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Guideway Protection and Conveyor Systems

GUIDEWAY PROTECTION SYSTEMS

CONVEYOR SYSTEMS

PROTECTIVE DEVICES

Safe. Clean. Reliable

Guideway Protection and Conveyor Systems

KABELSCHLEPP – that is motion. Motion as a principle of continuous development, a never-ending series of new inventions. Just like our product range. KABELSCHLEPP supplies reliable complete solutions covering all aspects of motion and transport for your machines.




From standard to customized

Where not only standard products, but also customer-specific solutions are the order of the day, being close to the customer is not just empty words, but a way of life.


Service is one of our greatest priorities

We are available for you 24 hours a day. Because our service department is oriented towards your requirements: If your production is down only because a conveyor system or a telescopic cover is out of order, then we can give you quick, reliable help.

It is often most advantageous to repair the equipment, since generally custom-manufactured items are involved. Our service technicians are familiar with many different manufacturers, and are thus able to get your production up and
running very quickly.

- Installation, maintenance and repair right at your location
- Large repairs and generaloverhauls at our Service Center in Hünsborn, Germany
- Quick delivery of spare parts
- Training your personnel for maintenance and small repairs
- Specimen construction and manufacture of prototypes

■ KABELSCHLEPP Service-Center Hünsborn

■ Repair stands in Hünsborn

SERVICE-HOTLINE: + 49 2762/97420 · kabelschlepp-service.de

Efficient and flexible thanks to modern manufacturing organisation

Efficiency – that is the key word that guides our entire company. A challenge that is part of the 21st century, and a challenge that we are eager to meet.

Our production facility for protection and conveyor systems is one of the most modern in Europe.

Constant investments in the most modern manufacturing systems and the expansion of our production areas to approximately 3500 m² give you very visible benefits:

- Top quality
- Short delivery times
- An excellent price/performance ratio

■ KABELSCHLEPP System Engineering

■ KABELSCHLEPP System Engineering Manufacturing

KABELSCHLEPP is a provider of solutions, e.g.:

Part conveyor – scratch-free parts transfer at production machines

The part conveyor is a solution for automatic production on punching nibbling machines. Both smooth and angular parts can be transported. The overall concept and the integration into the machine were developed in cooperation with our customers.

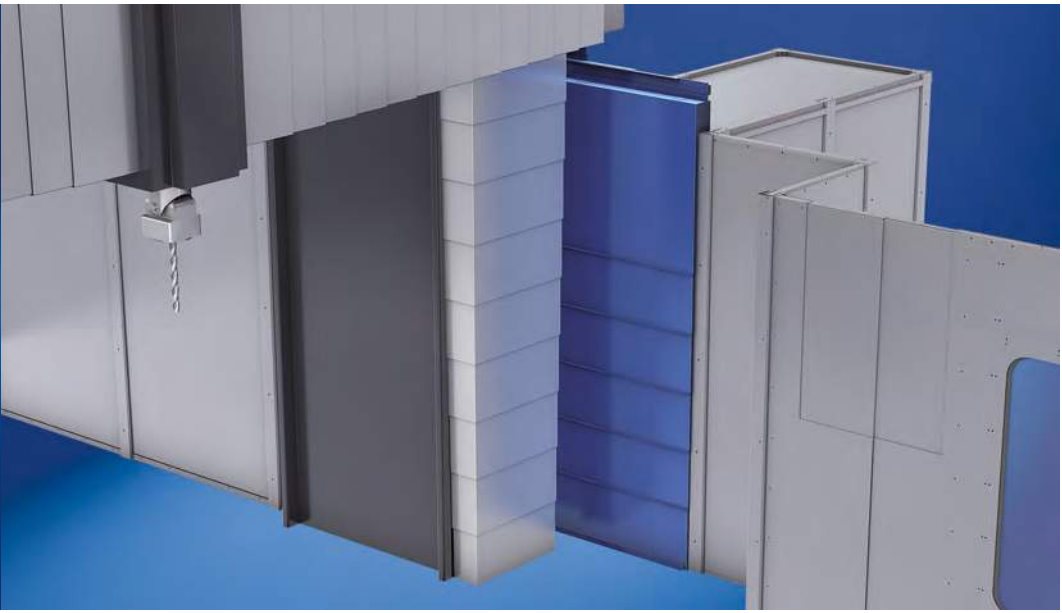
Gentle transport all the way to the parts depot

The parts conveyor provides the option of gently transporting parts with high standards for surface quality out into the required parts depot. The brush rollers in the discharge area ensure that the materials being transported are transfered to the parts depot virtually horizontally.

KABELSCHLEPP is a provider of solutions, e.g.:

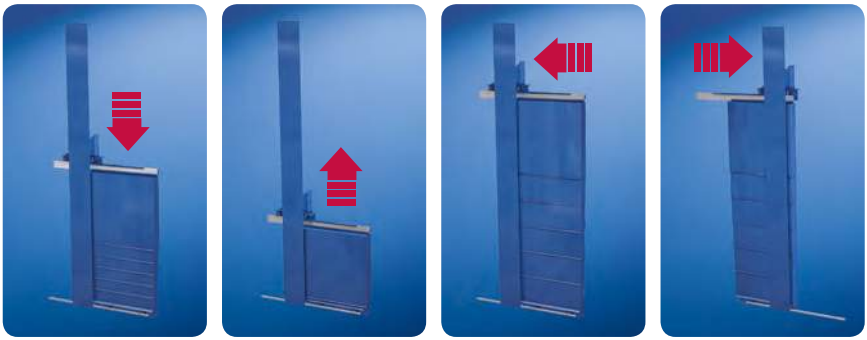
Chip protection wall can be traversed horizontally and vertically – variable chip protection

Machining tools should be kept ready near the machining area. To prevent damage and fouling of the tools that are kept ready, they have to be given special protection. Our chip protection wall separates the machining cell from the tool magazine and protects the tools in the magazine that are not needed for the current machining operation.



Variable protection of the tool magazine

The chip protection wall is fastened to a height-adjustable cross-beam, and moves with it in the vertical direction. An electric drive moves the wall in the horizontal direction for tool changing.




KABELSCHLEPP

Conveyor systems

Reliability and experience based on tradition

Hinged belt conveyors

Proven for a wide range of disposal tasks

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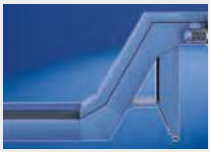
Scraper conveyors

For disposal of small materials

page 544



Modular conveyors

Hinged belt conveyors with modular construction

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Belt conveyors

The all-rounders – also for parts with sharp edges

page 550

Conveyor systems

Reliability and experience based on tradition

Our scraper belt, hinged belt and belt conveyors embody more than 50 years of experience. Systematic further development of our products and adaptation of their functions for use with the latest generation of machines guarantees you the utmost level of reliability.

Every production machine requires a disposal system

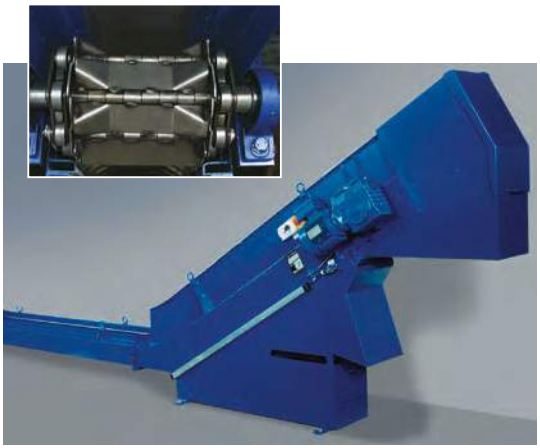
In the metalworking industry, tonnes of metal chips are created every day at cutting machine tools. We offer the right chip removal system and the suitable conveyor for your specific application.

- For disposal of chips at machine tools
- For transporting metal scrap and chips away from saws
- For disposal at stamping presses and laser cutting systems
- For disposal of edge scrap at trimming shears in coil cutting systems
- For transporting away casting waste in foundry lines

■ Standard hinged belt conveyor at a CNC boring machine

From standard to customized – we have a solution

- Everything from a single source – planning, design and manufacturing
- Standard conveyors available within a short time
- For an individual solution we will work together with you to design a suitable conveyor
- The optimal solution for whatever material is to be conveyed: hinged belt conveyor, scraper conveyor or belt conveyor
- Can be supplied with coolant processing if required
- Quality and long service life are our strong points
- Spare parts supplies are of course ensured for years to come
- Great price-performance ratio



■ Hinged belt conveyor developed for the Trumpf TUBEMATIC laser cutting machine. Special hinged belt plates prevent jamming of the material to be conveyed.

kabelschlepp.de
Fon: +49 2762 4003-0
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Designs and areas of application

Conveyors are an aspect of mechanical engineering, and are used especially on cutting machine tools. For **many applications** it is possible to use our **standard models**. The material to be conveyed, volume to be conveyed, and space limitations often already determine the type of conveyor.

In most cases, the variable dimensions such as the belt width, feed length, discharge height and incline are sufficient to take the requirements of the specific application in to account.

■ Hinged belt conveyors

■ Scraper conveyors

■ Belt conveyors

We also plan and manufacture special conveyors for very specific requirements, even complete chip disposal systems with machine cleaning, crushing, workshop cleaning and hopper storage.

■ Hinged belt conveyor for loading of a hopper system

■ Special model at a trimming shear with a belt width of 900 mm

■ Scraper conveyor for distribution of various chip materials

■ Scraper conveyor under a hopper system for aluminum chips

Hinged belt conveyors

Proven for a wide range of disposal tasks

Transportation of the material takes place on the upper trough of a revolving hinged belt. Drivers ensure transport of the material up the inclined section.

For wet machining the cooling lubrications are collected in the conveyor housing and can be fed back into the machine circuit via an optionally available coolant container or a pump station.

Our hinged belt conveyors can be used either as stand-alone conveyors at machine tools, or as linked conveyor systems. Depending on the design, the material to be conveyed is brought to the required height at a defined incline and then discharged.

This way we can solve your disposal tasks in over 80 % of all cases:

- Wet or dry chips
- Workpieces and waste
- Hot forgings
- Stampings and punching scrap
- And much more

■ Hinged belt conveyors

Structure

- Stable metal plate construction
- Standardized housing cross-section with variable width
- Robust worm gear motor with torque switching
- Customized discharge height
- Customized incline standards = 30°, 45° and 60°
- Floor mounting or as a push-in version into the machine base

Accessory examples

- Motor monitoring systems with current monitoring relay
- Other overload safety devices (on request)
- Coolant container with pump station
- Direct electrical connection to your machine controller
- Other special solutions are available. Please do get in touch with us, we will be happy to advise you.

Typical designs

Straight design

■ Can be used in a horizontal or inclined position. Max incline 45°

Straight/rising design

■ Max. incline 45°

Straight/rising/straight design

■ Max. incline 60°

Hinged belt conveyors

Proven for a wide range of disposal tasks

Types and main areas of application

SRF 040.00 – the elegant "small one", and particularly compact

Pitch of the hinged belt t = 40 mm

With its small pitch (40 mm) and extremely compact design, this conveyor is suitable for even the smallest machine tools.

SRF 063.00 – the "classic", and our best seller

Pitch of the hinged belt t = 63 mm

The conveyor type for most mechanical engineering applications.

SRF 100.00 – the "big one" and especially robust

Pitch of the hinged belt t = 100 mm

With a pitch of 100 mm, this conveyor is particularly useful when large quantities of chips are present.

SRF 150.00 – the "strongest" one we build

Pitch of the hinged belt t = 150 mm

Special solutions with 150 mm pitch for transporting away of large outputs or large parts.

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Hinged belt designs

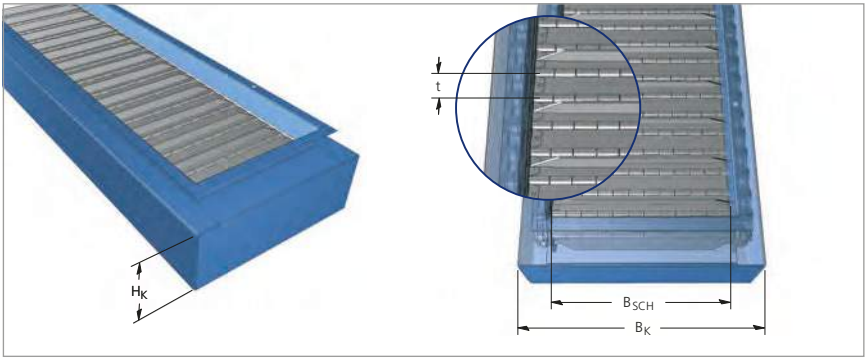
Various hinged belt designs are available for different operating conditions:

■ **Hinged belt (standard)**
for dry materials and chips with a low proportion of coolant

■ **Hinged belt with perforations**
for pre-separation of coolant for materials with a high proportion of coolant

■ **Hinged belt conveyor with corrugations**
for transporting "sticky" parts

Standard dimensions



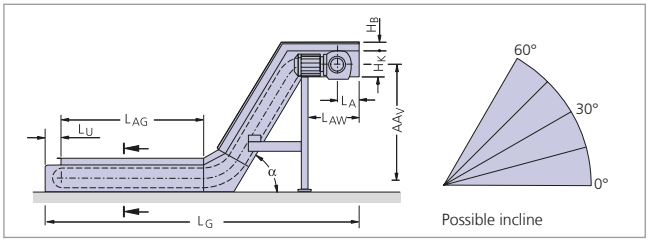
Type	Pitch t	Box height H_K	Hinged belt width B_{SCH}	Box width B_K
SRF 040.00	40	140	150, 200, 250, 300, 450, 600	B_{SCH} + 75 mm
SRF 063.00	63	216	150, 300, 450, 600, 750, 900	B_{SCH} + 120 mm
SRF 100.00	100	360	150, 300, 450, 600, 750, 900	B_{SCH} + 150 mm
SRF 150.00	150	540	300, 450, 600, 750, 900	B_{SCH} + 190 mm

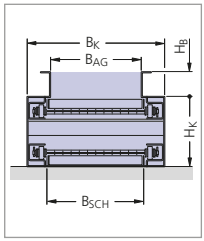
Special widths on request.

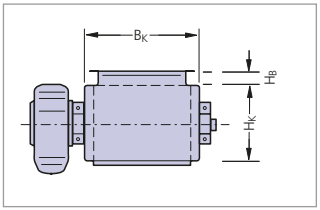
Hinged belt conveyors

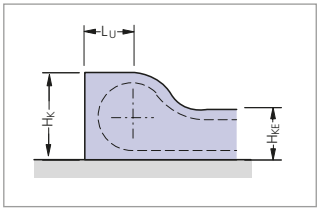
Proven for a wide range of disposal tasks

Dimensions of conveyor housing









Variable dimensions:

B_{Sch} = Hinged belt width
B_K = Box width
B_{AG} = Feed width
H_B = Panel height
AA_V = Distance between axles, vertica
L_{AG} = Feed length
L_{AW} = Discharge length
L_G = Total length of the conveyor
α = Incline

Design-dependent dimensions:

H_K = Box height
H_{KE} = Retracted box height
L_A = Length of the tail (discharge, incl. tensioning distance)
L_U = Length of the tail (feed)

The tensioning station is located at the discharge.

Type	H_B			H_K	H_{KE}	L_{AW} min	L_A	L_U
SRF 040.00	40	60	–	140	110	500	180	73
SRF 063.00	40	80	150	216	153	620	240	111
SRF 100.00	150	250	–	360	260	1000	600	185
SRF 150.00	150	250	350	540	390	1000	600	275

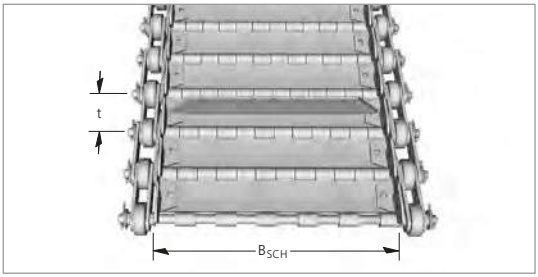
Dimensions in mm

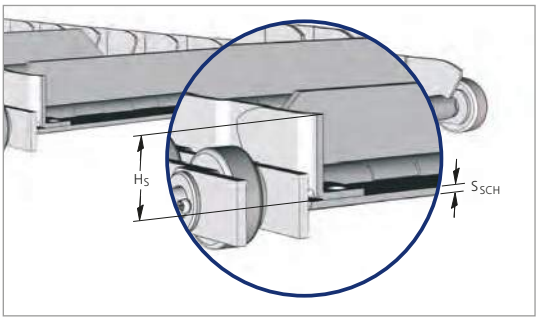
Dimensions of hinged belt

Manufactured of strip steel, the hinged belt plates have roller-formed hinge eyes, and are connected by means of axles to the side chains (which are designed as hollow pin chains), thus forming a hinged belt assembly.

Type	t	S_{SCH}	H_S
SRF 040.00	40	1.5	20
SRF 063.00	63	3.0	35
SRF 100.00	100	3.5	60
SRF 150.00	150	5.0	100

Dimensions in mm





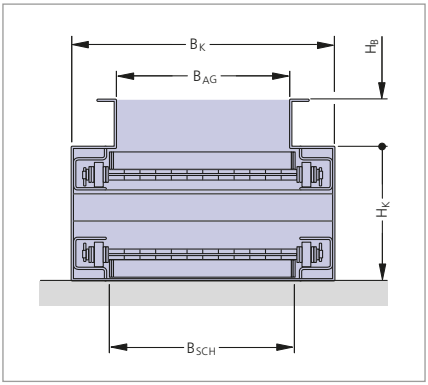
Definitions:

t = Pitch
B_{Sch} = Hinged belt width
S_{SCH} = Plate thickness of the conveyor
H_S = Height of the side rim

Dimensions as a function of the hinged belt width

Type	B_{SCH}	B_K	B_{AG}
SRF 040.00	150	225	130
	200	275	180
	250	325	230
	300	375	280
	450	525	430
	600	675	580
SRF 063.00	150	270	130
	300	420	280
	450	570	430
	600	720	580
	750	870	730
	900	1020	880
SRF 100.00	150	300	120
	300	450	270
	450	600	420
	600	750	570
	750	900	720
	900	1050	870
SRF 150.00	300	490	250
	450	640	400
	600	790	550
	750	940	700
	900	1090	850

Dimensions in mm



Definitions:

B_{SCH} = Hinged belt width
B_K = Box width
B_{AG} = Feed width

Hinged belt conveyor with WAVE-BELT System

No hinge – almost seamless

Chips, particels and dirt can accumulate in the hinges of conventional hinged belt conveyors.

The WAVE-BELT System has no hinges, the single plates of the WAVE-BELT System glide almost gap free one upon each other. The construction of the side rims has been optimized so that their surface is also smooth and almost gap free. The WAVE-BELT System is suitable for a variety of coolant-free application, where the defaults risk of jammed transported material shall be minimized.

Hinged belt conveyors with WAVE-BELT System

- Longer service life due to optimized belt construction
- Denser than conventional conveyors, as no hinges
- Extremely stable due to special shaping of the individual belt plates
- Easy to maintain because of bolted belt plates that can be easily replaced

■ The special design of the plates makes the complete belt extremely rigid and highly stressable.

WBS
KABELSCHLEPP
WAVE-BELT-System

This sign indicates that the latest generation of KABELSCHLEPP WAVE-BELT System is applied.

Easy replacement of individual hinge belt plates

The **belt plates** are bolted and can be easily replaced if needed **without having to dismantle the complete conveyor belt**.

■ Replacement of individual hinge belt plates **at the discharge**.

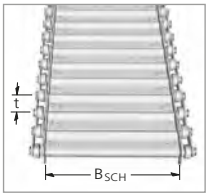
Dimensions of hinge belt conveyor WBC 063

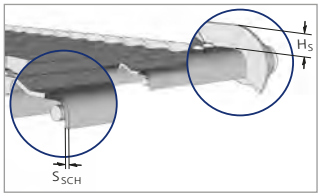
Hinge belt

Type	t	S_{SCH}	H_S
WBC 063.00	63	2.5	22.5

Dimensions in mm

t = Pitch
B_{Sch} = Hinged belt width
S_{SCH} = Plate thickness of the conveyor
H_S = Height of the side rim





Subject to change.

Scraper conveyors

For disposal of small materials

Transport of the material takes place via drivers which push the material along the floor of the housing towards the discharge.

Cooling lubricants are collected in the conveyor housing and can be fed back into the machine circuit via an added-on container or a pumping unit. Our scraper conveyors can be used as stand-alone conveyors at machine tools or as linked conveyor systems.

Depending on the design, the material to be conveyed is brought to the required height at a defined incline and then discharged.

The solution for small and short chips:

- Frequently used for machining of non-ferrous metals
- Can also be used for very hard, short chips
- Casting chips, milling chips and sawing chips

■ Scraper belt conveyors

Structure

- Stable metal plate construction
- Standardized housing cross-section with variable width
- Robust worm gear motor with torque switching
- Customized discharge height
- Customized incline standards = 30°, 45° and 60°
- Floor mounting or as a push-in version into the machine base

Accessory examples

- Motor monitoring systems with current monitoring relay
- Other overload safety devices (on request)
- Coolant container with pump station
- Direct electrical connection to your machine controller
- Other special solutions are available. Please do get in touch with us, we will be happy to advise you.

Typical designs

Straight design

- Can be used in a horizontal or inclined position. Max incline 45°

Straight/rising design

- Max. incline 45°

Straight/rising/straight design

- Max. incline 60°

Scraper conveyors

For disposal of small materials

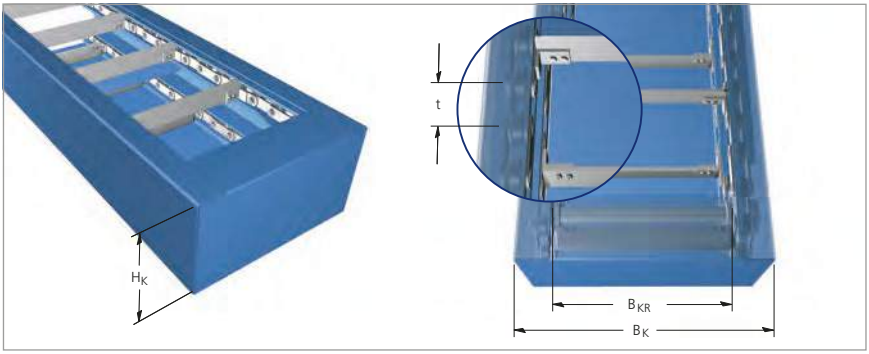
Types and main areas of application

KRF 040 – the "classic" scraper conveyor
Pitch of the scraper belt t = 40 mm
Our standard scraper conveyor for smaller machine tools and small quantities of chips.

KRF 063 – for somewhat "bigger" tasks
Pitch of the scraper belt t = 63 mm
For larger machines and larger quantities of chips.

KRF 100 – the "Jumbo" for highest demands
Pitch of the scraper belt t = 100 mm
Special solution for very large quantities of chips.

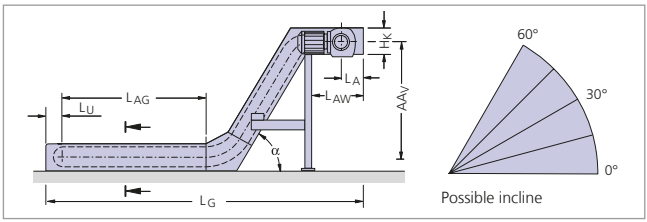
Standard dimensions

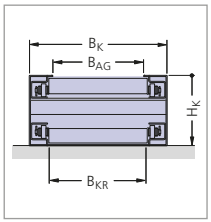


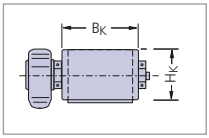
Type	Pitch t	Box height H_K	Scraper belt width B_{KR}	Box width B_K
KRF 040.00	40	140	150, 200, 250, 300, 450, 600	B_{KR} + 90 mm
KRF 063.00	63	216	150, 300, 450, 600, 750, 900	B_{KR} + 120 mm
KRF 100.00	100	420	150, 300, 450, 600, 750, 900	B_{KR} + 150 mm

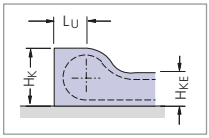
Special dimensions on request.

Dimensions of conveyor housing









Type	H_K	H_{KE}	L_{AW}	L_A	L_U min
KRF 040.00	140	110	500	180	73
KRF 063.00	216	153	620	240	106
KRF 100.00	360	260	1000	600	215

Dimensions in mm

Variable dimensions:

B_{KR} = Scraper width
B_K = Box width
B_{AG} = Feed width
AA_V = Distance between axles, vertical
L_{AG} = Feed length
L_{AW} = Discharge length
L_G = Total length of the conveyor
α = Incline

Design-dependent dimensions:

H_K = Box height
H_{KE} = Retracted box height
L_A = Length of the tail (discharge, incl. tensioning distance)
L_U = Length of the tail (feed)

Modular Conveyors

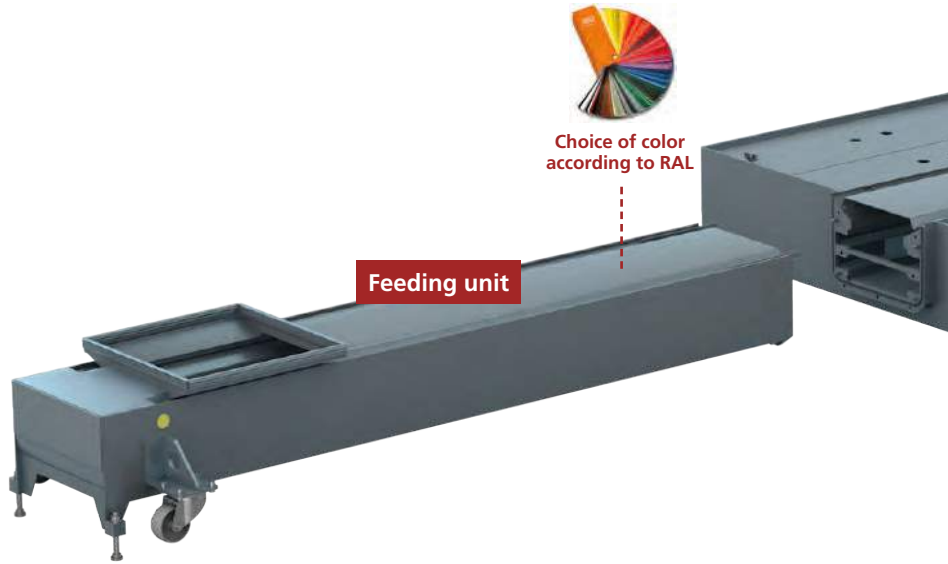
Hinge belt conveyors in modular design

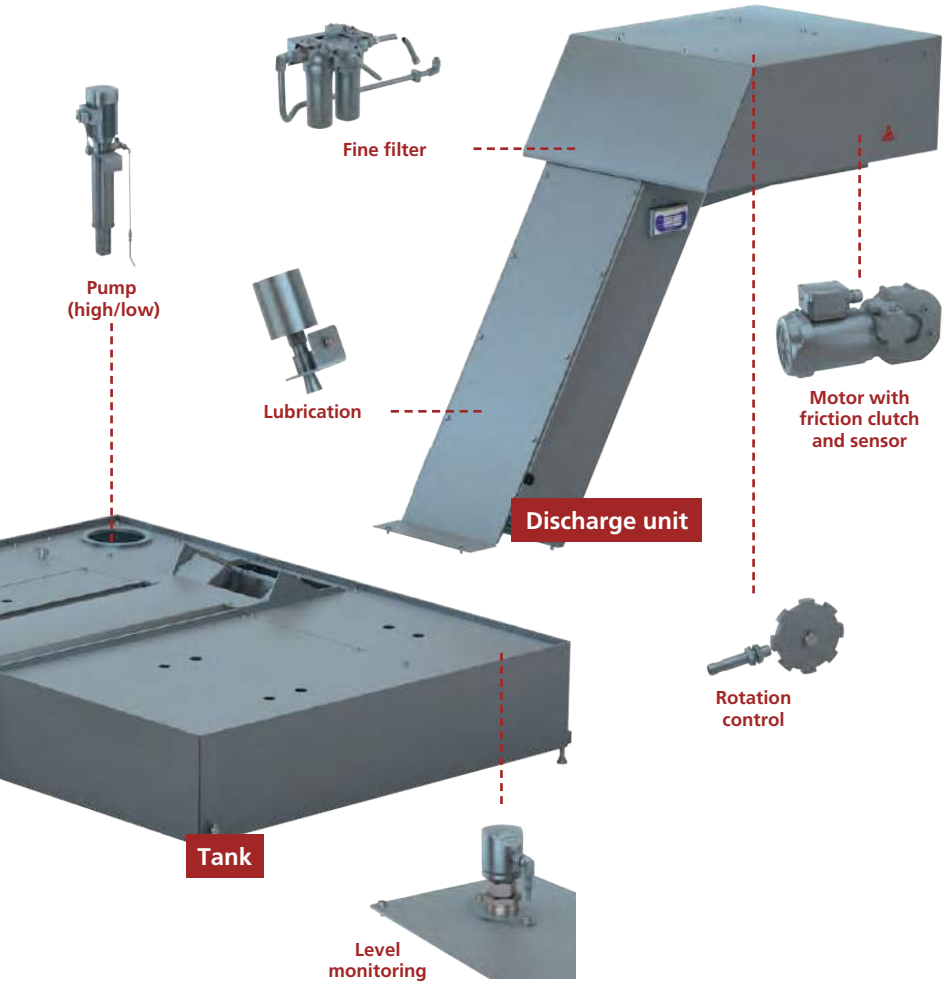
Using standard assemblies enables us to transfer our production methods to any global production site within the group of companies.

Thus, we realize a production nearby and guarantee shortest delivery times. Any time just where you are.

Configurable from standard modules:

- Discharge unit
- Tank
- Feeding unit
- Color according to RAL
- Options (exemplary)





Modular System for Hinge Belt Conveyors

Our modular system provides numerous opportunities to adapt the conveyor to your individual application.

- Optimum delivery times due to global production
- Cost-effective standard assemblies
- Numerous configuration options
- Replacement of single modules possible due to defined interface
- Concept is extandable
- RAL color at customers' option
- Delivery in operational condition – no onside installation required
- Reduced downtime by only replacing individual modules

We are happy to configure the most suitable system for you.

Belt conveyors

The all-rounders – also for parts with sharp edges

Our belt conveyors are predominantly used on punch-nibbling machines, for transporting punching scrap and punching trimmings.

However, other parts can also be transported, such as waste parts from plastic injection machines. The transport belt of the conveyor is resistant to oil and grease.

■ Belt conveyors

Structure

- Housing made of steel plate
- Oil-resistant belt
- Protective motor switch
- Convex return shafts
- Shafts with ball bearings
- Adjustable belt tension

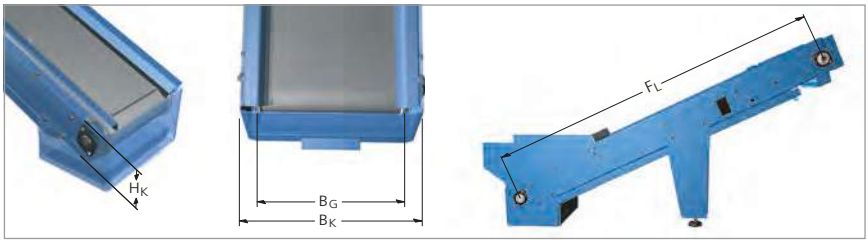
The universal transport solution, for applications where no cooling lubricant is present.

- Also suitable for parts with sharp edges
- Not suitable for transporting hot chips

Standard design

■ **Standard design**
Can be used in a horizontal or inclined position. Max incline 30°

Standard dimensions



Type	Box height H_K	Belt width B_G	Box width B_K	Maximum conveying length F_L
GBF	104	150, 200, 250, 300, 450, 600	B_G + 50	5000

Special widths on request.

Dimensions in mm

Subject to change.

Photograph: Waldrich Siegen Werkzeugmaschinen GmbH

Guideway protection systems

Perfect protection for guideways on machine tools

Telescopic covers

Perfect protection for guideways on machine tools

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Way wipers

The cleanup crew

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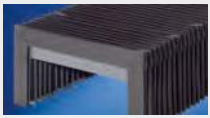
Link apron covers

Solutions for limited spaces

page 577



Bellows

Guideway protection solutions with very little compression

page 581

Conical spring covers

Protection under extreme conditions

page 583

Roll-up covers

Protection in a minimum of space

page 586

Telescopic covers

Perfect protection for guideways on machine tools

Wherever guideways on machines have to be protected, we have a suitable solution. Our guideway protections systems boast a high degree of operational reliability, a long service life, and make use of innovative technical solutions.

Every production machine requires protection for its guideway

Today, modern machine tools process workpieces at ever-greater cutting and travel speeds. The protection of guideways, measuring systems, drive elements and other vulnerable parts is absolutely essential.

Accelerations and speeds of machines are constantly increasing. Telescopic covers must also be able to cope with these challenges. This is where telescopic covers with harness mechanisms are used.

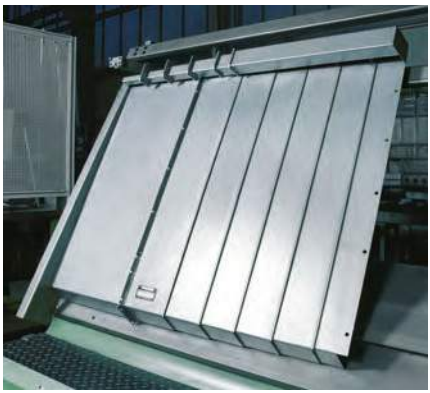
Telescopic cover for lathes

Telescopic cover at a milling machine

From individual manufacture to series production – we have a solution

The number of varieties is immense – no cover for a machine is exactly the same as any other.

Telescopic cover with flat shape on a boring machine



Special form of an inclined bed cover on a test framework

Designs and areas of application

Until the 1970s, telescopic covers seldom moved in speed ranges any greater than 15 m/min.

The expansion and compression of the individual boxes took place sequentially. Due to the low speed, there was hardly any impact pulse that caused interfering vibrations.

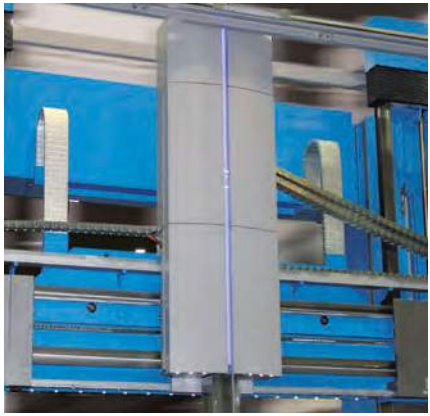
Over the years, however, improvements in drive technology have increased the travel speeds of the machines and thus also the speeds of the cover.

At high running speeds the impact pulses affecting the covers are enormous. This creates high impact noise and machine vibration. Furthermore extreme mechanical stress is exerted on the telescopic cover.

The landscape for telescopic covers has changed greatly in the last few years.

"Old" designs are less and less in demand, with modern concepts such as covers with differential drives taking their place.

■ Cross-beam cover at a milling machine



■ Telescopic cover at a milling machine

Telescopic covers are generally produced from cold-rolled uncoated thin plates in thicknesses from 1 to 3 mm.

In case of extremely aggressive environmental conditions (e.g. aggressive cooling lubricants), corrosion-resistant stainless steel plates may also be used.

KABELSCHLEPP GmbH Hünsborn develops and produces guide track protection systems for different axes of the machine, to customer specifications.

Telescopic covers

The speed is decisive

At speeds below 15 m/min a telescopic cover can still be built in the conventional form of box synchronization. At high running speeds the inevitable impact pulses lead to vibrations and clearly audible impact noise.

So-called differential drives serve to synchronize the boxes and eliminate impact pulses. KABELSCHLEPP has decided on the tried and proven harness mechanism principle for which special materials are used.

Telescopic cover with damping elements

1 Wiper systems in various designs

2 Rollers

2 Sliders

3 Gully in various designs

4 Damping systems in various designs

5 Structural metal plates to prevent slipping (on the largest box)

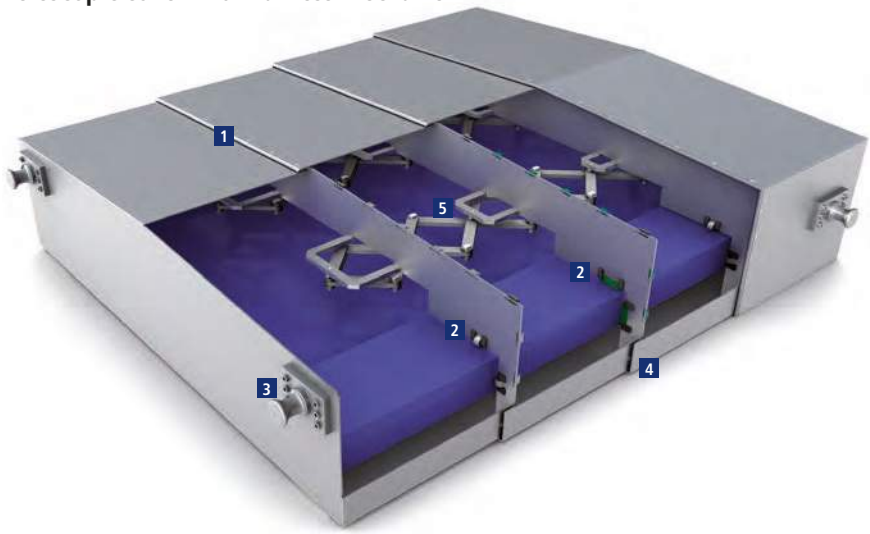
6 Lifting element

7 Locking system

Travel speed	Damper elements / harnesses
Up to 15 m/min	Not required
Up to 30 m/min	Damper elements
Up to 60 m/min	Damper elements / harnesses

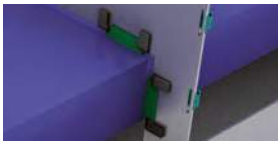
The use of damping elements depends on the travel speed and the moving mass. The information in the table should therefore only be viewed as guide values.

Telescopic cover with harness mechanism



1 Wiper systems in various designs

2 Rollers



2 Sliders

3 Lifting element

4 Locking system

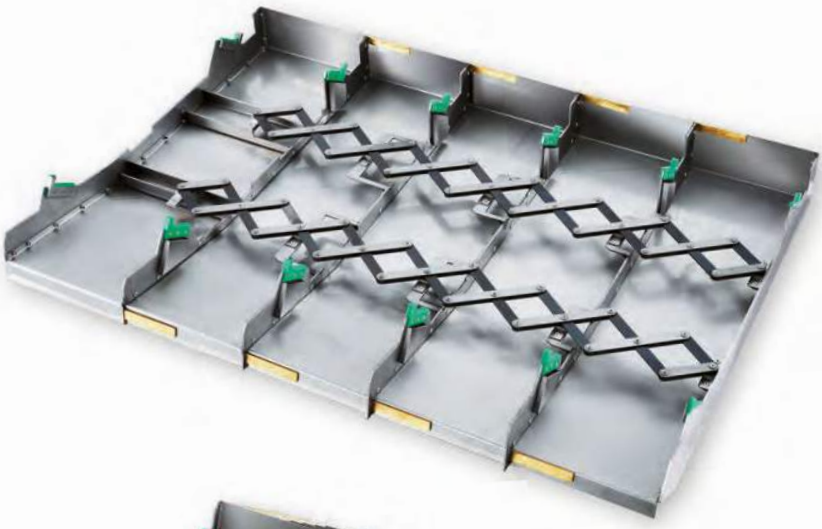
5 Synchronising device (harnesses) for fast-running telescopic covers

SXM – Mechanical elements with harnesses

KABELSCHLEPP sets the mark

To ensure impact-free expansion / compression of telescopic covers, they are used with so-called synchronisers (harnesses).

As a result, all of the cover boxes move evenly during expansion and compression. The individual boxes move relative to each other only at a differential speed.



■ Telescopic cover with proven harness mechanism in various expansion states.

SXM
KABELSCHLEPP
Synchronized Expansion Mechanism

SXM – Synchronized Expansion Mechanism.
The KABELSCHLEPP harness technology is used wherever you find this symbol.

Telescopic covers with harness mechanisms have many advantages:

- High travel speeds up to 200 m/min are possible.
- **Acceleration forces** and speeds are **uniformly distributed across all the plates**. This also applies to the resultant inertial forces.
- The **force peaks** that would normally occur when the telescopic covers dashed against each other **do not occur**.
- The disruptive **impact pulse** of the boxes **is eliminated**.

Cover with two harnesses

This solution has been developed for travel speeds greater than 100 m/min. Two harnesses ensure synchronization. In the example shown here the cover plates are made of 1 mm thick stainless steel.

The cover plates are riveted to the rear wall. Welding and the resulting heat effects have been avoided. Only the wiper is spot-welded.

SXM
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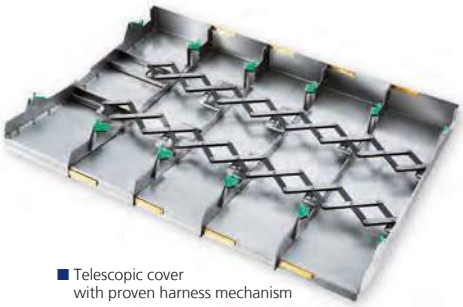
Synchronized Expansion Mechanism



■ Telescopic cover
with proven harness mechanism

Cover with one harness

This particularly lightweight solution has been developed for "small" machine tools. The cover plates are made of 1 mm thick normal steel.

The travel speed in this special application is only 30 m/min. The harness mechanism serves to ensure synchronization, however, and the reduced mass of all the elements means that it was possible to develop an especially cost-effective solution here.

■ Telescopic cover with only one harness

SXM
KABELSCHLEPP
Synchronized Expansion Mechanism

Telescopic covers

Perfect protection for guideways on machine tools

Photograph: Heinrich Georg GmbH Maschinenfabrik

Designs

Machine tools come in a wide variety of designs. That is why a modern lathe needs another type of telescopic cover than, for example, a large bed-type milling machine. The following designs provide an overview of typical designs.

Flat shape

The U-shaped design is generally used in a horizontal, lying position for milling table guides. With this design the maximum width of the telescopic cover should be limited to 1.5 m.

Roof shape, centric (eccentric)

This design is always advisable when cooling lubricants are used. The inclined surface allows the water – and naturally also the chips – to run off more easily. With large covers (> 3 m width) for reasons of stability, etc. at least three roof angles should be provided.

Flattened roof shape

The flattened roof shape is a special construction method with two roof angles. Primarily for dry operation and widths > 3 m.

Shape with incline to one side

The shape with incline to one side has a special roof shape. Depending on the possible incline, covers can be constructed with widths of up to 1.5 m. This shape is likewise a recommended solution when large amounts of coolant are present.

Depending on the angle of incline, this form also helps to discharge coolants / chips.

Vertically-installed telescopic cover

Standing covers are used on larger machine tools, mostly in the area above and below the cross beam. They can take many different shapes.

Blind cover

With blind telescopic covers, the cover plates move in separate guide rails, each of which is mounted on the machine at the sides. It is used exclusively in a vertical arrangement. The guide rails are generally made of brass.

Cross-beam cover

These covers are predominantly used on large gantry machine tools on a cross beam to the left and right of the support. The boxes are suspended vertically and protect the support guides from chips and cooling lubricants.

Tubular cover, polygonal cover

Tubular covers or covering shafts, spindles, etc. They can be made either with a round or a polygonal shape.

The round shape is possible up to a tube diameter of 120 mm, for bigger diameters one should choose a polygonal guide. Subsequent installation on the spindle without disassembly is the advantage of the polygonal guide.

Other forms and special designs tailored to your specific requirements are possible. Please do get in touch with us, we will be happy to advise you!

Wipers on telescopic covers

Wipers on telescopic covers keep the cover boxes clean and prevent the penetration of dirt and chips.

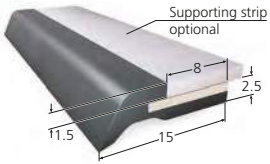
Welded-on and riveted-on wipers

With these types the support profile is spot-welded or riveted to the cover box.

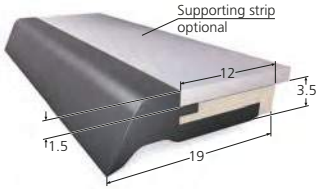
Type MA 8 / MA 12

These wipers consist of an NBR profile vulcanized onto a steel strip.

Necessary calculated distance of the cover plates 2.5 to 3.5 mm.



■ Wiper type MA 8



■ Wiper type MA 12

Type MA 8S / MA 12S

Wipers MA 8 and MA 12 are covered with a protective strip for protection against hot chips.

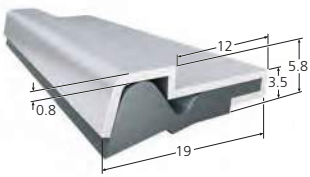
Necessary calculated distance of the cover plates 3.5 to 4 mm

■ Wiper type MA -S

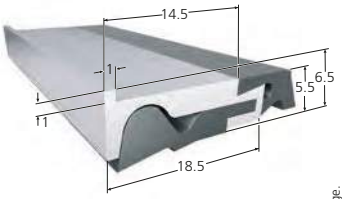
Type MA 12.1 / MA 18

A specially-milled steel plate profile is spot-welded to the boxes and a PUR wiper lip is inserted.

Necessary calculated distance of the cover plates 3.5 to 5.5 mm.



■ Wiper type MA 12.1



■ Wiper type MA 18

Welded-on and riveted-on wipers

Steel plate wiper made of spring band steel

A specially shaped, approximately 0.4 mm thick, approximately 25 mm wide band of stainless spring band steel is spot-welded to the cover plate. This wiper is recommended for dry machining.

Necessary calculated distance of the cover plates 1 mm.

Types with replaceable wiper lips

The replaceable wiper with a PU lip

This new generation of wipers can be replaced directly on the machine, without disassembling the telescopic cover.

The wiper lips have good gliding characteristics and are also usable where little lubricant is generated, e.g. on machine tools.

Turn-lock fasteners fasten the wiper to the cover plates. With a 90° turn of the turn-lock fasteners the wiper is locked or released. In this way the system can be easily switched out for fresh parts.

Necessary calculated distance of the cover plates 4 mm (VA 12 G) and 6 mm (VA 17 G).

■ Wiper type VA 12 G

■ Wiper type VA 17 G

Damping elements on telescopic covers

Telescopic covers with travel speeds greater than 15 m/min must be provided with dampers in order to reduce impact pulses.

Wiper type MA 18 with damping

The support profile is made of aluminum and is screwed or riveted on. The wiper lip is identical to MA 12.1. The special damping profile can be installed in the rear aperture formed onto the support profile.

Necessary calculated distance of the cover plates 5.5 mm.

Brass strips with damping

Brass strips are used primarily on standing covers. The damping profile described above can likewise be mounted on an appropriately drawn brass profile.

Necessary calculated distance of the cover plates 5.5 mm.

Progressive damping element

In order to reduce impact pulses effectively, progressive damping elements can be installed in the rear walls of the covers. Depending on application and running speed the number of dampers is varied in order to achieve an optimal result.

Splash- and hose-proof protection on telescopic covers

Over time cooling emulsion and fine chips can be "pumped" under the individual boxes and make it over the rear wall into the machinery space that is being protected. In many cases this is undesirable. Machine tools with hydrostatic bearings require "watertight" covers.

Gullies for telescopic covers

In order to catch coolant and chips that make it over the rear wall, a gully is generally installed on the back of the rear wall. This gully allows the fluids to be drained off to the sides.

Aluminum gully type AL 19

This gully is an extruded aluminum profile which is screwed onto the rear walls of the cover.

The cover plate is bent downwards so that it projects into the gully. This allows the coolant between the plates to flow into the moulded gully.

Condensation water that forms under the cover plates is wiped off by a lip and drained into gullies to the front and back. This makes it possible to achieve a very high level of waterproofing.

Gully type ST 05

This gully is screwed onto the rear wall. This has the advantage of, among other things, meaning that galvanized metal plates can be used (no welding necessary).

Condensation gully type ST 05 K

This gully is based on the proven type ST 05. An upward extending sealing membrane made of flexible synthetic moves in both directions catching the condensation and directing it into the drain gutters. From there it flows automatically into the side drains.

CROSS-COVER covers

Even longer service lives for horizontal machines

Wherever for example machining spindles of horizontal drilling machines move with high accelerations and speeds, horizontal and vertically moving cover elements are needed.

With the second CROSS-COVER generation you likewise receive a ready-to-install cover unit that is movable in two dimensions. They are adapted individually to your application and delivered ready to install.

Our reworking of its proven design has improved its dynamic characteristics and extended its service life.

Re-Design CROSS-COVER

With the second CROSS-COVER generation the use of gliding and guide elements and the systematically weight-optimized design have made possible even higher travel speeds.

In addition to improvement of the dynamic characteristic values through reduction of the moving masses, the covers are even more durable. They provide the same high penetration resistance as the service-proven system.

Re-Design CROSS-COVER

- Higher travel speeds and accelerations possible
- Longer service life
- Lighter thanks to optimized design
- Protection against spray water according to IP X5
- Size selections available on short notice

CROSS-COVER in various expansion states

SXM
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SXM – Synchronized Expansion Mechanism

Impact-free travel of the cover elements

To ensure impact-free expansion / compression, synchronizers (harnesses) are also used in the revised design.

Protection against spray water acc. to IP X5

The CROSS-COVER covers meet the requirements of protection class IP X5 (Ingress Protection – protection against hose water).

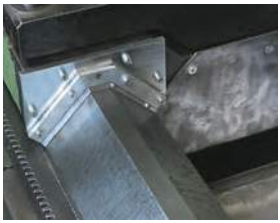
Subject to change.

Notes

Way wipers on guideways

The cleanup crew

Way wipers are essential to keep the guideways in a proper functional state, and thus to keep the machine tool permanently in operation. Even if the guideways are already protected by a telescopic cover, it is necessary to wipe fine, penetrating particles off of the vulnerable ways.



■ Harnessed way wipers

■ Cast wiper with steel support strip

■ Way wipers in a modular system

■ BAY-WIPE way wiper with optimised corner design.

Overview and delivery forms

Harnessed way wipers – proven in millions of applications

Available in a wide variety of shapes, harnessed according to your specifications, in bar form or available ex-stock.

Further information can be found on page 570.

Way wiper BA 65

Cast wiper with steel support strip, available ex-stock in bar form.

Further information can be found on page 572.

Way wiper BA 115 – with extra-long lip

Highly-flexible cast wiper with steel support strip, available ex-stock in bar form.

Further information can be found on page 573.

Way wipers in a modular system – the clever solution

The most economical alternative to cast wipers.

Further information can be found on page 574.

Way wiper types BA and BAS

The original!

Wipers of this type have a replaceable lip and guarantee high form stability and mechanical loading capacity. They are manufactured in custom forms according to your specifications. Available as bar material ex-stock.

Note: Reduce costs
With types BA and BAS the wiper lip is replaceable. In case of wear, only the lip has to be exchanged; the support profile can remain in use.

Properties

- Temperature range – 40 °C to 100 °C
- Support material: Aluminum
- Wiper lip material: Polyurethane
- Largely resistant to oils, greases, alkalis and water
- Pretension approx. 2 mm
- Replaceable wiper lip
- Standard length of bar material: 1000 mm

■ Inside or outside wiping forms are possible

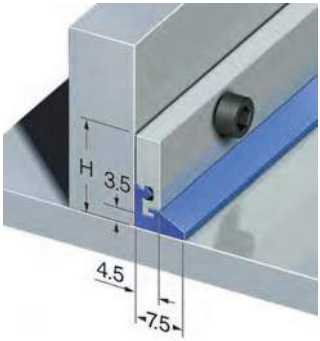
Dimensions and types

Type BA

Way wipers of this type are used mainly in those cases where installation conditions are restrictive, or where the wipers are additionally protected by means of a telescopic cover, a bellows, a link apron cover, or where no chips occur.

Type	Installation height H (clamped in position)
BA 18	17.5
BA 25	23.5

Standard length: 1000 mm

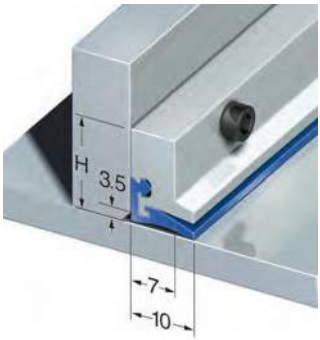


Type BAS

In this type series, the light metal support provides protection for the wiper lip. It is used primarily in the case of direct incidence of chips (no hot chips).

Type	Installation height H (clamped in position)
BAS 18	17.5
BAS 25	23.5
BAS 40	39.5

Standard length: 1000 mm



Pre-wiper for protection of the guideway

To protect the wiper lip from hot chips, and to remove coarse and stubborn dirt from the guideway, the way wiper must be fitted with a pre-wiper made from stainless spring steel or brass.

The pre-wiper and its corresponding light metal clamping strip are affixed to the machine component with the fastening screws of the wiper.

For straight way wipers with a corresponding hole pattern (distance between holes ≤ 80 mm), the clamping strip is not required.

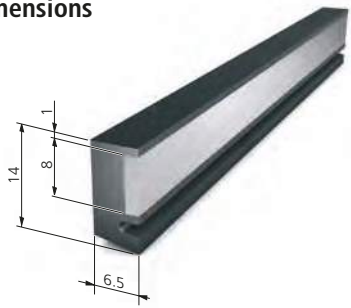
Way wiper BA 65 – bar material

Wipers of this type are compact and are notable for high shape accuracy and dimensional accuracy. It is manufactured in various forms, thus guaranteeing high repeatability.

Properties

- Temperature resistance – 40 °C to + 100 °C, briefly up to 140 °C
- Support material: Steel
- Wiper lip material: Abrasion-resistant synthetic rubber (NBR)
- Resistant to standard oils, greases, acids and bases
- Resistant to microorganisms

Dimensions



Way wiper BA 65-14

Way wiper BA 65-18

Way wiper BA 65-22

Way wiper BA 65-25

Type	Pretension (max.)
BA 65-14	1 mm
BA 65-18	1 mm
BA 65-22	2 mm
BA 65-25	1 mm

Length: 500 mm

Way wiper BA 115 – bar material

Highly flexible wiper with a max. pretension of 4 mm.
It is likewise manufactured in various forms, guaranteeing high repeatability.

Properties

- Temperature resistance – 40 °C to + 100 °C, briefly up to 140 °C
- Support material: Steel
- Wiper lip material: Abrasion-resistant synthetic rubber (NBR)
- Resistant to standard oils, greases, acids and bases
- Resistant to microorganisms

Dimensions

Way wiper BA 115-30

Type	Pretension (max.)
BA 115-30	4 mm

Length: 500 mm

Way wiper BA 65 VARIO

The most economical alternative to cast wipers – even for small quantities. On request we also manufacture them according to your specifications – custom tailored for your application. BA 65 VARIO way wipers are optionally available as complete wipers, or as individual wiper lips in bar form for your own harnessing.

So-called **"cast wipers"** are wipers consisting of a piece of neoprene rubber vulcanised onto a steel support profile. They are produced in specially-manufactured injection moulds. Larger quantities are essential, as the tool costs must be offset by the number of parts produced.

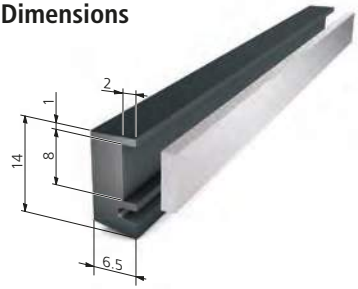
For the wiper system **BA 65 VARIO** no special tools are required: A pre-finished profile of synthetic rubber is custom-tailored. The support profile – usually made from metal – can be produced on a laser or nibbling machine.

Thus, smaller quantities can be produced in this way at a reasonable cost.

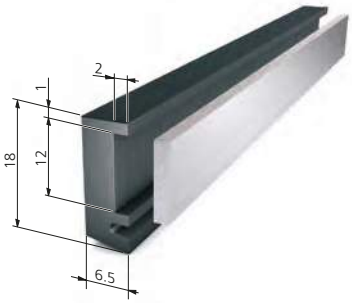
Properties

- Temperature resistance – 40 °C to + 100 °C, briefly up to 140 °C
- Support material: Steel, stainless steel
- Wiper lip material: Abrasion-resistant synthetic rubber (NBR)
- Resistant to standard oils, greases, acids and bases
- Pretension of the wiper lip: max. 1 mm
- Resistant to microorganisms

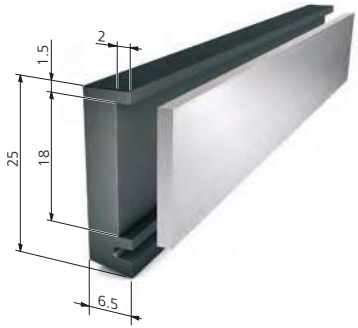
Dimensions



■ Way wiper BA 65-14 VARIO



■ Way wiper BA 65-18 VARIO



■ Way wiper BA 65-25 VARIO

Type	Pretension (max.)
BA 65-14	1 mm
BA 65-18	1 mm
BA 65-25	1 mm

Length: 500 mm

Delivery options

1. Construction set as individual parts

The support material and wiper lips are produced according to your specifications, and put together as a construction set.

■ Easy assembly of the individual parts

2. Ready-to-install wiper system

All parts are supplied affixed to the support profile.

■ Ready-to-install wiper system

3. Separate wiper lip

If your production department can produce the required support plates itself, you can order the wiper lip from us separately. The delivery length is 500 mm.

It can be ordered as follows:

....pcs. wiper lip BA 65-14 material no. 79000
....pcs. wiper lip BA 65-18 material no. 79001
....pcs. wiper lip BA 65-25 material no. 79003

■ Wiper lip bar material

Way wiper BAY-WIPE

Wiper with double action

BAY-WIPE by KABELSCHLEPP does what didn't seem possible up to now: A way wiper system that serves to wipe off oil inside while simultaneously removing foreign particles and coolants outside. In this way it protects particularly hydrostatic guideways by preventing the escape of lubricants.

Many wiper systems have problems at the point where a hydrostatic guideway goes round a corner. Rounded or bevelled corners on guideways are often problem areas, because the wiper elements cannot follow the profile closely enough.

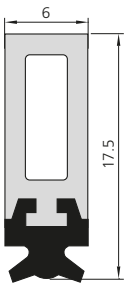
Our BAY-WIPE system now has these problem areas perfectly under control. Thanks to its optimised corner elements, which follow the contours of the path exactly, the guideway is wiped clean in both directions.

Properties

- Aluminum support profile with PUR wiper lip
- Wiper with double action: Wipes inside and outside
- Has separation effect by wiping on both sides
- Extremely low oil loss
- Prevents the invasion of foreign material
- Optimal regularity of pressure through minimum form deviation (die casting)
- Also provides seal at guideway protection bevel by conforming to shape
- Simple production, few parts

Dimensions

- Pretension: 0.4 mm
- Length: 516 mm



Intelligently designed, individually produced

The wiper lip of the BAY-WIPE was developed at the Institute for Machine Elements (IMA) at the University of Stuttgart. KABELSCHLEPP participated in this research project, and put the results into practice in a consistent manner.

A wiper lip that works in both directions is affixed directly to the support profile by means of a plastic injection moulding process. The straight sections of this profile, which have been cut to length, are then non-positively joined with pre-assembled corner elements. This allows a wiper system to be created from the individual parts, exactly suited to the contours of the guideway.

Link apron covers

Solutions for limited spaces

Link apron covers can be used anywhere where, for reasons of space, it is not possible to use telescopic covers. They lie directly on the guideways and can hang down freely at the end of the path, or be screwed on or wound around without any special guides.

Properties

- Small space requirement
- Protection against chips and lubricant
- Splash- and hose-proof
- Low weight
- Long service life
- Heat-resistant to 100 °C over extended periods
- Customized end attachment
- All link apron covers can be supplied with a roller device
- Lateral guides are not necessary
- Short delivery time
- Attractive price/performance ratio

Link apron covers

Solutions for limited spaces

Designs

Design 1

Lightweight, highly flexible solid profile link apron covers, thin design.

B_{min} = 100 mm
B_{max} = 950 mm
R_{min} = 25 mm
Weight = 5.6 kg/m²
Solid aluminum profile 19 x 3.0 mm with PU connecting elements

Design 2N

Lightweight, stable hollow profile link apron covers, extremely stress-resistant, even in large widths.

B_{min} = 100 mm
B_{max} = 2950 mm
R_{min} = 50 mm
Weight = 10 kg/m²
Hollow aluminum profile 20 x 5.5 mm with PU connecting elements

Design 3

Flexible solid metal link apron cover, with hinges and one-sided bend radius.

B_{min} = 100 mm
B_{max} = 2000 mm
R_{min} = 60 mm
Weight = 16.5 kg/m²
Hollow aluminum profile 18.5 x 6.8 mm with integrated hinge

Fastenings / connecting elements

Examples of fastening profiles

■ Standard end profile

■ Standard profile with mounting bracket

■ Straight end profile

■ Angle fastening profile

Installation variants

Roller devices

All link apron covers can be rolled up like a window blind.

They can be driven with spring or electric motors.

Notes

Subject to change.

Bellows

Guideway protection solutions with very little compression

KABELSCHLEPP bellows are used on all kinds of machine to provide protection for guideways and spindles, in those cases where no hot chips are present and accessibility is not a requirement.

Bellows can be individually produced from a range of different materials, depending on your specific requirements.

Properties

- Simple installation
- High travel speed
- Minimal compression
- High quality

Installation variants

- Horizontal, lying
- Horizontal, hanging
- Vertical

Delivery options

- For travel speeds of up to 1.5 m/s
- Customized production
- Available in a wide range of shapes
- Available in many different materials

Bellows

Guideway protection solutions with very little compression

Designs

U-bellows design

- Variable dimensions
- Customized in the guide
- Economically priced

■ U-bellows design

Box bellows design

- Covering for movable machine elements
- High form stability

■ Box bellows design

U-bellows design with lamellas

- Reliable protection against heavy chip generation
- Rust-resistant and acid-resistant telescopic plates
- Can be made coolant-proof upon request
- Rigid or movable design of the telescopic plates is possible

■ U-bellows design with lamellas

Additional shapes and designs are available on request.

Conical spring covers

Protection under extreme conditions

Conical spring covers protect spindles, columns, shafts, threads and rod guides reliably against contamination, chips and mechanical damage. They provide a good sealing function, and are self-cleaning if installed in a suitable position. High temperature resistance and resistance to chemicals guarantee reliable protection even under extreme operating conditions.

The springs are made of hardened high-quality spring band steel. The optimized design means that the horizontal bending and vertical deflection is very low. Thus, even in the extended state KABELSCHLEPP conical spring covers guarantee excellent protection against dirt and mechanical influences.

Properties

- Accident prevention for operating personnel from revolving spindles and shafts
- Reduction in downtimes resulting from contamination
- Increased machine service life
- Some conical spring covers are also available for retrofitting

Conical spring covers

Protection under extreme conditions

Installation positions

The conically wound conical spring covers automatically follow the motions of the machine. Made of high-quality blue polished steel or alternatively of stainless steel, they can be used in vertical, horizontal and inclined positions.

Vertical installation

When installed vertically, conical spring covers are mounted with the larger diameter at the top. This way the overlapping of the individual coils makes the conical spring covers self-cleaning.

Horizontal installation

When installed horizontally, conical spring covers are mounted with the larger diameter in the direction of the chip generation. In horizontal installation with larger diameters or longer expansion, the maximum expansion is reduced to 60 % of the value for vertical installation.

Moreover, a slight sag appears in the conical spring cover, which is about 2 – 5 % of the maximum expansion.

Installation in inclined position

In addition to vertical and horizontal installation, installation in an inclined position is also possible.
For small angles of incline above the horizontal the same conditions apply as in horizontal installation.

Installation of several conical spring covers in series

By connecting several conical spring covers in series it is possible to deal with special requirements, such as extra-long traversing distances.

We would be happy to advise you regarding such applications and can supply you with the necessary special flanges.

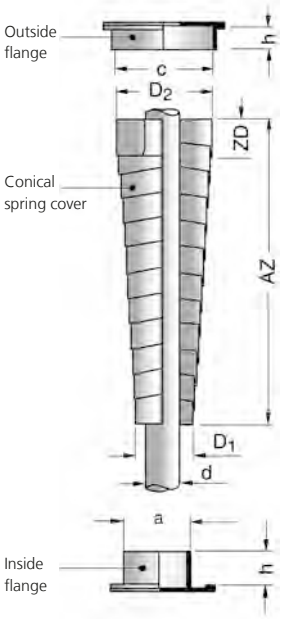
Retrofitting

Many conical spring covers are also available for retrofitting.

Selection

Selection of the conical spring cover suitable for your specific application is generally based on the following criteria:

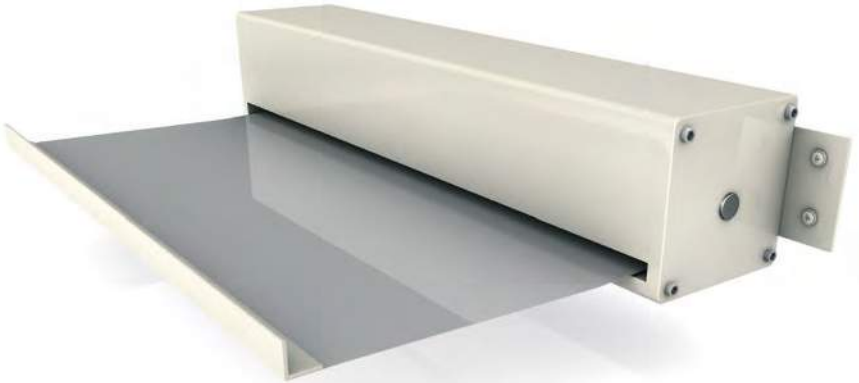
- Internal diameter D1
- Expansion AZ (vertical / horizontal)
- Compression ZD



Roll-up covers

Protection in a minimum of space

KABELSCHLEPP roll-up covers serve to protect contact surfaces and guideways on all kinds of machine.



Properties

- For high travel speeds
- Minimal space required
- Customized production
- Simple installation
- Long service life
- Cost-effective

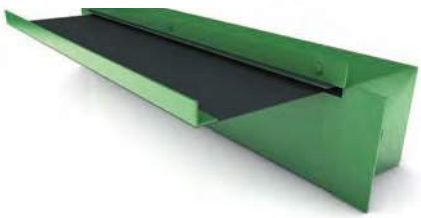
Designs

Roll-up cover without housing

Roll-up covers without a housing are suitable for areas with limited space, and facilitate optimal integration into the machine enclosure.

Roll-up cover with housing

Roll-up covers with an additional housing made of steel or aluminum protect the standard roll-up cover and allow simple installation or retrofitting.

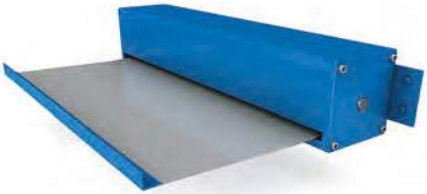


Roll-up covers with plastic band

- Reliable protection against cutting waste, oil and cooling emulsions
- Particularly suitable for high travel speeds thanks to its low own weight
- Minimal space required
- Very resistant to tearing due to plastic layered special fabric
- Various materials are possible

Roll-up covers with steel band

- Very good protection against cutting waste, oil and cooling emulsions
- Rust-resistant and acid-resistant spring band steel with thickness from 0.2 to 0.4 mm
- Suitable for high travel speeds and greater mechanical loads
- Only available with housing




1315

Protective devices

according to EN ISO 12100

PROTECT-PANEL

page 590

The “impenetrable” housing for your machines

PROTECT-PANEL system

The "impenetrable" housing for your machines

High speeds, quick machining cycles, cooling water and chips: Machine tools represent a dangerous environment for people. This is why all machine tools are contained in nearly "impenetrable" housings.

These help reduce or eliminate the hazards for the persons who work with them. With the KABELSCHLEPP PROTECT-PANEL system, we offer you optimized protection for a particularly attractive price.

Steel plate construction for a totally harmonised system

Every protective device is produced to your specifications – nevertheless made from standardized parts. We design in 3D and assemble your protective device from predefined elements. Special connecting elements hold the walls in line.

The entire system is made of steel. Extremely sturdy wall modules are created by using a combination of screws and rivets as well as sandwich-design without weld joints from industrially preassembled components. The wall elements are normally mounted vertically on C-profiles, e.g. on the shop floor. Unevenness of the floor surface can be compensated by adjusting hardware.

This production method offers you several advantages: Short design times by use of standardized parts. Short delivery times, since our production is based on predefined processes. Shorter installation time, since our mounting profiles are standardized and the wall elements are assembled with only a few screws. Processing on state-of-the-art processing machine tools provides a high precision for all elements. Avoiding welding as much as possible eliminates the potential for distortion and irregularties.

KABELSCHLEPP PROTECT-PANEL – modules:

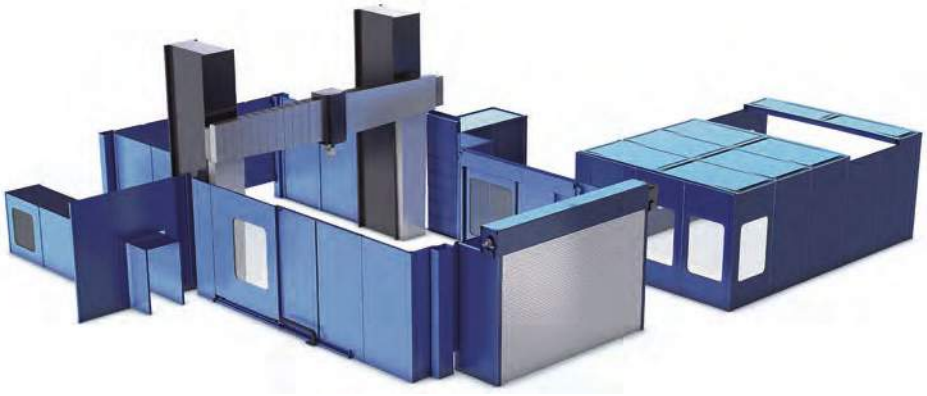
- Wall modules
- Window modules
- Corner modules
- Roof modules
- Sliding doors
  – automatic design
  – telescopic design
- Folding doors
- Lift gates
- Roll gates
- Chip protection walls
- Powder coated
  (colour as desired, RAL 9002 is standard)

PROTECT-PANEL: Secure protection against water spray

The unique connecting element means that the wall elements are sealed against water spray, and are joined to each other in an extra-sturdy manner. Each pair of modules is joined by specially-formed plates held together by bolts. An additional plate on the inside forms a labyrinth seal. In order to direct the remaining water spray downwards, we have fitted a deflector plate which guides the downward-flowing water directly into a particle conveyor, for example. The sandwich construction of the wall elements, together with the deflector plate, result in a sealed protective wall which can withstand even high water pressures.

- Protection against sprayed fluids:
  Sealed with a rubber seal and deflector plate.

Protective devices in modular design



PROTECT-PANEL – modules:

■ **Wall modules**
(standard dimensions B x H 1235 x 2350 mm)

■ **Window modules**
(with special glass pane insert)

■ **Corner modules**

■ **Roof modules**

■ **Sliding doors**
(automatic design)

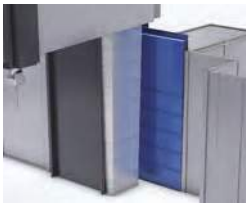
■ **Sliding doors**
(telescopic design)

■ **Folding doors**
(electric motor-driven under PLC control)

■ **Lift gates**
(up to six segments)

■ **Roll gates**
(vertical/vertical-horizontal motion)

■ **Roll gates with stainless steel lamellas**
(opens quickly, lightweight design)



■ **Movable chip protection walls**
(vertical and horizontal)

Subject to change.

PROTECT-PANEL system

The "impenetrable" housing for your machines

Protective devices in modular design

Wall modules

The standard wall module measurements are defined at 1235 mm width, 2350 mm height and 50 mm thickness. The sheet thickness of the outside cover plates is 2 mm.

Also the DIN EN 12415 and/or 17 standards are fulfilled by a total sheet thickness of 4 mm.

Using a 150 mm high floor-mounted C-profile with a wall connection element creates a grid spacing of 1250 x 2500 mm (W x H). The wall modules can be mounted side-by-side to form long walls. When necessary, supporting-columns are installed to add to lateral stability. Corner modules and roofs also provide a stabilizing effect and add to wall stability considerably. Connection elements have a labyrinth-seal on the work area side so that additional synthetic or rubber seals are not necessary. All parts of the walls are riveted or screwed together and are protected against rust by a powder coating in the desired colours. Cavity sealing protects the inner sides of the walls from condensation.

Windows modules

In the staging area of the machine polycarbonate-glass compound windows with high-grade steel frames are used which meet the DIN/EN 12415 standards for lathes and/or DIN/EN 12417 for machining centers. Outside the work area safety windows which are designated as single-pane safety glass are usually sufficient.

All window panes are installed in the walls – where necessary – in a splash-proof way. While the windows themselves are always produced as a rectangle, the opening can be formed according to customer preference. Whether oval, rectangular or rectangular with rounded corners, the organization of the external cover plates in the window area makes any shape possible.

Usual window measurements are 1000 x 1200 mm (W x H). The wall module in the standard measurements is made as a window module. If larger window widths are desired special modules are necessary.

Corner modules

Wall modules can be combined to form corner modules. It is irrelevant whether it is a standard or a custom wall width. Specially designed corner profiles combine the elements at the header sides using screws and rivets imbedded in the already coated walls.

A metal valance reaching to the ground closes the outside corner opening and provides good aesthetics. As seen from the staging area the inside corner is sealed and waterproof without the use of synthitic seals. The 90° corner constructed in this way is
extremely stable.

Multiple colours – as shown in the picture – require seperately produced elements, since otherwise a powder coating would not be possible.

Roof modules

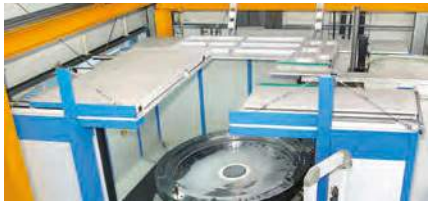
The machine tools had to be secured at the top for reasons of job safety.

The task: Although the covers to be constructed do not have to bear the same load as the side walls, they need to ensure a high degree of stability to effectively block flying chips.

Based on our PROTECT-PANEL system, we developed a roof with a sandwich design that is both lightweight and stable.

To dispense with inner braces, a bearing structure was selected that is also used for suspension bridges: Steel cables and pylons assume the static function for the roof elements.

Since workpieces are frequently supplied by cranes in processing centres, the roof was designed to open a few locations. This opening was created by two movable elements that telescopically overlap. The sliding roof elements take up very little space when open.



PROTECT-PANEL system

The "impenetrable" housing for your machines

Protective devices in modular design

Sliding doors (automatic design)

Because automatic doors are integrated into the machine tool programme, they automatically open and close according to the required production cycle. For heights of 2-3 m that's nothing special. But the automatic door in the PROTECT-PANEL system can manage much bigger sizes.

At the production plant of one of our customers, a first automatic door has been installed which is 6500 mm high, 1600 mm wide, 500 kg in weight and can open and close within 5 seconds. It's a challenge that we were able to solve with the help of linear drives, a three-phase motor and control shaft technology.

Sliding doors (telescopic design)

The access to the inside of machining centres is particular large due to our space-saving telescopic sliding door. Components in XXL format can be easily supplied.

The PROTECT-PANEL system already boasts of a series of sliding door and roll gate solutions. The telescopic sliding door can be opened wide quickly, but it remains impenetrable when closed.

The sliding door elements also come in a sandwich construction and additionally provided with bullet-proof glass window to allow a view of the interior.

Folding doors

To make exchanging workpieces easier, and if it is not possible to implement a guide rail in the upper and lower areas of the enclosure, then you can equip the enclosure with a folding door which moves to the side. The folding door is suspended only from a lateral post, leaving the greatest possible open space for your workpieces, especially in the upwards direction.

The door elements have the same design as the wall elements. Each of them is driven by a 24 V DC motor with a planetary gear unit and integrated PLC controller. Country-specific voltages can easily be obtained using an appropriate transformer.

Modern CAN-BUS technology makes it possible to program different motion patterns for individual door elements. Teaching and loading of programs are remarkably simple. If suitable CAN-BUS equipment is present, the motors can also be monitored using the machine controller. When closed, the doors are held together by a locking mechanism, and will not open even if a person leans on them, for example. The end positions can be monitored and interrogated either via the program, or by means of additional limit switches.

Lift gates

Unlike the roll gate, the lift gate has a small number of larger segments, which all move together. The segments have a sandwich construction, which makes them extremely resistant to penetration. These larger segments are thus not rolled up, but instead are positioned one behind the other, and hang neatly one behind the other when the door is open.

A special feature of this gate is its lifting and lowering mechanism, which makes use of pulleys. Each gate element is suspended on two pulleys, which raise or lower all of the elements evenly.

Roll gates

When changing pallets on machine tools, a gate is required that moves at high speeds when opening and closing. The PROTECT-PANEL roll gate functions in principle like a garage door. A segmented gate moves upwards and is rolled up. The height of an already built gate structure is 3500 mm.

The lamellas of this gate are made from aluminum, and are reinforced on the inside with steel inserts. This guarantees the required penetration resistance.

Roll gates with stainless steel lamellas

Different production processes require differentiated gate solutions. The roll gate with rugged stainless steel lamellas is an economical solution featuring lightweight construction.

Thanks to the special shaping of the lamellas the gates are very stable despite their low intrinsic weight and are very resistant to flying chips. The lightweight construction means that high speeds can be achieved when opening and closing.

Movable chip protection walls

Machining tools should be kept ready near the machining area in order to ensure short distances and thus short changing times. To prevent damage and fouling of the tools that are kept ready, they have to be given special protection.

Our chip protection wall separates the machining cell from the tool magazine and protects the tools in the magazine that are not needed for the current machining operation.

It can be traversed horizontally for loading; during machining it follows the vertical motion of the cross beam.

Hinged belt conveyors question form.

Purpose of the conveyor: _____

Material to be conveyed: _____

Type of material to be conveyed (for chips: type of chip): _____

Max. dimensions of material to be conveyed: _____

Material: _____

Output: _____ m^3/h _____ kg/h

Coolant

Type of coolant: ☐ Emulsion ☐ Oil _____

Quantity of coolant: _____ l/min

Coolant container: ☐ On conveyor housing
☐ Separate container
☐ With pump
☐ With float bracket

Electrical connection values:

Operating voltage: _____ volts

Control voltage: _____ volts

Frequency: _____ Hz

Electrical control

☐ Supplied by KABELSCHLEPP GmbH

☐ Material to be provided by customer

Design of control _____

Overload safety

☐ Electrical overload protection (e.g. motor protection switch)

☐ Current monitoring relay

☐ Torque switching via limit switch
(only when conveyor driven by attachable gear motor)

Paintwork

Primer _____

Paint – RAL _____

Design

☐ Straight

☐ Straight/rising

☐ Straight/rising/straight

■ **Straight design**
Horizontal or rising
Max. incline 45°

■ **Straight/rising design**
Max. incline 45°

■ **Straight/rising/straight design**
Max. incline 60°

Enquiry forms

Question forms and technical information

Hinged belt conveyors question form

Area of application:

Machining processes

☐ turning ☐ milling ☐ drilling ☐ grinding
☐ punching ☐ pressing ☐ laser ☐ _____

Conveyed goods:

Chips

_____
material (cast iron, Al, St, Ms, Cu, ...)

☐ flow chips ☐ finely broken < 5 cm
☐ broken ☐ curled, swarf clusters
☐ other _____

Type of chips: ☐ compressible
☐ not compressible
☐ high-strength

Ball formation: ☐ yes ☐ no

Apparent density: _____ kg/m³

Chip volume (machined): _____ m³/h

Chip temperature: _____ °C

Parts

_____
material (cast iron, Al, St, Ms, Cu, ...)

☐ waste parts ☐ good parts ☐ punched parts
☐ forged parts ☐ other _____

Dimension: _____ mm

Shape: _____

Parts temperature: _____ °C

Units/min: _____

Apparent density: _____ kg

Parts weight: _____ kg/unit

Task

☐ continuous ☐ at intervals
☐ time between intervals _____ min
☐ sliding ☐ falling
☐ falling height _____ mm

_____
Infeed peak (e.g. 0.5 m3 in 10 minutes; 20 units in 10 minutes)

■ **Straight design**
Horizontal or rising.
Max. incline 45°

■ **Straight/rising design**
Max. incline 45°

■ **Straight/rising/straight design**
Max. incline 60°

Subject to change.

Cutting lubrication:

Cutting fluid

☐ water ☐ oil ☐ emulsion ☐ without lubricant

_____ l/min
Quantity

_____
Manufacturer/type

Coolant pumps

☐ High pressure

_____
Quantity

_____
Manufacturer/type

_____ l/min
Pumping capacity

_____ bar
at

☐ Low pressure

_____
Quantity

_____
Manufacturer/type

_____ l/min
Pumping capacity

_____ bar
at

☐ Level switch

_____
Type

_____
Switching points

Screen(s)/filters

☐ filter basket ☐ wedge wire screen

_____ mm
Hole/wedge width

Coolant tank

☐ on the pump housing ☐ separate container

_____ litres
Volume

Conditions:

Environment

☐ dust ☐ other _____

_____ °C
Ambient temperature

_____ %
Relative humidity

Installation situation

☐ individual conveyor ☐ connected conveyor _____ Stück

Chip conveyor, divided: ☐ yes ☐ no Length per pitch: _____ mm

☐ next to machine bed ☐ in machine bed ☐ in coolant tank

☐ internal ☐ external only ☐ discharge external

Chip discharge: ☐ direct access ☐ indirect access

Discharge into: ☐ container ☐ chute: ☐ motorised / ☐ manual

☐ follow-up conveyor ☐ free fall

Available space in the machine bed/foundation

_____ mm Height _____ mm Width

_____ mm Length

_____ Foundation, pit, channel, connections for coolant

_____ Manufacturer of processing machine/type

Electrical system:

Connection

_____ V Supply voltage _____ Hz Frequency

_____ V Control voltage _____ Certifications (CE, UL, CSA, ...)

Electrical control:

☐ supplied by KABELSCHLEPP GmbH - Hünsborn ☐ provided by customer

_____ Control version

Overload protection:

☐ electrical overload protection (e.g. motor protection switch) ☐ current measuring relay

☐ torque switch-off via limit switch (only for drive through shaft-mounted gear motor)

Paint coat:

_____ ☐ textured ☐ smooth

Paint coat – RAL (if nothing is specified, RAL 7035 light grey will be supplied)

Other:

Requirement

_____ Annual requirement _____ Place/country of use

Installation:

☐ installed by KABELSCHLEPP GmbH - Hünsborn ☐ installed by customer

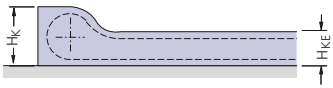
Design:

Total length L_G: _____ mm Box width B_K: _____ mm

Belt width B_{SCH}: _____ mm

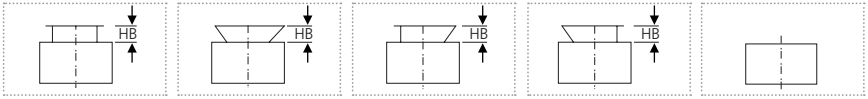
Box height H_K: ☐ 140 mm (SRF 040.00) ☐ 216 mm (SRF 063.00) ☐ 360 mm (SRF 100.00) ☐ 540 mm (SRF 150.00)

Reduced box height H_{KE}: (if required) ☐ 110 mm (SRF 040.00) ☐ 153 mm (SRF 063.00) ☐ 260 mm (SRF 100.00) ☐ 390 mm (SRF 150.00)



Design of the cover panel in the feed area (see cross section A-B)

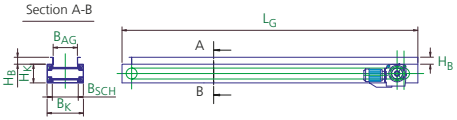
☐ V 1 ☐ V 2 ☐ V 3 ☐ V 3.1 ☐ V 4



☐ **straight**

Total length of conveyor L_G: _____ mm

Cover panel height H_B: _____ mm



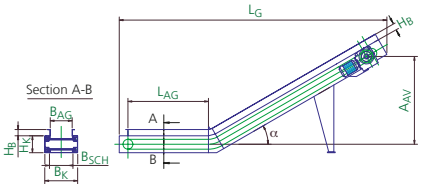
☐ **straight/rising**

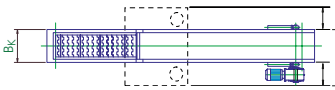
Feed length L_{AG}: _____ mm

Centre distance vertical AA_V: _____ mm

Alpha: ☐ 30° ☐ 45° ☐ 60° ☐ _____°

Cover panel height H_B: _____ mm





_____ mm

_____ mm

☐ **straight/rising/straight**

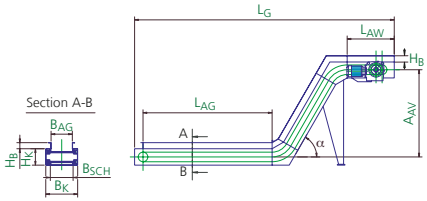
Feed length L_{AG}: _____ mm

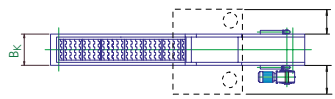
Centre distance vertical AA_V: _____ mm

Alpha: ☐ 30° ☐ 45° ☐ 60° ☐ _____°

Discharge length L_{AW}: _____ mm

Cover panel height H_B: _____ mm





_____ mm

_____ mm

Subject to change.

Scraper conveyors question form

Area of application:

Machining processes

☐ turning ☐ milling ☐ drilling ☐ grinding
☐ punching ☐ pressing ☐ laser ☐ _____

Conveyed goods:

Chips

_____
material (cast iron, Al, St, Ms, Cu, ...)

☐ flow chips ☐ finely broken < 5 cm
☐ broken ☐ curled, swarf clusters
☐ other _____

Type of chips: ☐ compressible
☐ not compressible
☐ high-strength

Ball formation: ☐ yes ☐ no

Apparent density: _____ kg/m³

Chip volume (machined): _____ m³/h

Chip temperature: _____ °C

Parts

_____
material (cast iron, Al, St, Ms, Cu, ...)

☐ waste parts ☐ good parts ☐ punched parts
☐ forged parts ☐ other _____

Dimension: _____ mm

Shape: _____

Parts temperature: _____ °C

Units/min: _____

Apparent density: _____ kg

Parts weight: _____ kg/unit

Task

☐ continuous ☐ at intervals
☐ time between intervals _____ min
☐ sliding ☐ falling
☐ falling height _____ mm

_____
Infeed peak (e.g. 0.5 m3 in 10 minutes; 20 units in 10 minutes)

■ **Straight design**
Horizontal or rising.
Max. incline 45°

■ **Straight/rising design**
Max. incline 45°

■ **Straight/rising/straight design**
Max. incline 60°

Subject to change.

Cutting lubrication:

Cutting fluid

☐ water ☐ oil ☐ emulsion ☐ without lubricant

_____ l/min _____
Quantity Manufacturer/type

Coolant pumps

☐ High pressure

_____ _____
Quantity Manufacturer/type

_____ l/min _____ bar
Pumping capacity at

☐ Low pressure

_____ _____
Quantity Manufacturer/type

_____ l/min _____ bar
Pumping capacity at

☐ Level switch

_____ _____
Type Switching points

Screen(s)/filters

☐ filter basket ☐ wedge wire screen _____ mm
Hole/wedge width

Coolant tank

☐ on the pump housing ☐ separate container _____ litres
Volume

Conditions:

Environment

☐ dust ☐ other _____

_____ °C _____ %
Ambient temperature Relative humidity

Installation situation

☐ individual conveyor ☐ connected conveyor _____ Stück

Chip conveyor, divided: ☐ yes ☐ no Length per pitch: _____ mm

☐ next to machine bed ☐ in machine bed ☐ in coolant tank

☐ internal ☐ external only ☐ discharge external

Chip discharge: ☐ direct access ☐ indirect access

Discharge into: ☐ container ☐ chute: ☐ motorised / ☐ manual

☐ follow-up conveyor ☐ free fall

Available space in the machine bed/foundation

_____ mm Height _____ mm Width

_____ mm Length

_____ Foundation, pit, channel, connections for coolant

_____ Manufacturer of processing machine/type

Electrical system:

Connection

_____ V Supply voltage _____ Hz Frequency

_____ V Control voltage _____ Certifications (CE, UL, CSA, ...)

Electrical control:

☐ supplied by KABELSCHLEPP GmbH - Hünsborn ☐ provided by customer

_____ Control version

Overload protection:

☐ electrical overload protection (e.g. motor protection switch) ☐ current measuring relay

☐ torque switch-off via limit switch (only for drive through shaft-mounted gear motor)

Paint coat:

_____ ☐ textured ☐ smooth

Paint coat – RAL (if nothing is specified, RAL 7035 light grey will be supplied)

Other:

Requirement

_____ Annual requirement _____ Place/country of use

Installation:

☐ installed by KABELSCHLEPP GmbH - Hünsborn ☐ installed by customer

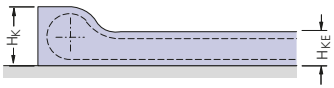
Bauform:

Gesamtlänge L_G: _____ mm Kastenbreite B_K: _____ mm

Kratzerbreite B_{KR}: _____ mm

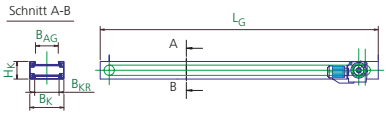
Kastenhöhe H_K: ☐ 140 mm (KRF 040.00) ☐ 216 mm (KRF 063.00)
☐ 360 mm (KRF 100.00)

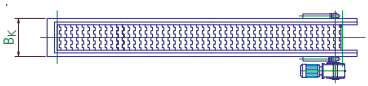
Eingezogene Kastenhöhe H_{KE}: (bei Bedarf)
☐ 110 mm (SRF 040.00)
☐ 153 mm (SRF 063.00)
☐ 260 mm (SRF 100.00)



☐ **straight**

Total length of conveyor L_G: _____ mm



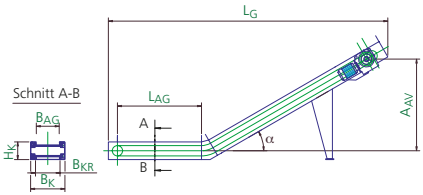


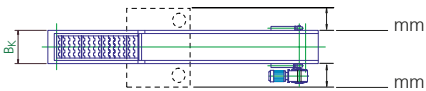
☐ **straight/rising**

Feed length L_{AG}: _____ mm

Centre distance vertical AA_V: _____ mm

Alpha: ☐ 30° ☐ 45° ☐ 60° ☐ _____°





_____ mm

_____ mm

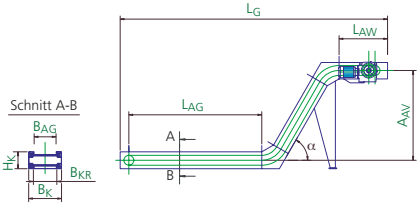
☐ **straight/rising/straight**

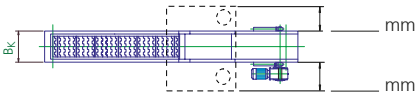
Feed length L_{AG}: _____ mm

Centre distance vertical AA_V: _____ mm

Alpha: ☐ 30° ☐ 45° ☐ 60° ☐ _____°

Discharge length L_{AW}: _____ mm





_____ mm

_____ mm

Notes

Subject to change.

Belt conveyors question form

Purpose of the conveyor: _____

Material to be conveyed:

Type of material to be conveyed (for chips: type of chip): _____

Max. dimensions of material to be conveyed: _____

Material: _____

Output: _____ m^3/h _____ kg/h

■ **Standard design**
Horizontal or rising.
Max. incline 30°

Electrical connection values:

Operating voltage: _____ volts

Control voltage: _____ volts

Frequency: _____ Hz

Electrical control

☐ Supplied by KABELSCHLEPP GmbH

☐ Material to be provided by customer

Design of control _____

Overload safety

☐ Electrical overload protection (e.g. motor protection switch)

☐ Current monitoring relay

Varnish coating

Primer _____

Paint – RAL _____
(if not otherwise specified, RAL 7035 – light-grey – will be delivered)

Construction dimensions:

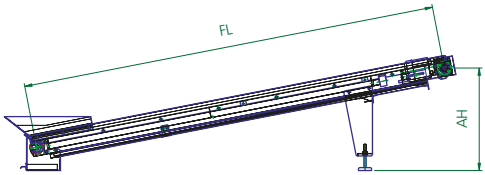
Conveying length F_L: _____ mm

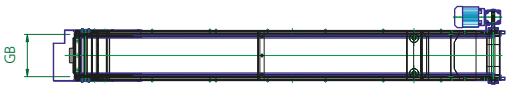
Discharge height A_H: _____ mm

Belt width G_B: _____ mm

Additional information

_____





Telescopic covers question form

Machine data:

Machine type: _____

Use of telescopic cover:

☐ Machine base

☐ Standing

☐ Cross-beam

Machine travel (travel distance LS_K) _____ mm

Travel speed v: _____ m/min

Acceleration a: _____ m/s^2

Width of guideway B_B: _____ mm

Guideway lubrication:

☐ Hydrostatic

☐ Aerostatic

☐ Other _____

Photograph: Waldrich Siegen Werkzeugmaschinen GmbH

Data for the design of the telescopic cover:

Travel length of telescopic cover L_S: _____ mm

Maximum compression of telescopic cover L_Z: _____ mm

Possible width of the telescopic cover B_A: _____ mm

Possible height of the telescopic cover above the guideway $H1_{.x}$: _____ mm

Possible total height of telescopic cover H_G: _____ mm

Connection of telescopic cover: _____

Wiper with protective strip for protection against hot chips: ☐ Yes ☐ No

Additional information:

Interference contours around the telescopic cover (way wipers, lines, etc.):

_____

Design of the telescopic cover: ☐ Not walkable-on ☐ Walkable-on when at rest

Quantity of chips: _____ kg/h

Type of chips: _____

Coolant:

Type: _____

Quantity: _____ l/min

Can consoles be attached? ☐ Yes ☐ No

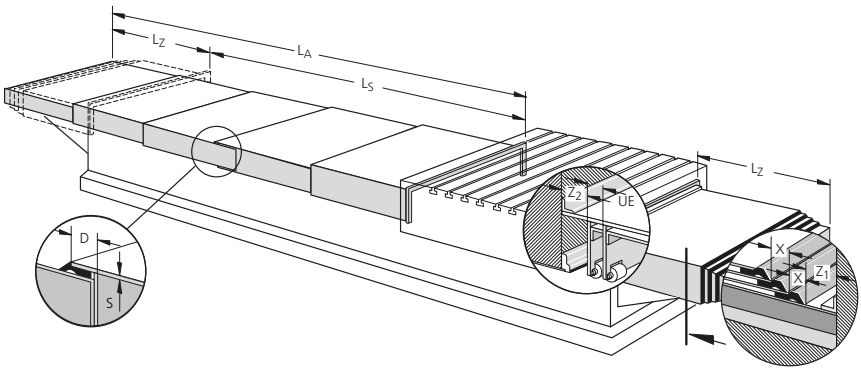
Should consoles be attached? ☐ Yes ☐ No

Other information

_____

Horizontally-installed telescopic covers

Technical information



Explanation of terms
Technical explanations

B_A = Maximum width of the telescopic cover

B_B = Width of guideway

B_{U1} = Width of undergrip – left

B_{U2} = Width of undergrip – right

h_1 = Thickness of upper bundle of plates

h_2 = Thickness of side bundle

h_3 = Thickness of undergrip bundle

$H_{1.1}$ = Height of telescopic cover above the contact surface – left

$H_{1.2}$ = Height of telescopic cover above the contact surface – right

$H_{2.1}$ = Height of side leg piece – left

$H_{2.2}$ = Height of side leg piece – right

H_G = Total height of telescopic cover

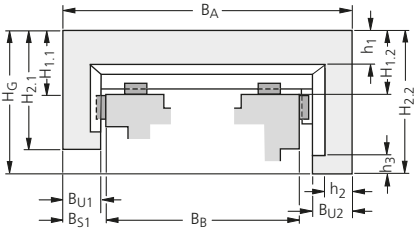
Z_1 = Console plate extension

Z_2 = Support plate extension

v = Travel speed

L_{SK} = Machine travel length

The travel length of the machine is the distance that a moving machine component travels from one end position to the other.



L_S = Travel length of telescopic cover

$L_S = L_{SK}$ + reserve

L_Z = Compression

If the individual sheet metal elements are compressed in an end position, then the compression is the length of the bundle of metal plates.

n = Number of plates

s = Plate thickness

D = Sheathing (non-expandable plate length)

UE = Distance between the plates at the support

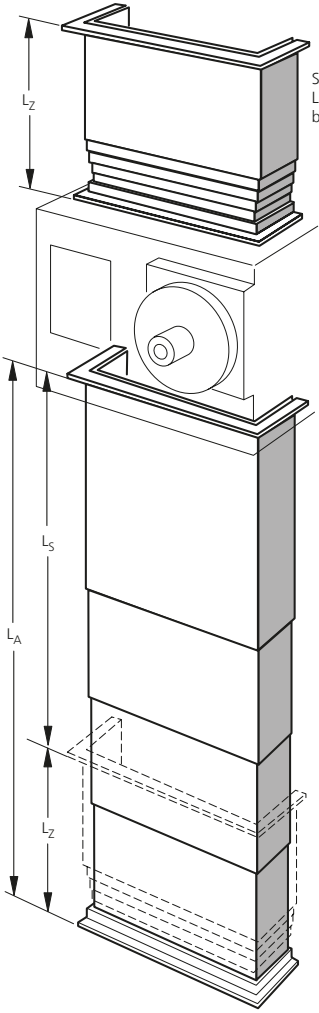
X = Gradation of metal plate at the driver wipe

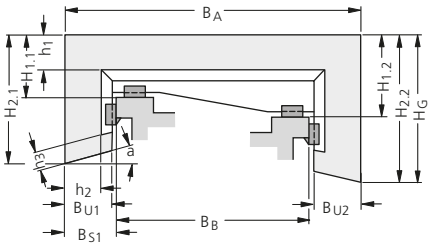
l = Plate length

The relationship between the plate length and plate width is selectable up to a ratio of **1:8**.

Vertically-installed telescopic covers

Technical information





Eyplanation of terms
Technical explanations

B_A = Maximum width of the telescopic cover

B_B = Width of guideway

B_{U1} = Width of undergrip – left

B_{U2} = Width of undergrip – right

h_1 = Thickness of upper bundle of plates

h_2 = Thickness of side bundle

h_3 = Thickness of undergrip bundle

a = Angle at undergrip

$H_{1.1}$ = Height of telescopic cover above the contact surface – left

$H_{1.2}$ = Height of telescopic cover above the contact surface – right

$H_{2.1}$ = Height of side leg piece – left

$H_{2.2}$ = Height of side leg piece – right

H_G = Total height of telescopic cover

v = Travel speed

L_{SK} = Machine travel length

The travel length of the machine is the distance that a moving machine component travels from one end position to the other.

L_S = Travel length of telescopic cover

$L_S = L_{SK}$ + reserve

L_Z = Compression

If the individual sheet metal elements are compressed in an end position, then the compression is the length of the bundle of metal plates.

n = Number of plates

s = Plate thickness

D = Sheathing (non-expandable plate length)

UE = Distance between the plates at the support

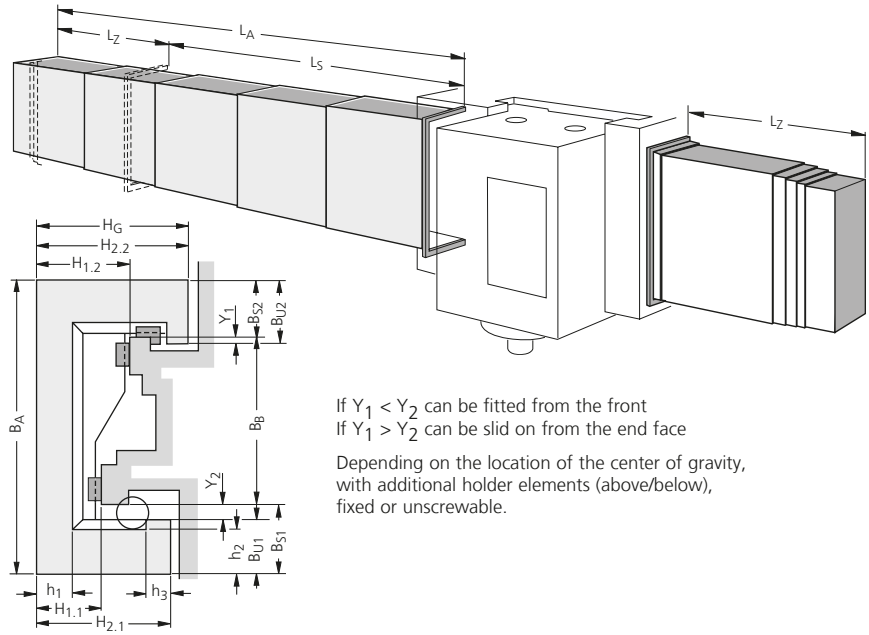
X = Gradation of metal plate at the driver wiper

l = Plate length

The relationship between the plate length and plate width is selectable up to a ratio of **1:8**.

Horizontal, hanging telescopic covers

Technical information



If $Y_1 < Y_2$ can be fitted from the front
If $Y_1 > Y_2$ can be slid on from the end face

Depending on the location of the center of gravity, with additional holder elements (above/below), fixed or unscrewable.

Explanation of terms
Technical explanations

B_A = Maximum width of the telescopic cover

B_B = Width of guideway

B_{U1} = Width of undergrip – left

B_{U2} = Width of undergrip – right

h_1 = Thickness of upper bundle of plates

h_2 = Thickness of side bundle

h_3 = Thickness of undergrip bundle

$H_{1.1}$ = Height of telescopic cover above the contact surface – left

$H_{1.2}$ = Height of telescopic cover above the contact surface – right

$H_{2.1}$ = Height of side leg piece – left

$H_{2.2}$ = Height of side leg piece – right

H_G = Total height of telescopic cover

v = Travel speed

L_{SK} = Machine travel length

The travel length of the machine is the distance that a moving machine component travels from one end position to the other.

L_S = Travel length of telescopic cover

$L_S = L_{SK}$ + reserve

L_Z = Compression

If the individual sheet metal elements are compressed in an end position, then the compression is the length of the bundle of metal plates.

n = Number of plates

s = Plate thickness

D = Sheathing (non-expandable plate length)

UE = Distance between the plates at the support

X = Gradation of metal plate at the driver wiper

l = Plate length

The relationship between the plate length and plate width is selectable up to a ratio of **1:8**.

Way wipers question form

Standard design:

Type	Standard length	Quantity
Type BA 18	1000 mm	_____
Type BA 25	1000 mm	_____
Type BAS 18	1000 mm	_____
Type BAS 25	1000 mm	_____
Type BAS 40	1000 mm	_____
Type BA 65-14	500 mm	_____
Type BA 65-18	500 mm	_____
Type BA 65-25	500 mm	_____
Type BA 115-30	500 mm	_____
BAY-WIPE	516 mm	_____

Harnessed wipers:

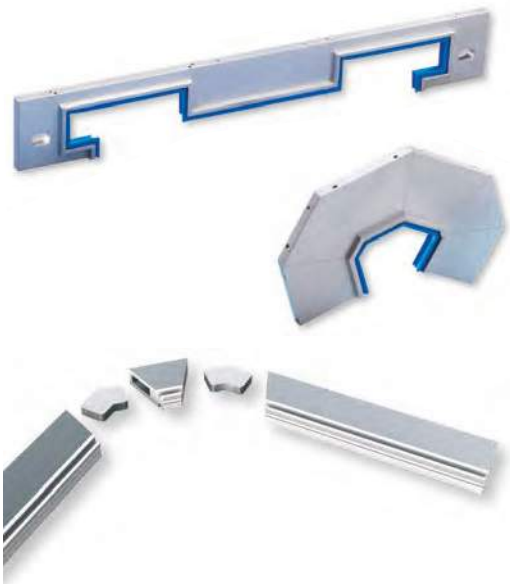
Drawing/sketch of the wiper with precise dimensioning

Pre-wiper for protecting the wiper lip against hot chips:

☐ yes ☐ no

Environmental conditions (temperature, coolant, dirt, etc.):

_____



Link apron covers question form

Travel speed: _____ m/min

Length: _____ mm

Width: _____ mm

Designs:

☐ **Design 1**

B_{min} = 100 mm

B_{max} = 950 mm

R_{min} = 25 mm

Weight = 5.6 kg/m²

Solid aluminum profile 19 x 3.0 mm
with PU connecting elements

■ **Design 1**

☐ **Design 2N**

B_{min} = 100 mm

B_{max} = 2950 mm

R_{min} = 50 mm

Weight = 10 kg/m²

Hollow aluminum profile 20 x 5.5 mm
with PU connecting elements

■ **Design 2N**

☐ **Design 3**

B_{min} = 100 mm

B_{max} = 2000 mm

R_{min} = 60 mm

Weight = 16.5 kg/m²

Hollow aluminum profile 18.5 x 6.8 mm
without PU connecting elements

■ **Design 3**

End attachment:

_____

Comments:

_____

Bellows question form

Drawing/sketch of the cross-section to be covered

Travel speed: _____ m/min

Total expansion: _____ mm

Compression: _____ mm

Machine travel: _____ mm

Max. external dimensions: _____ mm

End attachment:

_____

Installation position:

_____

Environmental conditions (temperature, etc.):

_____

Use of emulsions (type and quantity in l/min):

_____

Annual requirements:

_____

Conical spring covers question form

Internal diameter: _____ mm

Travel speed: _____ m/min

Total expansion: _____ mm

Compression: _____ mm

Machine travel: _____ mm

Max. external dimensions: _____ mm

Material:

☐ Spring band steel, blue polished

☐ Stainless steel

Installation position:

_____

Environmental conditions (temperature, etc.):

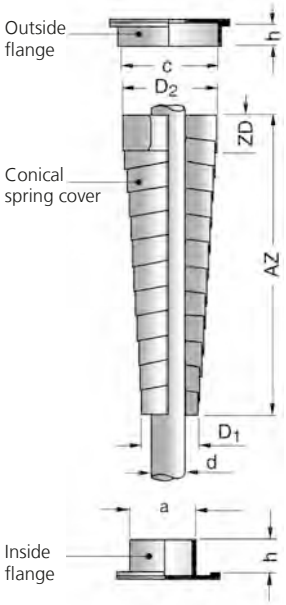
_____

Use of emulsions (type and quantity in l/min):

_____

Annual requirements:

_____



Type designation

025 – 0100 – 020 V 0

- Spiral internal diameter D_1 in mm
- Vertical expansion AZ in mm
- Compression ZD in mm
- Installation position: V = vertical, H = horizontal
- Spiral material: 0 = Spring band steel, blue polished, 1 = Stainless steel

Conical spring cover

d = Shaft/spindle diameter
a = Diameter of the guide sleeve
= Hole diameter in the external flange
a ≤ D_1 – 4 mm
D_1 = Spiral internal diameter
D_2 = Spiral external diameter
c = External diameter of the internal flange
Internal diameter of the external flange
c ≥ D_2 + 6 mm
h = Flange height
(0.6 x ZD ≤ h ≤ (ZD – 2 mm))
ZD = Compression
AZ = Expansion / expansion length

The guide flange is not included in the scope of supply, but can be supplied at the same time on request.

When ordering please indicate the installation position and spiral material. See "Type designation".

Subject to change.

Roll-up covers question form

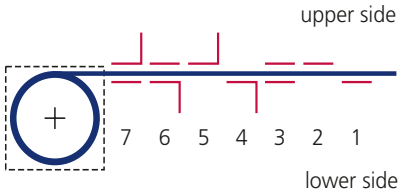
Travel speed: _____ m/min

Total expansion: _____ mm

Machine travel: _____ mm

Belt width: _____ mm

End attachment:



☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7

Installation position:

_____

Design:

☐ With housing

☐ Without housing

Belt type:

☐ Stainless steel

☐ Plastic

Environmental conditions (temperature, emulsions, etc.):

_____

Annual requirements:

_____

Subject to change.

Notes

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Notes

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With our worldwide technical sales and service network we are close to our customers at all times. This ensures quick response, individual support and personal service – based everywhere on an understanding of local requirements.

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