TS 2νν
## Symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
</table>
| ![120](image1.png) | Permissible section load  
(here: 120 kg) |
| ![toothed_belt](image2.png) | Toothed belt conveyor medium |
| ![1500_mm](image3.png) | Reversible operation permissible  
(here: max. 1500 mm section length) |
| ![ESD_sensitive_areas](image4.png) | Suitable for use in ESD sensitive areas.  
We recommend that you contact your Rexroth representative. |
| ![unit_has_its_own.drive](image5.png) | Unit has its own drive |
| ![compressed_air_connection](image6.png) | Compressed air connection required  
(here: 4 to 6 bar) |
| ![pushlock_type](image7.png) | Pushlock-type clamped connection for compressed air  
(here: 4 mm diameter) |
| ![temperature](image8.png) | Temperature of the transported material  
(here: 160°C) |
| ![reference](image9.png) | Reference to technical data/dimensions |
| ![reference](image10.png) | Reference to further information |
| ![page_reference](image11.png) | Page reference |
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Rexroth – We bring movement into module production

Whether wafer-based solar modules or thin-film technology modules – production of these products is an extremely sensitive and complex process that consists of numerous processing steps, and also places the highest demands on material transport before, during, and after the individual processing stations.

The glass plates are not only relatively large and extremely fragile, but also extremely sensitive to contamination. Rexroth has developed a special transfer system that takes these high demands into consideration and is characterized by a high level of cost-effectiveness: the TS 2pv.
Special demands require customized solutions. The TS 2pv transfer system has been consistently adapted to product- and process-specific concerns in the solar industry.

In use for many years in various industries, our “classic” transfer technology forms the basis for customization.

Individual systems can be implemented quickly and inexpensively through the use of numerous standard components. Included is Rexroth’s well-known quality and comprehensive, worldwide service. System implementation also includes individual consultation on how to configure your TS 2pv transfer system.

Please contact your Rexroth representative with any questions about system configuration. www.boschrexroth.com/various/utilities/location/
Ideal for gentle material flow
The production process for solar modules demands jolt and vibration-free transport without accumulation operation. To accomplish this, the conveyor sections are divided into short segments:
- Depending on the respective module dimensions, the individual segments are usually two to three meters long, 0.6 to 1.5 meters wide, and are made of two to five tracks.
- Each segment has its own drive.
- The drive stops to position the module for processing, or if the following section segment is still occupied by another module.
- Frequency converters ensure soft braking and accelerating.
- The LTS lift transverse unit gently moves the modules from longitudinal sections to transverse sections.

Created for clean production
A clean production environment is decisive when manufacturing modules, as this is the only way to ensure a uniformly high level of product quality. As a result, suitability for cleanrooms was at the forefront during the development of the TS 2pv and its associated components.
- Components that fulfill the requirements for cleanroom class 6 in accordance with EN ISO 14644-1 (corresponds to class 1000 in accordance with U.S. Fed. Standard 209E)
- No contamination by silicone, grease, or oil
- Almost fully wear-resistant toothed belts with an extremely tight textile coating and singed edge
- ESD-compatible components to avoid electrostatic charge, which prevents the attraction of dust particles

A hot tip for hot plates
The temperature-resistant solar conveyor has been specially designed for transporting hot glass plates with temperatures of up to 160°C. It can be implemented with up to 5 tracks, depending on the size of the solar panels.

Special features:
- Heat-resistant toothed belt and guide profile
- Hexagon shaft and flange for TS gear motors
- Integrated dynamic toothed belt tensioner

Created for clean production
A clean production environment is decisive when manufacturing modules, as this is the only way to ensure a uniformly high level of product quality. As a result, suitability for cleanrooms was at the forefront during the development of the TS 2pv and its associated components.
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- The drive stops to position the module for processing, or if the following section segment is still occupied by another module.
- Frequency converters ensure soft braking and accelerating.
- The LTS lift transverse unit gently moves the modules from longitudinal sections to transverse sections.
Components for longitudinal conveyors

## Components for longitudinal conveyors

<table>
<thead>
<tr>
<th>Component Type</th>
<th>Notes</th>
</tr>
</thead>
</table>
| CSS/B belt section | • Slight corrections to the end position of the solar modules possible on the belt section  
• Cost-efficient solution |
| CSS/BM belt section | • Slight corrections to the end position of the solar modules possible on the belt section  
• Center motor mounting position |
| CSS/F belt section | • Conveyor medium with a high friction coefficient enables fast acceleration and deceleration  
• Modules do not slide on the belt section  
• System dimensions identical to CSS/B |
| CSS/FM belt section | • Conveyor medium with a high friction coefficient enables fast acceleration and deceleration  
• Center motor mounting position  
• System dimensions identical to CSS/B |
| CSS/NT belt section | • Transport of plates up to 160°C, e.g. after lamination  
• Conveyor medium with a high friction coefficient enables fast acceleration and deceleration  
• Modules do not slide on the belt section |
| Transmission drive | |

**CSS/BM belt section 2-3**

**CSS/F belt section 2-4**

**CSS/FM belt section 2-5**

**CSS/NT belt section 2-6**

**Transmission drive 2-7**
## Components for longitudinal conveyors

### CSS/B belt section

**Application:**
- Longitudinal conveyors to transport glass modules of varying dimensions
- Longitudinal conveyors to transport wafer trays
- Not designed for accumulation operation

**Version:**
- Belt section of 2 to 5 tracks to securely support glass modules over the entire width. Distance between tracks can be determined individually (b1 to b4).
- Permissible load:
  - Per track: max. 0.15 kg/cm of support surface length and max. 60 kg
  - Per belt section: max. 120 kg
- Suitable for reversible operation (up to 3000 mm)
- Conveyor medium: special textile toothed belt. Ideal for lateral positioning processes due to its low friction coefficient with the workpiece.
- Easy replacement of the toothed belts due to disassembly from above; no realignment necessary.
- Gear motors are suitable for operation with frequency converters.
- Motor mounting at right (MA = R) or left (MA = L) is possible at any track of the belt section (MS = 1 to 5; MS = 1 indicates the left-hand track in the direction of transport). Observe the min. distance of 165 mm if motor is mounted between the tracks (b1 to b4)
- Outside motor mounting: suspended or horizontal; motor mounting between the tracks: suspended
- Motor connection either with cable/plug (AT = S) or terminal box (AT = K)
- Version with lateral guide (FP = 1) ideal for framed glass modules; version without lateral guide (FP = 0) for unprocessed glass modules with rough edges
- Suitable for use in cleanroom environments up to cleanroom class 6 according to ISO 14644-1

### Table: CSS/B Ordering Parameters

<table>
<thead>
<tr>
<th>Tracks</th>
<th>Ordering Number</th>
<th>b min</th>
<th>Distance to Corresponding Tracks</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3 842 998 537</td>
<td></td>
<td>160 mm (160 ... 3000 mm)</td>
</tr>
<tr>
<td>3</td>
<td>3 842 998 538</td>
<td>b1</td>
<td>290 mm (85 ... 1000 mm)</td>
</tr>
<tr>
<td>4</td>
<td>3 842 998 539</td>
<td>b2</td>
<td>420 mm (85 ... 1000 mm)</td>
</tr>
<tr>
<td>5</td>
<td>3 842 998 540</td>
<td>b3</td>
<td>550 mm (85 ... 1000 mm)</td>
</tr>
</tbody>
</table>

### Delivery Condition:
- b ≤ 2000 mm: assembled
- b > 2000 mm: partially assembled
- Motor is enclosed separately.

### Optional Accessories:
- SFS frames, 4-2
- SZS/B leg set, 4-3
- FC frequency converter, 7-13
Components for longitudinal conveyors

**CSS/BM belt section**

**Application:**
- Longitudinal conveyors to transport glass modules of varying dimensions
- Longitudinal conveyors to transport wafer trays
- For installation situations that have no space for the motor at the ends of the belt section
- Not designed for accumulation operation

**Version:**
- Lengthwise motor mounting position can be specified by the user (see dimension l1)
- Other features as with CSS/B

**Delivery condition:**
- \( b \leq 2000 \text{ mm} \): assembled
- \( b > 2000 \text{ mm} \): partially assembled
- Motor is enclosed separately.

**Optional accessories:**
- SFS frames, \( \varnothing 4-2 \)
- SZS/B leg set, \( \varnothing 4-3 \)
- FC frequency converter, \( \varnothing 7-13 \)

**Application:**
— Longitudinal conveyors to transport glass modules of varying dimensions
— Longitudinal conveyors to transport wafer trays
— For installation situations that have no space for the motor at the ends of the belt section
— Not designed for accumulation operation

**Version:**
— Lengthwise motor mounting position can be specified by the user (see dimension l1)
— Other features as with CSS/B

**Delivery condition:**
— \( b \leq 2000 \text{ mm} \): assembled
— \( b > 2000 \text{ mm} \): partially assembled
— Motor is enclosed separately.

**Optional accessories:**
— SFS frames, \( \varnothing 4-2 \)
— SZS/B leg set, \( \varnothing 4-3 \)
— FC frequency converter, \( \varnothing 7-13 \)

**CSS/BM Belt Section**

<table>
<thead>
<tr>
<th>Tracks</th>
<th>No.</th>
<th>Ordering parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3 842 998 541</td>
<td>( b ) (160 ... 3000 mm)</td>
</tr>
<tr>
<td>3</td>
<td>3 842 998 542</td>
<td>( b ) (85 ... 1000 mm)</td>
</tr>
<tr>
<td>4</td>
<td>3 842 998 543</td>
<td>( b ) (85 ... 1000 mm)</td>
</tr>
<tr>
<td>5</td>
<td>3 842 998 544</td>
<td>( b ) (85 ... 1000 mm)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( l ) (450 ... 6000 mm)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( l_1 ) (160 - l-290 mm)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FP Lateral guide (1 = with; 0 = without)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( v_N ) (0; 6; 9; 12; 15; 18; 21; 36)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>U ( \varnothing 7-11 )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( f ) ( \varnothing 7-11 )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AT Motor connection (S = cable/plug; K = terminal box)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MS Motor mounting on track (1 = left ... 5 = right)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MA Motor mounting (R = right; L = left)</td>
</tr>
</tbody>
</table>

1. \( b_{\min} = 165 \text{ mm} \) if motor is mounted between the tracks
2. \( v_N = 0, U = 0, f = 0 \): without motor and without gear
3. \( v_N = 0, U = 0, f = 50/60 \text{ Hz} \): without motor, with gear (if technically practical)
4. Distance with the highest index is calculated

Special versions on request.
Components for longitudinal conveyors

CSS/F belt section

Application:
- Longitudinal conveyors to transport glass modules of varying dimensions
- Not designed for accumulation operation

Version:
- Belt section of 2 to 5 tracks to securely support glass modules over the entire width. Distance between tracks can be determined individually (b1 to b4). Observe the minimum dimensions.
- Permissible load:
  - Per track: max. 0.15 kg/cm of support surface length and max. 40 kg
  - Per belt section: max. 120 kg
- Suitable for reversible operation (up to 3000 mm)
- Textile toothed belt with PU layer for high friction coefficients and improved static friction when starting and accelerating
- Easy replacement of the toothed belts due to disassembly from above; no realignment necessary.
- Gear motors are suitable for operation with frequency converters.
- Motor mounting at right (MA = R) or left (MA = L) is possible at any track of the belt section (MS = 1 to 5; MS = 1 indicates the left-hand track in the direction of transport). Observe the min. distance of 165 mm if motor is mounted between the tracks (b1 to b4)
- Outside motor mounting: suspended or horizontal; motor mounting between the tracks: suspended
- Motor connection either with cable/plug (AT = S) or terminal box (AT = K)
- Version with lateral guide (FP = 1) ideal for framed glass modules; version without lateral guide (FP = 0) for unprocessed glass modules with rough edges
- Suitable for use in cleanroom environments up to cleanroom class 6 according to ISO 14644-1

Delivery condition:
- b \leq 2000 mm: assembled
- b > 2000 mm: partially assembled
- Motor is enclosed separately.

Optional accessories:
- SFS frames, \( \varphi 4-2 \)
- SZS/B leg set, \( \varphi 4-3 \)
- FC frequency converter, \( \varphi 7-13 \)
Components for longitudinal conveyors

CSS/FM belt section

Application:
- Longitudinal conveyors to transport glass modules of varying dimensions
- For installation situations that have no space for the motor at the ends of the belt section
- Not designed for accumulation operation

Version:
- Lengthwise motor mounting position can be specified by the user (see dimension l1)
- Other features as with CSS/F

Delivery condition:
- \( b \leq 2000 \text{ mm} \): assembled
- \( b > 2000 \text{ mm} \): partially assembled
- Motor is enclosed separately.

Optional accessories:
- SFS frames, \( \varnothing 4-2 \)
- SZS/B leg set, \( \varnothing 4-3 \)
- FC frequency converter, \( \varnothing 7-13 \)

CSS/FM

3 842 998 655
MS = 1
MA = L

<table>
<thead>
<tr>
<th>Tracks</th>
<th>No.</th>
<th>Ordering parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3 842 998 652</td>
<td>b (160 ... 3000 mm)</td>
</tr>
<tr>
<td>3</td>
<td>3 842 998 653</td>
<td>b1[^1] (85 ... 1000 mm)</td>
</tr>
<tr>
<td>4</td>
<td>3 842 998 654</td>
<td>b2[^2] (85 ... 1000 mm)</td>
</tr>
<tr>
<td>5</td>
<td>3 842 998 655</td>
<td>b3[^2] (85 ... 1000 mm)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b4[^2] (85 ... 1000 mm)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>l (450 ... 6000 mm)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>l1 (160 ... l-290 mm)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FP Lateral guide (1 = with; 0 = without)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( v_N )[^3] (0; 6; 9; 12; 15; 18; 21; 36)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>U ( (\varnothing 7-11) )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>f ( (\varnothing 7-11) )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AT Motor connection (S = cable/plug; K = terminal box)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MS Motor mounting on track (1 = left ... 5 = right)</td>
</tr>
<tr>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

[^1] \( b_{\text{min}} = 165 \text{ mm} \) if motor is mounted between the tracks

[^2] \( v_N = 0, U = 0, f = 0 \): without motor and without gear

[^3] \( v_N = 0, U = 0, f = 50/60 \text{ Hz} \): without motor, with gear (if technically practical)

[^3] Distance with the highest index is calculated

Special versions on request.
Components for longitudinal conveyors

CSS/NT belt section

Application:
- Longitudinal conveyors to transport glass modules
- Suitable for transporting plates up to 160°C, e.g. as a transport system after lamination.
- Not designed for accumulation operation

Version:
- Belt section of 2 to 5 tracks to securely support glass modules over the entire width. Distance between tracks can be determined individually (b1 to b4). Observe the minimum dimensions.
- Permissible load:
  - Per track: max. 0.3 kg/cm of support surface length and max. 60 kg
  - Per belt section: max. 120 kg
- Suitable for reversible operation on section lengths of up to 1500 mm
- Special textile toothed belt with Viton coating
- Dynamic belt tensioner to compensate for belt elongation due to temperature
- Easy replacement of the endless toothed belts due to lateral disassembly; no realignment necessary. Also possible on inside tracks, due to couplings on the hexagonal shaft.
- Gear motors are suitable for operation with frequency converters.
- Price advantage for orders of specific standard lengths as well as significant reduction in delivery times for toothed belts in service cases
- Suitable for use in cleanroom environments up to cleanroom class 7 according to ISO 14644-1

Delivery condition:
- Motor is enclosed separately.
- Optional accessories:
  - SFS frames, \( \varnothing 4-2 \)
  - SZS/N leg set, \( \varnothing 4-4 \)
  - FC frequency converter, \( \varnothing 7-13 \)
  - Toothed belt tensioner (tool for belt exchange), 3 842 541 202

Application:
- Longitudinal conveyors to transport glass modules
- Suitable for transporting plates up to 160°C, e.g. as a transport system after lamination.

Version:
- Belt section of 2 to 5 tracks to securely support glass modules over the entire width. Distance between tracks can be determined individually (b1 to b4). Observe the minimum dimensions.
- Permissible load:
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  - Per belt section: max. 120 kg
  - Suitable for reversible operation on section lengths of up to 1500 mm

Delivery condition:
- Motor is enclosed separately.

Optional accessories:
- SFS frames, \( \varnothing 4-2 \)
- SZS/N leg set, \( \varnothing 4-4 \)
- FC frequency converter, \( \varnothing 7-13 \)
- Toothed belt tensioner (tool for belt exchange), 3 842 541 202
Components for longitudinal conveyors

Transmission drive

Application:
- For the installation of larger external motors to transfer higher torque values (maximum section loads of the belt sections may not be exceeded)

Version:
- Belt drive gear for gear motors that need to be installed at a lower depth so they can be passed over.
- Suitable for flange gear versions, flange diameter 120 mm (B5 version for worm gears), and hollow shaft, diameter 20 mm
- Designed for Spiroplan right-angle gear motors WAF20, WAF30 or WAF37 and worm gear motors SAF37
- Maximum transferable torque (at gear output):
  - CSS/B, CSS/BM, CSS/F, CSS/FM: $M_{\text{max}} = 12 \text{ Nm}$
  - CSS/NT: $M_{\text{max}} = 20 \text{ Nm}$
- Suspended mounting of gear motor required

Delivery condition:
- Not assembled, in single parts
- Pre-pressed bearing
- Including adapter set and additional hexagon shaft for mounting on CSS/B, CSS/BM, CSS/F and CSS/FM. The adapter set is omitted with CSS/NT.

Required accessories:
- Torque support – provided by system owner
Components for longitudinal conveyors
Components for transverse conveyors

<table>
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<tr>
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<td>3-3</td>
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<tr>
<td>LTS/F lift transverse unit</td>
<td>3-4</td>
</tr>
<tr>
<td>LTS/NT lift transverse unit</td>
<td>3-5</td>
</tr>
<tr>
<td>TTS/B, TTS/F, TTS/NT, RES/M rotary modules</td>
<td>3-6</td>
</tr>
</tbody>
</table>
LTS/B and LTS/F lift transverse units for constructing right-angled section branches are available in two designs:

**A** With continuous tracks in the lift transverse unit
- One drive for the lift transverse unit
- The inside tracks of the infeeding belt section are replaced by non-driven roller sections in the area of the lift transverse unit

**B** With non-continuous tracks in the lift transverse unit
- All tracks of the infeeding belt section are driven and are extended in the area of the lift transverse unit
Components for transverse conveyors

**LTS/B lift transverse unit**

**Application:**
- LTS/B lift transverse unit for constructing right-angled section branches
- Installation in CSS/B and CSS/BM belt sections

**Version:**
- Version with two to five tracks. The distance between tracks can be determined individually (b_Q1 to b_Q4). Observe the minimum dimensions.
- Section loads up to 120 kg (per track: max. 0.15 kg/cm surface length; max. 60 kg)
- Conveyor medium: special textile toothed belt for minimal abrasion, as with CSS/B
- Gear motors are suitable for operation with frequency converters.
- Motor mounting at right (MA = R) or left (MA = L) is possible at any track of the belt section
- Version with lateral guide (FP = 1) particularly suitable for framed glass modules; version without lateral guide (FP = 0) preferably for unprocessed glass modules with rough edges
- Two lift positions

**Delivery condition:**
- \( b \leq 2000 \text{ mm} \): assembled
- \( b > 2000 \text{ mm} \): partially assembled
- Motor is enclosed separately.

**Required accessories:**
- Belt section to be assembled
Components for transverse conveyors

LTS/F lift transverse unit

**Application:**
- LTS/F lift transverse unit for constructing right-angled section branches
- Installation in CSS/F and CSS/FM belt sections

**Version:**
- Version with two to five tracks. The distance between tracks can be determined individually (bQ1 to bQ4). Observe the minimum dimensions.
- Permissible load:
  - Per track: max. 0.15 kg/cm of support surface length and max. 40 kg
  - Per belt section: max. 120 kg
- Toothed belt with PU layer for high friction coefficients and improved static friction when starting and accelerating, as with CSS/F
- Easy replacement of the endless toothed belt due to disassembly from above; no realignment necessary.
- Gear motors are suitable for operation with frequency converters.
- Motor mounting at right (MA = R) or left (MA = L) is possible at any track of the belt section
- Version with lateral guide (FP = 1) particularly suitable for framed glass modules; version without lateral guide (FP = 0) preferably for unprocessed glass modules with rough edges
- Two lift positions

**Delivery condition:**
- \( b \leq 2000 \text{ mm} \): assembled
- \( b > 2000 \text{ mm} \): partially assembled
- Motor is enclosed separately.

**Required accessories:**
- Belt section to be assembled
Components for transverse conveyors

LTS/NT lift transverse unit

Application:
— LTS/NT lift transverse unit for constructing right-angled section branches
— Installation in CSS/NT belt sections
— Suitable for transporting plates up to 160°C, e.g. as a transport system after lamination.

Version:
— Special textile toothed belt with Viton coating
— Version with two to five tracks. The distance between tracks can be determined individually (bQ1 to bQ4). Observe the minimum dimensions.
— Section load: max. 120 kg (per track: max. 0.3 kg/cm surface length, max. 60 kg)
— Easy replacement of the endless toothed belts due to lateral disassembly; no realignment necessary. Also possible on inside tracks, due to couplings on the hexagonal shaft.
— Optionally with integrated toothed belt tensioner (TU = 1)
— Toothed belt recirculation without reverse bending
— Gear motors are suitable for operation with frequency converters.
— Other features as with CSS/NT

Delivery condition:
— Motor is enclosed separately.

Required accessories:
— Belt section to be assembled
Components for transverse conveyors

TTS/B, TTS/F, TTS/NT rotary module

**Application:**
- Particularly gentle transport for direction changes or as a corner return unit
- Direction change of 90°, 180° or 270° while maintaining orientation (front remains in the front)
- Diverter function to outfeed from a main transport section

**Version:**
- 2 to 5-track CSS/B, CSS/BM, CSS/F, CSS/FM, or CSS/NT belt section with rotating bearing
- Rotary movement generated by electric motor with adjustable acceleration and deceleration ramp
- Optional version: Rotary movement generated pneumatically
- Conveyor medium with varying friction coefficients
- Optionally available with protective enclosure
- Section load: max. 60 kg

**Scope of delivery:**
- Incl. base frame

TTS/B, TTS/F, TTS/NT:
Order on request
Components for transverse conveyors

RES/M rotary module

Application:
Manual rotation of solar modules at a manual workstation

Version:
- Automatic lift unit with manual rotary table
- Prevents solar modules from sliding during manual rotation
- Mechanical safeguard against lowering
- Unobstructed edges for assembly, framing or gluing
- 2 rotational directions
- Section load up to 60 kg

Scope of delivery:
- Incl. base frame

RES/M:
Order on request
Components for transverse conveyors
Leg sets

Frames, leg sets

| SFS frames | 4-2 |
|SZS leg sets | 4-4 |
|Accessories: Basic Mechanical Elements | 4-6 |
Leg sets

SFS frames

Application:
- Free-standing, stable frames for CSS/B, CSS/BM, CSS/F, CSS/FM and CSS/NT belt sections

Version:
- Extruded aluminum profiles
- Height-adjustable bases
- Easy assembly

Scope of delivery:
Incl. height-adjustable bases

Delivery condition:
Unassembled kit

Required accessories:
- Connection kit for fastening the unit

SFS frame:
Order on request
Leg sets

**SZS/B leg set**

**Application:**
Leg sets for belt sections
- CSS/B
- CSS/BM
- CSS/F
- CSS/FM

Leg sets must be installed close to the ends of the belt sections. They must be mounted at a uniform distance of max. 2000 mm and anchored to the floor with foundation brackets.

**Version:**
- Extruded aluminum profiles
- Height-adjustable bases
- The leg set comes with two, three, or four vertical struts, depending on the width.
- Reinforcement required, either by mounting to machines or installing braces with Basic Mechanical Elements, $\varnothing 4-4$

**Scope of delivery:**
Incl. height-adjustable bases, incl. fastening material for mounting the legs sets on the belt section.

Delivery condition: unassembled

**Required accessories:**
- Foundation bracket 3 842 146 815, $\varnothing 4-4$
- Anchor bolts 3 842 526 560, $\varnothing 4-4$

**Optional accessories:**
- Reinforcement made of Basic Mechanical Elements, $\varnothing 4-4$

**SZS/B**

<table>
<thead>
<tr>
<th>No.</th>
<th>Ordering parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>SZS/B 3 842 998 585</td>
<td>$b$ (160 - 3000 mm)</td>
</tr>
<tr>
<td></td>
<td>$h_{SZ}$ (250 - 2000 mm)</td>
</tr>
</tbody>
</table>
Leg sets

**SZS/N leg set**

**Application:**
Leg sets for belt sections
- CSS/NT

Leg sets must be installed close to the ends of the belt sections. They must be mounted at a uniform distance of max. 2000 mm and anchored to the floor with foundation brackets.

**Version:**
- Extruded aluminum profiles
- Height-adjustable bases
- The leg set is equipped with two, three, or four vertical struts, depending on the width.
- Reinforcement required, either by mounting to machines or installing braces with Basic Mechanical Elements, $\varnothing 4-5$

**Scope of delivery:**
Incl. height-adjustable bases, incl. fastening material for mounting the legs sets on the belt section.

Delivery condition: unassembled

Required accessories:
- Foundation bracket 3 842 146 815, $\varnothing 4-5$
- Anchor bolts 3 842 526 560, $\varnothing 4-5$

Optional accessories:
- Reinforcement made of Basic Mechanical Elements, $\varnothing 4-5$

<table>
<thead>
<tr>
<th>No.</th>
<th>Ordering parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>SZS/N</td>
<td>3 842 998 593</td>
</tr>
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</table>

<table>
<thead>
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<th>SZS/N</th>
<th>No.</th>
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<tr>
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<td>3 842 998 593</td>
<td>$b$ (160 - 3000 mm)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$h_{SZ}$ (250 - 2000 mm)</td>
</tr>
</tbody>
</table>
Leg sets

**Accessories:**

**Basic Mechanical Elements**

**Application:**
Foundation bracket (A) to secure the leg sets with anchor bolts (B). 45x45L profile (E), 45° connector (F) for reinforcing the frame.

---

**Foundation bracket**

<table>
<thead>
<tr>
<th>No.</th>
<th>3 842 146 815</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>20</td>
</tr>
</tbody>
</table>

**Anchor bolt**

<table>
<thead>
<tr>
<th>No.</th>
<th>3 842 526 560</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>1</td>
</tr>
</tbody>
</table>

**T-head bolt, flange nut**

<table>
<thead>
<tr>
<th>No.</th>
<th>3 842 345 081</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>100</td>
</tr>
<tr>
<td>D</td>
<td>100</td>
</tr>
</tbody>
</table>

**Foundation bracket set**

<table>
<thead>
<tr>
<th>No.</th>
<th>3 842 338 979</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A + C + D)</td>
<td>20</td>
</tr>
</tbody>
</table>

*) Part number. Article can only be ordered in the quantity specified as a packing unit ( ).

---

**45x45L profile**

<table>
<thead>
<tr>
<th>No.</th>
<th>3 842 992 425/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>1</td>
</tr>
</tbody>
</table>

**45° connector**

<table>
<thead>
<tr>
<th>No.</th>
<th>3 842 535 428</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>1</td>
</tr>
</tbody>
</table>
Leg sets
Positioning and orientation, transportation control

### Positioning and orientation

### Transportation control

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stop</td>
<td>5-2</td>
</tr>
<tr>
<td>Fixed stop with air nozzle</td>
<td>5-3</td>
</tr>
<tr>
<td>DAS/30 damper</td>
<td>5-4</td>
</tr>
<tr>
<td>Damper with blower</td>
<td>5-5</td>
</tr>
<tr>
<td>VE 2/D-60 stop gate</td>
<td>5-6</td>
</tr>
<tr>
<td>Air nozzle</td>
<td>5-7</td>
</tr>
</tbody>
</table>
Positioning and orientation, transportation control

Stop

Application:
- As a stop for solar modules moving from a transverse section to a longitudinal section
- For simple lateral positioning processes
- Used only with toothed belts with a low friction coefficient
- Max. stop weight 60 kg for $v_{\text{max}} \leq 3 \text{ m/min}$

Installation location:
- CSS/B, CSS/BM belt section
- LTS/B lift transverse unit

Version:
- Polymer in an anti-static version with screw-on stop rail

Scope of delivery:
Incl. fastening material for mounting to the belt section or lift transverse unit

Delivery condition: unassembled

Stop

| No. | 3 842 519 717 |
Positioning and orientation, transportation control

Fixed stop with air nozzle

Application:
- As a stop for solar modules moving from a transverse section to a longitudinal section
- With blower to prevent EVA or PVF films from being caught
- Used only with toothed belts with a low friction coefficient
- Max. stop weight 60 kg for \( v_{\text{max}} \leq 3 \text{ m/min} \)

Installation location:
- CSS/B, CSS/BM belt section
- LTS/B lift transverse unit

Version:
- A soft jet of air on the front side prevents hanging film from being caught when the solar module hits the stop
- Compressed air supply with approx. 4-6 bar
- Compressed-air connection via 4-mm pushlock-type connection
- Individually adjustable
- Nozzle outlet diameter: 1-1.5 mm

Scope of delivery:
Incl. fastening material for mounting to the belt section or lift transverse unit

Delivery condition: assembled

Stop with blower:
Order on request
Positioning and orientation, transportation control

DAS/30 damper

Application:
— As a stop for solar modules with cushioned movement from a transverse section to a longitudinal section or vice versa
— For solar modules with a total weight of 30-60 kg
— Transport speed when impacting the damper \( v_{\text{max}} \leq 3 \text{ m/min} \)
— Used only with toothed belts with a low friction coefficient

Installation location:
— CSS/B, CSS/BM belt section
— LTS/B lift transverse unit

Version:
— Pneumatic damper with infinitely adjustable damping
— Pneumatic return parallel to opening of the stop gate, which permits the solar module to move towards the damper.

Scope of delivery:
Incl. fastening material for mounting to the lift transverse unit

Delivery condition: unassembled

<table>
<thead>
<tr>
<th>Load (kg)</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-60</td>
<td>3 842 515 351</td>
</tr>
</tbody>
</table>
Positioning and orientation, transportation control

Damper with blower

**Application:**
- As a stop for solar modules with cushioned movement from a transverse section to a longitudinal section or vice versa
- With blower to prevent EVA or PVF films from being caught
- For solar modules with a total weight of 30-60 kg
- Transport speed when approaching the damper $v_{\text{max}} \leq 3 \text{ m/min}$
- Used only with toothed belts with a low friction coefficient

**Installation location:**
- CSS/B, CSS/BM belt section
- LTS/B lift transverse unit

**Version:**
- Pneumatic damper with infinitely adjustable damping
- Pneumatic return parallel to opening of the stop gate, which permits the solar module to move towards the damper.
- A soft jet of air on the front side prevents hanging film from being caught when the solar module hits the fixed stop
- Compressed air supply with approx. 4-6 bar
- Compressed air connection via 4-mm pushlock-type connection
- Individually adjustable

**Scope of delivery:**
Incl. fastening material for mounting to the lift transverse unit

**Delivery condition:** assembled

Damper with blower:
Order on request
Positioning and orientation, transportation control

VE 2/D-60 stop gate

Application:
- Dampened stopping of a solar modular on defined bearing surfaces
- Transport speed when approaching the damper $v_{\text{max}} \leq 3 \text{ m/min}$
- Used only with toothed belts with a low friction coefficient
- Correction of the position (centering) of a module on the belt section. Can be realized through a lateral mounting to the belt section.

Installation location:
- CSS/B, CSS/BM belt section

Version:
- Pneumatic stop gate with infinitely adjustable damping
- Optimum damping for small plate weights of up to 60 kg

Scope of delivery:
Incl. fastening material for mounting to the belt section

Delivery condition: assembled

VE 2/D-60 stop gate:
Order on request
Positioning and orientation, transportation control

Air nozzle

**Application:**
- Prevents hanging film from being caught, e.g. when the solar module hits a stop gate or stop
- Used in conjunction with a stop gate or stop

**Installation location:**
- CSS/... belt section

**Version:**
- Outlet on the top blows a soft jet of air below the protruding film on an approaching solar module, thus lifting the film. This prevents it from being caught when the module hits a subsequent stop.
- Compressed air supply with approx. 4-6 bar
- Compressed-air connection via 4-mm pushlock-type connection
- Individually adjustable

**Scope of delivery:**
Incl. fastening material for mounting to the belt section

**Delivery condition:** assembled

Air nozzle:
Order on request
Positioning and orientation, transportation control
Special modules

LIFO storage 6-2
Lift 6-3
Special modules

LIFO storage

Application:
– Vertical temporary storage for 10 to 30 solar modules. Functions in accordance with the “last in, first out” principle.
– Mounted within the line in the longitudinal or transverse conveyor

Version:
– Independent module
– Expanding mandrel to lift the solar modules from the belt section. Stored above the conveying level.
– Vertical movement via electrical axles

Scope of delivery:
– Incl. CSS belt section
– Incl. enclosure
– Incl. complete sensor system

Order on request
Special modules

Lift

Application:
- To bridge differences in the transport level

Version:
- Lift of up to 550 mm (larger lifts are also possible)
- Lifting movement via servo drive for the vertical axis
- Optional version: pneumatic lifting movement (lift \( \leq 50 \text{ mm} \))

Scope of delivery:
- Incl. CSS/BM, CSS/NT, or CSS/FM belt section
- Incl. frequency converter
- Incl. complete sensor system
- Optional version:
  Incl. enclosure

Lift:
Order on request
Special modules
# Technical data

## Technical data

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
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<td>7-2</td>
</tr>
<tr>
<td>CSS/BM, CSS/FM belt section</td>
<td>7-3</td>
</tr>
<tr>
<td>CSS/NT belt section</td>
<td>7-4</td>
</tr>
<tr>
<td>Transmission drive</td>
<td>7-5</td>
</tr>
<tr>
<td>LTS/B, LTS/F lift transverse unit</td>
<td>7-6</td>
</tr>
<tr>
<td>LTS/NT lift transverse unit</td>
<td>7-7</td>
</tr>
<tr>
<td>Stop, fixed stop with air nozzle</td>
<td>7-8</td>
</tr>
<tr>
<td>DAS/30 damper, damper with blower</td>
<td>7-9</td>
</tr>
<tr>
<td>VE 2/D-60 stop gate, air nozzle</td>
<td>7-10</td>
</tr>
<tr>
<td>Motor data</td>
<td>7-11</td>
</tr>
<tr>
<td>Transportation speed, motor connection</td>
<td>7-12</td>
</tr>
<tr>
<td>Load limit of drive</td>
<td>7-13</td>
</tr>
</tbody>
</table>
Technical data

CSS/B, CSS/F belt section

The position of the cross connector may deviate from that in the figure.

3 842 998 537: $b_{\text{min}} = 160$ mm
3 842 998 538: $b_{\text{min}} = b_{1\text{min}} + b_{2\text{min}} + 3 \times 45 - 15 = 290$ mm
3 842 998 539: $b_{\text{min}} = b_{1\text{min}} + b_{2\text{min}} + b_{3\text{min}} + 4 \times 45 - 15 = 420$ mm
3 842 998 540: $b_{\text{min}} = b_{1\text{min}} + b_{2\text{min}} + b_{3\text{min}} + b_{4\text{min}} + 5 \times 45 - 15 = 550$ mm
CSS/BM, CSS/FM belt section

The position of the cross connector may deviate from that in the figure.

3 842 998 541: \( b_{\text{min}} = 160 \text{ mm} \)
3 842 998 542: \( b_{\text{min}} = b_{1\text{min}} + b_{2\text{min}} + 3 \times 45 - 15 = 290 \text{ mm} \)
3 842 998 543: \( b_{\text{min}} = b_{1\text{min}} + b_{2\text{min}} + b_{3\text{min}} + 4 \times 45 - 15 = 420 \text{ mm} \)
3 842 998 544: \( b_{\text{min}} = b_{1\text{min}} + b_{2\text{min}} + b_{3\text{min}} + b_{4\text{min}} + 5 \times 45 - 15 = 550 \text{ mm} \)
Technical data

CSS/NT belt section

3 842 998 632: \( b_{\text{min}} = 255 \text{ mm} \)
3 842 998 633: \( b_{\text{min}} = b_{1_{\text{min}}} + b_{2_{\text{min}}} + 3 \times 45 - 15 = 540 \text{ mm} \)
3 842 998 634: \( b_{\text{min}} = b_{1_{\text{min}}} + b_{2_{\text{min}}} + b_{3_{\text{min}}} + 4 \times 45 - 15 = 825 \text{ mm} \)
3 842 998 635: \( b_{\text{min}} = b_{1_{\text{min}}} + b_{2_{\text{min}}} + b_{3_{\text{min}}} + b_{4_{\text{min}}} + 5 \times 45 - 15 = 1050 \text{ mm} \)
Technical data

Transmission drive
Technical data

LTS/B, LTS/F lift transverse unit
Technical data

LTS/NT lift transverse unit
Technical data

Stop

Fixed stop with air nozzle

Stop

Fixed stop with air nozzle
Technical data

DAS/30 damper
Damper with blower

DAS/30 damper

Damper with blower
Technical data

VE 2/D-60 stop gate
Air nozzle

VE 2/D-60 stop gate

Air nozzle

*) lift
Technical data

Motor data

Electrical connection conditions for the drive motors:
Connection to a 3-phase, 5-wire system (L1, L2, L3, N, PE). All motors are equipped with protective temperature switches which must be connected to an overload switch-off and wired by the system installer according to the technical functions for operation during system set-up.

Standard connection voltages for three-phase motors:
Indicate the voltage/frequency combination in the ordering information for components that are operated with three-phase motors.

| Voltage/frequency combinations (U/f) |
|-----------------|-----------------|
| U/f             | U/f             |
| 200 V/50 Hz     | 220 V/60 Hz     |
| 230 V/50 Hz     | 380 V/60 Hz     |
| 400 V/50 Hz     | 460 V/60 Hz     |
| 500 V/50 Hz     | 575 V/60 Hz     |
| 0\(^1\)/50 Hz   | 0\(^1\)/60 Hz   |

\(^1\) Without motor, with gear (if technically practical)

Motor design in accordance with cURus (UL Recognition Mark USA + Canada)

<table>
<thead>
<tr>
<th>Circuit type</th>
<th>(\Delta)</th>
<th>Y</th>
<th>(\Delta)</th>
<th>Y</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage at 50 Hz</td>
<td>200 V</td>
<td>230 V</td>
<td>400 V</td>
<td>500 V</td>
<td></td>
</tr>
<tr>
<td>Voltage at 60 Hz</td>
<td>220 V</td>
<td>380 V</td>
<td>460 V</td>
<td>575 V</td>
<td></td>
</tr>
</tbody>
</table>

Current consumption at rated power: 634 (A)

\(I_1\) (A) | \(I_2\) (A) | \(I_3\) (A) | \(I_4\) (A) | \(I_5\) (A) | \(\cos \phi\) | \(P\) (W)\(^3\) | \(P\) (W)\(^4\)
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0</td>
<td>1.2</td>
<td>1.7</td>
<td>1.1</td>
<td>0.8</td>
<td>0.60</td>
<td>250</td>
<td>290</td>
</tr>
</tbody>
</table>

\(^3\) Power factor
\(^4\) Power output at 50 Hz
\(^5\) Power output at 60 Hz

The data are typical values.
Subject to changes. See the motor rating plate for binding information.
Technical data

Transportation speeds $v_N$

Motor connection

<table>
<thead>
<tr>
<th>Modular unit</th>
<th>$v_N$ (m/min)</th>
<th>$v$ (m/min)</th>
<th>Motor type</th>
<th>$v$ (m/min)</th>
<th>Motor type</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSS/B</td>
<td>36</td>
<td>37.4</td>
<td>634</td>
<td>(45.0)</td>
<td>634</td>
</tr>
<tr>
<td>CSS/BM</td>
<td>21</td>
<td>--</td>
<td>--</td>
<td>21.6</td>
<td>634</td>
</tr>
<tr>
<td>CSS/F</td>
<td>18</td>
<td>18.0</td>
<td>634</td>
<td>18.0</td>
<td>634</td>
</tr>
<tr>
<td>CSS/FM</td>
<td>15</td>
<td>15.0</td>
<td>634</td>
<td>14.4</td>
<td>634</td>
</tr>
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<td></td>
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<td>12.0</td>
<td>634</td>
<td>10.8</td>
<td>634</td>
</tr>
<tr>
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<td>9</td>
<td>9.0</td>
<td>634</td>
<td>8.7</td>
<td>634</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>6.0</td>
<td>634</td>
<td>5.4</td>
<td>634</td>
</tr>
<tr>
<td>CSS/NT</td>
<td>36</td>
<td>33.8</td>
<td>634</td>
<td>33.9</td>
<td>634</td>
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<tr>
<td></td>
<td>18</td>
<td>16.9</td>
<td>634</td>
<td>20.3</td>
<td>634</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>13.5</td>
<td>634</td>
<td>16.3</td>
<td>634</td>
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<tr>
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<tr>
<td></td>
<td>9</td>
<td>8.5</td>
<td>634</td>
<td>8.1</td>
<td>634</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>5.6</td>
<td>634</td>
<td>6.8</td>
<td>634</td>
</tr>
</tbody>
</table>

Motor connection with cable/plug (AT = S) and 3A metal industrial plug-in connector

Shielded cable in accordance with VDE 0282 part 810, e.g.:

- Lapp Olflex (4 x 1.5 mm²) + 2 x (2 x 0.75 mm²)

Connection list

<table>
<thead>
<tr>
<th>Connection terminals motor 3-</th>
<th>Wire no.</th>
<th>Pin no.</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>U1</td>
<td>1</td>
<td>1</td>
<td>L1</td>
</tr>
<tr>
<td>V1</td>
<td>2</td>
<td>2</td>
<td>L2</td>
</tr>
<tr>
<td>V1</td>
<td>3</td>
<td>3</td>
<td>L3</td>
</tr>
<tr>
<td>TW1</td>
<td>5</td>
<td>4</td>
<td>Thermo</td>
</tr>
<tr>
<td>TW2</td>
<td>6</td>
<td>5</td>
<td>Thermo</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>Shield</td>
</tr>
<tr>
<td></td>
<td>PE</td>
<td>PE</td>
<td>PE</td>
</tr>
</tbody>
</table>

Plug | Socket

Shielded cable in accordance with VDE 0282 part 810, e.g.:

- Lapp Olflex (4 x 1.5 mm²) + 2 x (2 x 0.75 mm²)
Technical data

Layout of the belt sections and drive

The width and mass of the transported solar modules influence the layout of the belt sections (number of tracks) and the permissible operating time of the motor.

No. of tracks
— Lateral protrusion of the solar modules is permissible.
— For track spacing: \( b_{\text{max}} = 600 \, \text{mm} \); this limits deflection of the glass modules (glass strength: 4 \( \text{mm} \)).
— For framed modules, the entire longitudinal side must lie on the track.

We recommend using the following frequency converters in regions with 230 V (single-phase)/400 V (3-phase) line voltage:
— Bosch Rexroth IndraDrive FC 230 V, 0.37 kW (R911311055)
— Bosch Rexroth IndraDrive FC 400 V, 0.55 kW (R911311061)

The frequency converter is supplied with a standard I/O module. Further available modules:
— PROFIBUS DP (R911311072)
— CANopen (R911311074)
— DeviceNet (R911311075)

Technical data:
— \( T_{\text{ambient}} \); 0–50 °C (in control cabinet)
— Protection class IP20 (control cabinet installation)
— Altitude \( \leq 1000 \) m above sea level.
  At higher altitudes, performance decreases by 1% for each 100 m of altitude.

Please ask your Rexroth representative for information on other operating conditions.

Table 1: Minimum number of tracks for 4 mm thick glass plates

<table>
<thead>
<tr>
<th>Module width ( W_{\text{module}} ) (mm)</th>
<th>( 0 \ldots 1600 )</th>
<th>( 1601 \ldots 2100 )</th>
<th>( &gt; 2100 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum no. of tracks</td>
<td>2 ... 3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Technical data

Observe the following information for the drive layout:

— The permissible section load per track must not be exceeded.
— The permissible section load for all belt sections for \( v_N = 18 \text{ m/min} \) or \( 36 \text{ m/min} \) depends on the operating time of the drive; see Diagrams 1 to 3.

The operating time (OT) is valid for a travel time of \( 3 \text{ s} \leq t \leq 20 \text{ s} \).

Acceleration and braking times of at least 0.5 s are included in the cycle times. To ensure sufficient self-cooling of the motors, the motor frequency must not fall below 16 Hz when at a standstill. The operating time must not exceed 66%.

The diagrams apply to a motor ambient temperature of 25°C. The motor temperatures may reach 60°C with a high number of cycles.

Permissible length of the shielded motor cable: max. 20 m

Example:
Glass plate with \( m = 20 \text{ kg} \) on a 2-track CSS/B or CSS/BM with \( v_N = 36 \text{ m/min} \).

Based on Diagram 1:
Operating time \( OT \leq 60\% \)
Given a travel time of \( 6 \text{ s} \), the minimum cycle time \( t_{\text{min}} = 10 \text{ s} \)
Material number overview

<table>
<thead>
<tr>
<th>Material number</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 842 146 815</td>
<td>4-5</td>
</tr>
<tr>
<td>3 842 338 979</td>
<td>4-5</td>
</tr>
<tr>
<td>3 842 345 081</td>
<td>4-5</td>
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