

TS 2pv

Version **2.2**

The Drive & Control Company



Symbols

	Permissible section load (here: 120 kg)
	Toothed belt conveyor medium
	Reversible operation permissible (here: max. 1500 mm section length)
	Suitable for use in ESD sensitive areas. We recommend that you contact your Rexroth representative.
	Unit with energy-efficient drive available
	Compressed air connection required (here: 4 to 6 bar)
	Pushlock-type clamped connection for compressed air (here: 4 mm diameter)
	Temperature of the transported material (here: 160°C)
	Reference to technical data/dimensions
	Reference to further information
	Page reference

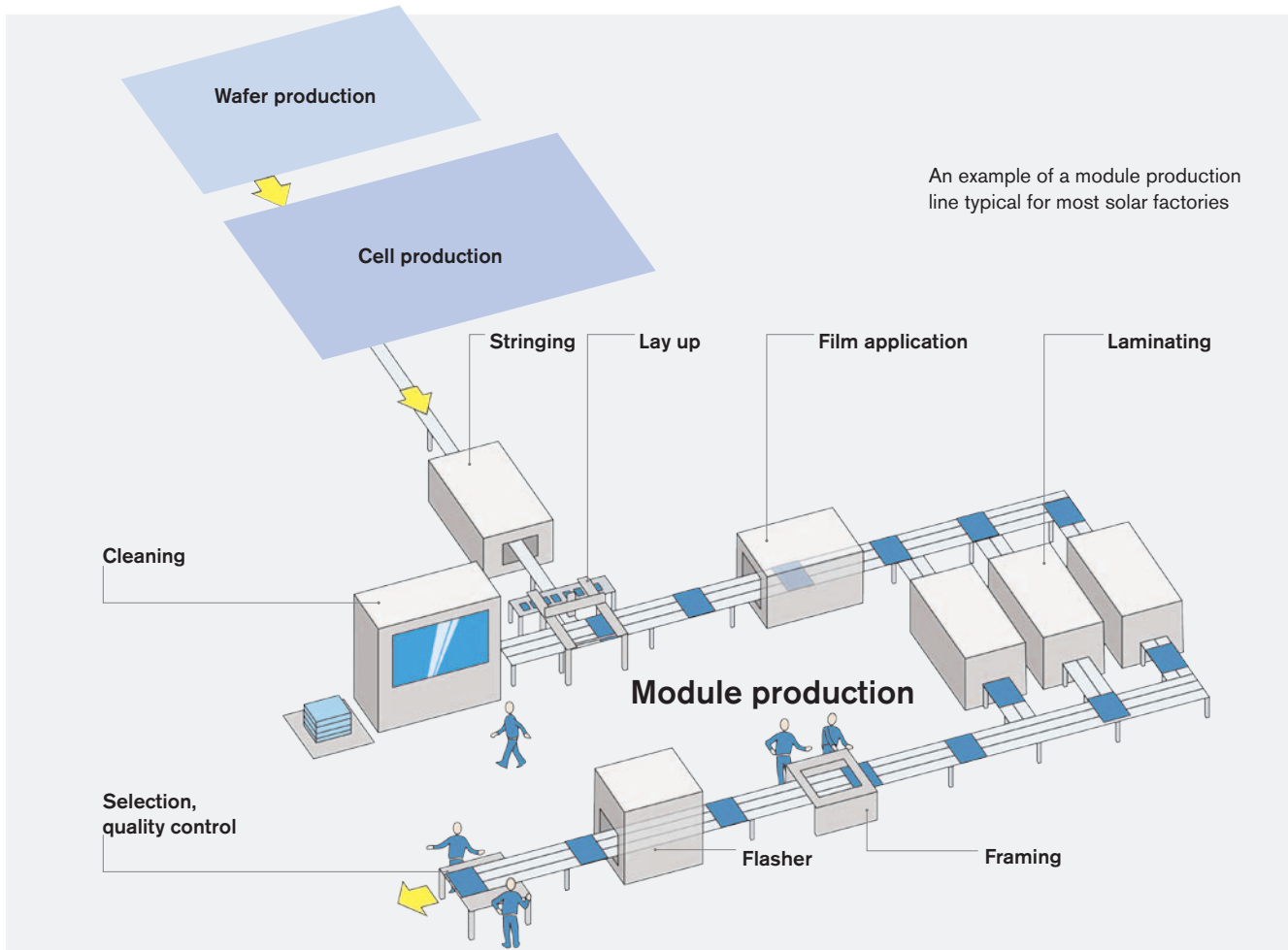
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Rexroth – We bring movement into module production

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/variou/utlities/location/

1



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



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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



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Energy efficiency – Rexroth 4EE

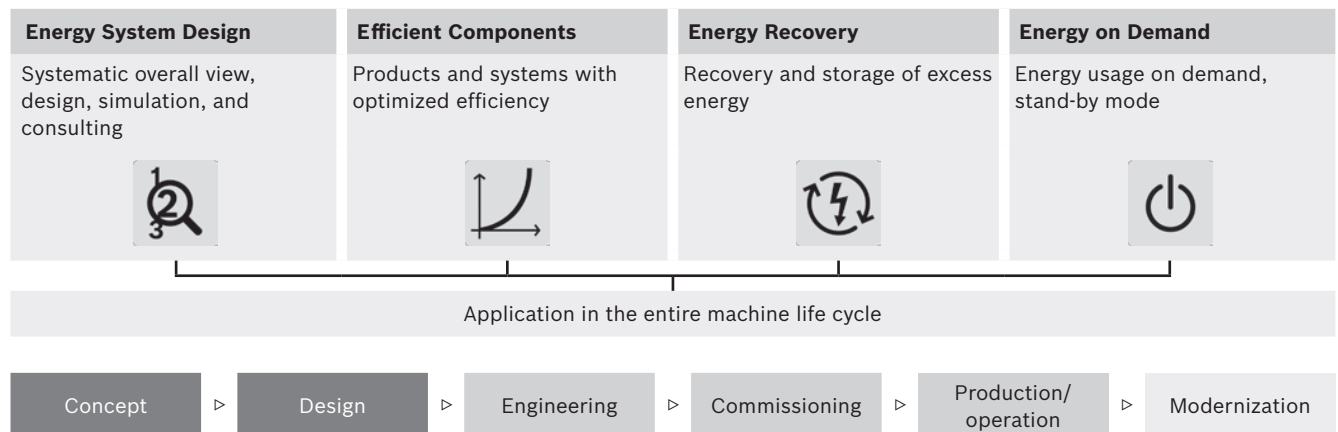


Energy efficiency – a key factor for corporate success

From an economic point of view, energy efficiency and reduced emissions lower operating costs and offer a competitive edge in the fiercely competitive global market. In addition, they help support compliance with environmental standards.

All potentials for optimization are used effectively when not only the details of a system but the system as a whole is optimized.

The 4EE system features four levers:



Efficient system layout

To achieve high energy efficiency, the system must be examined as a whole – as early as in the planning phase. The TS 2plus modular system offers numerous modules, all of which enable you to implement a transfer system tailored precisely to your application. This effectively prevents over-dimensioning and high energy losses in advance.



Energy-efficient modules

The TS 2plus modules are equipped with particularly energy-efficient drives. The efficiency of most of the motors already exceed requirements planned for the future. The interplay of friction-optimized materials, e.g. on slide rails, friction-minimizing gear oils, and numerous further design details ensures an optimized overall system.



Energy use on demand

Minimal energy consumption requires the ability to be able to switch off system components on demand. The majority of motors in the TS 2plus system are designed for start-stop operation and frequency converter operation.



Worldwide approval

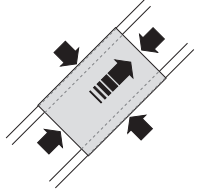
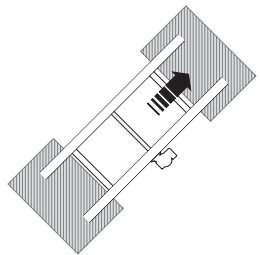
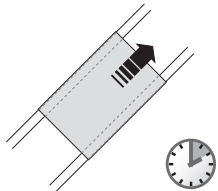
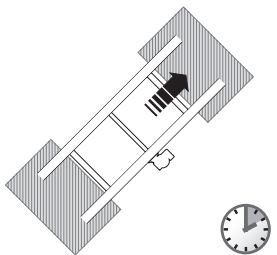
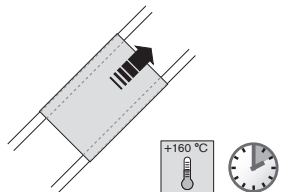
For international use, most of the motors feature CE, cURus, and CCC approvals.

Components for longitudinal conveyors

Components for longitudinal conveyors

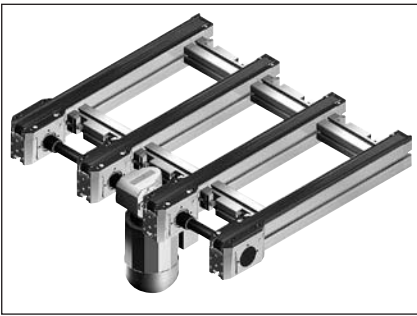
CSS/B belt section	2-2
CSS/BM belt section	2-3
CSS/F belt section	2-4
CSS/FM belt section	2-5
CSS/NT belt section	2-6
Transmission drive	2-7

2

CSS/B	- Slight corrections to the end position of the solar modules possible on the belt section - Cost-efficient solution	
CSS/BM	- Slight corrections to the end position of the solar modules possible on the belt section - Center motor mounting position	
CSS/F	- 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	- Conveyor medium with a high friction coefficient enables fast acceleration and deceleration - Center motor mounting position - System dimensions identical to CSS/B	
CSS/NT	- 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	

Components for longitudinal conveyors

CSS/B belt section



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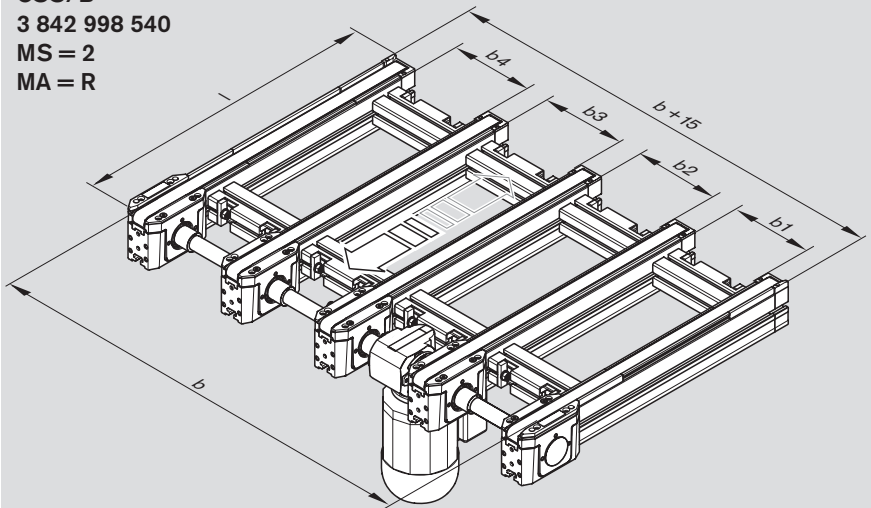
Application:

- 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

CSS/B
3 842 998 540
MS = 2
MA = R



00136114

3 842 998 537:	b _{min} = 160 mm
3 842 998 538:	b _{min} = 290 mm
3 842 998 539:	b _{min} = 420 mm
3 842 998 540:	b _{min} = 550 mm

CSS/B

Tracks	No.	Ordering parameters
2	3 842 998 537	b (160 ... 3000 mm)
3	3 842 998 538	b1 ¹⁾ (85 ... 1000 mm)
4	3 842 998 539	b2 ^{1) 3)} (85 ... 1000 mm)
5	3 842 998 540	b3 ^{1) 3)} (85 ... 1000 mm)
		b4 ^{1) 3)} (85 ... 1000 mm)
		l (290 ... 6000 mm)
		FP Lateral guide (1 = with; 0 = without)
		v _N ²⁾ (0; 6; 9; 12; 15; 18; 21; 36)
		U (☞ 7-11)
		f (☞ 7-11)
		AT Motor connection (S = cable/plug; K = terminal box)
		MS Motor mounting on track (1 = left ... 5 = right)
		MA Motor mounting (R = right; L = left)

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

Delivery condition:

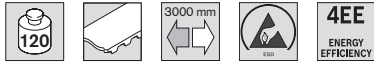
- b ≤ 2000 mm: assembled
- b > 2000 mm: partially assembled
- Motor is enclosed separately.

Optional accessories:

- SFS frames, ☞ 4-2
- SZS/B leg set, ☞ 4-3
- FC frequency converter, ☞ 7-15

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:

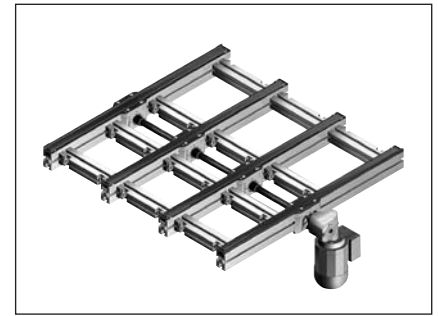
- Lengthwise motor mounting position can be specified by the user (see dimension l1)
- Other features as with CSS/B

Delivery condition:

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

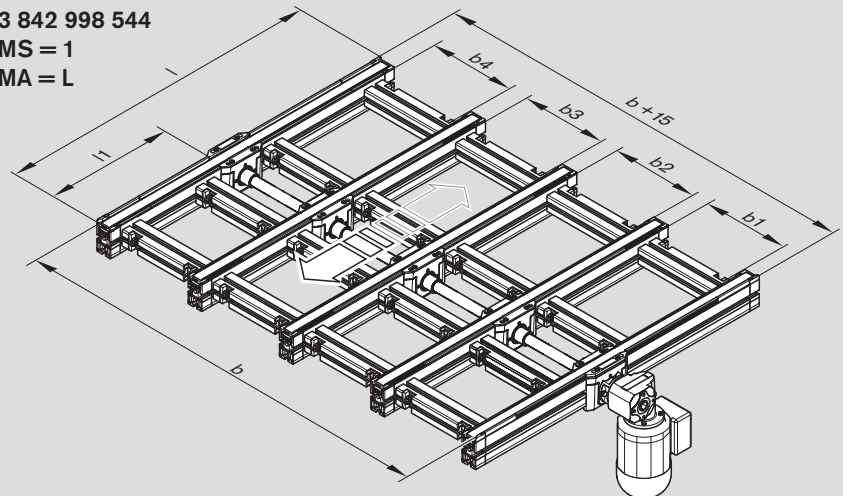
Optional accessories:

- SFS frames, 7-11 4-2
- SZS/B leg set, 7-11 4-3
- FC frequency converter, 7-11 7-15



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CSS/BM
3 842 998 544
MS = 1
MA = L



00136115

3 842 998 541:	$b_{\min} = 160$ mm
3 842 998 542:	$b_{\min} = 290$ mm
3 842 998 543:	$b_{\min} = 420$ mm
3 842 998 544:	$b_{\min} = 550$ mm

CSS/BM

Tracks	No.	Ordering parameters
2	3 842 998 541	b (160 ... 3000 mm)
3	3 842 998 542	b1 ¹⁾ 3) (85 ... 1000 mm)
4	3 842 998 543	b2 ¹⁾ 3) (85 ... 1000 mm)
5	3 842 998 544	b3 ¹⁾ 3) (85 ... 1000 mm)
		b4 ¹⁾ 3) (85 ... 1000 mm)
		l (450 ... 6000 mm)
		l1 (160 - l-290 mm)
		FP Lateral guide (1 = with; 0 = without)
		v_N ²⁾ (0; 6; 9; 12; 15; 18; 21; 36)
		U (7-11)
		f (7-11)
		AT Motor connection (S = cable/plug; K = terminal box)
		MS Motor mounting on track (1 = left ... 5 = right)
		MA Motor mounting (R = right; L = left)

¹⁾ $b_{x_{\min}} = 165$ mm if motor is mounted between the tracks

²⁾ $v_N = 0$, $U = 0$, $f = 0$: without motor and without gear

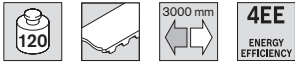
$v_N = 0$, $U = 0$, $f = 50/60$ Hz: without motor, with gear (if technically practical)

³⁾ Distance with the highest index is calculated

Special versions on request.

Components for longitudinal conveyors

CSS/F belt section

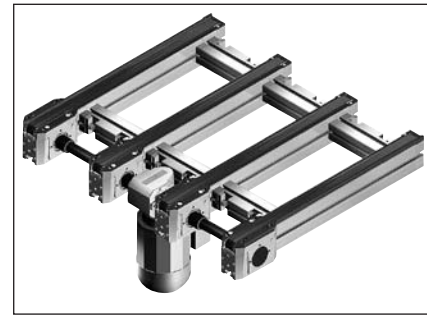


Application:

- 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



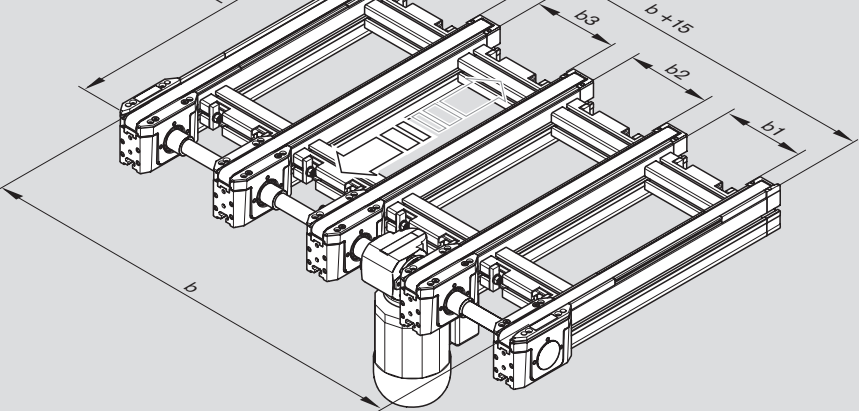
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CSS/F

3 842 998 645

MS = 2

MA = R



00136114

3 842 998 642:	$b_{\min} = 160 \text{ mm}$
3 842 998 643:	$b_{\min} = 290 \text{ mm}$
3 842 998 644:	$b_{\min} = 420 \text{ mm}$
3 842 998 645:	$b_{\min} = 550 \text{ mm}$

CSS/F

Tracks	No.	Ordering parameters
2	3 842 998 642	b (160 ... 3000 mm)
3	3 842 998 643	b1 ¹⁾ (85 ... 1000 mm)
4	3 842 998 644	b2 ^{1) 3)} (85 ... 1000 mm)
5	3 842 998 645	b3 ^{1) 3)} (85 ... 1000 mm)
		b4 ^{1) 3)} (85 ... 1000 mm)
		l (290 ... 6000 mm)
		FP Lateral guide (1 = with; 0 = without)
		v_N ²⁾ (0; 6; 9; 12; 15; 18; 21; 36)
		U (☞ 7-11)
		f (☞ 7-11)
		AT Motor connection (S = cable/plug; K = terminal box)
		MS Motor mounting on track (1 = left ... 5 = right)
		MA Motor mounting (R = right; L = left)

¹⁾ $b_{x_{\min}} = 165 \text{ mm}$ if motor is mounted between the tracks

²⁾ $v_N = 0, U = 0, f = 0$: without motor and without gear

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

³⁾ Distance with the highest index is calculated

Special versions on request.

Delivery condition:

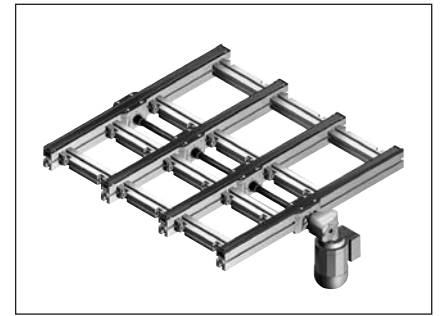
- $b \leq 2000 \text{ mm}$: assembled
- $b > 2000 \text{ mm}$: partially assembled
- Motor is enclosed separately.

Optional accessories:

- SFS frames, ☞ 4-2
- SZS/B leg set, ☞ 4-3
- FC frequency converter, ☞ 7-15

Components for longitudinal conveyors

CSS/FM belt section



00136116

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

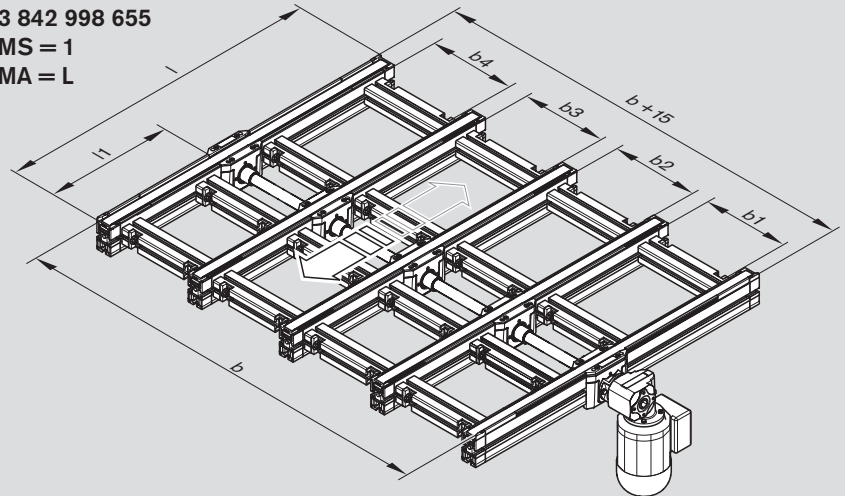
Delivery condition:

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

Optional accessories:

- SFS frames, 7-2
- SZS/B leg set, 7-3
- FC frequency converter, 7-15

CSS/FM
3 842 998 655
MS = 1
MA = L



3 842 998 652:	$b_{\min} = 160$ mm
3 842 998 653:	$b_{\min} = 290$ mm
3 842 998 654:	$b_{\min} = 420$ mm
3 842 998 655:	$b_{\min} = 550$ mm

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CSS/FM

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

¹⁾ $b_{x_{\min}}$ = 165 mm if motor is mounted between the tracks

²⁾ v_N = 0, U = 0, f = 0: without motor and without gear

v_N = 0, U = 0, f = 50/60 Hz: without motor, with gear (if technically practical)

³⁾ Distance with the highest index is calculated

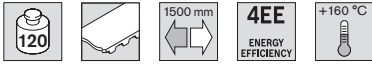
Special versions on request.



7-3

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:

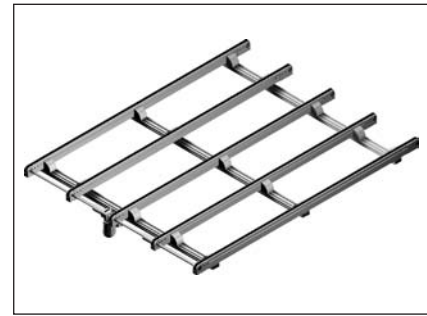
- Belt section of 2 to 5 tracks to securely support glass modules over the entire width. Distance between tracks can be determined individually (b1 to b4). Observe the minimum dimensions.
- Permissible load:
 - Per track: max. 0.3 kg/cm of support surface length and max. 60 kg
 - Per belt section: max. 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.

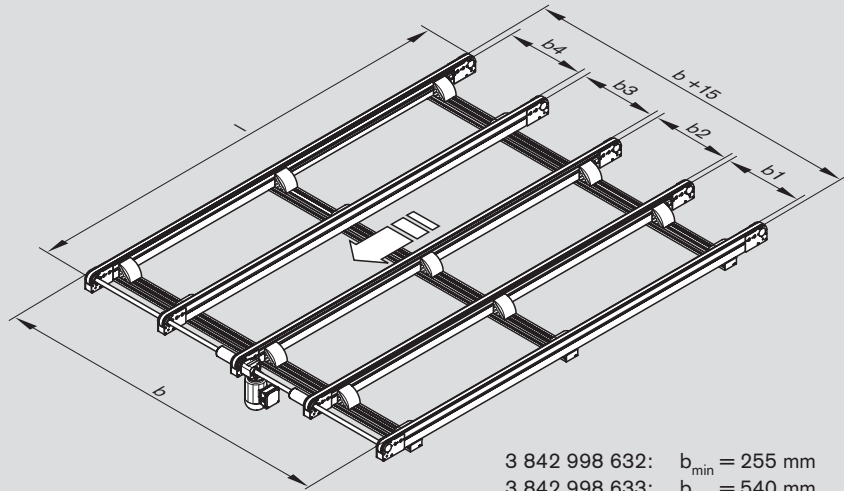
Optional accessories:

- SFS frames, 4-2
- SZS/N leg set, 4-4
- FC frequency converter, 7-15
- Toothed belt tensioner (tool for belt exchange), **3 842 541 202**



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CSS/NT
3 842 998 635
MS = 3
MA = L



00136116a

3 842 998 632:	b _{min} = 255 mm
3 842 998 633:	b _{min} = 540 mm
3 842 998 634:	b _{min} = 825 mm
3 842 998 635:	b _{min} = 1050 mm

CSS/NT

Tracks	No.	Ordering parameters
2	3 842 998 632	b (255 ... 2300 mm)
3	3 842 998 633	b1 ¹⁾ (180 ... 1000 mm)
4	3 842 998 634	b2 ^{1) 4)} (240 ... 1000 mm)
5	3 842 998 635	b3 ^{1) 4)} (240 ... 1000 mm)
		b4 ^{1) 4)} (180 ... 1000 mm)
		l ²⁾ (550 ... 3000 mm)
		Standard lengths: 550, 1000, 1500, 2000, 2500, 3000
		FP Lateral guide (1 = with; 0 = without)
		v _N ³⁾ (0; 6; 9; 12; 15; 18; 36)
		U (7-11)
		f (7-11)
		AT Motor connection (S = cable/plug; K = terminal box)
		MS Motor mounting on track (1 = left ... 5 = right)
		MA Motor mounting (R = right; L = left)
		TU Toothed belt tensioner (1 = on every track; 0 = none)

¹⁾ b_{x min} = 350 mm if motor is mounted between the tracks

²⁾ Length deviation ± 0.5%

³⁾ v_N = 0, U = 0, f = 0: without motor and without gear

v_N = 0, U = 0, f = 50/60 Hz: without motor, with gear (if technically practical)

⁴⁾ Distance with the highest index is calculated

Special versions on request.

Components for longitudinal conveyors

Transmission drive



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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:

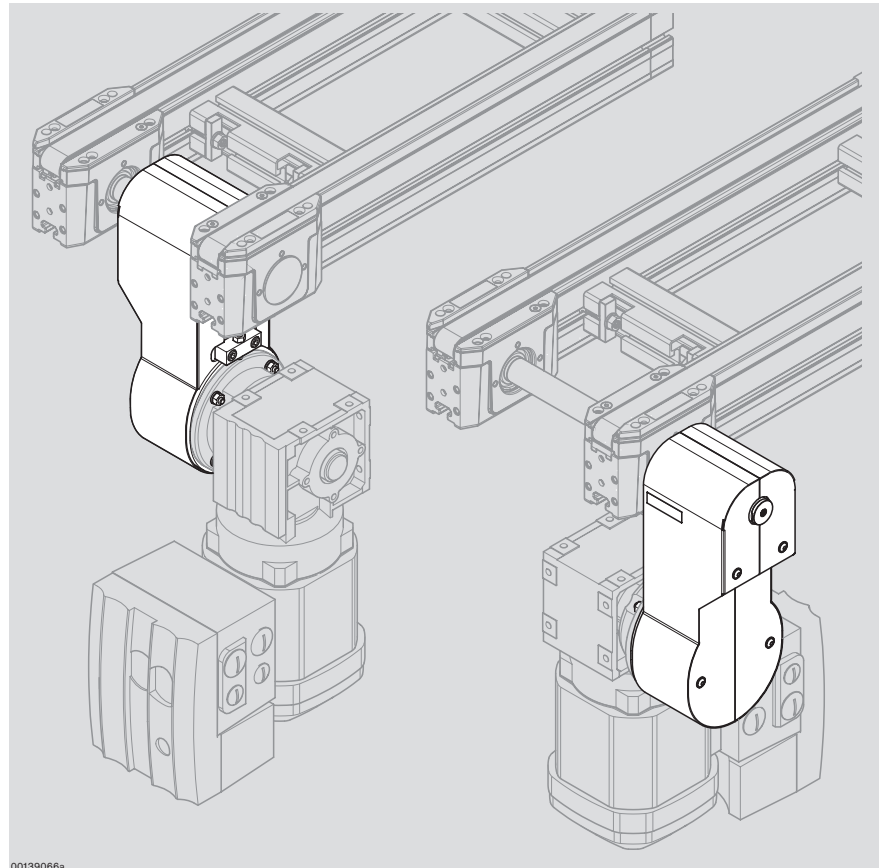
- Belt drive gear for gear motors that need to be installed at a lower depth so they can be passed over.
- Suitable for flange gear versions, flange diameter 120 mm (B5 version for worm gears), and hollow shaft, diameter 20 mm
- Designed for Spiroplan right-angle gear motors WAF20, WAF30 or WAF37 and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



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Transmission drive:

3 842 542 550



Components for longitudinal conveyors

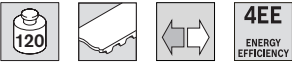
Components for transverse conveyors

Components for transverse conveyors

LTS/... lift transverse unit	3-2
TTS/B, TTS/F, TTS/NT rotary modules	3-4
RES/M rotary modules	3-5

Components for transverse conveyors

LTS/... lift transverse unit



21513

Application:

- LTS/... lift transverse unit, consisting of a CSS/... belt section and a lift unit for constructing right-angled section branches.

Version:

- Version with two to four tracks. The distance between tracks can be determined individually (b1 to b3). Observe the minimum dimensions.
- Permissible load:
 - Per track:
 - max. 0.15 kg/cm of support surface length,
 - max. 40 kg for LTS/F,
 - max. 60 kg for LTS/B.
 - Per belt section: max. 120 kg
- O-rings for high friction coefficients and improved static friction in transverse transport.
- Tracks without lateral guide.
- Reversible over the entire value range.
- Easy toothed belt exchange.
- 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 4; MS = 1 indicates the left-hand track in the direction of transport).
- Motor connection either with cable/plug (AT = S) or terminal box (AT = K)
- Two lift positions

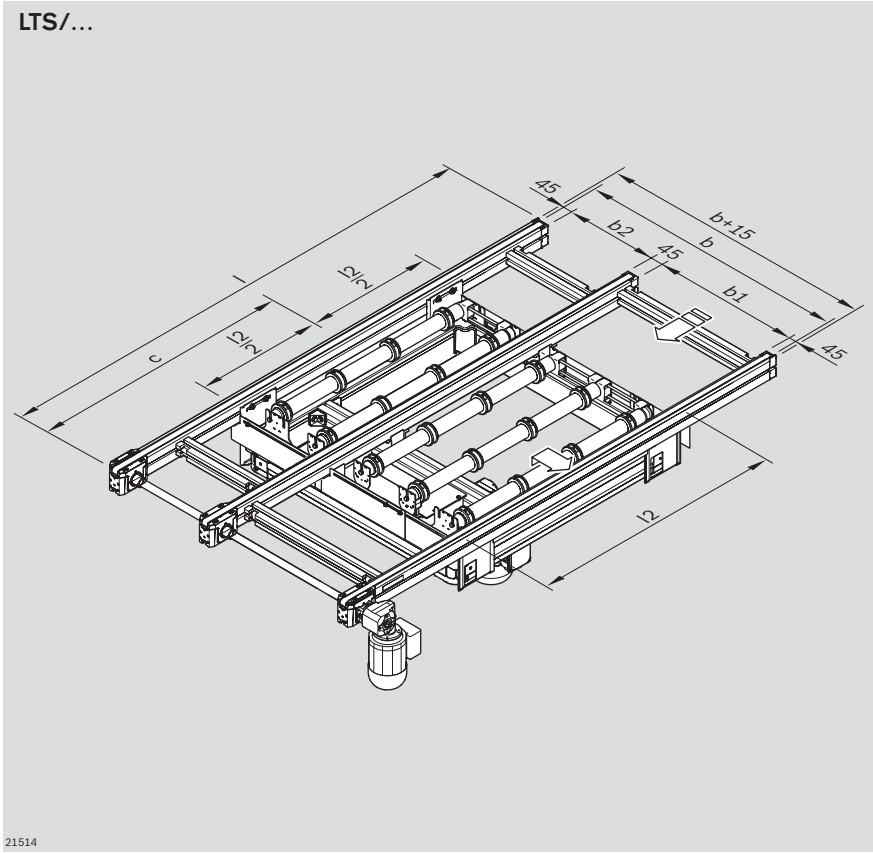
Condition on delivery:

- Assembled
- Motors are included separately.

Required accessories:

- SZS/B leg set, 4-3

LTS/...



21514

Recommended size (BG) for plate length:

Plate length	BG		
l = 500 mm to 800 mm	BG1	c = 697 mm to l – 567 mm	l2 = 734 mm
l = 800 mm to 1100 mm	BG2	c = 817 mm to l – 717 mm	l2 = 1034 mm
l = 1100 mm to 1400 mm	BG3	c = 967 mm to l – 867 mm	l2 = 1334 mm
l = 1400 mm to 1750 mm	BG4	c = 1150 mm to l – 1050 mm	l2 = 1700 mm
l = 1750 mm to 2100 mm	BG5	c = 1300 mm to l – 1200 mm	l2 = 2000 mm

Components for transverse conveyors

LTS/B-... / LTS/F-...

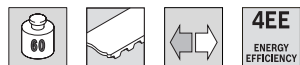
Tracks	LTS/B-... No.	LTS/F-... No.	Ordering parameters		
2	3 842 998 672	3 842 998 682	2 tracks	3 tracks	4 tracks
3	3 842 998 673	3 842 998 683	b (450 to 675 mm)	(576 to 1320 mm)	(812 to 1965 mm)
4	3 842 998 674	3 842 998 684	b1 (375 to 600 mm)	(240 to 600 mm)	(216 to 600 mm)
			b2 (216 to 600 mm)	(216 to 600 mm)	(216 to 600 mm)
			b3 (216 to 600 mm)	(216 to 600 mm)	(216 to 600 mm)
			l 1264 to 6000 mm, when BG = 1) (1564 to 6000 mm, when BG = 2) (1864 to 6000 mm, when BG = 3) (2230 to 6000 mm, when BG = 4) (2530 to 6000 mm, when BG = 5)		
			BG Sizes 1 to 5		
			c Lift unit center position		
			v _N ²⁾ (0; 6; 9; 12; 15; 18; 21; 36)		
			U (☞ 7-11)		
			f (☞ 7-11)		
			AT Motor connection (S = cable/plug; K = terminal box)		
			MS Motor mounting on track (1 = left to 5 = right)		
			MA Motor mounting (R = right; L = left)		

²⁾ v_N = 0, U = 0, f = 0: without motor and without gear



Components for transverse conveyors

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



Application:

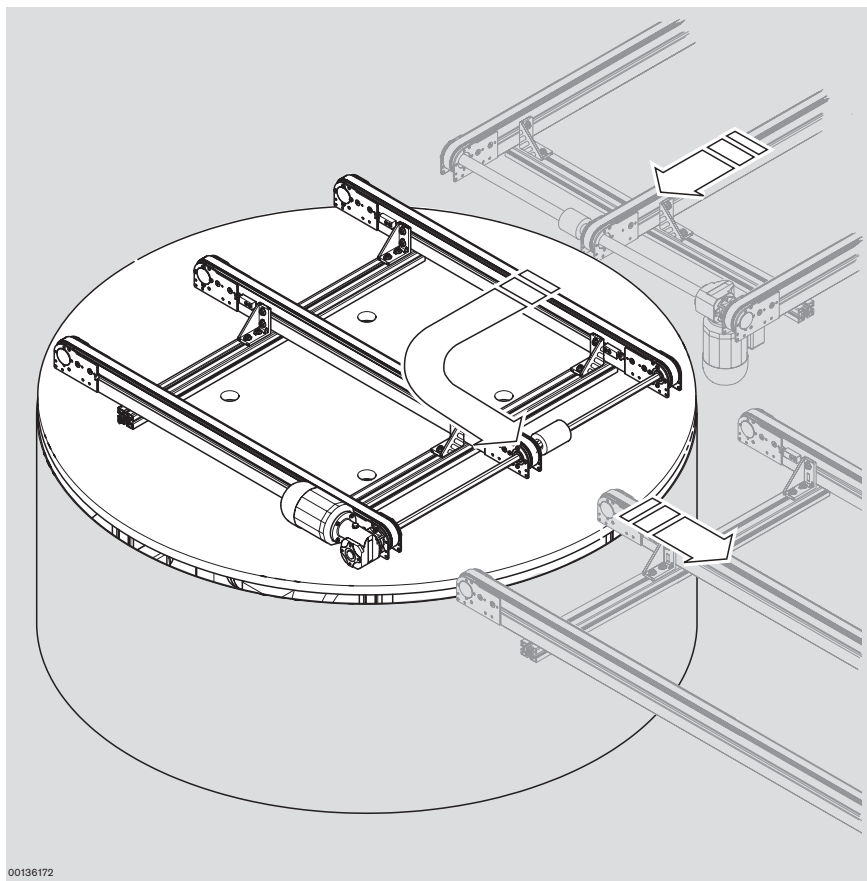
- Particularly gentle transport for direction changes or as a corner return unit
- Direction change of 90°, 180° or 270° while maintaining orientation (front remains in the front)
- Diverter function to outfeed from a main transport section

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



00136172

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:

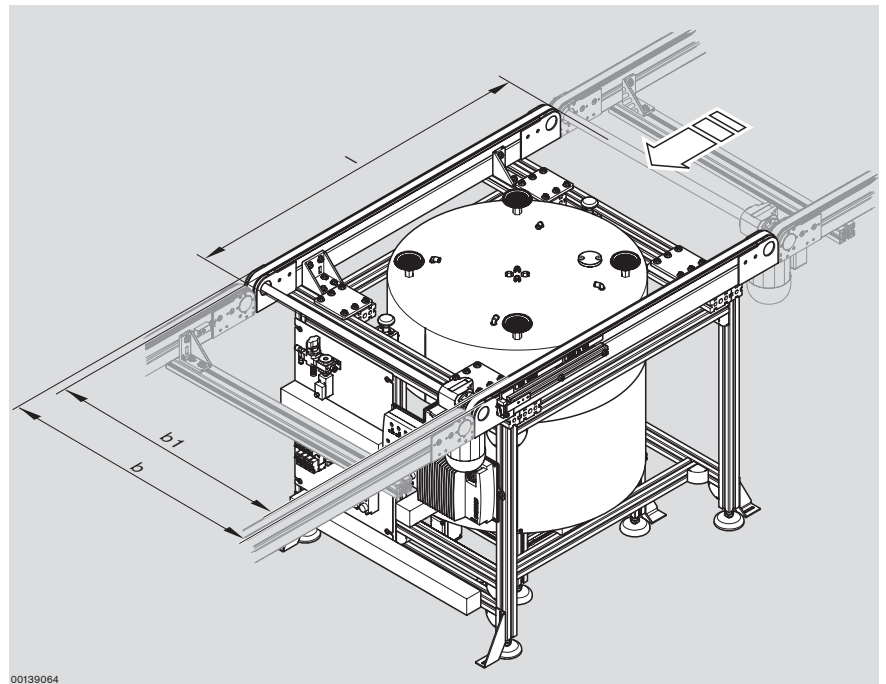
- Automatic lift unit with manual rotary table
- Prevents solar modules from sliding during manual rotation
- Mechanical safeguard against lowering
- Unobstructed edges for assembly, framing or gluing
- 2 rotational directions
- Section load up to 60 kg

Scope of delivery:

- Incl. base frame



00139063



00139064

RES/M:
Order on request

Components for transverse conveyors

Leg sets

Frames, leg sets

SFS frames	4-2
SZS leg sets	4-3
Accessories: Basic Mechanical Elements	4-5

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:

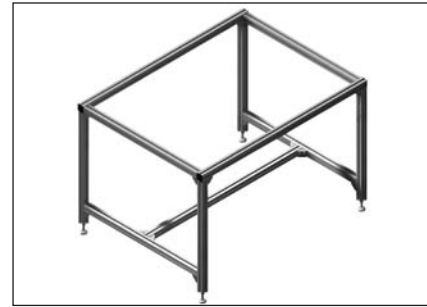
Incl. height-adjustable bases

Delivery condition:

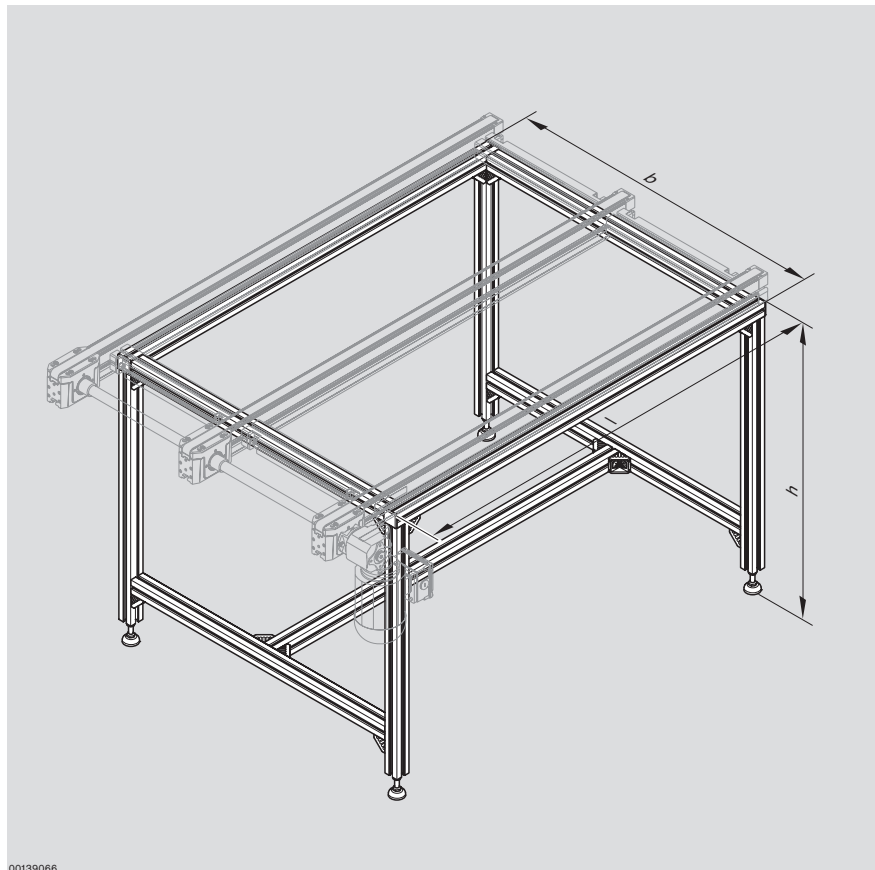
Unassembled kit

Required accessories:

- Connection kit for fastening the unit



00139065



00139066

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, 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**, 4-5
- Anchor bolts **3 842 526 560**, 4-5

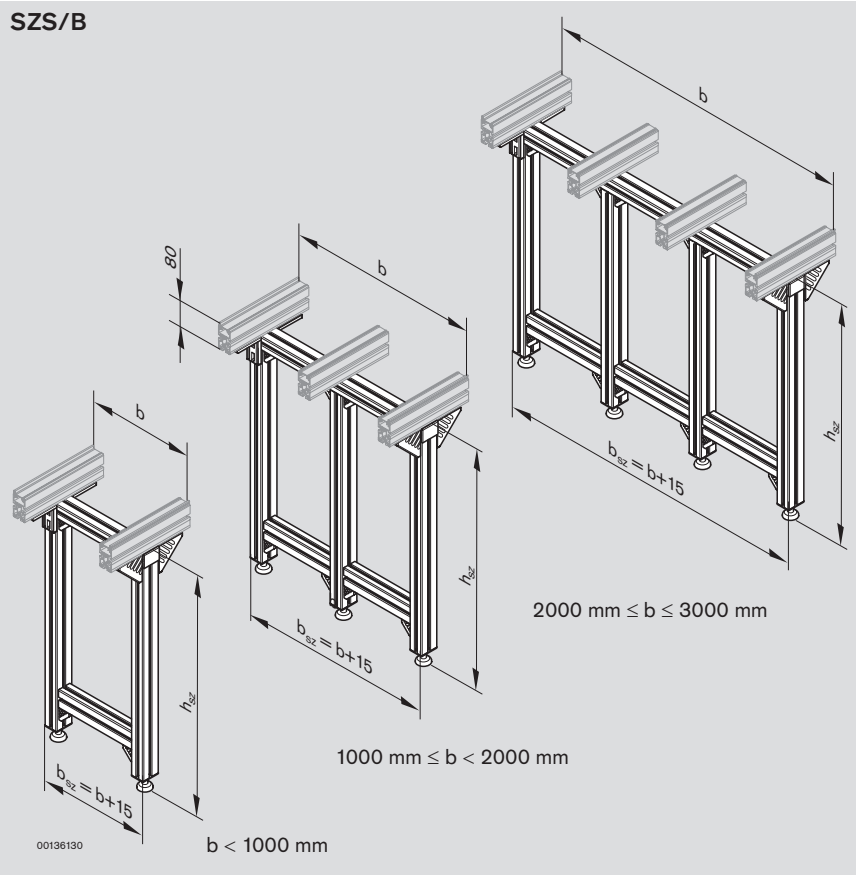
Optional accessories:

- Reinforcement made of Basic Mechanical Elements, 4-5



00136157

SZS/B



00136130

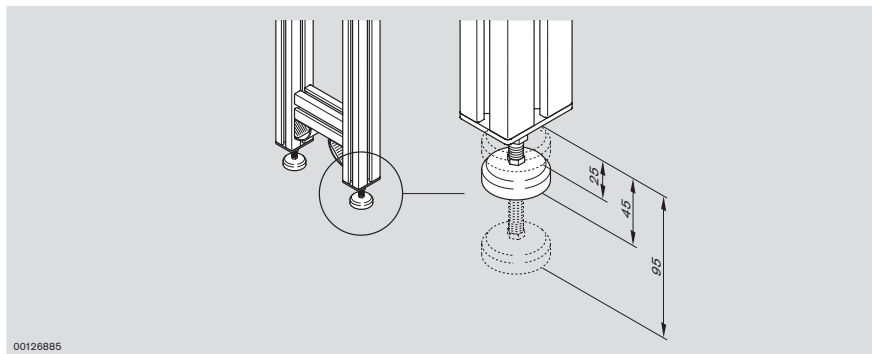
b < 1000 mm

1000 mm ≤ b < 2000 mm

2000 mm ≤ b ≤ 3000 mm

SZS/B

	No.	Ordering parameters
SZS/B	3 842 998 585	b (160 - 3000 mm)
		hSZ (250 - 2000 mm)



00126885

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, 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:

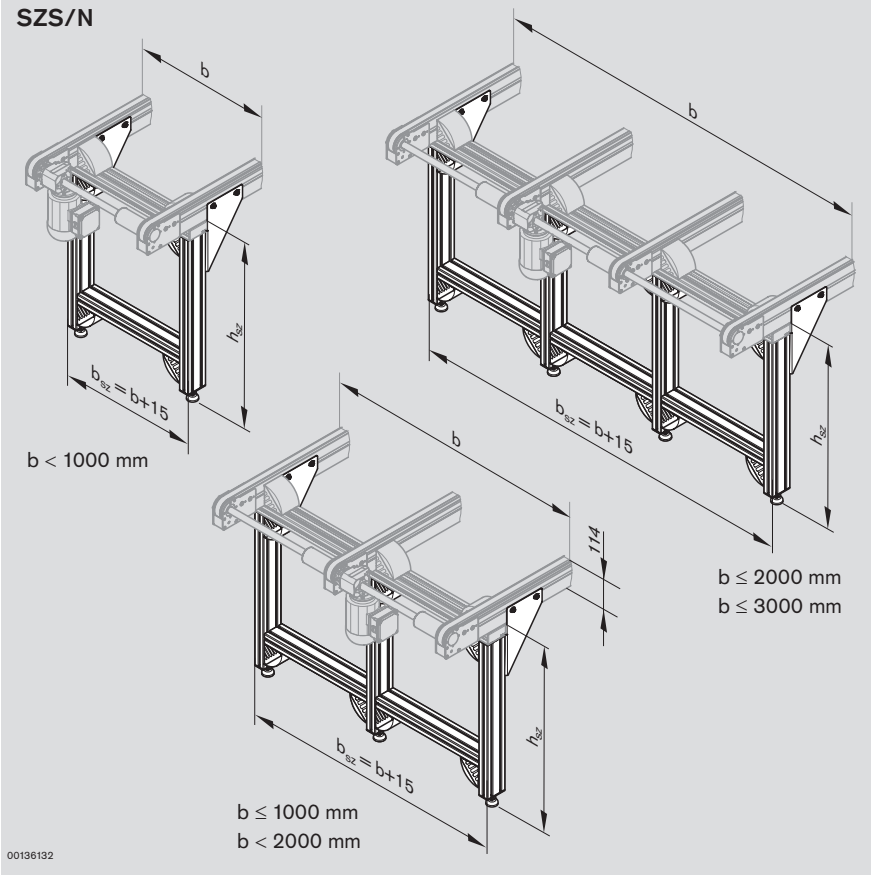
- Foundation bracket **3 842 146 815**, 4-5
- Anchor bolts **3 842 526 560**, 4-5

Optional accessories:

- Reinforcement made of Basic Mechanical Elements, 4-5

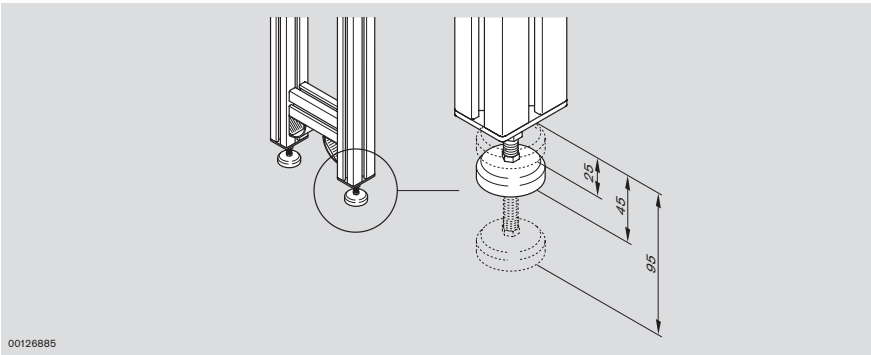


00136131



SZS/N

	No.	Ordering parameters
SZS/N	3 842 998 593	b (160 - 3000 mm)
		hSZ (250 - 2000 mm)

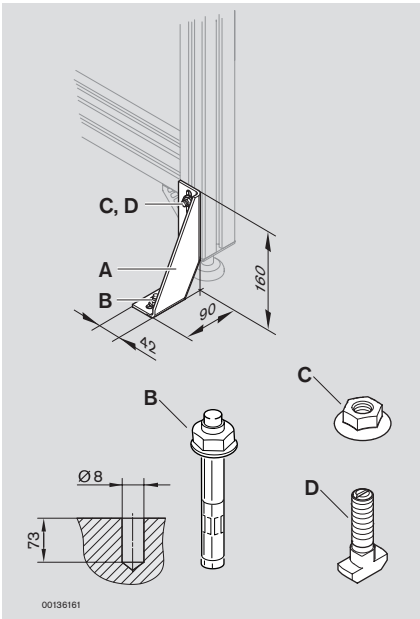


00126885

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.



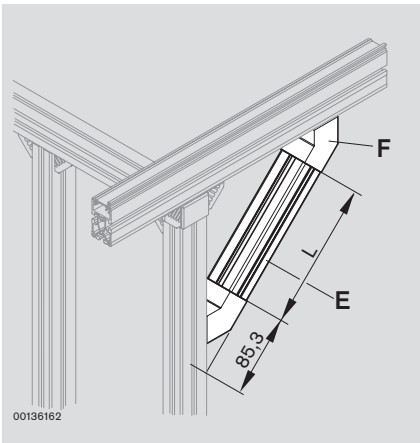
Foundation bracket		
		No.
A	20	3 842 146 815 ^{*)}

Anchor bolt		
		No.
B	1	3 842 526 560 ^{*)}

T-head bolt, flange nut		
		No.
C	100	3 842 345 081 ^{*)}
D	100	3 842 528 715 ^{*)}

Foundation bracket set		
		No.
(A + C + D)	20	3 842 338 979 ^{*)}

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



45x45L profile		
		No.
E	1	3 842 992 425/L

45° connector		
		No.
F	1	3 842 535 428

Leg sets

Positioning and orientation, transportation control

Positioning and orientation Transportation control

Stop	5-2
Fixed stop with air nozzle	5-3
DAS/30 damper	5-4
Damper with blower	5-5
VE 2/D-60 stop gate	5-6
Air nozzle	5-7

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 $v_{\max} \leq 3 \text{ m/min}$

Installation location:

- CSS/B, CSS/BM belt section
- LTS/B, LTS/F lift transverse unit

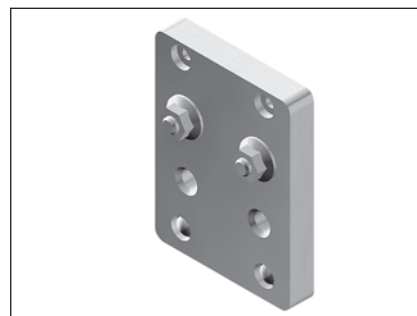
Version:

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

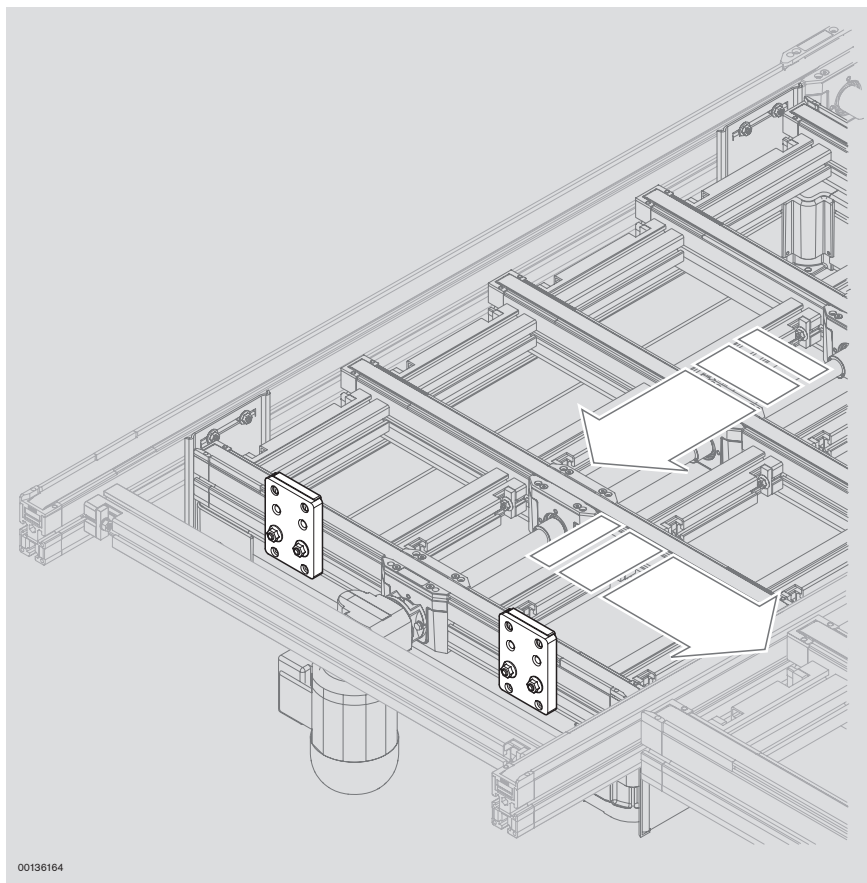
Scope of delivery:

Incl. fastening material for mounting to the belt section or lift transverse unit

Delivery condition: unassembled



00136139



00136164

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 $v_{\max} \leq 3 \text{ m/min}$

Installation location:

- CSS/B, CSS/BM belt section
- LTS/B, LTS/F lift transverse unit

Version:

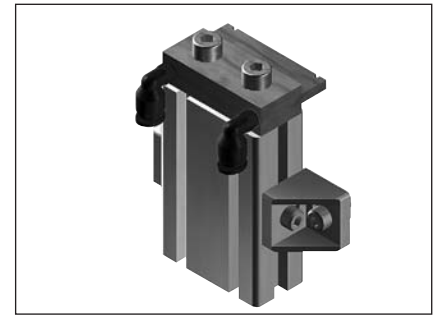
- A soft jet of air on the front side prevents hanging film from being caught when the solar module hits the stop
- Compressed air supply with approx. 4-6 bar
- Compressed-air connection via 4-mm pushlock-type connection
- Individually adjustable
- Nozzle outlet diameter: 1-1.5 mm

Scope of delivery:

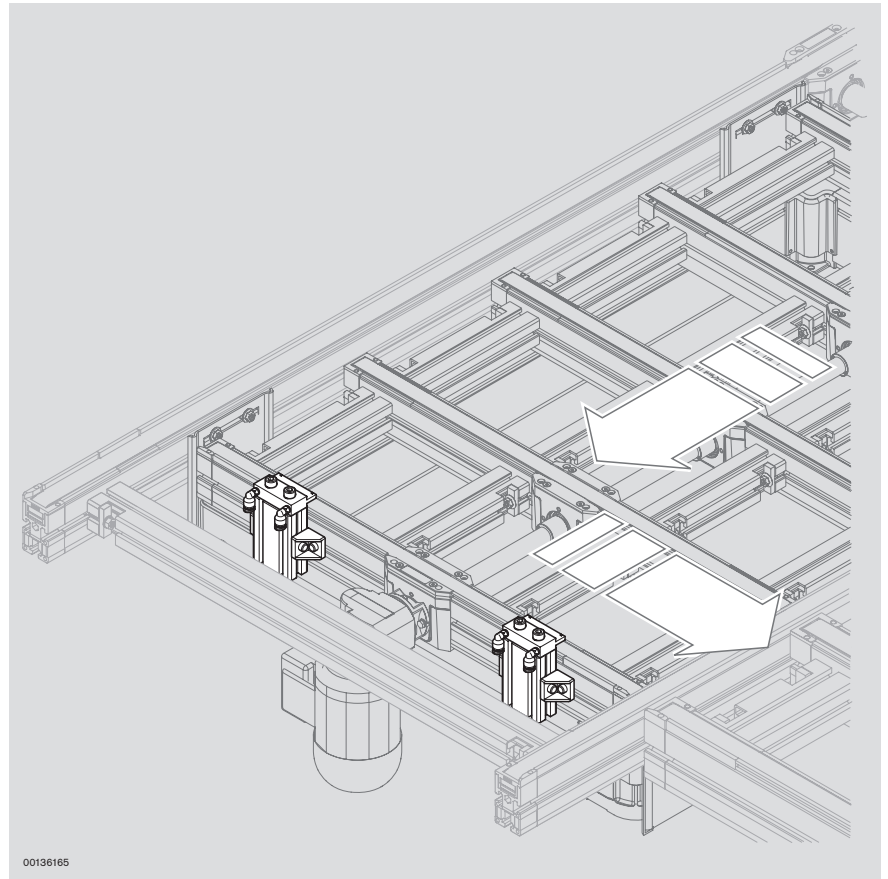
Incl. fastening material for mounting to the belt section or lift transverse unit

Delivery condition: assembled

Stop with blower:
Order on request



00136140



00136165

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 $v_{\max} \leq 3 \text{ m/min}$
- Used only with toothed belts with a low friction coefficient

Installation location:

- CSS/B, CSS/BM belt section
- LTS/B, LTS/F lift transverse unit

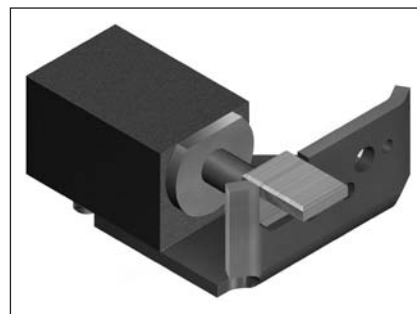
Version:

- 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.

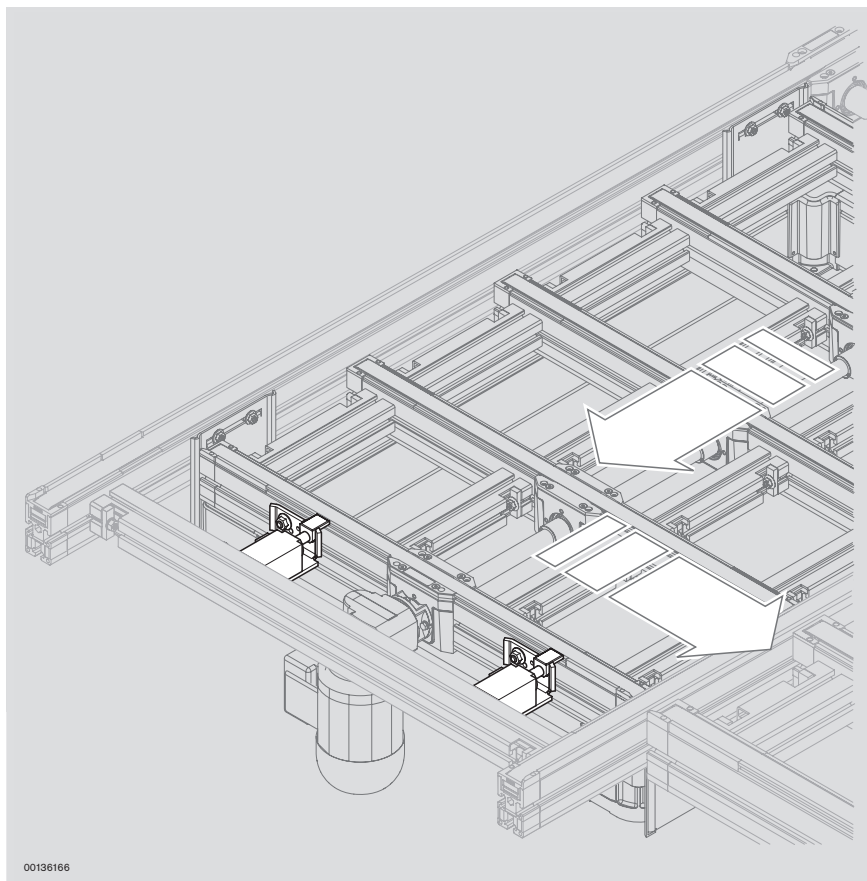
Scope of delivery:

Incl. fastening material for mounting to the lift transverse unit

Delivery condition: unassembled



00136160



00136166

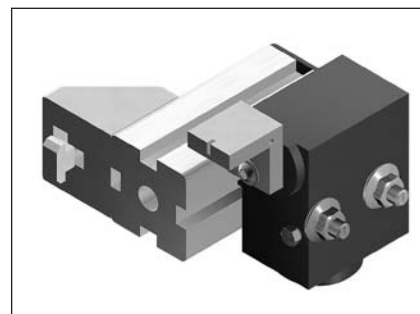
DAS/30

Load (kg)	No.
30-60	3 842 515 351



Positioning and orientation, transportation control

Damper with blower



00136143

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 $v_{\max} \leq 3$ m/min
- Used only with toothed belts with a low friction coefficient

Installation location:

- CSS/B, CSS/BM belt section
- LTS/B, LTS/F lift transverse unit

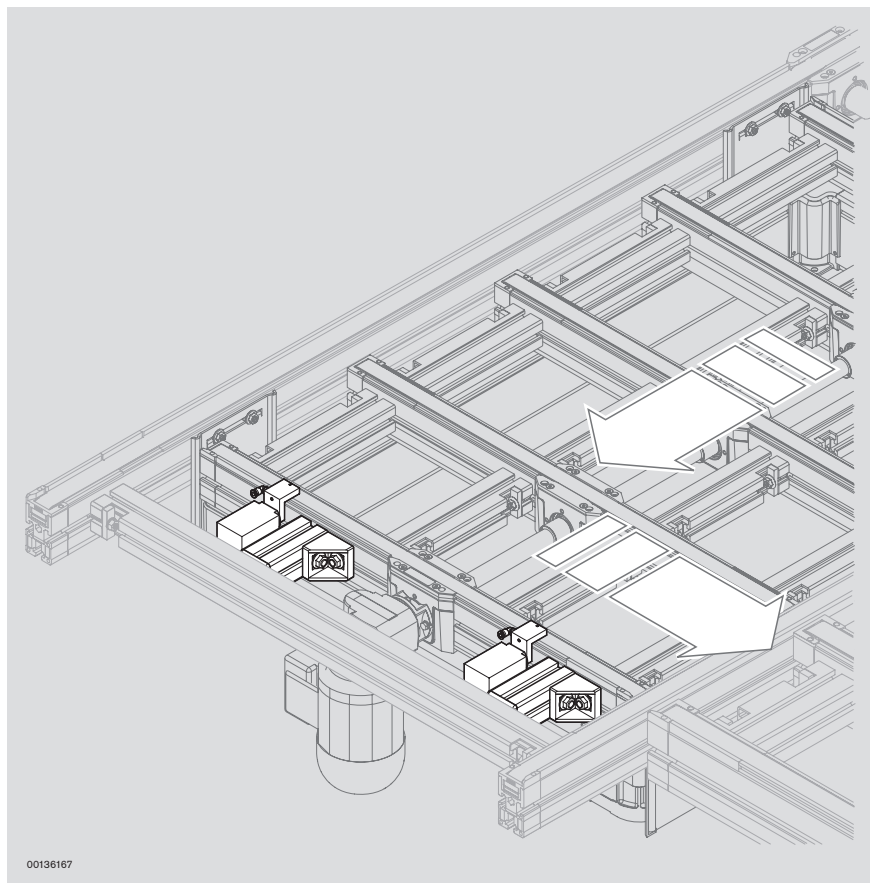
Version:

- 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



00136167

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 $v_{\max} \leq 3 \text{ m/min}$
- 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

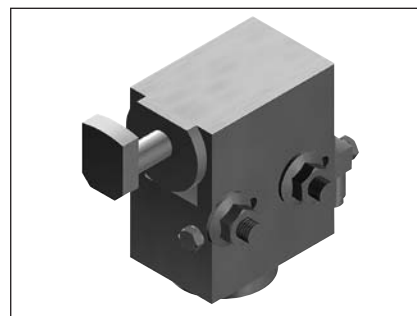
Version:

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

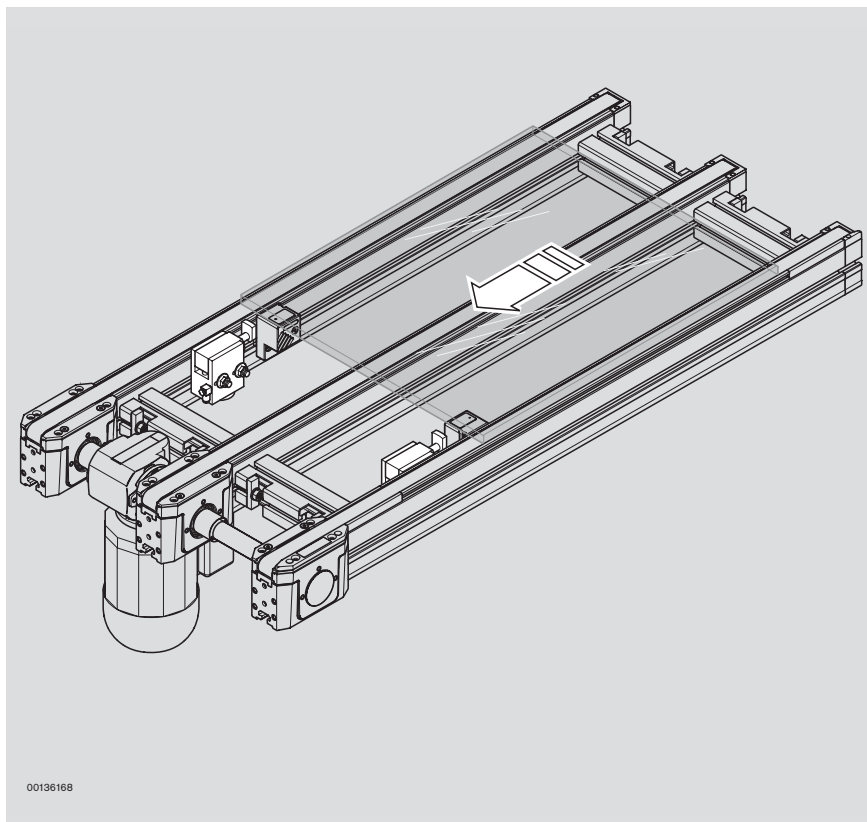
Scope of delivery:

Incl. fastening material for mounting to the belt section

Delivery condition: assembled



00136144



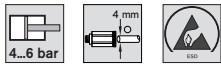
00136168

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

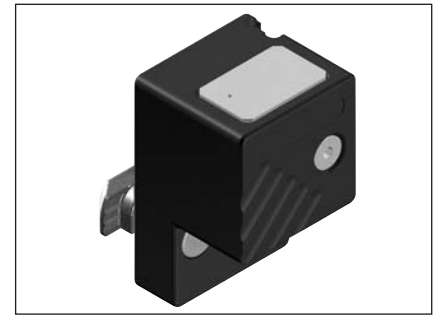
Version:

- 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

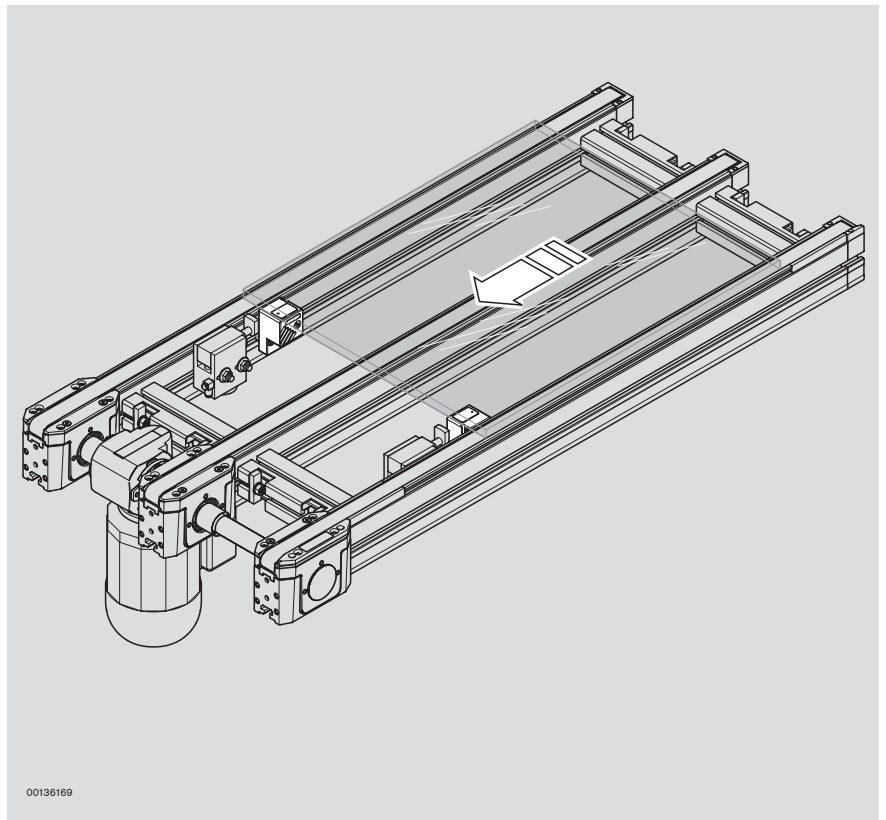
Scope of delivery:

Incl. fastening material for mounting to the belt section

Delivery condition: assembled



00136146



Air nozzle:

Order on request

Positioning and orientation, transportation control

Special modules

Special modules

LIFO storage	6-2
Lift	6-3

Special modules

LIFO storage



Application:

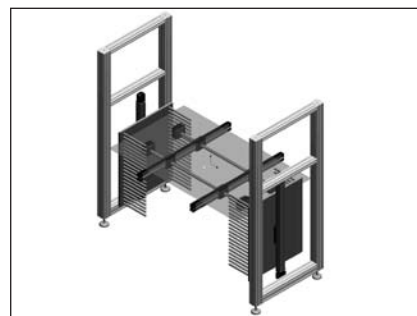
- Vertical temporary storage for 10 to 30 solar modules. Functions in accordance with the “last in, first out” principle.
- Mounted within the line in the longitudinal or transverse conveyor

Version:

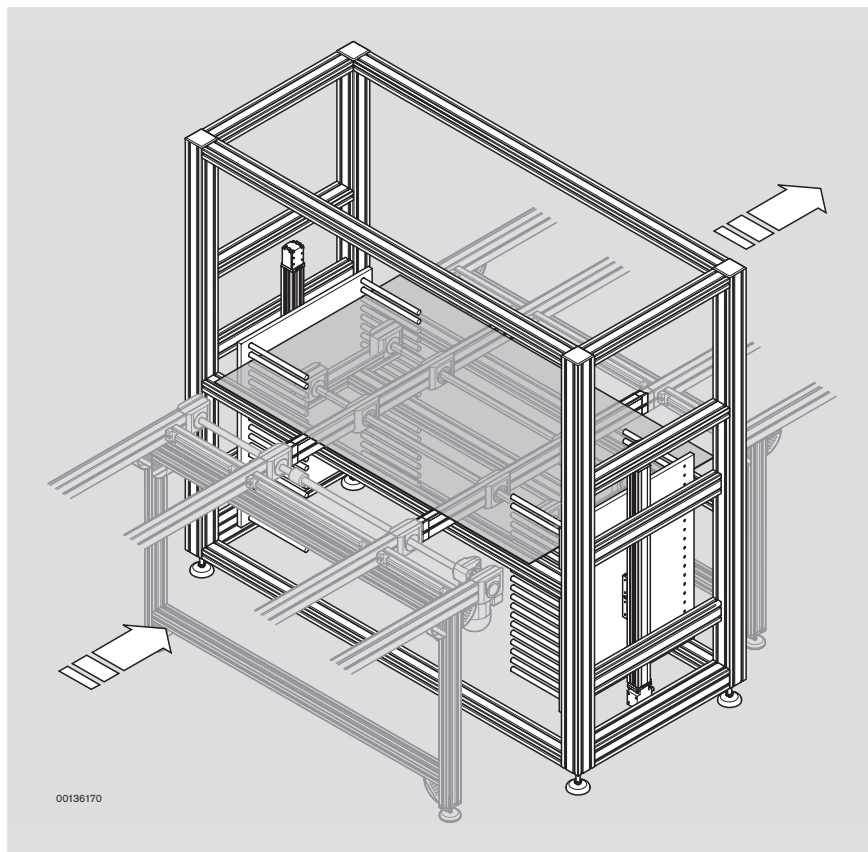
- Independent module
- Expanding mandrel to lift the solar modules from the belt section. Stored above the conveying level.
- Vertical movement via electrical axles

Scope of delivery:

- Incl. CSS belt section
- Incl. enclosure
- Incl. complete sensor system



00136158



00136170

LIFO storage:
Order on request

Special modules

Lift



Application:

- To bridge differences in the transport level

Version:

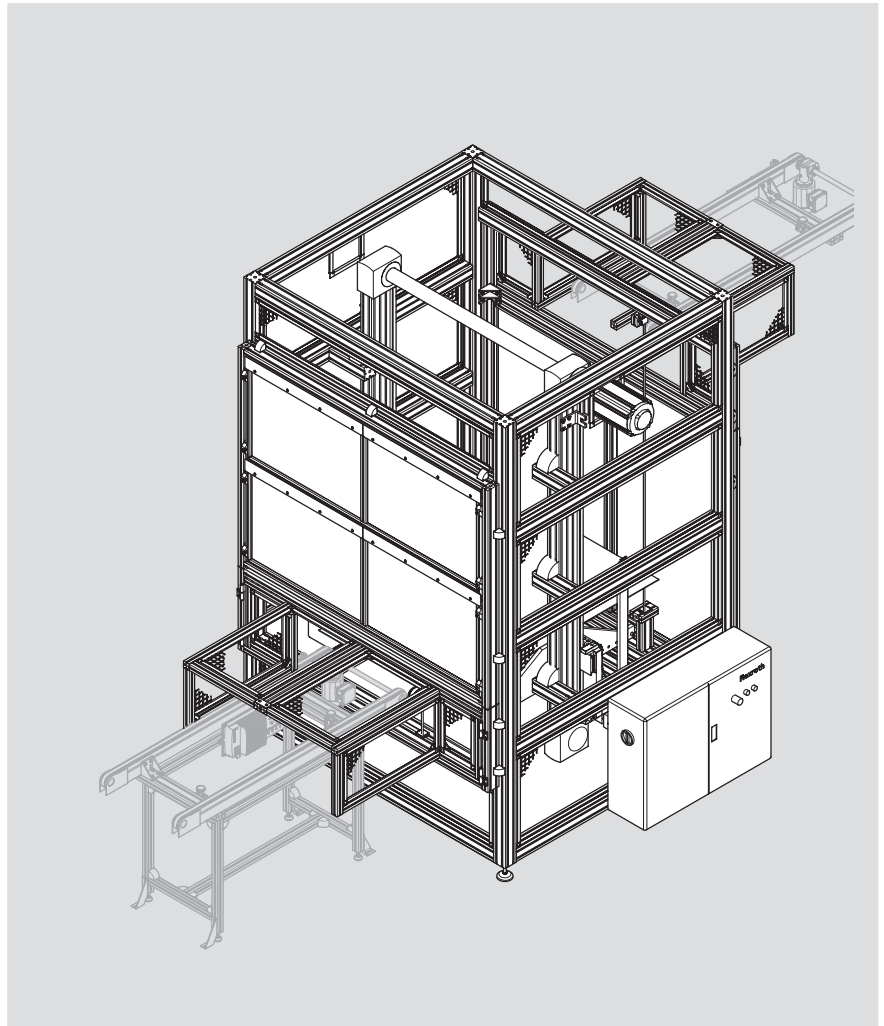
- Lift of up to 550 mm (larger lifts are also possible)
- Lifting movement via servo drive for the vertical axis
- Optional version: pneumatic lifting movement (lift ≤ 50 mm)

Scope of delivery:

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



00139068



6

Lift:
Order on request

Special modules

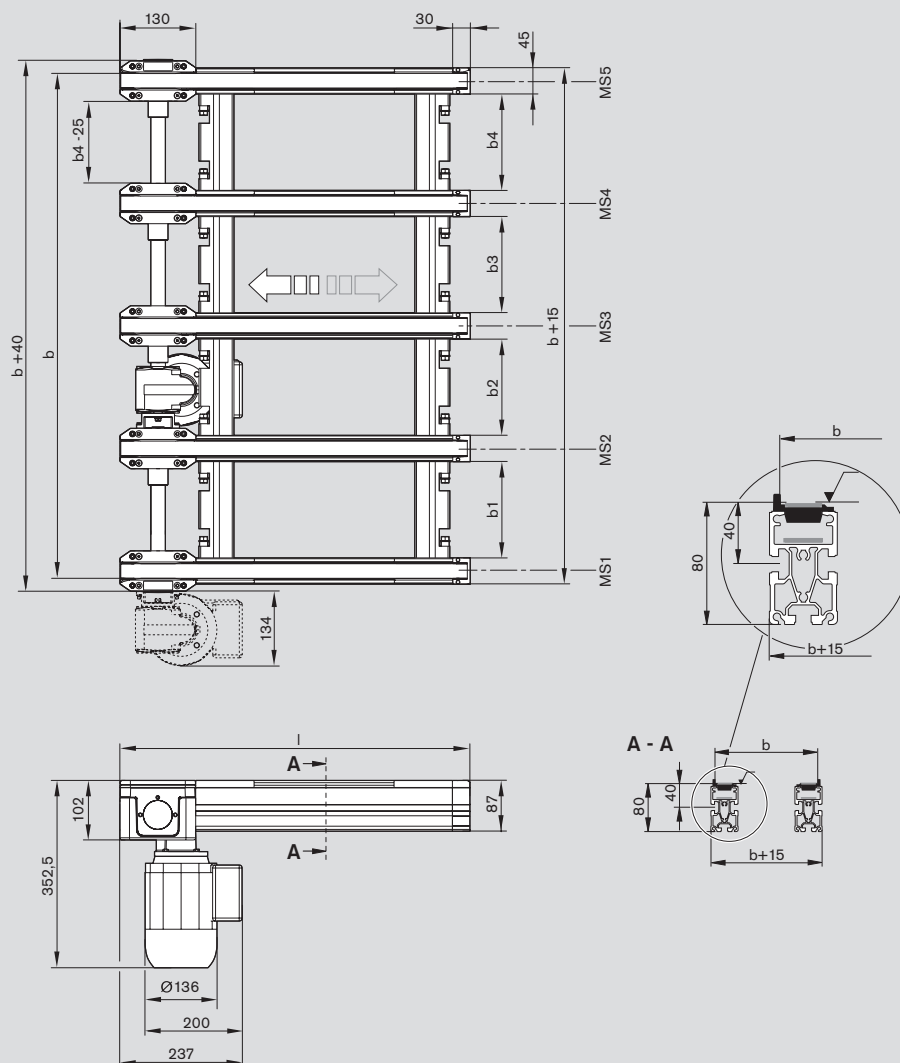
Technical data

Technical data

CSS/B, CSS/F belt section	7-2
CSS/BM, CSS/FM belt section	7-3
CSS/NT belt section	7-4
Transmission drive	7-5
LTS/... lift transverse unit	7-6
Stop, fixed stop with air nozzle	7-7
DAS/30 damper, damper with blower	7-8
VE 2/D-60 stop gate, air nozzle	7-9
Motor data	7-10
Transportation speed, motor connection	7-14
Layout of the belt sections and drive	7-15

Technical data

CSS/B, CSS/F belt section



00136147

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

3 842 998 537: $b_{\min} = 160 \text{ mm}$

3 842 998 538: $b_{\min} = b_{1\min} + b_{2\min} + 3 \times 45 - 15 = 290 \text{ mm}$

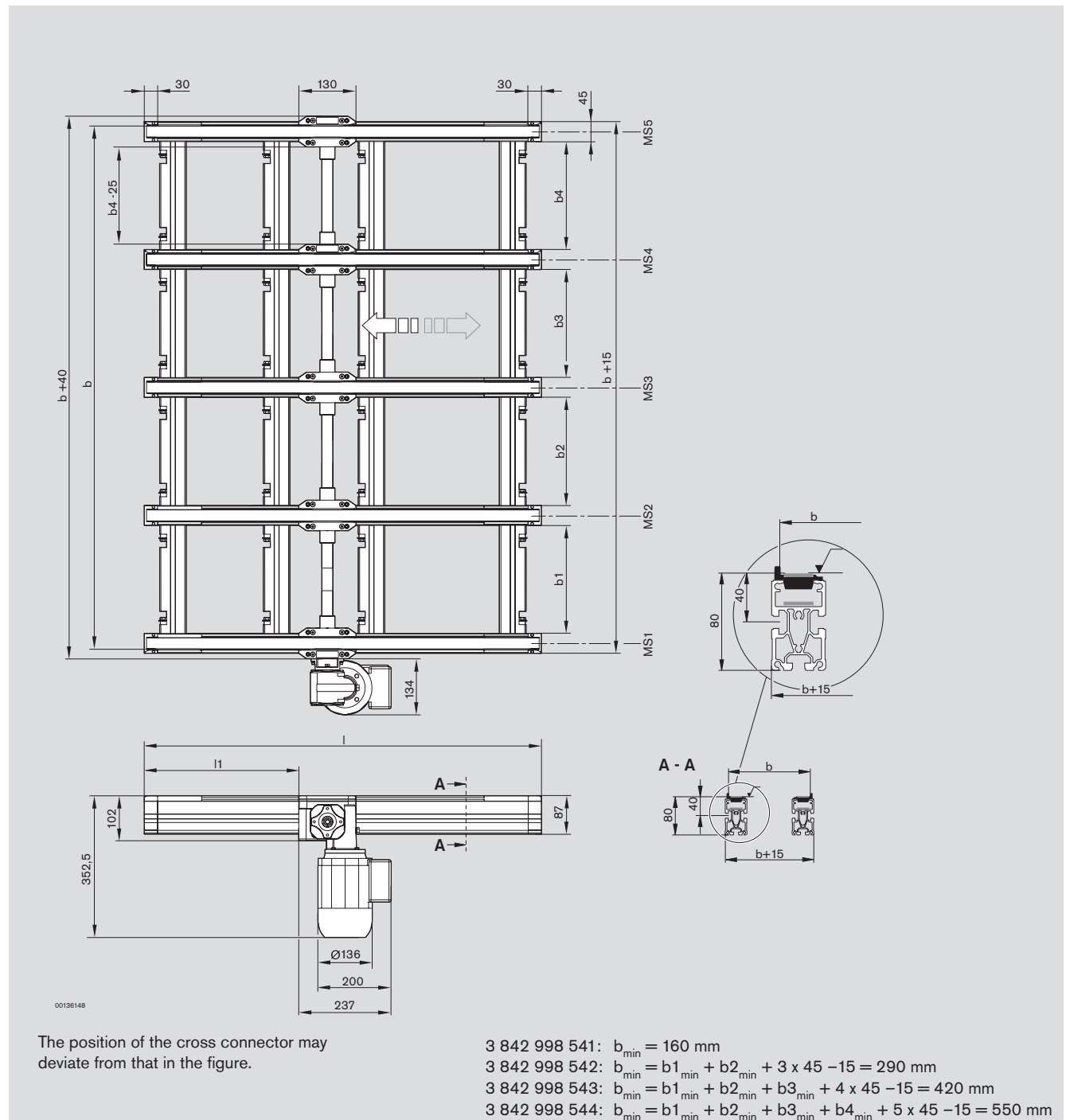
3 842 998 539: $b_{\min} = b_{1\min} + b_{2\min} + b_{3\min} + 4 \times 45 - 15 = 420 \text{ mm}$

3 842 998 540: $b_{\min} = b_{1\min} + b_{2\min} + b_{3\min} + b_{4\min} + 5 \times 45 - 15 = 550 \text{ mm}$



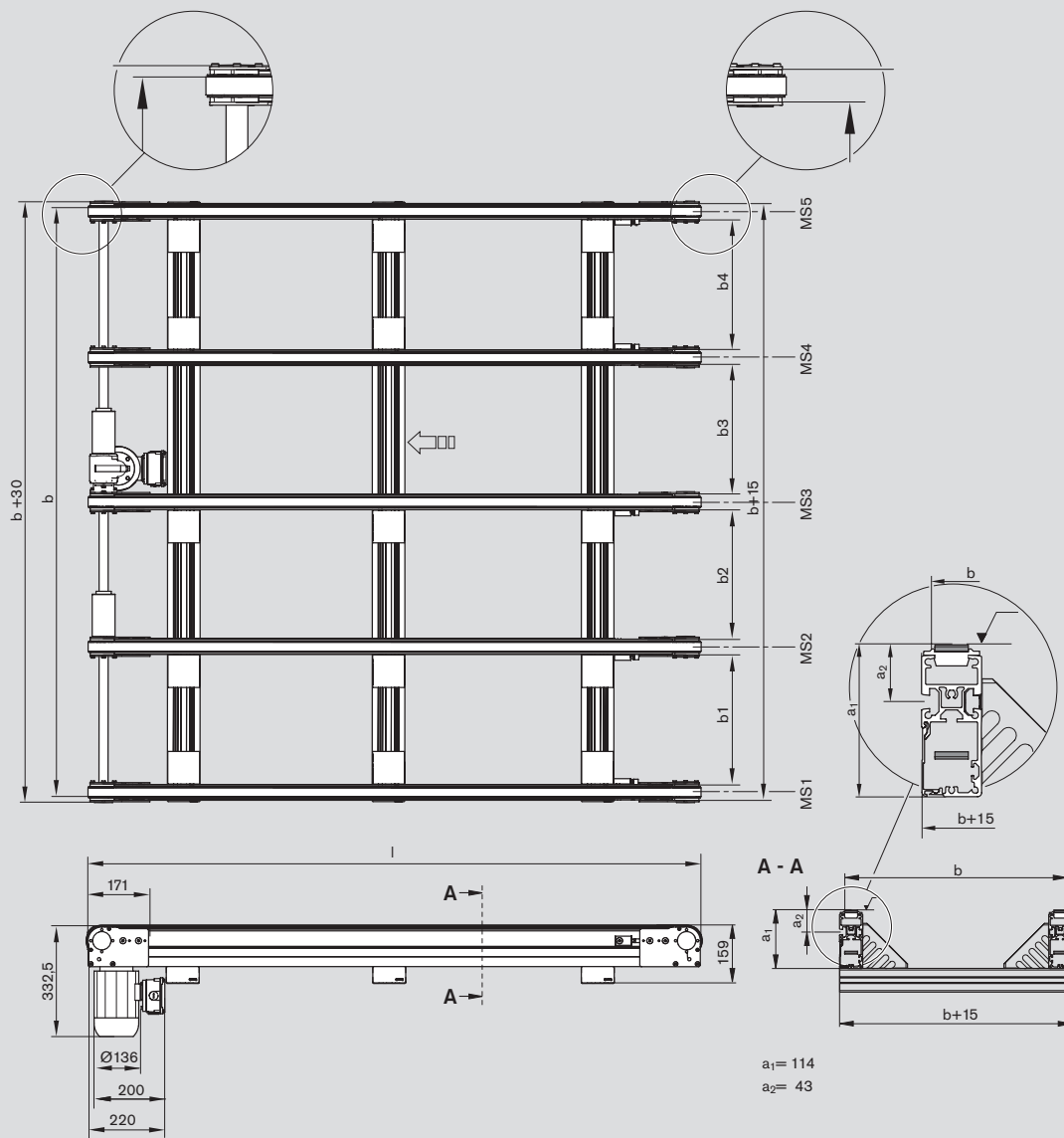
Technical data

CSS/BM, CSS/FM belt section



Technical data

CSS/NT belt section

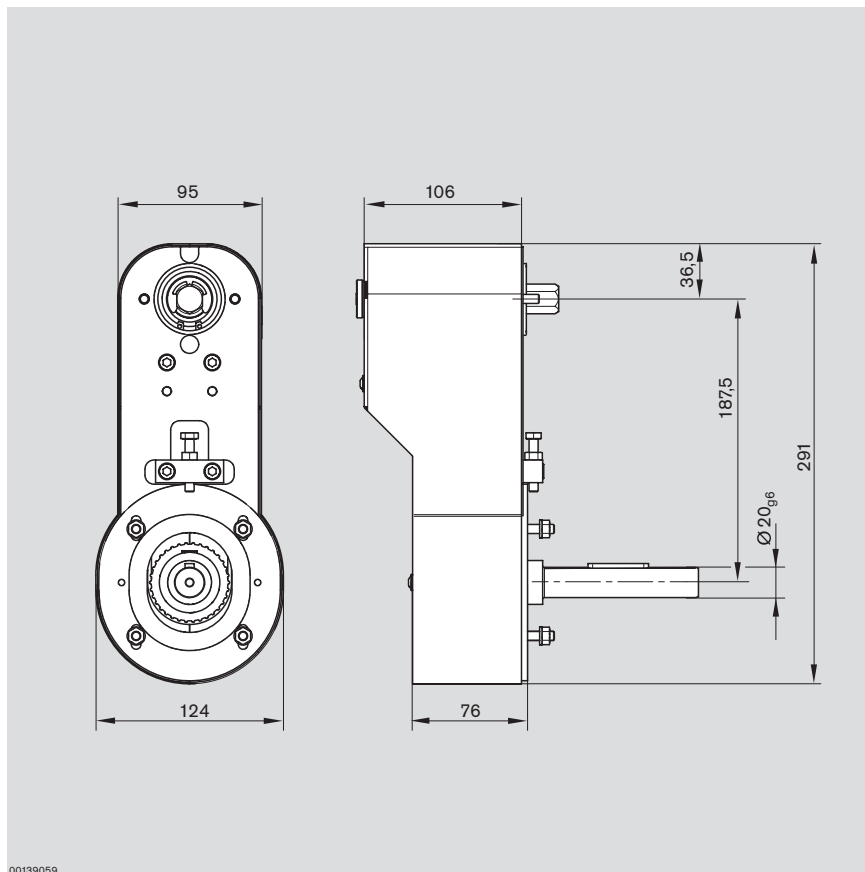


00136149

- 3 842 998 632: $b_{\min} = 255 \text{ mm}$
 3 842 998 633: $b_{\min} = b1_{\min} + b2_{\min} + 3 \times 45 - 15 = 540 \text{ mm}$
 3 842 998 634: $b_{\min} = b1_{\min} + b2_{\min} + b3_{\min} + 4 \times 45 - 15 = 825 \text{ mm}$
 3 842 998 635: $b_{\min} = b1_{\min} + b2_{\min} + b3_{\min} + b4_{\min} + 5 \times 45 - 15 = 1050 \text{ mm}$

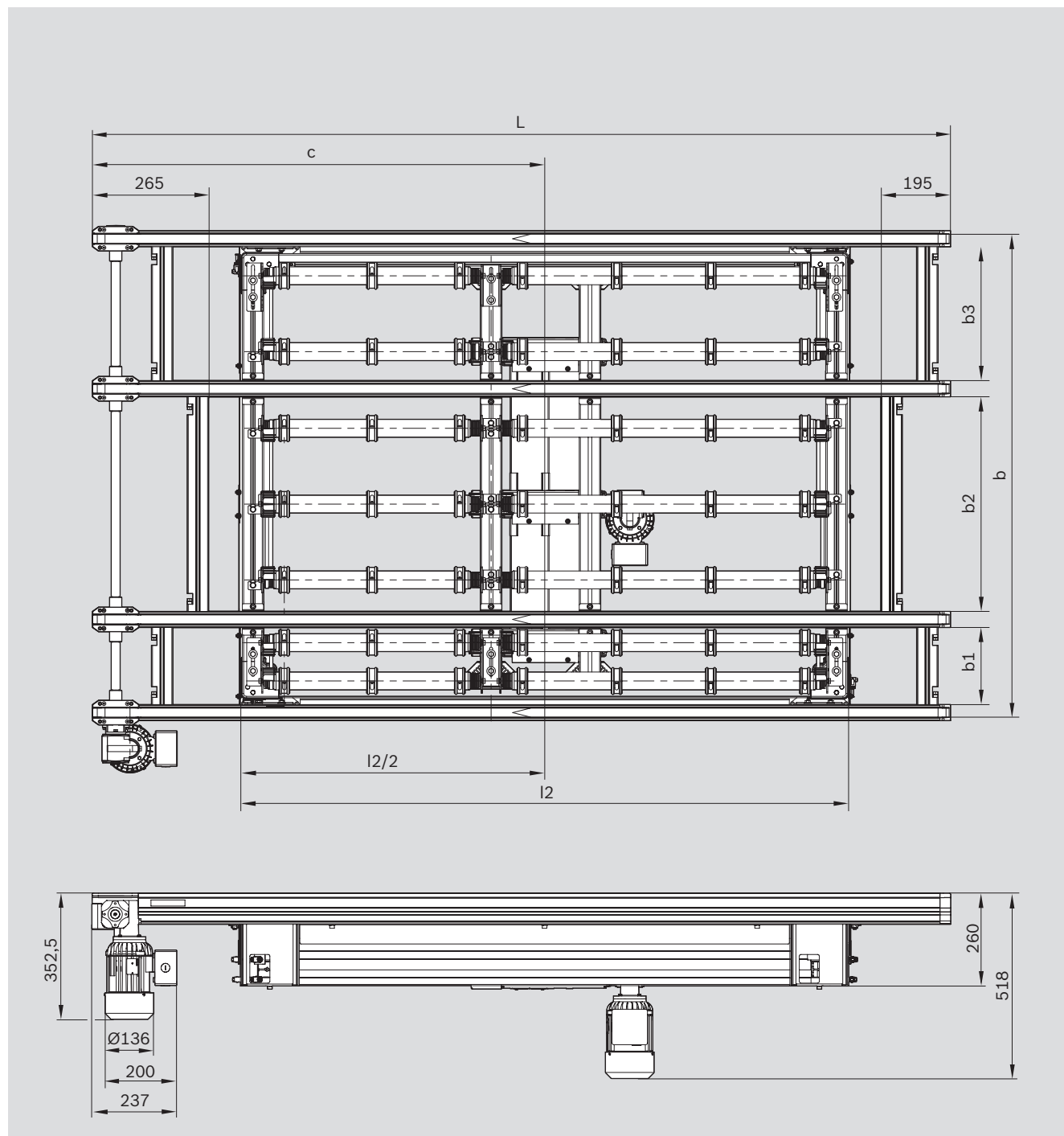
Technical data

Transmission drive



Technical data

LTS/... lift transverse unit

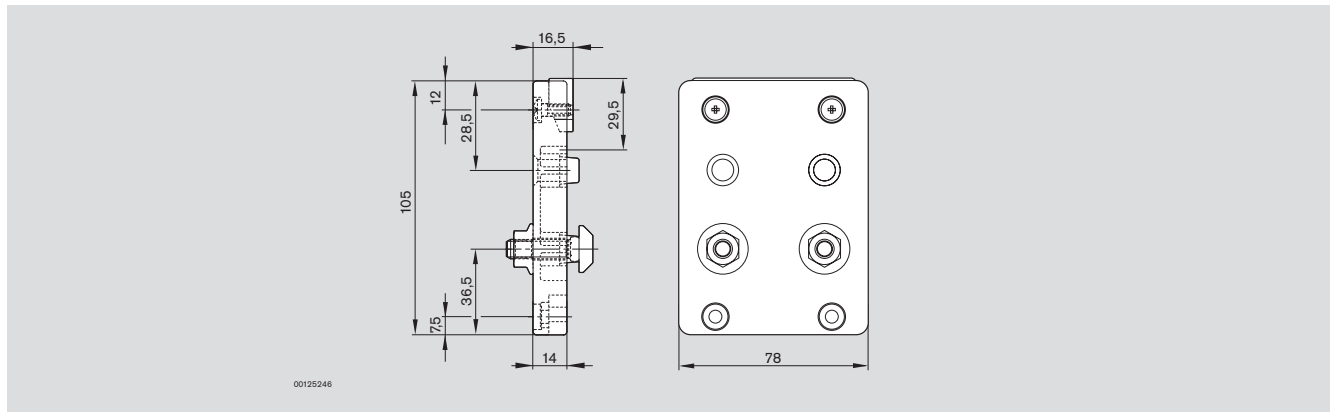


Technical data

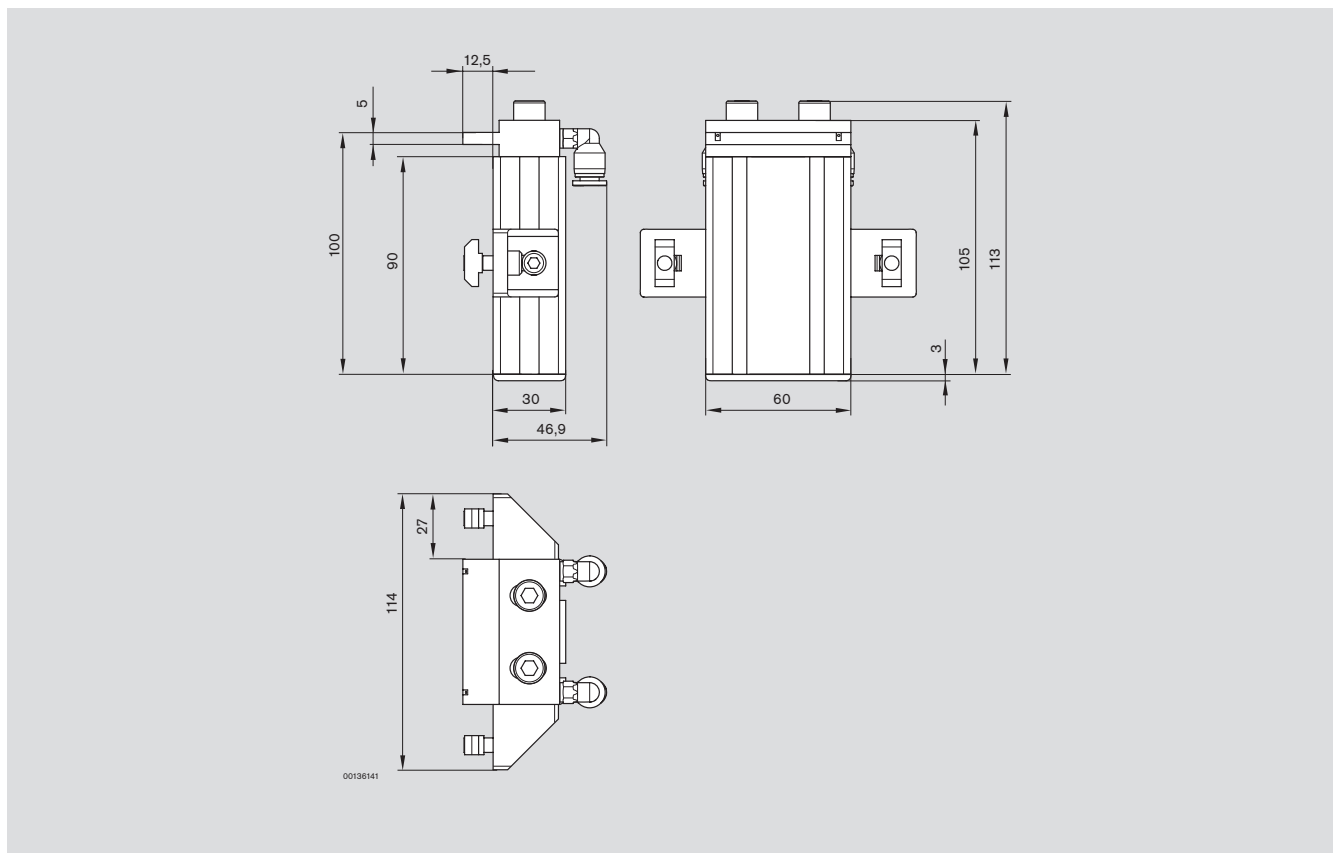
Stop

Fixed stop with air nozzle

Stop



Fixed stop with air nozzle

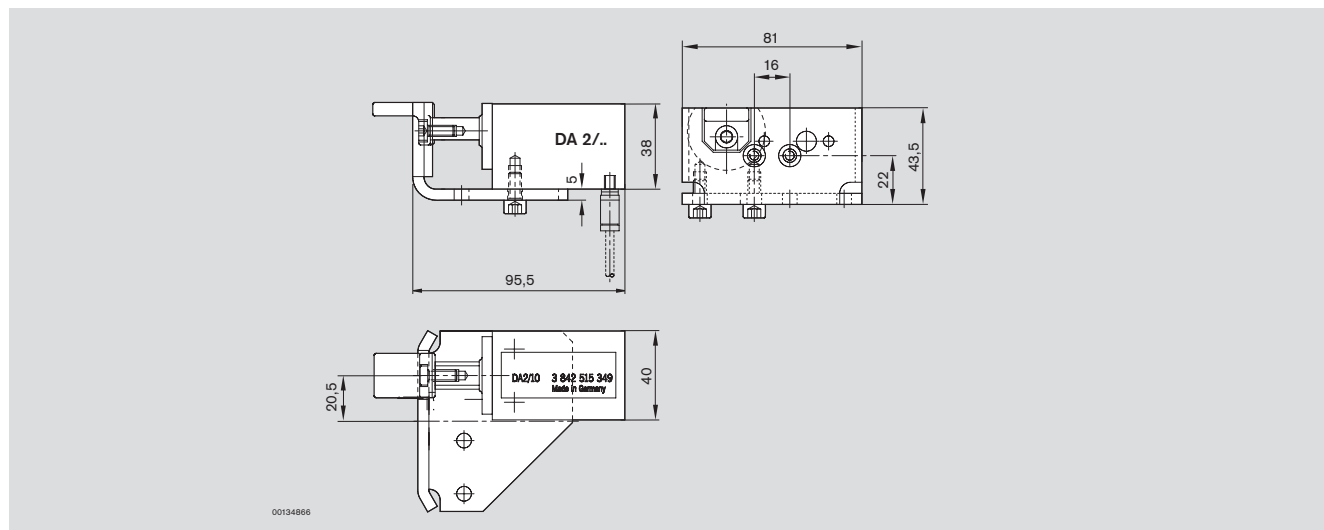


Technical data

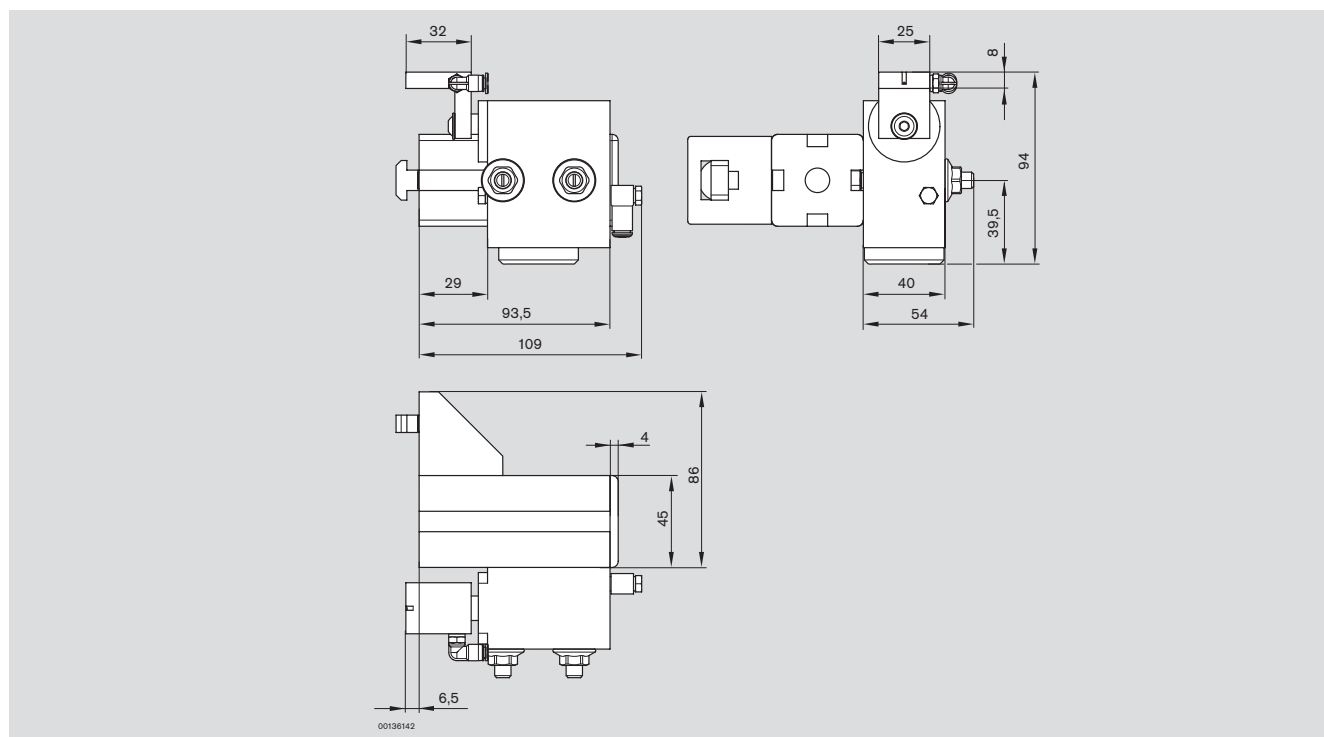
DAS/30 damper

Damper with blower

DAS/30 damper



Damper with blower

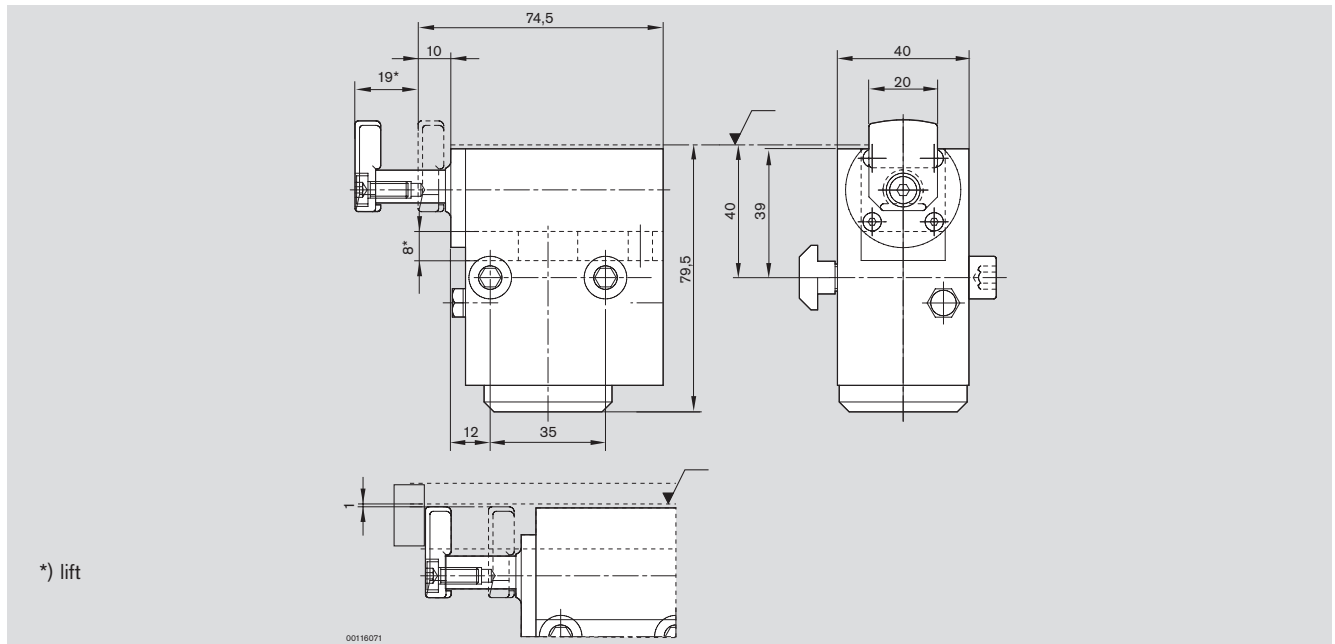


Technical data

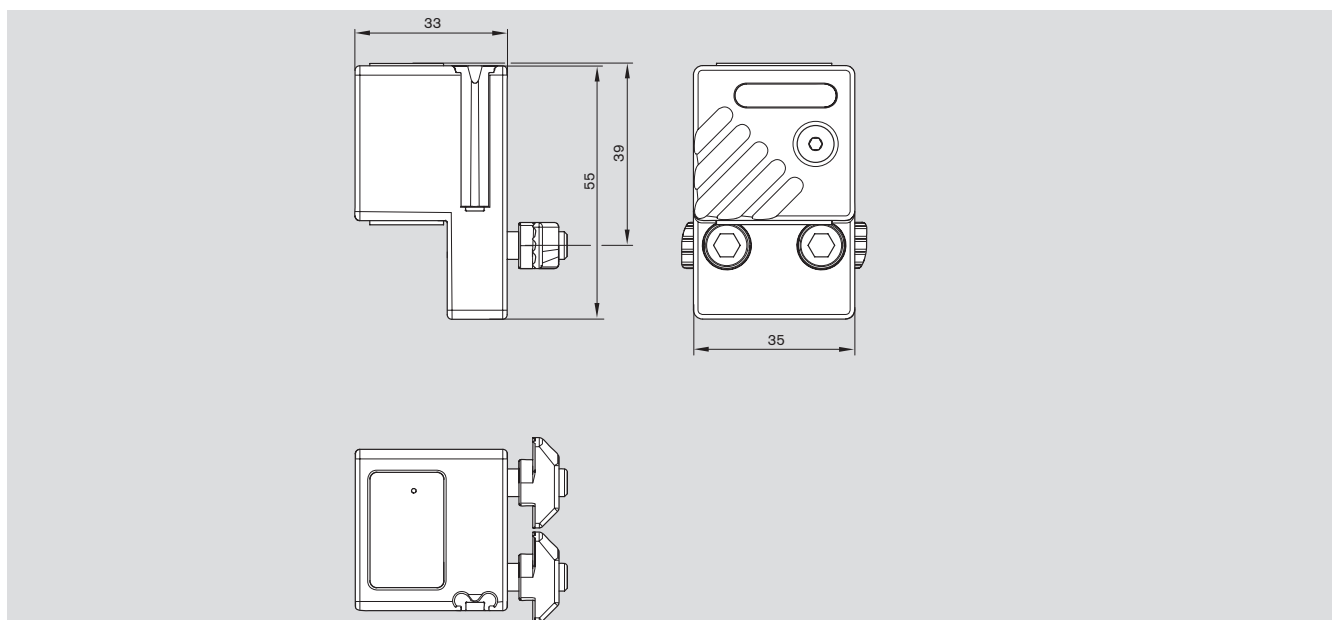
VE 2/D-60 stop gate

Air nozzle

VE 2/D-60 stop gate



Air nozzle



Technical data

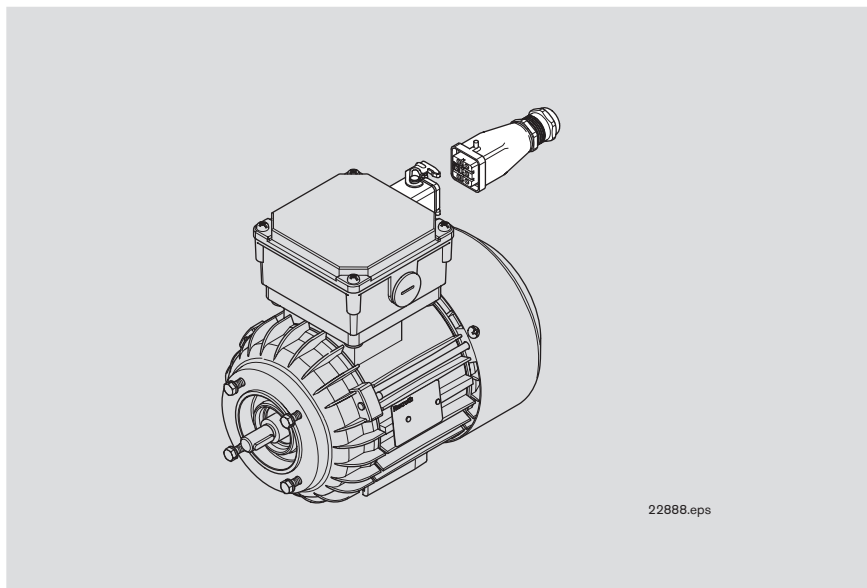
Motor data

Electrical connection requirements:

Connection to a 3-phase, 5-wire system (L1, L2, L3, N, PE), a connection plan is included with the terminal box. All motors are equipped with a thermal contact*), which has to be connected to an overload switch-off.

*) Bi-metal thermal contact, tripping at $150\text{ °C} \pm 5\text{ °C}$

Motor types without Index b



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

Technical data

Motor data

Performance data

Note:

The data is typical values.

We reserve the right to make changes.

See motor type plate for official data.

Please note the country applicability.

Voltage class	IE 3	A	A	B	D
Circuit type		Δ	Y	Y	Y
Voltage U at f = 50 Hz	x	200 V ± 10 %		400 V +10...-12 %	
Voltage U at f = 60 Hz	x	220 V ± 10 %	400 V ± 10 %	460 V +10...-12 %	575 V ± 10 %

				Current consumption at nominal power		Power factor	Power output at	
	IE 3	I _N (A)	I _N (A)	I _N (A)	I _N (A)	cos φ	(50Hz) P (kW)	(60Hz) P (kW)
Motor type ¹⁾	634	x	1,65	0,9	0,85	0,6	0,25	0,29

¹⁾ Suitable for continuous operation, start-stop operation with an operating time of up to 70% and frequency converter operation.

Certification for the motor, cable and plug components:

IE3 motors: CE, cURus, CCC

3-phase motors T_U (°C)	P_V / P_N
< 40	1 ¹⁾
45	0,95
50	0,90
55	0,85
60	0,8

¹⁾ Motor rating (0.37; 0.25; 0.12 kW)

Motor rating

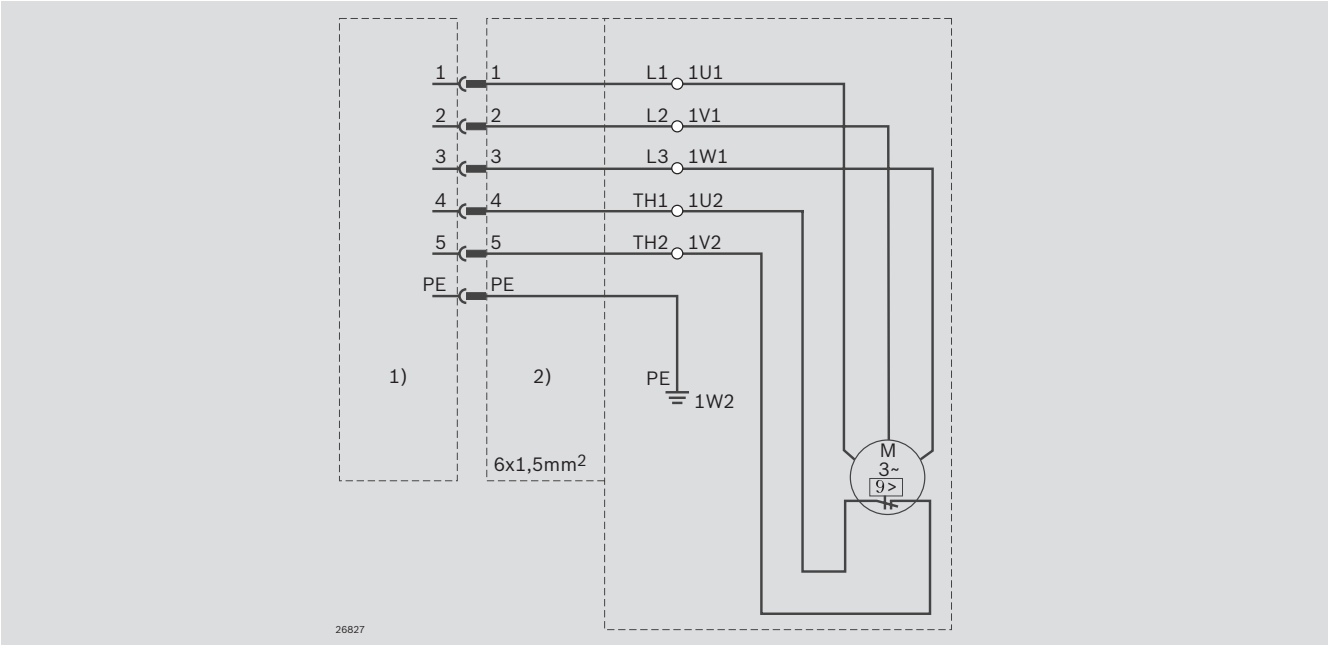
The ambient operating temperature T_U influences the rated power P_N of the gear motors.

Technical data

Motor connection

Motor connection with cable/plug (AT = 1)

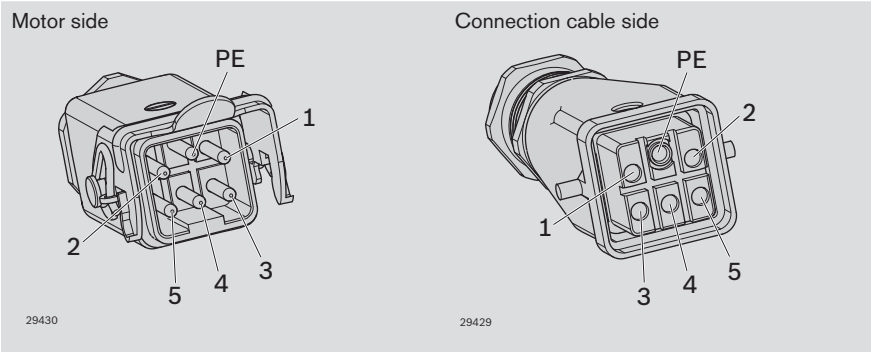
Circuit diagram



- 1) Connection cable side
 2) Motor side

Connection list

Connection terminals, Pin no. Code motor 3~		
U1	1	L1
V1	2	L2
W1	3	L3
TW1	4	Th1
TW2	5	Th2
	PE	PE



Technical data

Motor connection

Motor protection switch

Motor type	50 Hz			60 Hz			Motor protection switch	
	Rated output	Voltage		Rated output	Voltage		Δ [A]	Y [A]
		Δ [V]	Y [V]		Δ [V]	Y [V]		
634	0,25	200	N/A	0,29	220	400	1,90	1,10
		N/A	400		N/A	460	N/A	1,00
		N/A	N/A		N/A	575	N/A	0,80

7

Country applicability

	Europe	Switzerland	USA	Canada	Brazil	Australia	New Zealand	South Korea	China	India
Line voltage (3x....)	400 V	400 V	480 V ¹⁾	480 V ¹⁾ 575 V	220 V 380 V ³⁾ 440 V ¹⁾	400 V 415 V ²⁾	400 V 415 V ²⁾	220 V 380 V ³⁾ 440 V ¹⁾	380 V ²⁾	415 V ²⁾
Line voltage tolerance	±10 %	±10 %	±10 %	±10 %	±10 %	±5 %	±5 %			±5 %
Line frequency	50 Hz	50 Hz	60 Hz	60 Hz	60 Hz	50 Hz	50 Hz	60 Hz	50 Hz	50 Hz

1) ~460V/60Hz

2) ~400V/50Hz

3) ~400V/60Hz

Technical data

Transportation speed v_N

Motor connection

Unit	v_N (m/min)	50 Hz		60 Hz	
		v (m/min)	Motor type	v (m/min)	Motor type
CSS/B	36	37,4	634	(45,0)	634
CSS/BM	21	–	–	21,6	634
CSS/F	18	18,0	634	18,0	634
CSS/FM	15	15,0	634	14,4	634
	12	12,0	634	10,8	634
	9	9,0	634	8,7	634
	6	6,0	634	5,4	634
CSS/NT	36	33,8	634	33,9	634
	18	16,9	634	20,3	634
	15	13,5	634	16,3	634
	12	11,3	634	13,6	634
	9	8,5	634	8,1	634
	6	5,6	634	6,8	634

Technical data

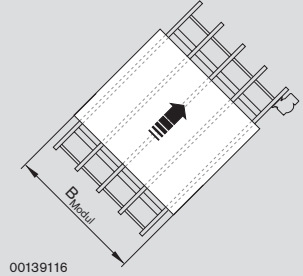
Layout of the belt sections and drive

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: $bx_{\max} = 600 \text{ mm}$; this limits deflection of the glass modules (glass strength: 4 mm).
- For framed modules, the entire longitudinal side must lie on the track.

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



Module width W_{module} (mm)	0 ... 1600	1601 ... 2100	> 2100
Minimum no. of tracks	2 ... 3	4	5

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_{ambient} : 0–50 °C (in control cabinet)
- Protection class IP20 (control cabinet installation)
- Altitude $\leq 1000 \text{ m}$ 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.

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 $v_N = 18$ m/min or 36 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 $m = 20$ kg on a 2-track CSS/B or CSS/BM with $v_N = 36$ m/min.

Based on Diagram 1:

Operating time $OT \leq 60\%$

Given a travel time of 6 s, the minimum cycle time_{min} = 10 s

Diagram 1: CSS/B, CSS/BM; permissible section load

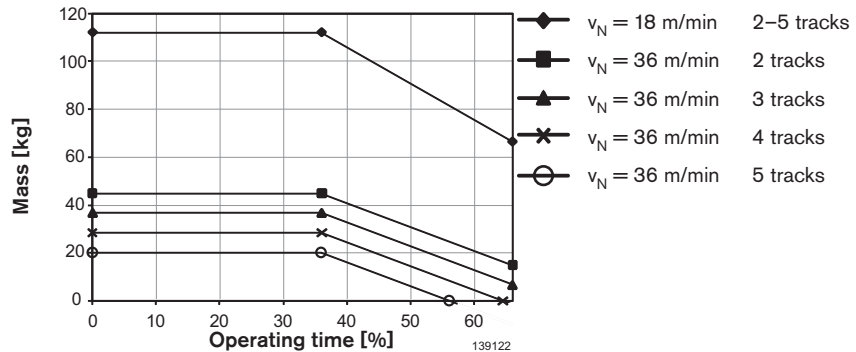


Diagram 2: CSS/F, CSS/FM; permissible section load

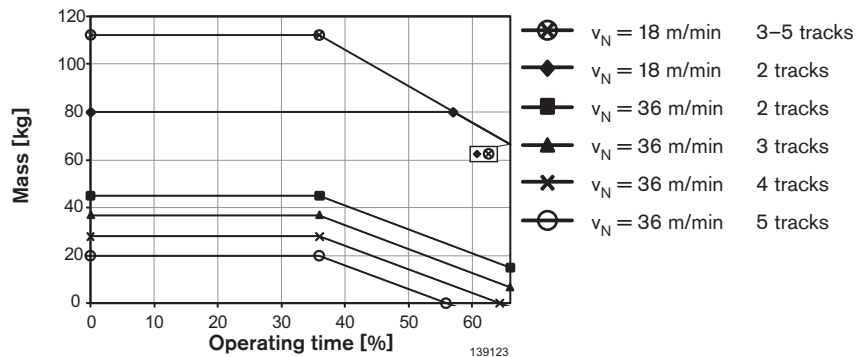
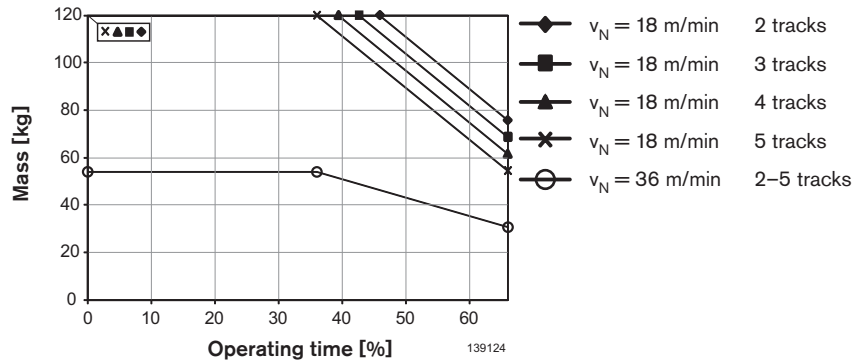


Diagram 3: CSS/NT; permissible section load



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