be complemented
Stahlflex® covers – modular design for overhead or vertical installation

<table>
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FZ = Lmax / Lmax per scale
Lmin = FZ x Lmin per scale plus scale over-run

View of a travel stand machine
Stahlflex® covers – single piece or modular design for large area vertical installation

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<thead>
<tr>
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Scale

Stahlflex® covers as system solution – single piece or modular design for wall and roof

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<th>Scale</th>
<th>Lmax</th>
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<tr>
<td>115 mm</td>
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<td>7,5 mm</td>
</tr>
</tbody>
</table>

Scale

FZ = Lmax / Lmax per scale
Lmin = FZ x Lmin per scale
plus scale over-run
Plugged system

The plugged system developed by the MöllerWerke makes it possible to firmly couple the nevertheless be detached. The plugged spring element latches into a pocket-shaped holder in which it is locked into position. To break the connection, the plugged spring element must be pressed together to release it out of the locking device. This can be repeated any number of times, because the deformation of the spring element takes place in the elastic range.

Exchangeable scales

A further development step of the Stahlflex® covers is the modular system design with exchangeable scales. In this system the spring steel elements of the cover are connected to plastic elements. The special feature of this system: The connection is devised such that individual elements can be mounted and dismounted. This makes it possible to replace destroyed scales individually. This advantage is welcomed by the machine operators, because it means that the repair effort and the costs for replacement parts are significantly reduced.
Supporting machine components – complete systems.

Thus the MöllerWerke decided a few years ago not only to take up this trend, but also to set own standards. Today machine manufacturers tend to require complete modules, as modern machine tools are based on modular design. The task amounted to developing a multifunctional complete unit.

In detail this entailed: Integration of the guides for the covers. A weight-optimised light and compact design was required, which can be mounted quickly in the machine without great effort. The complete unit performs a supporting function for the machine shrouding.

The complete units are safely delivered to the machine on a transport frame or other suitable transport device. The scope of delivery also includes the mounting instructions for all steps from releasing the transport securing devices to the finished installation in the machine. On request installation of the first complete unit can be managed on site by our engineers.
The results are complete units from the MöllerWerke.

Convince yourself of the high performance of our complete units. We are pleased to take over the complete development from the first constructional design file to the finished product.
Box and polygonal bellows

Allround protection with corners.

Box bellows

Box bellows surround the machine components to be protected or the dangerous areas on all four sides. They are provided as protection against dust, dirt or liquids, to feed fresh air or to safely shield dangerous places (e.g. lifting tables).

Box bellows have many advantages

- welded-in supporting frames in each fold – long flanks do not collapse
- numerous proven materials are available
- a divided bellows design facilitates retrofitting without requiring machine/device dismantling
- almost any dimension can be produced; MöllerWerke delivers sizes from a matchbox up to a car garage

Structure of the möllerbalg® box bellows

Length calculations

<table>
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<tr>
<th>Standard materials</th>
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</table>

These formulae are intended as help for the length calculation of möllerbalg® box bellows. The results are approximations. In most cases desired deviations therefrom can be realised. Please contact our application engineers.
Polygonal bellows

Polygonal bellows, like box bellows, provide allround protection. However, no supporting frames are needed. The form stability of the folds is achieved by the multiple-layer structure of the external cover. Polygonal bellows are utilised as cover for piston rods and guide columns in mechanical engineering. They are used as light-proof camera bellows of large format cameras, reproduction cameras and large format copy machines. MöllerWerke offers polygonal bellows as prism types and conical types in tetragonal, hexagonal and octagonal version as well as special versions.

Advantages of polygonal bellows

• attractive design
• light-proof
• dustproof
• excellent extension ratio
• largely resistant to oil
• in accordance with the NC-production, polygonal bellows are constructed by the MöllerWerke with CAD support

Required constructional specifications for polygonal bellows

- $L_{min}$
- $L_{max}$
- $D$, $d$ or $F_t$
- $L_{min}$, $L_{max}$, $F_t$
- inner rectangular dimension or outer rectangular dimension
- inner rectangular dimensions of both connecting sides
- depth of fold
- centre offset of the two connecting sides relative to each other

Laser beam protection bellows as box bellows or polygonal bellows

MöllerWerke is a development partner of renowned laser machine manufacturers and well known for its special solutions and new developments. The personnel of the MöllerWerke is pleased to assist you with the design of your laser beam protection bellows.

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Disc bellows made of elastomers

Smallest mounting dimension – greatest extension.

Disc bellows have a special rank among the bellows. Their mounting dimension is smaller than that of all other bellows – and their extension ratio is enormous. They are assembled with individual discs connected alternately at the outer diameter and the inner diameter. Thereby the material makes a homogeneous connection which is inseparable and completely impervious. Sleeves or flanges can be mounted on both ends of the disc bellow.

Disc bellows are mostly utilised to protect machines or machine components. The application fields are diverse, ranging from hydraulic and pneumatic pistons via threaded and ball roll spindles to processing and measuring machines. The forms of the disc bellows are as manifold as the products which they protect. The classical disc bellows are circular, but other geometries are possible, too, with corresponding tools.

Disc bellows protect persons against injury by moving machine elements

- dust and dirt
- wood and metal chips
- liquids such as water, oil, emulsions and chemicals

Standard materials:

CSM rubber:
If no special requirements are imposed with regard to the resistance to oil, we usually recommend CSM rubber. Its advantages are high weather resistance combined with adequate resistance to oil and chemicals. The permissible operating temperature range is -20°C to +110°C. Extreme resistance to flexural fatigue.

NBR rubber:
NBR rubber is particularly resistant to oil, emulsions and fuel. However, it is not as weather resistant as CSM rubber.

Special materials:

Viton:
This fluoroelastomer is particularly resistant to acids and of all the materials mentioned here it features the highest permissible thermal stress (-20°C to approx. +160°C).

PUR:
Polyurethane is very resistant to abrasion, torsionally stiff and resistant to acids and alkalis. Furthermore, this material is physiologically innocuous and therefore eminently suitable for utilisation in medical equipment as well as in the food industry.
Information with regard to the definition of the disc bellows

Explanation of the abbreviations:

- **Da** = external diameter
- **Di** = internal diameter
- **Ft** = fold depth
- **Fz** = number of folds
- **AF** = extension per fold
- **Lmin** = length in compressed state
- **Lmax** = length in extended state
- **H** = stroke
- **DS 1** = sleeve diameter 1
- **DS 2** = sleeve diameter 2
- **DF 1** = flange diameter 1
- **DF 2** = flange diameter 2
- **b 1** = sleeve width 1

Fold depth **Ft** = \((Da - Di) : 2\)
Extension per fold **AF** = \(Ft \times 1.1\)
Maximum length **Lmax** = \(AF \times Fz\)
Number of folds **Fz** = \(Lmax : AF\)
Minimum length **Lmin** = \(Fz \times 2.5\)

Selection of the attachment

- **A) Sleeve** for attachment with hose binders. Combination with flange is possible.
- **B) Flange** formed from the last fold. Attachment with sheet metal ring and recessed head screws. Combination with sleeve is possible.
- **C) Spacer flange** fixing with sheet metal flange and screws. Combination with sleeve is possible.

You can request your product solution now.

Please send your fax to: MöllerWerke GmbH
Kupferhammer  •  33649 Bielefeld  •  Fax Nr.: +49 (0) 521-44 77 333

<table>
<thead>
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<td>your phone No.</td>
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</table>
Form components made of molerit®

TAUCHPERFORM® – Immerging into a new dimension

The worldwide unique, automated system offers designers new opportunities in the design of plastic moulded parts with different geometries. The manufacture of injection moulds is often uneconomical for small to medium series. The tool production for TAUCHPERFORM® is associated with significantly less effort and cost.

For quantities up to 15,000 pieces, TAUCHPERFORM® offers a flexible and efficient alternative to other moulding processes. After just three weeks, the first sample is available. So products can be modified and optimized quickly with little effort. Mouldings and bellows made with TAUCHPERFORM® can be found in the entire industry, such as electrical engineering, mechanical engineering, sanitary engineering, medical and automotive technology.

The advantages of the dip moulding method

- nearly all shapes are possible, including complex geometries
- small batches can be produced with low tool costs
- various hardness ranges possible within one dip moulded component
- 2 colours possible within one dip moulded component
- surface optionally mat or glossy
- standard colours: black, red, yellow, grey, transparent; special colours can be selected if required
- 100 % reproducibility
The material

molerit® is a special mixture based on PVC. Careful selection of the components is made according to the aspects of health compatibility, environmental compatibility and technological properties. With PVC as a basis, a polymer with high chemical resistance is utilised, which is well known through decades of experience. The properties of molerit® depend strongly on the auxiliary materials and the production mode, and they can be adapted to suit a wide diversity of technical requirements. An extensive range of types with a broad spectrum of properties is available: low temperature suitability, high temperature suitability, haptic, optics, flame retarding, individually optimised media resistance (oil, grease, petroleum ether, salts, acids and alkalis). Furthermore, molerit® can be manufactured in almost any colour – even as glass-transparent component.

Material properties of molerit®

<table>
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<tr>
<th>material</th>
<th>hardness shore A +/-5%</th>
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<th>max. utilisation temperature (°C)</th>
<th>mechanical properties</th>
<th>resistance against oil and grease</th>
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<th>alkaline washing solution (1%)</th>
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<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>V-0</td>
<td></td>
</tr>
<tr>
<td>molerit® T 80</td>
<td>80</td>
<td>-32,5</td>
<td>70°</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>V-0</td>
<td></td>
</tr>
</tbody>
</table>

F = good resistance to oil and grease
FL = equipped to be flame resistant
K = very good cold resistance
M = mat surface
○ = very good
○ = good
○ = satisfactory
○ = conditional
1) with dark coloration
2) short-term stress up to +120°C possible
3) radiation crosslinked (Shore D +5/-10)
4) in vehicle interior also for occasional surface temperature up to 85°C

The outstanding properties of molerit®

- High resistance to cracking due to ageing or the effect of light
- Good resistance to UV radiation
- Cold stability down to -50°C
- Thermal form stability up to +70°C, in the cabin area up to +85°C
- With radiation crosslinking up to +100°C
- Very good resistance to acids, alkalis, sea water and gases
- Material types in many hardness grades, see the material table on this page
- Special type for enhanced resistance to mineral oil and grease

Utilisation in vehicle engineering

Scan code to learn more about TAUCHPERFORM®
The method

In the TAUCHPERFORM® process a teach robot determines the geometric parameters for each new article. These are the basic data for TAUCHPERFORM®. When the tool has been inserted into the system, it is heated and dipped into a basin with the molerit®. The material gelatinates around the mould (tool) which exactly images the inner contour of the finished part. The wall thickness of the product is determined by the dwell time in the molerit® and by the thermal capacity of the tool. The fully gelatinated and cooled dip moulded component is pulled off the tool.

Radiation crosslinking after dipping

This process produces two material properties in one component. The desired flexibility of the soft plastic component is retained in certain areas, whereas in defined zones the form stability and hardness of hard plastic parts is produced. The areas of the dip moulded component which are to be crosslinked are exposed to a dosed beta radiation. This alters the material and hard zones evolve with have greater mechanical strength and thermal form stability.

Dip moulding tools – quick and cost-effective, available already starting at 500 Euro

MöllerWerke constructs dip moulded components and their tools with the help of 2-D and 3-D CAD systems. The tools are produced on modern CNC machines. If modifications of the tools become necessary during the pilot phase, they can usually be implemented quickly and cost-effective.

Special versions of the dip moulding parts:

- can also be combined with each other as components
- venting or exhaust ventilation of the form components can be provided with additional air flaps or air screens
- increase of the stability with inserted wire rings
- can be sectioned by sewing-in zip or cleat fasteners
- print marking possible
- metal or plastic flanges can be incorporated
MöllerWerke GmbH – customer proximity is our topmost principle!

We have the right möllerbalg® for your machine or application.

Let us solve your cover problems.

MöllerWerke GmbH
möllerbalg®
Kupferhammer
D-33649 Bielefeld

Phone: +49 (0) 521 - 44 77 0
Fax: +49 (0) 521 - 44 77 333
Email: info@moellerwerke.de
Internet: www.moellerwerke.de

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