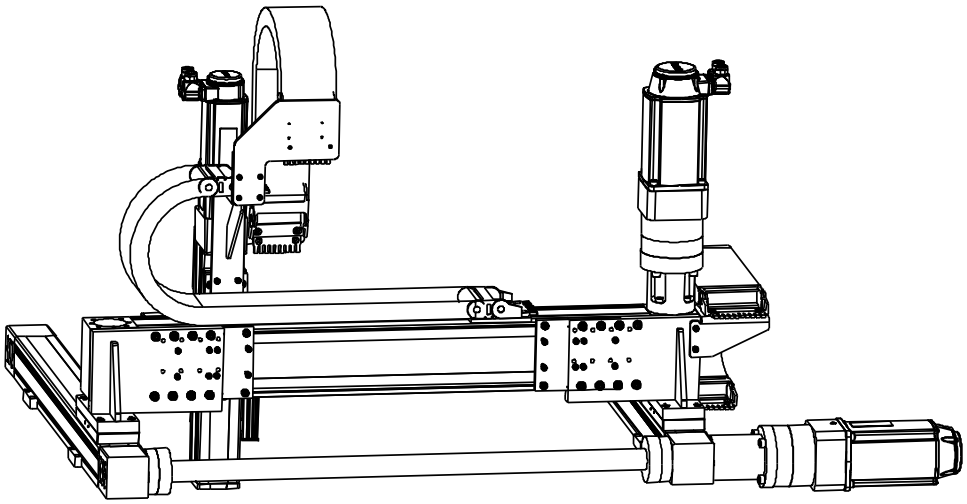
Three-dimensional gantry electric
RPE 100
RPE 200

Assembly- and Operating manual



Translation of the original manual

Dear Customer,

Congratulations on choosing a SCHUNK product. By choosing SCHUNK, you have opted for the highest precision, top quality and best service.

You are going to increase the process reliability of your production and achieve best machining results – to the customer's complete satisfaction.

SCHUNK products are inspiring.

Our detailed assembly and operation manual will support you.

Do you have further questions? You may contact us at any time – even after purchase. You can reach us directly at the mentioned addresses in the last chapter of these instructions.

Kindest Regards,

Your SCHUNK GmbH & Co. KG
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Table of contents

Appendix (on CD-ROM)

1 About this manual

1.1 Purpose/validity

This manual is part of the module and describes the safe and proper assembling.

This manual is valid only for the module specified on the front page.

1.2 Target groups

Target group	Task
Manufacturer, operator	➔ Keep this manual available for the personnel at all times. ➔ Require personnel to read and observe this manual and the applicable documents, especially the safety notes and warnings.
Skilled personnel, fitter	➔ Read, observe and follow this manual and the applicable documents, especially the safety notes and warnings.

Tab. 1

1.3 Applicable documents

Detailed device documentation is included in the unit's scope of delivery:

Document	Purpose	See
Component documentation	Technical data or application parameters of individual components and information about maintenance and repair and troubleshooting	Chapter 9, page 20

Tab. 2

1.4 Symbols in this manual

To give you quick access to information, the following symbols will be used in this guide:

Symbol	Meaning
⚠ **DANGER**	Dangers for persons. Nonobservance causes death or serious injuries.
⚠ **WARNING**	Dangers for persons. Nonobservance causes death or serious injuries.
⚠ **CAUTION**	Dangers for persons. Nonobservance can cause slight injuries.
NOTICE	Information on avoiding material damage.
➔	Handling instruction, also measures in a warning or note.

Tab. 3

1.5 Copyright

This manual remains the copyrighted property of SCHUNK GmbH & Co. KG. It is solely supplied to our customers and operators of our products and forms part of the unit.

This documentation may not be duplicated or made accessible to third parties, in particular competitive companies, without our prior permission.

1.6 Technical changes

We reserve the right to make alterations for the purpose of technical improvement.

2 Basic safety notes

2.1 Intended use

The unit is to be used only for the application contractually agreed between the manufacturer/supplier and user.

The unit is intended for installation in a machine/system. The requirements of the applicable guidelines must be observed and complied with.

The unit may be used only in the context of its defined application parameters.

To use this unit as intended, it is also essential to observe the technical data and installation and operation notes in this manual and to comply with the maintenance intervals.

Any other use or use exceeding that specified is an infringement of use for intended purpose. The manufacturer bears no liability for damage resulting from such use.

Use which is not specified as an intended use is for instance when

- the unit is used with machines/systems or workpieces that are not designed to be used with the unit.
- the unit is operated without protective equipment in accordance to the EC Machinery Directive.
- the statutory safety and accident-prevention regulations and the standards and guidelines valid at the usage site are not observed.

2.2 Controlled production

The unit represents the state of the art and the recognized safety rules at the time of delivery. However, it can present risks if, for example:

- The unit is not used in accordance with its intended purpose.
- The unit is not installed or maintained properly.
- The EC Machinery Directive, the VDE directives, the safety, accident-prevention regulations and environmental protection regulations valid at the usage site, or the safety and installation notes are not observed.

➔ The unit must only be used when in technically perfect condition and in accordance with its designated use and the instructions set out in the operating manual, and only by safety-conscious persons who are fully aware of the risks involved in operating the unit.

➔ Immediately remedy faults that could impair safety.

➔ In addition to this manual, statutory and other safety and accident-prevention regulations and the standards and guidelines valid at the usage site must be complied with.

2.2.1 Protective equipment

When the unit is in use, when in rotation and when it is stationary, protective equipment must be used to catch flying parts should the unit or part of the unit fail.

The protective equipment must comply with EC Machinery Directive requirements.

The machine/system manufacturer must ensure that the wall thickness in the machine’s paneling is adequate and must not use polycarbonate glass for protective windows, because this may cause a threat to the life and limb of the operator if the component should break.

2.2.2 Constructional changes, attachments, or modifications

Modifications, additions and conversions which could impair safety may not be made to the unit without SCHUNK's permission.

Non-authorized modifications results in the exclusion from product liability.

2.2.3 Spare parts

Spare parts must meet the requirements of the manufacturer and/or the supplier. This can always be guaranteed with original spare parts.

Improper repair as well as use of non-original spare parts results in the exclusion from product liability.

2.3 Obligations of the manufacturer/operator

2.3.1 Choice of personnel and personnel qualifications

Work on the unit may only be carried out by reliable personnel. The legal minimum age must be observed.

The assembly, commissioning, maintenance, and repair of the unit may be performed only by trained specialist personnel who have been shown how to perform the said work activities.

The manufacturer/operator must ensure that the personnel are adequately and appropriately trained to perform the work on the unit allocated to them.

Every person called upon by the operator to work on the unit must have read and understood the complete Assembly and Operating Manual, especially chapter 2 "Basic safety notes". This applies particularly to occasional personnel such as maintenance personnel.

We recommend that the manufacturer/operator require employees to sign that they have read and understood the Assembly and Operating Manual.

Furthermore we recommend that the manufacturer/operator require employees to sign that they have participated in training courses.

In addition to this manual, the statutory and other safety and accident-prevention regulations and the standards and guidelines valid at the usage site must be complied with.

We recommend that the manufacturer/operator issue in-house operating instructions which take into account the known qualifications of the operating personnel.

- ➔ Only employ trained personnel who have been shown how to perform the work activities. If necessary, make use of the manufacturer’s training programmes.
- ➔ Personnel requiring training and instruction or those who are already receiving training and instruction must be supervised on the unit by skilled personnel.
- ➔ Define areas of responsibility of the personnel. Enable personnel to refuse instructions issued by third parties which breach safety regulations.

2.3.2 Organizational measures

- ➔ Ensure that at least one copy of this manual is kept in the direct vicinity of the machine/system where the unit is installed, and that it is accessible for the relevant persons.
- ➔ Ensure that personnel have read and understood this manual, especially chapter 2"Basic safety notes".
- ➔ Provide instruction about and observe the safety and accident-prevention regulations valid at the usage site.
- ➔ Provide instruction about and observe the environmental protection regulations valid at the usage site.
- ➔ Ensure that the safety and hazard warning signs on the machine/system are observed and that the signs are clearly legible.
- ➔ Provide protective equipment.
- ➔ Check the personnel’s conduct regarding awareness of safety and hazards from time to time.

2.3.3 Disposal

- ➔ Send unit components for recycling or properly dispose of them according to local regulations.

2.4 Personnel responsibilities

2.4.1 Safety-conscious working

- ➔ Avoid any manner of working that may interfere with the function and operational safety of the unit.
- ➔ Observe the safety and accident-prevention regulations valid at the usage site.
- ➔ Observe the environmental protection regulations valid at the usage site.
- ➔ Wear protective equipment.

2.4.2 Safety measures during transport

- ➔ Observe safety measures during the transport and handling of very heavy units.

2.4.3 Safety measures during operation

- ➔ Only operate the unit when all protective equipment has been fitted and is in full working order.
- ➔ Check the unit at least once per shift for externally visible damage and faults.
- ➔ Report any changes including changes in operational behaviour to the responsible place/persons immediately. If necessary immediately shut down and lock out the machine/system.

2.4.4 Behaviour in the event of faults and/or emergencies

If faults on the unit occur which could impair safety or the operational behaviour indicates the occurrence of a fault:

- ➔ Shut the machine/system down immediately, lock out and report the fault to the responsible place/persons.
- ➔ Faults may be eliminated by trained and authorized personnel only.
- ➔ Only restart the machine/system when the cause of the fault has been eliminated.

2.4.5 Testing/inspections

- ➔ Observe the stipulated periods for regular tests and inspections.

2.5 Notes on particular risks

Risk of injury when the machine/system moves unexpectedly!

➔ Remove the energy supplies before installation, modification, maintenance, or adjustment work.

➔ Make sure that there is no more residual energy in the system.

➔ Perform maintenance, modifications, and additions outside the danger zone.

➔ For all work, secure the unit against accidental operation.

Risk of injury from falling of the unit during transport and assembly!

➔ Secure unit during transport and assembly with adequately sized straps.

➔ Mount the unit, so that it will cause no harm by tilting over or falling down.

Risk of injury due to uncontrolled movements of the unit when malfunction of the sensors and electrical distribution panelboard.

➔ Observe the correct connection of the sensors and electrical distributors.

Risk of injury due to squeezing and clamping between the slide and the base plate during movement of the modules.

➔ Remove the energy supplies before installation, modification, maintenance, or adjustment work.

➔ Make sure that there is no more residual energy in the system.

➔ Perform maintenance, modifications, and additions outside the danger zone.

➔ For all work, secure the unit against accidental operation.

➔ The danger zone must be surrounded by a safety fence during operation.

3 Warranty

The warranty is valid for 24 months from the delivery date to the production facility under the following conditions:

- Observation of the maintenance and lubrication intervals (see Component documentation)

Parts touching the workpiece and wearing parts are not part of the warranty. Also observe our general terms of business.

The warranty does not cover:

- Damage occurring as a result of incorrect operation.
- Claims under warranty are excluded when repair or intervention is carried out by persons not authorized to do so.
- This also applies if accessories and spare parts are used which are not designed for our unit

4 Technical Data

Reference value	Value
noise level [dB(A)]	≤ 70
ambient temperature [C]	0° to +80°
permissible payload [kg] Three-dimensional gantry electric RPE 100 Three-dimensional gantry electric RPE 200	 10 20
dynamic values	
horizontal	
max. acceleration a [m/s²]	5
max. speed v [m/s]	1
vertical	
max. acceleration a [m/s²]	2
max. speed v [m/s]	0,25

Tab. 4

Note
Additional technical data contain the documentations of the components in the Appendix.

5 Configuration

The unit consists of following components:

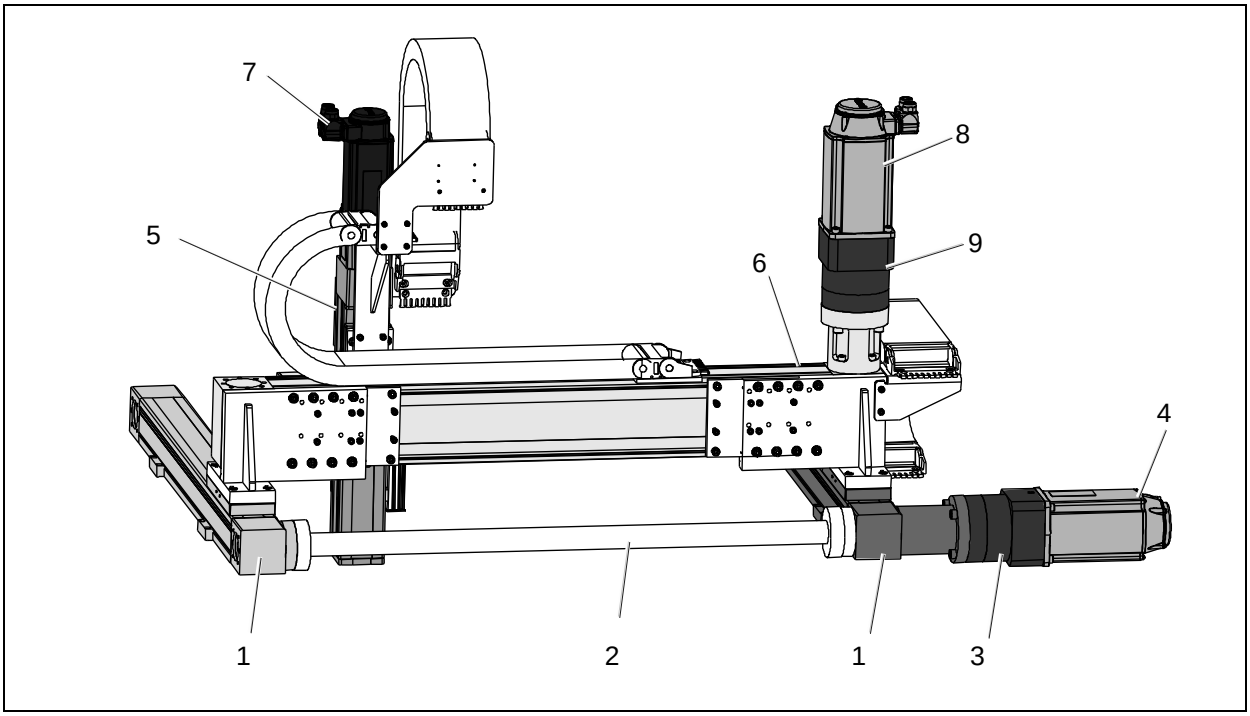

Fig. 1

Item	Designation	See
1	Linear axis Beta 80 ZSS with toothed beld drive - feed / rotation = 220 mm	Documentation „Linear axis Beta“, Appendix 1
2	Synchronizaztion shaft	
3	Planetary gearing GTE 120-NN1-008B-NN21	
4	Drive MSK-060-C-0300	Documentation „Drive MSK“, Appendix 3
5	*RPE 100:* Linear axis Beta 60-SSS with spindel drive - feed / rotation = 5 mm *RPE 200:* Linear axis Beta 80-SSS with spindel drive - feed / rotation = 5 mm with 2x proximity switch IN each	Documentation „Linear axis Beta“, Appendix 1 Documentation „Sensors“, Appendix 4
6	*RPE 100:* Linear axis Beta 100D-ZSS with toothed beld drive - feed / rotation = 160 mm *RPE 200:* Linear axis Beta 100D-ZSS with toothed beld drive - feed / rotation = 220 mm with 2x proximity switch IN each	Documentation „Linear axis Beta“, Appendix 1 Documentation „Sensors“, Appendix 4
7	Drive MSK-040-B-045	Documentation „Drive MSK“, Appendix 3
8	*RPE 100:* Drive MSK-050-B-0300 *RPE 200:* Drive MSK-060-C-0300	Documentation „Drive MSK“, Appendix 3
9	*RPE 100:* Planetary gearing GTE 120-NN1-008B-NN20 *RPE 200:* Planetary gearing GTE 120-NN1-008B-NN21	

Tab. 5

6 Assembly and initial operation

6.1 Mechanical connection

⚠ WARNING

Risk of injury when the machine/system moves unexpectedly!

➔ Switch off power supply.

➔ Make sure that there is no more residual energy in the system

⚠ WARNING

Risk of injury from falling of the unit during assembly!

➔ Secure unit during assembly with adequately sized straps.

➔ Note the tightening torque of fixing screws.

⚠ WARNING

Risk of injury when the machine/system moves unexpectedly, by moving of the linear axis!

➔ Switch off power supply before assembly and maintenance.

➔ Make sure that there is no more residual energy in the system

The mechanical connection hast o be carried out at the linear axis Beta 80 ZSS.

Information on mounting the linear axis Beta contains the service manual Beta-80-100-140-ZRS-ZSS Appendix 1 -Chapter 6, from page 20.

6.2 Connection of the motors

⚠ GEFAHR

Danger of electrical potential!

➔ Switch off power supply before assembly, adjustment and maintenance, and secure against restart.

➔ The electrical installation may be performed only by a trained electrician.

➔ Cover live parts.

➔ Detect absence of voltage, ground and short-circuit.

The unit can be selected with the motors provided by SCHUNIK and their mechanical connection or without motors, flanges and couplings.

Information on connection of the motors contains the Project Planning Manual MSK, Appendix 3, Chapter 8.

6.3 Connection of Sensors

⚠ WARNING

Risk of injury when the machine/system moves unexpectedly!

➔ Switch off power supply.

➔ Make sure that there is no more residual energy in the system.

⚠ WARNING

Risk of injury due to electrical energy!

➔ Switch off power supply.

Information on connection und handling of sensors contains:

- Maintenance manual Beta 60-80-SRS-SSS (Appendix 1)
- Maintenance manual Beta 80-100-140 ZRS-ZSS (Appendix 1)

6.4 Assembly of handling modules

⚠ WARNING

Risk of injury when the machine/system moves unexpectedly!

➔ Switch off power supply.

➔ Make sure that there is no more residual energy in the system.

Notes

- Do not contribute any excessive forces and torques during assembly of loads.
- The evenness of the mounting surface must be less than 0.02 mm.
- Choose a proper connection, with a load that has his own guide mechanism and align them adequately.
- Avoid contact with the linear gantry during operation.
- Select appropriate tightening torques for the assembly of the gantry module or loads at the gantry module in accordance with the general guidelines for screw connections.

7 Maintenance and repair

⚠ WARNING

Risk of injury when the machine/system moves unexpectedly!

Due to movement of the axis!

➔ Remove the energy supplies before maintenance.

➔ Make sure that there is no more residual energy in the system.

➔ Perform maintenance outside the danger zone.

⚠ CAUTION

Allergic reactions due to grease in contact with skin!

➔ Wear gloves.

Maintenance interval

Weekly examination on easily visible damages or wear, or contamintion of the system.

The maintenance intervals apply to the single components according their servicing manuals.

The component documentation contains maintenance and repair information.

Component	See
Linear axis Beta 60 SSS Linear axis Beta 80 SSS	Maintenance manual Beta 60-80-SRS-SSS Appendix 1- chapter 10, from page 32
Linear axis Beta 80 ZSS Linear axis Beta 100 D ZSS Linear axis Beta 140 ZSS	Maintenance manual Beta 100-140 ZRS-ZSS Appendix 1- chapter 10, from page 30
Drive MSK	Maintenance free
Sensors	Maintenance free
Pillar assembly system	Maintenance free

Tab. 6

8 Troubleshooting

The component documentation contains troubleshooting information.

9 Component documentation

The scope of delivery includes the documentation for the following components (see CD-ROM, Appendix 1-2):

Components	Manufacturer	Appendix
Linear axis Beta	SCHUNK	1
Drive MSK	SCHUNK	2

Tab. 7

10 Translation of original EC declaration of incorporation

In terms of the EC Machinery Directive 2006/42/EC, annex II B

Manufacturer/ distributor	SCHUNK GmbH & Co. KG. Spann- und Greiftechnik Bahnhofstr. 106 – 134 D-74348 Lauffen/Neckar

We hereby declare that the following product:

Product designation:	Three-dimensional gantry electric
ID number:	381330 … 381739

meets the applicable basic requirements of the Directive Machinery (2006/42/EC).

The incomplete machine may not be put into operation until conformity of the machine into which the incomplete machine is to be installed with the provisions of the Machinery Directive (2006/42/EC) is confirmed.

Applied harmonized standards, especially:

EN ISO 12100-1	Safety of machines - Basic concepts, general principles for design -- Part 1: Basic terminology, methodology
EN ISO 12100-2	Safety of machines - Basic concepts, general principles for design -- Part 2: Technical principles

The manufacturer agrees to forward on demand the special technical documents for the incomplete machine to state offices.

The special technical documents according to Annex VII, Part B, belonging to the incomplete machine have been created.

Person responsible for documentation: Mr. Michael Eckert, Tel.: +49(0)7133/103-2204

Location, date/signature: Hausen, March 2011 i.V.

Title of the signatory Director for Development

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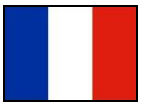

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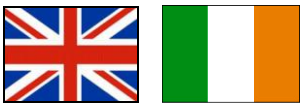

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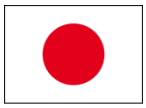

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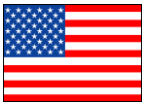

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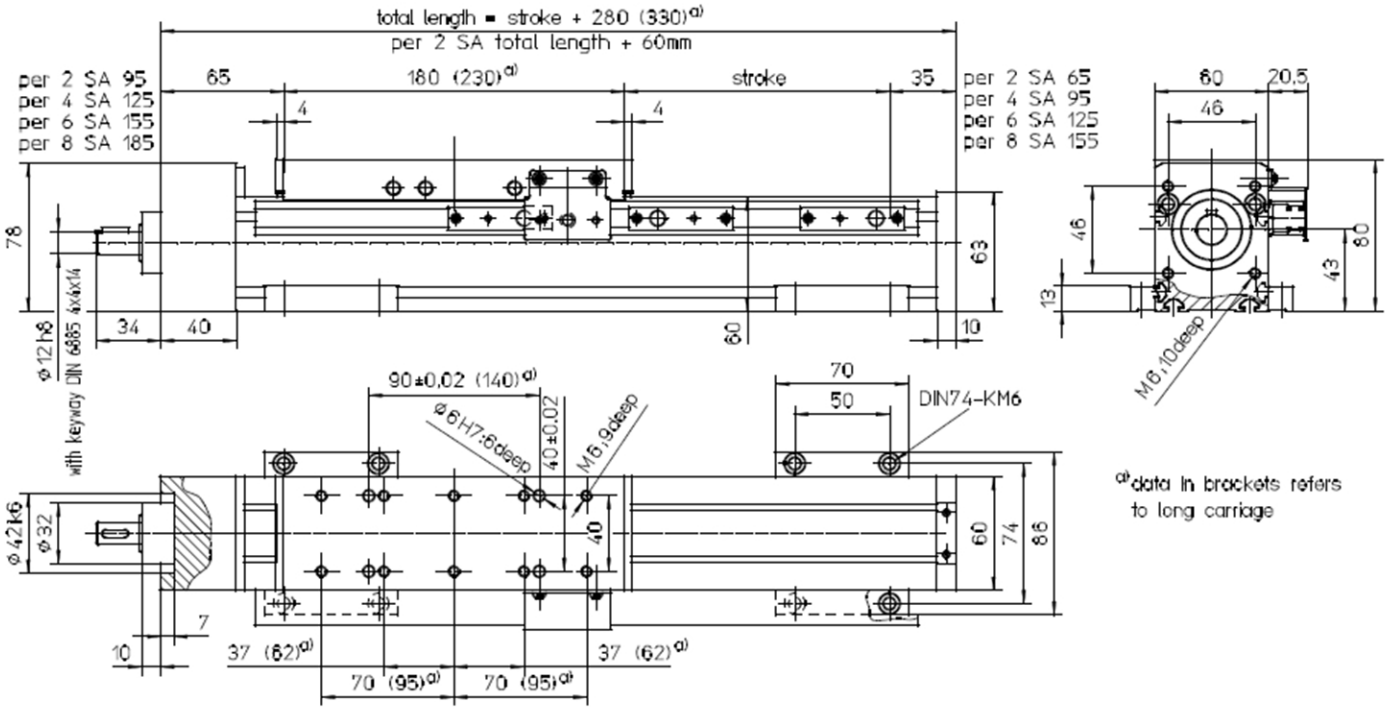
Appendix 1

Linear axis Beta

HSB beta® Mechanical Linear Drive Beta 60-SGV-SSS

with ball screw drive (KGT) or trapezoidal screw drive (TGT)
and sliding guide (SGV) or linear guide (SSS)

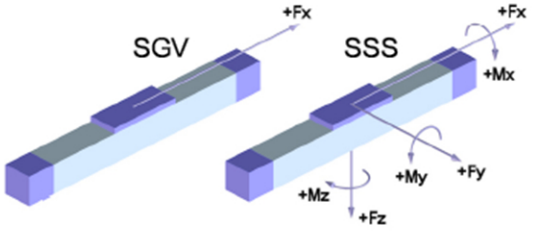


Weights	SGV	SSS
Basic length, no stroke:	3.65 kg	4.30 kg
100 mm stroke:	0.65 kg	0.80 kg
Carriage 180 mm:	1.15 kg	1.50 kg
Carriage 230 mm:	-	1.80 kg

Total length max.: 5400 mm
(longer on request)

Technical data	SGV	SSS
Linear speed max.:	2.50 m/s	
Acceleration max.:	20 m/s²	
Repeatability:	± 0.03 mm (KGT)	
Idle torque:	0.70 Nm	

Loads and load moments



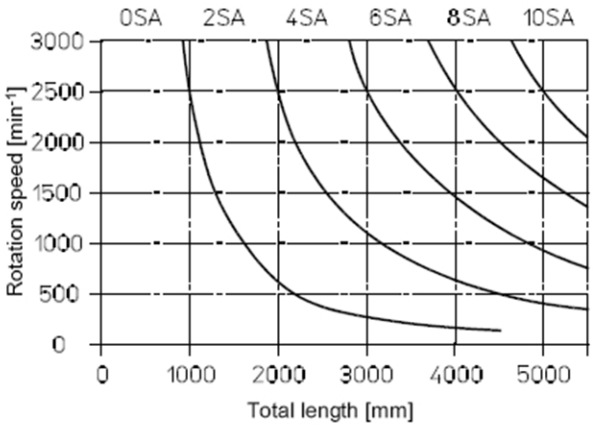
	SGV	SSS
Load	dynamic [N]	
F_X d)	4000	
F_Y	-	600
F_Z	-	1800
$-F_Z$	-	1200
Load moment	dynamic [Nm]	
M_X	-	60
M_Y	-	180 (220)
M_Z	-	120 (150)

„-“ => Must have an external linear guide.
Data in brackets refers to long carriage (230)

Drive element	KGT	TGT
Rotation speed max.:	3000 min⁻¹	1500 min⁻¹
Diameter:	20 mm	
Pitch:	5 / 20 / 50 mm	4 / 8 / 16 mm
Mass inertia:	8.50 •10⁻⁵ kgm²	

(Pitch 50 mm only possible with long carriage (230))

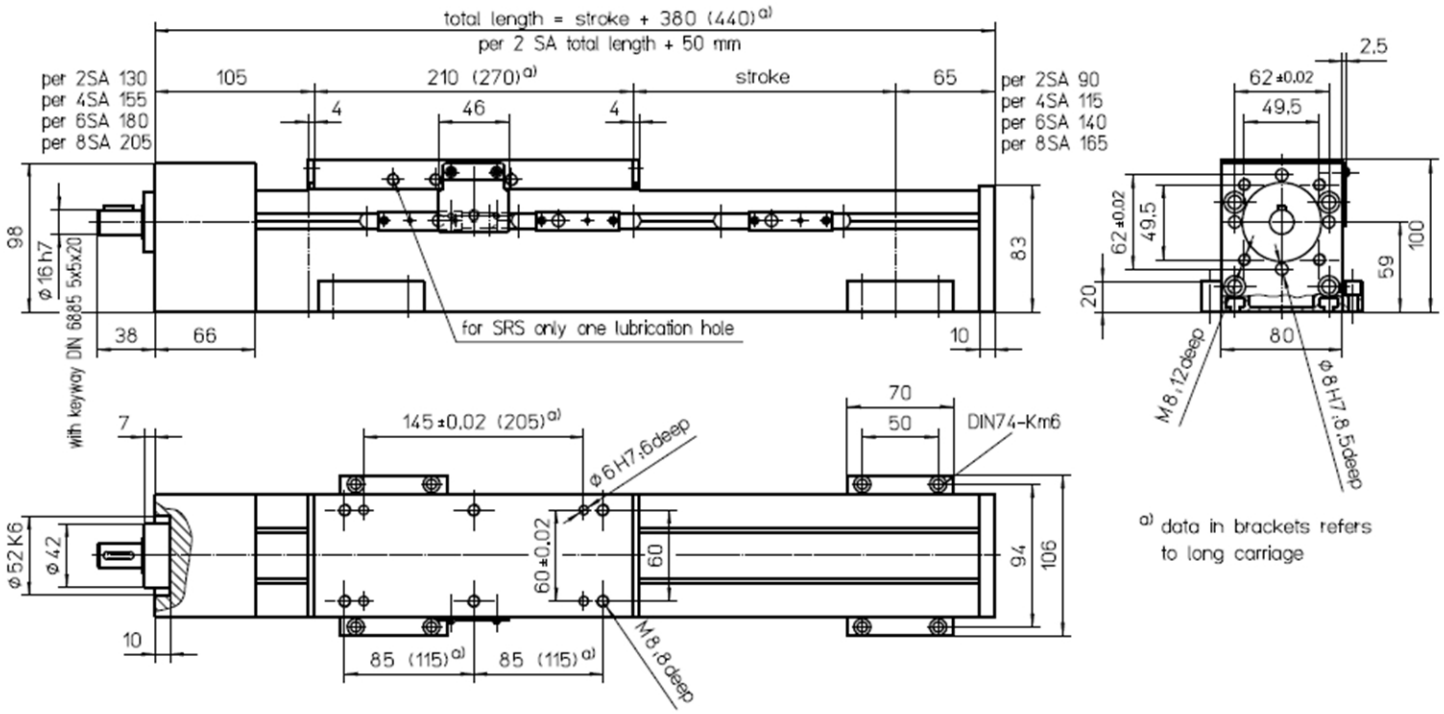
Screw supports SA



Design „SGV“ only possible with standard carriage.
Special design: Screw supports with damping ring (Extension of total length: 10 mm per 2 SA)

HSB beta® Mechanical Linear Drive **Beta 80-SRS-SSS**

with ball screw drive (KGT) or trapezoidal screw drive (TGT)
and roller guideway (SRS) or linear guide (SSS)



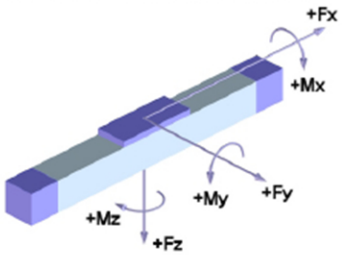
a) data in brackets refers to long carriage

Weights	SRS	SSS
Basic length, no stroke	5.40 kg	6.20 kg
100 mm stroke:	0.70 kg	1.10 kg
Carriage 210 mm:	2.20 kg	1.90 kg
Carriage 270 mm:	2.80 kg	2.40 kg

Total length max.: 5400 mm
(longer on request)

Technical data	SRS	SSS
Linear speed max.:	2.50 m/s	
Acceleration max.:	20 m/s²	
Repeatability:	± 0.03 mm (KGT)	
Idle torque:	0.60 Nm	0.80 Nm

Loads and load moments

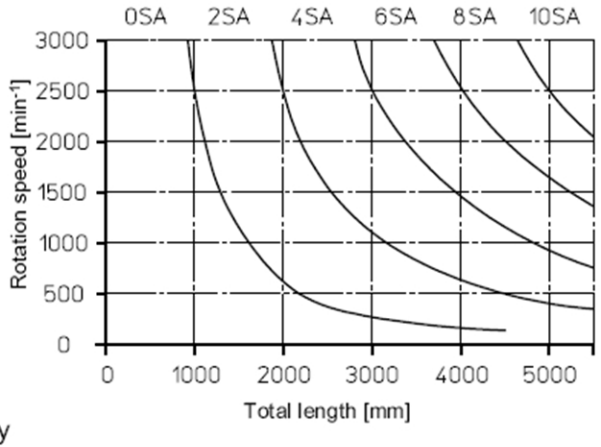


	SRS	SSS
Load	dynamic [N]	
F_X	4000	
F_Y	500	800
F_Z	1500	3000
$-F_Z$	800	2000
Load moment	dynamic [Nm]	
M_X	50	100
M_Y	180 (270)	250 (300)
M_Z	100 (130)	250 (300)

Data in brackets refers on long carriage (270)

Drive element	KGT	TGT
Rotation speed max.:	3000 min⁻¹	1500 min⁻¹
Diameter:	20 mm	
Pitch:	5 / 20 / 50 mm	4 / 8 / 16 mm
Mass inertia:	8.50 •10⁻⁵ kgm²/m	

Screw supports SA



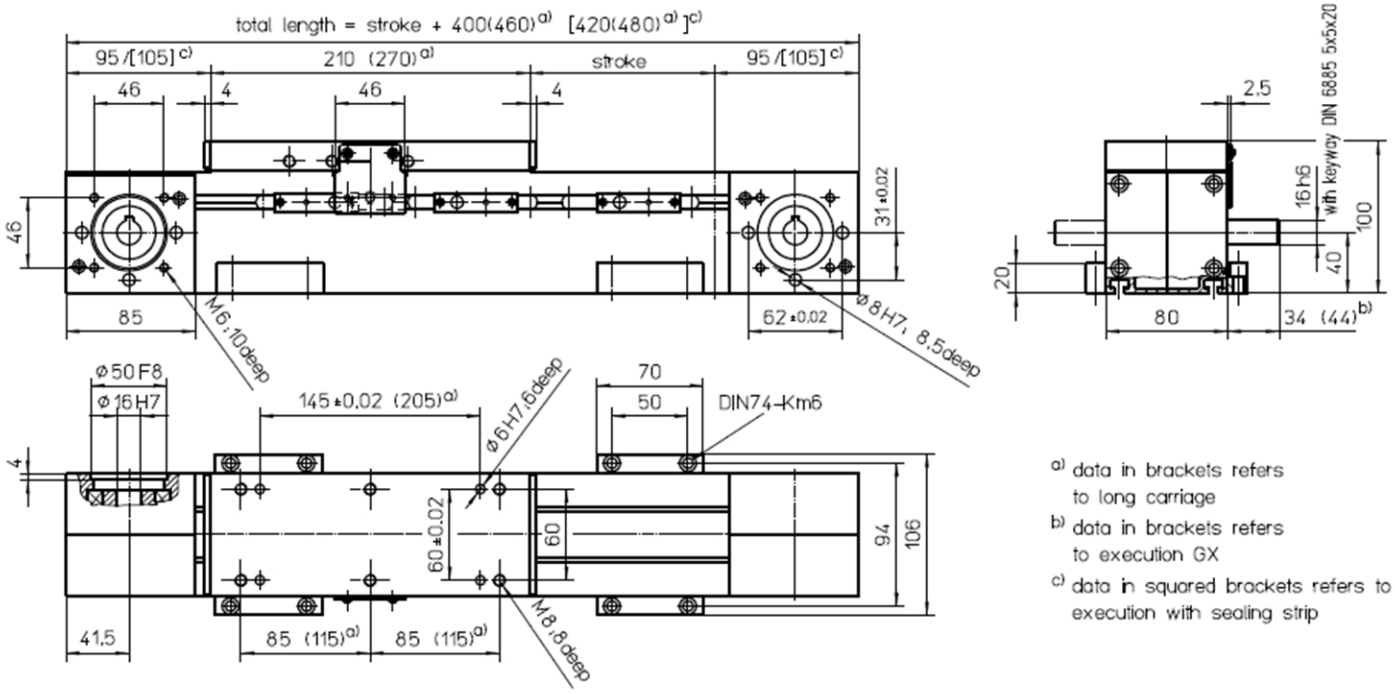
Note: For Mechanical Linear Drives with roller guideway
see static load capacity „C_{stat}“ in case of static loads.

Special design: Screw supports with damping ring (Extension of total length: 10 mm per 2 SA)

Type „MM“: Carriage 270 mm long – only 5 and 20 mm pitch

HSB beta® Mechanical Linear Drive **Beta 80-ZRS-ZSS**

with tooth belt drive and roller guideway (ZRS) or linear guide (ZSS)



a) data in brackets refers to long carriage

b) data in brackets refers to execution GX

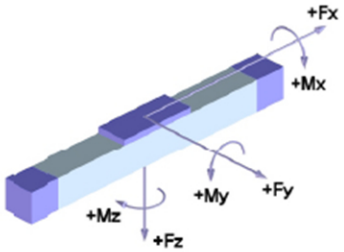
c) data in squared brackets refers to execution with sealing strip

Weights	ZRS	ZSS
Basic length, no stroke	5.50 kg	6.10 kg
100 mm stroke	0.60 kg	0.85 kg
Carriage 210 mm:	2.10 kg	1.80 kg
Carriage 270 mm:	2.70 kg	2.30 kg

Total length max.: 8000 mm
(longer on request)

Technical data	ZRS	ZSS
Linear speed max.:	8.00 m/s	5.00 m/s
Acceleration max.:	40 m/s²	
Repeatability:	± 0.08 mm	
Idle torque:	1.50 Nm	
Mass inertia:	$3.30 \cdot 10^{-3}$ kgm²	$3.00 \cdot 10^{-3}$ kgm²
Drive element:	tooth belt **32 AT5-E**	
Stroke per revolution:	220 mm	

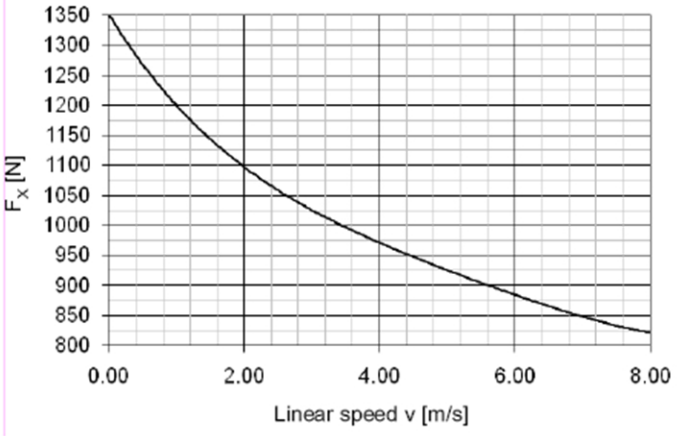
Loads and load moments



	ZRS	ZSS
Load	dynamic [N]	
F_X d)	1350	
F_Y	500	800
F_Z	1500	3000
$-F_Z$	800	2000
Load moment	dynamic [Nm]	
M_X	50	100
M_Y	180 (220)	250 (300)
M_Z	100 (130)	250 (300)

d) Maximum data (see Diagram „F_X-v-Diagram“)
Data in brackets refers to long carriage (270)

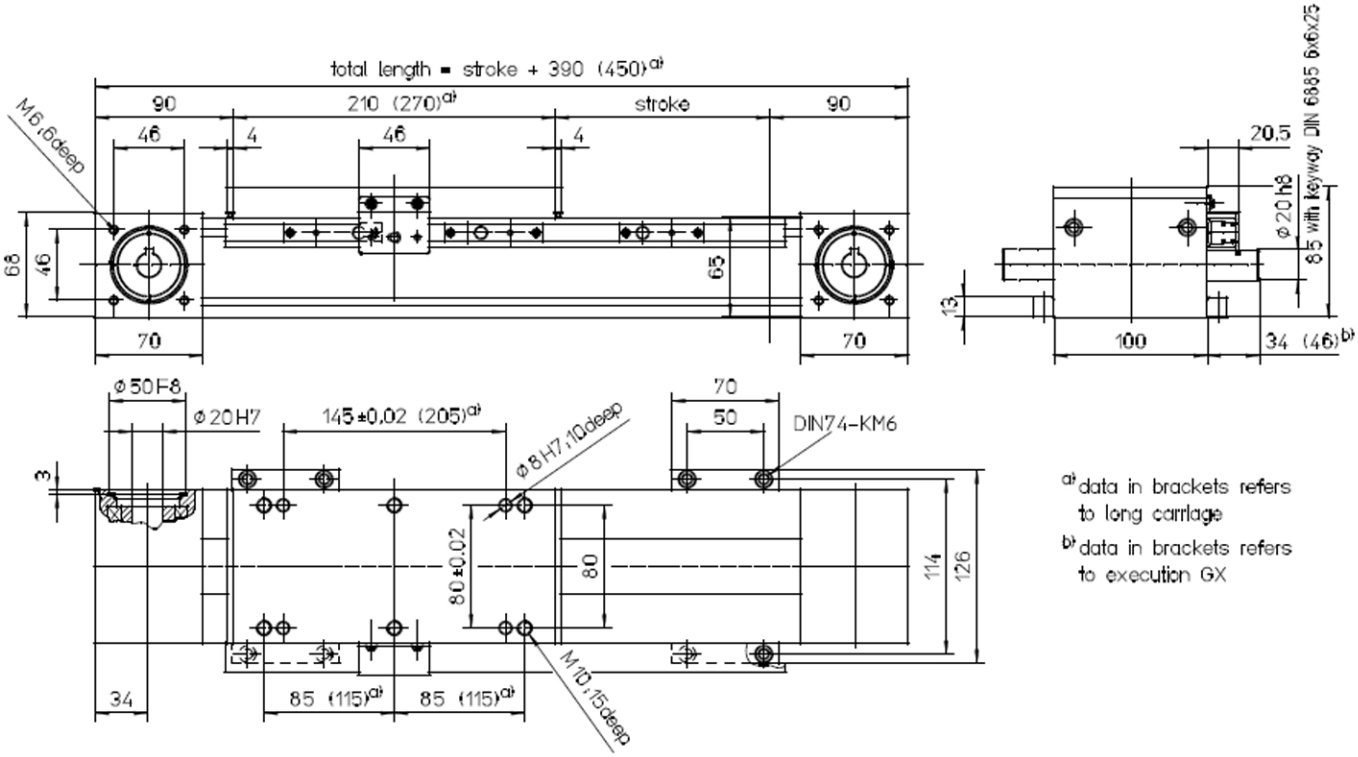
F_X - v - Diagram



Note: For Mechanical Linear Drives with roller guideway see static load capacity „C_{stat}“ in case of static loads.

HSBbeta® Mechanical Linear Drive Beta 100-D-ZSS

with tooth belt drive and double linear guide (ZSS)



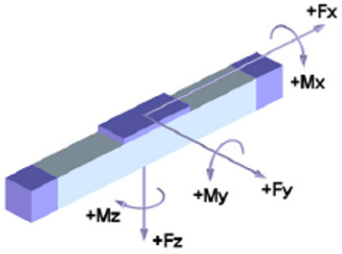
a) data in brackets refers to long carriage

b) data in brackets refers to execution GX

Weights	ZSS
Basic length, no stroke:	6.80 kg
100 mm stroke:	0.75 kg
Carriage 210 mm:	3.50 kg
Carriage 270 mm:	4.10 kg
Total length max.: (longer on request)	8100 mm

Technical data	ZSS
Linear speed max.:	5.00 m/s
Acceleration max.:	60 m/s²
Repeatability:	± 0.08 mm
Idle torque:	2.50 Nm
Mass inertia:	2.80 •10⁻³ kgm²
Drive element:	tooth belt 40 AT10-E
Stroke per revolution:	160 mm

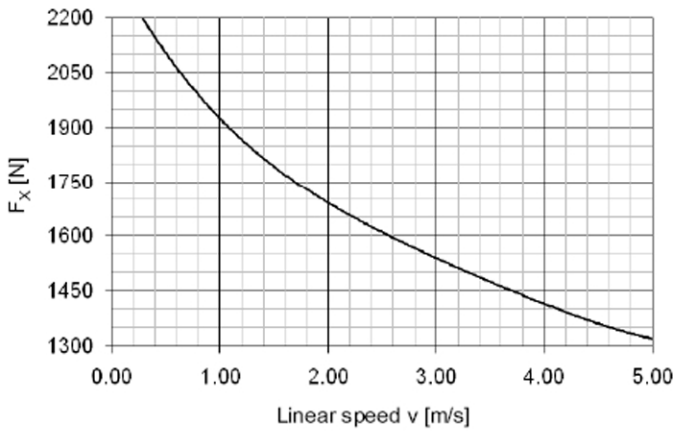
Loads and load moments



	ZSS
Load	dynamic [N]
F_X d)	2200
F_Y	1800
F_Z	4000
$-F_Z$	3000
Load moment	dynamic [Nm]
M_X	350
M_Y	750 (1000)
M_Z	750 (1000)

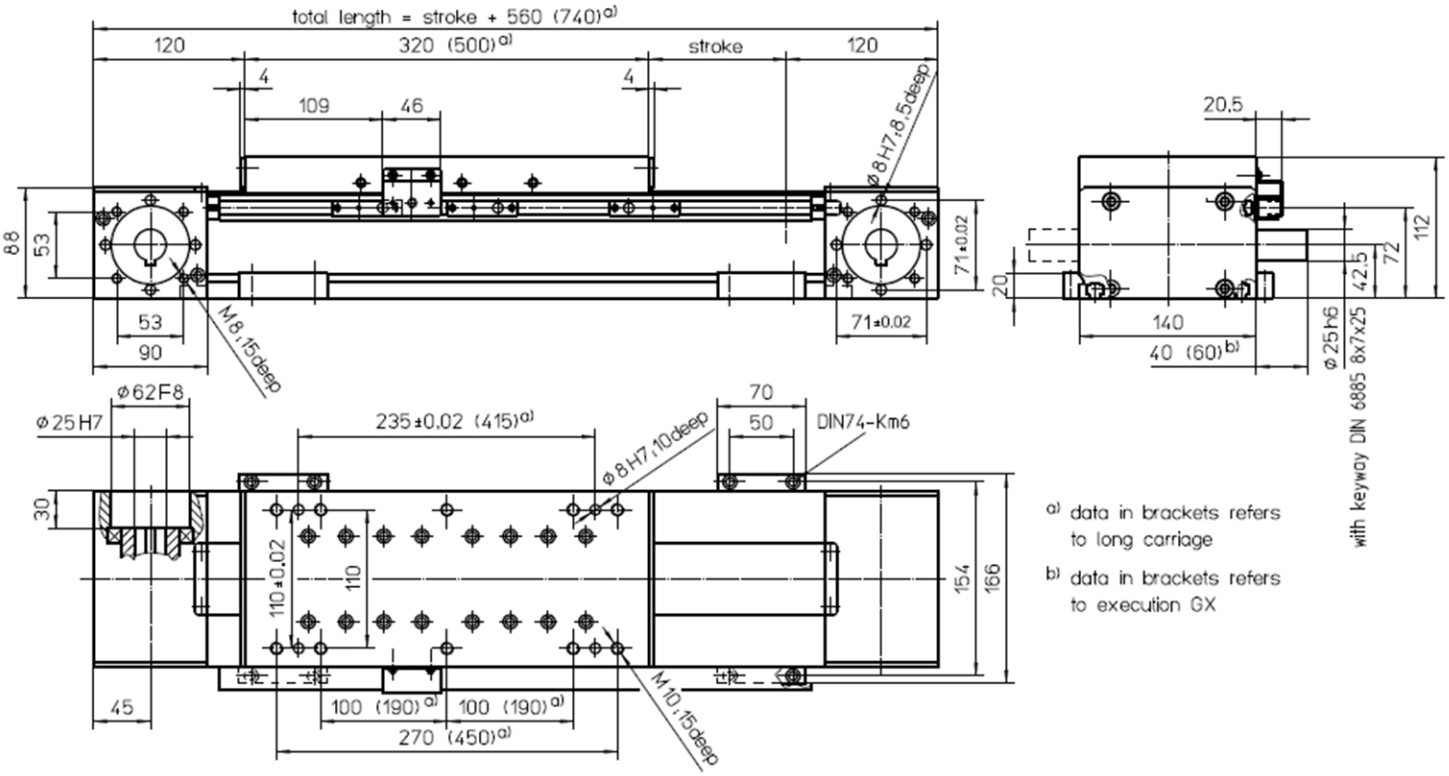
d) Maximum data (see Diagram „F_X-v-Diagram“)
Data in brackets refers to long carriage (270)

F_X - v - Diagram



HSBbeta® Mechanical Linear Drive **Beta 140-ZRS-ZSS**

with tooth belt drive and roller guideway (ZRS) or double linear guide (ZSS)



a) data in brackets refers to long carriage

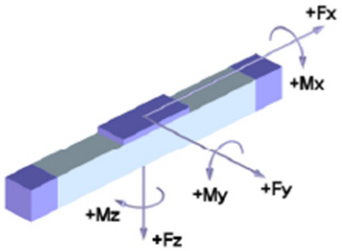
b) data in brackets refers to execution GX

Weights	ZRS	ZSS
Basic length, no stroke:	13.50 kg	15.00 kg
100 mm stroke:	1.30 kg	1.70 kg
Carriage 320 mm:	7.00 kg	7.50 kg
Carriage 500 mm:	11.00 kg	11.70 kg

Total length max.: 8100 mm
(longer on request)

Technical data	ZRS	ZSS
Linear speed max.:	8.00 m/s	5.00 m/s
Acceleration:	60 m/s²	
Repeatability:	± 0.08 mm	
Idle torque:	3.50 Nm	
Mass inertia:	$1.90 \cdot 10^{-2}$ kgm²	$2.00 \cdot 10^{-2}$ kgm²
Drive element:	tooth belt **50 AT10-E**	
Stroke per revolution:	220 mm	

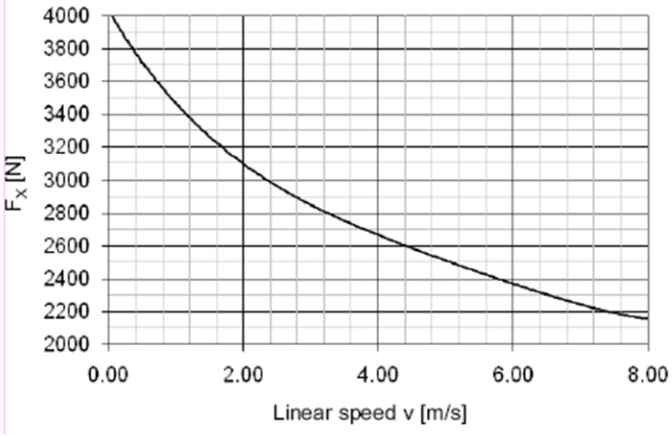
Loads and load moments



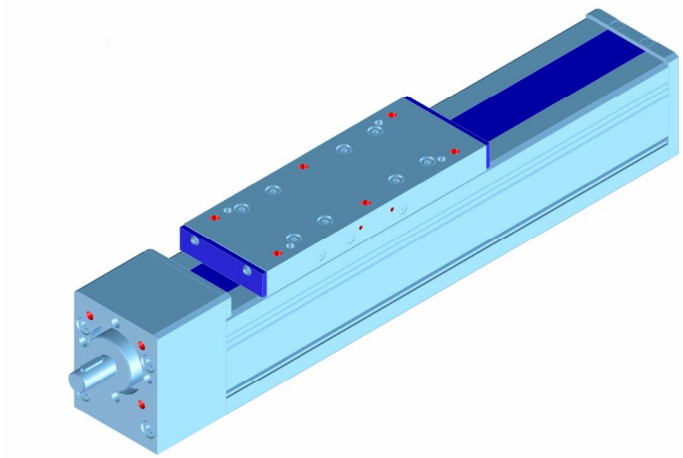
	ZRS	ZSS
Load	dynamic [N]	
F_X d)	4000	
F_Y	2500	
F_Z	5000	6000
$-F_Z$	3000	4000
Load moment	dynamic [Nm]	
M_X	350	500
M_Y	700 (900)	1000 (1300)
M_Z	700 (900)	1000 (1300)

d) Maximum data (see Diagram „F_X-v-Diagram“)
Data in brackets refers to long carriage (500)

F_X - v - Diagram



Note: For Mechanical Linear Drives with roller guideway see static load capacity „C_{stat}“ in case of static loads.



Assembly and Maintenance Manual

Linear Unit

HSB-beta®

Types

Beta 60-SGV-SSS
Beta 70-C-SRS-SSS
Beta 80-SRS-SSS
Beta 80-SGV
Beta 100-D-SSS
Beta 110-SRS-SSS
Beta 110-C-SGV
Beta 140-SRS-SSS
Beta 140-C-SSS
Beta 165-SSS
Beta 165-SGV
Beta 165-C-SGV
Beta 180-SSS
Beta 180-C-SRS-SSS

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Contents

About this manual

Applicability

This manual applies to the following linear units with spindle drive:

- Beta 60-SGV-SSS
- Beta 70-C-SRS-SSS
- Beta 80-SRS-SSS
- Beta 80-SGV
- Beta 100-D-SSS
- Beta 110-SRS-SSS
- Beta 110-C-SGV
- Beta 140-SRS-SSS
- Beta 140-C-SSS
- Beta 165 - SSS
- Beta 165-SGV
- Beta 180 - SSS
- Beta 180-C-SRS-SSS

The drawings show the Beta 60-SSS type and serve as examples for all other types, though some of the details may differ.

1 Safety

The Assembly and Maintenance Manual is a component element of the product package, and must always be kept to hand as a reference source.
The Manual must be passed on if the unit is sold on or given away.

If there is anything in this manual which you do not fully understand, please be sure to contact the manufacturers.

1.1 Symbols used

This manual employs the following symbols to indicate hazards as well as other types of symbol:

DANGER

Indicates immediate danger.
Failure to observe this notice entails risk of death or very serious injury.

WARNING

Indicates moderate risk.
Failure to observe this notice may result in death or serious injury.

CAUTION

Indicates minor risk.
Failure to observe this notice may result in light to moderate injury or damage to property.

☛ Note
Indicates tips on use of the machine and optimising its efficiency.

1.2 Regulation use

The mechanical linear unit is intended for installation in machines, and is used solely for manipulating, positioning, transporting, palletising , loading, unloading, clamping, clocking, tensioning, testing, measuring, handling and pushing workpieces or tools.

Pay attention to the basic applications of the linear unit set out in sections 4 and 3.

In order to comply with the EU Directive governing Electromagnetic Compatibility (EMC), the mechanical linear unit may only be used in industrial environments.

Any other use, or use for purposes beyond those stipulated, will be classed as illegitimate. The manufacturers accept no liability for any loss thereby incurred. The risk is borne solely by the operators.

1.3 General safety

Preconditions for operation

The linear unit must not be put into operation until the machine or line into which it is installed conforms to the following:

- Relevant accident prevention regulations
- Generally accepted safety standards
- EU directives
- Standards governing the electromagnetic compatibility of machinery
- Other applicable standards
- Applicable national legislation.

Safe operation

To ensure safe operation, refer to the following documents:

- This operating manual for the linear unit, particularly the technical data
- The operating manual for the line into which it is installed

1.4 Use in clean rooms (ISO 14644)

The linear units used in clean rooms are fitted with a vent hole (generally G1/8“) at the basic profile.

The following guidelines must be observed:

- The linear unit must be subjected to a negative pressure of 0.8 bar.
- The linear unit must be relubricated with a grease suitable for use in clean rooms (basic lubrication carried out using Klüberplex BE11-462).

1.5 Use in explosive environments

If the linear units are used in potentially explosive environments, operators must take steps to prevent explosions in accordance with ATEX Directives 94/9/EC and 1999/92/EC and ensure explosion-proofing is installed.

The following ATEX rules must be observed:

- Operators must check the linear unit at least once a week, and ideally every day. The checks should cover: smooth running, functionality of all seals, and adequate lubrication.
- After being in continuous service for approximately 5000 hours, the functionality of the linear unit must be checked by a qualified expert assigned by the manufacturer.

- The operator/manufacturer of the end-product must ensure that the linear unit is integrated into the potential equalisation system of the overall plant at the ports provided for the purpose. Where the unit is used in a dust-explosion hazard zone, the compressed air supply must additionally be connected to the linear unit.
- The limit switches must be supplied via an isolating amplifier. For the EX isolation an intrinsically safe input circuit is required. The isolating amplifier is not supplied by HSB.
- The linear unit may only be used under the conditions approved by the manufacturer. They include:
  - Ambient temperature
  - Maximum output
  - Speed < 1 m/s; When using a monitored central lubrication system up to 1.5 m/s, and where the unit is used in a dust-explosion hazard zone additionally with a monitored compressed air supply
  - Loading
  - Pressure
  - Frequency etc.

1.6 Technical condition of the linear unit

State of the art

The unit conforms to the current state of the art and applicable rules and regulations. The unit conforms to the EU Machinery Directive, harmonised European standards or corresponding national standards:

- Machinery Directive 2006/42/EC
- EN ISO 12 100-1 and 12 100-2 Safety of machinery, equipment and plant
- EN ISO 13850:2006: Safety of machinery; emergency-stop devices
- DIN EN 60 204-1:2006: Electrical equipment for industrial machines
- 2004/108/EC: EMC Directive
- EMVG: German law relating to the electromagnetic compatibility of equipment dated 26.02.2008 (Federal Gazette I p. 220)

1.7 Modifications to the linear unit

Modifications

The linear unit must not be modified, either in its basic design or in its safety components, without our written consent. Any such unauthorised modification will void our liability in respect of the unit.

The operating company may only carry out the maintenance and repair work detailed in this operating manual. Any other measures, such as to replace wearing parts and components, may be carried out only in consultation with our service engineers, by the service engineers themselves, or by us directly.

Installed safety devices must never be dismantled or disabled.

When fitting special attachments to the unit, follow the fitting instructions provided by the manufacturers!

1.8 Requirements for personnel

The linear unit has been designed and built in accordance with the state of the art and accepted safety standards. Hazards may nevertheless be posed when operating it. Consequently, the unit may only be installed and operated by trained, competent personnel.

All personnel assigned to install, operate, maintain, repair or dismantle a linear unit must have read and understood this operating manual, and in particular section 1, “Safety”.

Work on parts carrying live electrical current may be carried out only by trained electricians. Such work includes:

- Installing safety limit switches
- Mounting a drive unit
- Checking the direction of rotation of the drive

1.9 Obligations of the operating company

Instruction of personnel

In accordance with EU Health and Safety Directive 89/655/EEC articles 6(1) and 7 and with the Framework Directive 89/391/EEC articles 1(1) and 6(1), the company operating the linear unit must provide personnel assigned to install, operate, maintain, repair or dismantle the unit with appropriate instruction, in particular with regard to safety.
We recommend that companies require their personnel to provide written confirmation of having received such instruction.

Checking the unit

In accordance with EU Health and Safety Directive 89/655/EEC article 4a, the operating company must subject to the unit to thorough checking prior to putting it into operation, after carrying out repairs, and after malfunctions have occurred.

Legibility and maintenance of affixed notices and labels

The operating company must ensure that all notices and labels attached to the unit are fully legible (in particular details of the serial number) and must ensure compliance with all instructions contained on them. Damaged or illegible notices and labels must be replaced.

2 Warranty

The warranty conditions are laid down in the terms and conditions of delivery and payment issued at time of order. Warranty cover will be voided if:

- the unit is not operated in accordance with the stipulated regulation use;
- the instructions set out in this operating manual are not followed;
- the unit is modified without the consent of the manufacturers;
- screws sealed by locking varnish are unlocked.

The manufacturer's warranty in respect of maintenance and repair work applies only if original replacement parts are used.

3 Technical data – Standard model

Technical data - Linear unit **Beta type with spindle drive**	**Sizes**								
	Beta 60				**Beta 70-C**				
	SSS		**SGV**		**SRS**		**SSS**		
Drive element	KGT[2)]	TGT[3)]	BSD	TSD	KGT[2)]	TGT[3)]	BSD	TSD	
Max. speed [rpm]	3000	1500	3000	1500	3000	1500	3000	1500	
Spindle diameter [mm]	20				16				
Spindle pitch [mm]	5 20 50	4 8 16	5 20 50	4 8 16	5 10 20	4 8	5 10 20	4 8	
Moment of inertia [kgm²/m]	8.50×10^{-5}				3.25×10^{-5}				
Max. velocity[1)] [m/s]	2,50				1,00				
Max. acceleration [m/s^2]	20				20				
No-load torque [Nm]	0,70				0,35		0,40		
Maximum travel (standard) [mm]	5120				2730				
Repeat accuracy [mm]	±0,03	-	±0,03	-	±0,03	-	±0,03	-	
Operating temperature [°C] (continuous operation)	0 ... 80				0 ... 80				
Geometrical moment of inertia I_Y [mm^4]	473055				585283		563059		
Geometrical moment of inertia I_Z [mm^4]	577258				854713		852507		
Length of standard carriage [mm]	180		180		190				
Length of long carriage [mm]	230		-		240				
Weight (without travel) [kg]	4,30		3,65		3,65		3,50		
Weight (per 100 mm travel) [kg]	0,80		0,65		0,45		0,60		
Weight of standard carriage [kg]	1,50		1,15		1,60		1,25		
Weight of long carriage [kg]	1,80		-		2,02		1,60		
Noise emission max. [dB A] [4)]	85				80		80		

[1)] *Dependent on spindle pitch at max. speed*
[2)] *Ball Screw Drive*
[3)] *Trapezoidal Screw Drive*
[4)] *The figure will vary based on assembly with other system components*

Technical data - Linear unit Beta type with spindle drive	**Sizes**								
	Beta 80						**Beta 100-D**		
	SRS		**SSS**		**SGV**		**SSS**		
Drive element	KGT[2]	TGT[3]	BSD	TSD	BSD	TSD	BSD	TSD	
Max. speed [rpm]	3000	1500	3000	1500	3000	1500	3000	1500	
Spindle diameter [mm]	20				25	24	20		
Spindle pitch [mm]	5 20 50	4 8 16	5 20 50	4 8 16	5 10 25 50	5 10	5 20 50	4 8	
Moment of inertia [kgm²/m]	8.50×10^{-5}				2.25×10^{-4}		8.50×10^{-5}		
Max. velocity[1] [m/s]	2,50						2,50		
Max. acceleration [m/s²]	20						20		
No-load torque [Nm]	0,60		0,80		1,00		1,30		
Maximum travel (standard) [mm]	5020						5060		
Repeat accuracy [mm]	±0,03		±0,03		±0,03		±0,03		
Operating temperature [°C] (continuous operation)	0 ... 80		0 ... 80		0 ... 80		0 ... 80		
Geometrical moment of inertia I_Y [mm⁴]	1294343		1372019				917779		
Geometrical moment of inertia I_Z [mm⁴]	1732340		1677956				2328911		
Length of standard carriage [mm]	210						210		
Length of long carriage [mm]	270				-		270		
Weight (without travel) [kg]	5,40		6,20		12,50		6,20		
Weight (per 100 mm travel) [kg]	0,70		1,10		1,40		0,75		
Weight of standard carriage [kg]	2,20				5,80		3,40		
Weight of long carriage [kg]	2,80		2,40		-		4,00		
Noise emission max. [dB A] [4]	80		80		80		80		

[1] *Dependent on spindle pitch at max. speed*
[2] *Ball Screw Drive*
[3] *Trapezoidal Screw Drive*
[4] *The figure will vary based on assembly with other system components*

Technical data - Linear unit **Beta type with spindle drive**	**Sizes**							
	Beta 110				**Beta 110-C**			
	SRS		**SGV**		**SGV**			
Drive element	KGT[2]	TGT[3]	BSD	TSD	BSD	TSD		
Max. speed [rpm]	3000	1500	3000	1500	3000	1500		
Spindle diameter [mm]	25	24	25	24	40			
Spindle pitch [mm]	5 10 25 50	5 10	5 10 25 50	5 10	5 10 20 40	7		
Moment of inertia [kgm²/m]	2.25×10^{-4}				1.65×10^{-3}			
Max. velocity[1] [m/s]	2,50				2,0			
Max. acceleration [m/s²]	20				20			
No-load torque [Nm]	1,00		1,50		1,50			
Maximum travel (standard) [mm]	4920				4920			
Repeat accuracy [mm]	±0,03	-	±0,03	-	±0,03	-		
Operating temperature [°C] (continuous operation)	0 ... 80				0 ... 80			
Geometrical moment of inertia I_Y [mm⁴]	5114812		4974348		4974348			
Geometrical moment of inertia I_Z [mm⁴]	6177042		5898662		5898662			
Length of standard carriage [mm]	320				320			
Length of long carriage [mm]	500				-			
Weight (without travel) [kg]	12,50		13,50		15,40			
Weight (per 100 mm travel) [kg]	1,40		1,70		2,25			
Weight of standard carriage [kg]	5,80		5,30		6,00			
Weight of long carriage [kg]	9,10		8,30		-			
Noise emission max. [dB A] [4]	80		80		80			

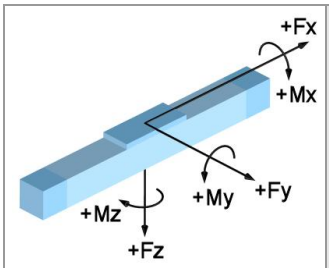
[1] *Dependent on spindle pitch at max. speed*
[2] *Ball Screw Drive*
[3] *Trapezoidal Screw Drive*
[4] *The figure will vary based on assembly with other system components*

Technical data - Linear unit Beta type with spindle drive	**Sizes**								
	Beta 140				**Beta 165**				
	SRS		**SSS**		**SSS**		**SGV**		
Drive element	KGT[2)]	TGT[3)]	BSD	TSD	BSD	TSD	BSD	TSD	
Max. speed [rpm]	3000	1500	3000	1500	3000	1500	3000	1500	
Spindle diameter [mm]	25	24	25	24	40				
Spindle pitch [mm]	5 10 25 50	5 10	5 10 25 50	5 10	5 10 20 40	7	5 10 20 40	7	
Moment of inertia [kgm²/m]	2.25×10^{-4}				1.65×10^{-3}				
Max. velocity[1)] [m/s]	2,50				2,00				
Max. acceleration [m/s²]	20				20				
No-load torque [Nm]	1,00		1,50		3,00				
Maximum travel (standard) [mm]	4920				4910				
Repeat accuracy [mm]	±0,03	-	±0,03	-	±0,03		±0,03		
Operating temperature [°C] (continuous operation)	0 ... 80				0 ... 80				
Geometrical moment of inertia I_Y [mm⁴]	3159202				25391136				
Geometrical moment of inertia I_Z [mm⁴]	9975915				31673479				
Length of standard carriage [mm]	320				400				
Length of long carriage [mm]	500				600				
Weight (without travel) [kg]	14,00		15,00		37,90		35,00		
Weight (per 100 mm travel) [kg]	1,40		1,90		4,20		3,80		
Weight of standard carriage [kg]	6,20		7,00		11,50		10,50		
Weight of long carriage [kg]	9,70		10,90		17,25		16,25		
Noise emission max. [dB A] [4)]	80		80		80		80		

[1)] *Dependent on spindle pitch at max. speed*
[2)] *Ball Screw Drive*
[3)] *Trapezoidal Screw Drive*
[4)] *The figure will vary based on assembly with other system components*

Technical data - Linear unit **Beta type with spindle drive**	**Sizes**								
	Beta 140-C		**Beta 180-C**				**Beta 180**		
	SSS		**SRS**		**SSS**		**SSS**		
Drive element	KGT[2]	TGT[3]	BSD	TSD	BSD	TSD	BSD	TSD	
Max. speed [rpm]	3000	1500	3000	1500	3000	1500	3000	1500	
Spindle diameter [mm]	25	24	32				32		
Spindle pitch [mm]	5 10 25 50	5 10	5 10 20 40	6	5 10 20 40	6	5 10 20 40	6	
Moment of inertia [kgm²/m]	2.25×10^{-4}		6.45×10^{-4}				6.45×10^{-4}		
Max. velocity[1] [m/s]	2,50		2,00				2,00		
Max. acceleration [m/s²]	20		20				20		
No-load torque [Nm]	1,50		1,80		2,50		2,50		
Maximum travel (standard) [mm]	4920		4930				4930		
Repeat accuracy [mm]	±0,03	-	±0,03	-	±0,03	-	±0,03	-	
Operating temperature [°C] (continuous operation)	0 ... 80		0 ... 80				0 ... 80		
Geometrical moment of inertia I_Y [mm⁴]	3127894		9236448				9236448		
Geometrical moment of inertia I_Z [mm⁴]	9071334		23586987				23586987		
Length of standard carriage [mm]	320		380				380		
Length of long carriage [mm]	500		600				600		
Weight (without travel) [kg]	15,00		35,00		37,00		33,50		
Weight (per 100 mm travel) [kg]	1,90		2,50		3,00		2,80		
Weight of standard carriage [kg]	7,00		13,20		14,30		10,80		
Weight of long carriage [kg]	10,90		14,30		15,40		15,50		
Noise emission max. [dB A] [4]	80		80		80		80		

[1] *Dependent on spindle pitch at max. speed*
[2] *Ball Screw Drive*
[3] *Trapezoidal Screw Drive*
[4] *The figure will vary based on assembly with other system components*



Forces and moments - Beta linear unit with spindle drive

Type designation	Dynamic forces [Nm]				Dynamic moments [Nm]			
	F_X	F_Y	F_Z	$-F_Z$	M_X	M_Y	M_Z	$M_{no\text{-}load}$
Beta 40-SGS	1000	80	150	75	6	6	8	0,3
Beta 40 - SSS	1000	500	600	300	12	30	30	0,3
Beta50-C-SRS	1000	300	600	400	30	60	50	0,3
Beta 60 - SSS	4000	600	1800	1200	60	180	120	0,7
Beta 60-SGV	4000	-	-	-	-	-	-	0,7
Beta 70-C-SRS	2000	300	1000	400	35	120	60	0,3
Beta 70-C-SSS	2000	600	1800	1200	60	180	120	0,4
Beta 70-A-SRS	1500	300	1000	400	35	120	60	0,3
Beta 80-SRS	4000	500	1500	800	50	180	100	0,6
Beta 80 - SSS	4000	800	3000	2000	100	250	250	0,8
Beta 80-SGV	6000	-	-	-	-	-	-	1,5
Beta 100-D-SSS	4000	1800	4000	3000	350	750	750	1,5
Beta 110-C-SGV	16000	-	-	-	-	-	-	1,5
Beta 110-SRS	6000	3000	5000	2500	400	800	600	1,5
Beta 110 - SSS	6000	2000	8000	4000	300	600	450	1
Beta 140-SRS	6000	2500	5000	3000	350	700	700	1,5
Beta 140 - SSS	6000	2500	6000	4000	500	1000	1000	1,8
Beta 140-C-SSS	6000	3200	7500	5000	600	1200	1200	1,8
Beta 165-SGV	18000	-	-	-	-	-	-	3
Beta 165 - SSS	18000	5000	15000	8000	700	1400	1100	3
Beta 180 - SSS	12000	6000	12000	6000	1500	3000	1500	2,5
Beta 180-C-SRS	6000	6000	10000	6000	1200	2000	1200	1,8
Beta 180-C-SSS	6000	6000	15000	8000	1800	3600	1800	2,5

Figures in ( ) relate to the long carriage.

$M_{no\text{-}load}$ = No-load torque ±30%

The forces and moments quoted are maximum values for the single load. In the event of combined loading or simultaneous occurrence of multiple moments or forces, the individual values must be reduced. In case of doubt consult Technical Support.

Dynamic load ratings of ball screw drives - Beta linear unit

Model and size	Nominal Ø in [mm]	Pitch in [mm]	C_{dyn} [N]
Beta 40 Beta 50 C	12	4	3400
		5	4400
Beta 70 Beta 70-C	16	5	9300
		10	15400
		20	7450
Beta 60 Beta 80 Beta 100-D	20	5	10500
		20	11600
		50	13000
Beta 110 Beta 140 Beta 140-C	25	5	12300
		10	13200
		25	16700
		50	15400
Beta 120-C Beta 180 Beta 180-C	32	5	21500
		10	33400
		20	29700
		40	14900
Beta 165 Beta 110-C-SGV	40	5	23800
		10	38000
		20	33300
		40	35000
Beta 165-C-SGV	50	10	68700
		20	60000

Dynamic load rating of ball screw nut to DIN 69051, 1989

Dynamic load ratings of rail guides - Beta linear unit

Model	Size	Number of rails	Number of carriages	Load rating per carriage C_{dyn} [N] THK / Rex*	Preten-sion F_V THK / Rex*	M_t [Nm] THK / Rex*	Guide spacing in direction x (lx1) [mm]	Guide spacing in direction y (ly) [mm]
Beta 40	12	1	2	3175 / 1205	-	25 / 14	83 (163)	-
Beta 60	15	1	2	11271 / 7800	3% / 8%	60 / 74	106 (156)	
Beta 70	15	1	2	11271 / 7800	3% / 8%	60 / 74	124 (174)	-
Beta 80	20	1	2	17700 / 18800	3% / 8%	210 / 240	128 (188)	-
Beta 80-C	25	1	2	25160 / 22800	3% / 8%	340 / 320	122 (182)	-
Beta 100	20	1	2	17700 / 18800	3% / 8%	210 / 240	152 (272)	-
Beta 100-D-ZSS	15	2	4	11271 / 7800	3% / 8%	-	150 (210)	56
Beta 100-D-ASS	15	2	4	11271 / 7800	3% / 8%	-	192	56
Beta 100-D-SSS	15	2	4	11271 / 7800	3% / 8%	-	150 (210)	56
Beta 110	25	1	2	25160 / 22800	3% / 8%	340 /320	203 (383)	-
Beta 120	25	1	2	25160 / 22800	3% / 8%	340 / 320	144 (324)	-
Beta 120-C	30	1	2	35558 / 31700	3% / 8%	580 /540	184 (364)	-
Beta 140	15	2	4	11667 / 7800	3% / 8%	-	180 (330)	72
Beta 140-ASS	15	2	4	11667 / 7800	3% / 8%	-	242 (322)	72
Beta 140-C-ZSS	20	2	4	17700 / 18800	3% / 8%	-	200 (400)	76
Beta 140-C-ASS	20	2	4	17700 / 18800	3% / 8%	-	220 (300)	76
Beta 140-C-SSS	20	2	4	17700 / 18800	3% / 8%	-	210 (360)	76
Beta 165-ZSS	35	1	2	49448 / 41900	3% / 8%	985 / 890	198 (398)	-
Beta 165-SSS	35	1	2	49448 / 41900	3% / 8%	985 / 890	219 (329)	-
Beta 180-ZSS	20	2	4	17700 / 18800	3% / 8%	-	172 (392)	84
Beta 180-AZSS	20	2	8	17700 / 18800	3% / 8%	-	430	84
Beta 180-ASS	20	2	4	17700 / 18800	3% / 8%	-	306	84
Beta 180-SSS	20	2	4	17700 / 18800	3% / 8%	-	247 (467)	84
Beta 180-C-ZSS	25	2	4	25160 / 22800	3% / 8%	-	272 (492)	84
Beta 180-C-ASS	25	2	4	25160 / 22800	3% / 8%	-	307	84
Beta 180-C-SSS	25	2	4	25160 / 22800	3% / 8%	-	233 (453)	84

Figures in ( ) relate to the long carriage
The load rating and pre-tension figures relate to the standard linear guidance system with recirculating linear ball bearings
** Rex = Rexroth*

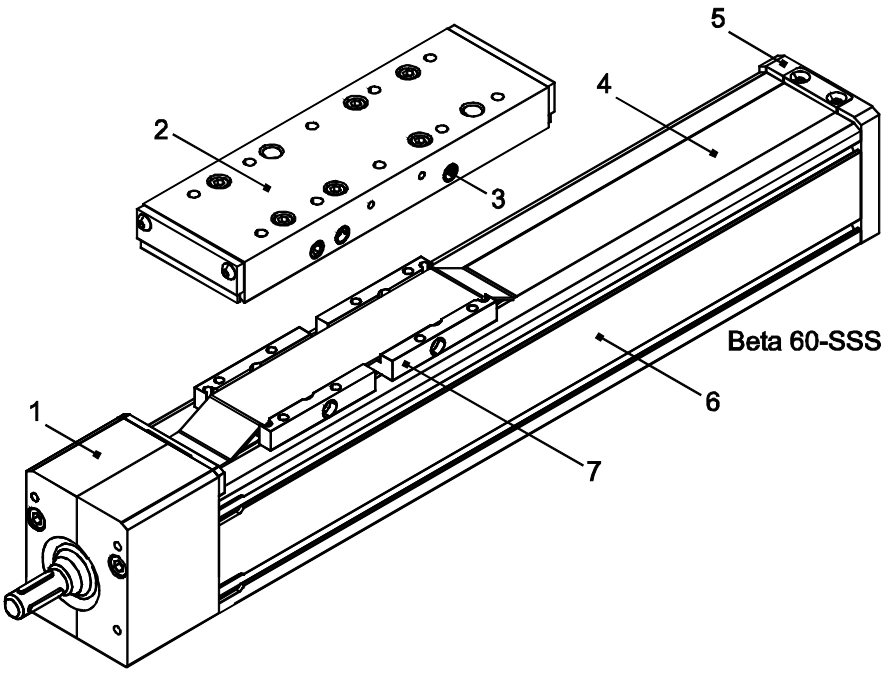
Tightening torques [Nm] for fixing screws						
Fixing screws	**M4**	**M5**	**M6**	**M8**	**M10**	The figures given are intended as guides. For shorter insertion depths, the figures must be adjusted accordingly.
DIN912/ISO4762-8.8	2,7	5,4	9,0	22,0	43,0	
DIN912/ISO4762-10.9	3,0	5,7	9,0	22,0	43,0	
DIN912/ISO4762-12.9	3,0	5,7	9,0	22,0	3438,0	

Tightening torques [Nm] for clutch with clamping hub					
Size	**14**	**19**	**24**	**28**	**38**
Clutch diameter [mm]	30	40	55	65	80
Screw size	M3	M6	M6	M8	M8
Tightening torque [Nm]	1,34	10,50	10,50	25,00	25,00

Tightening torques [Nm] for clutch with clamping ring hub					
Size	**14**	**19**	**24**	**28**	**38**
Clutch diameter [mm]	30	40	55	65	80
Screw size	M3	M4	M5	M5	M6
Tightening torque [Nm]	1,34	2,90	6,00	6,00	10,00

4 Product description

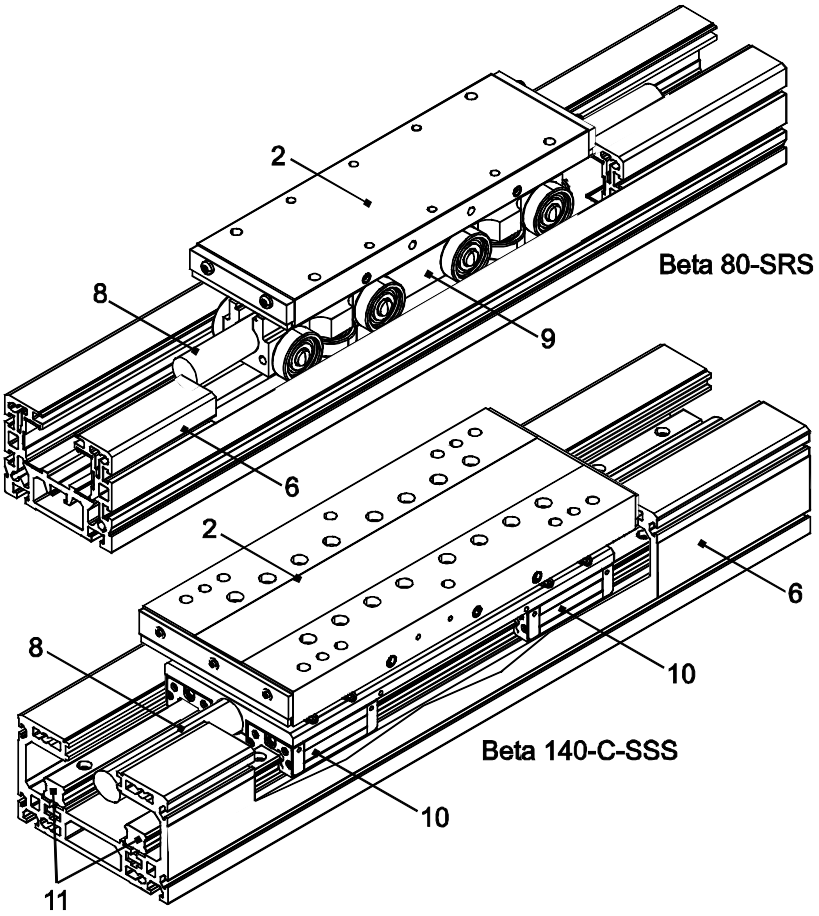
Linear unit with spindle drive



Key	1	Fixed bearing	5	Movable bearing
	2	Carriage	6	Base profile
	3	Lubricating nipple	7	Driver
	4	Cover band		

Figure 1: Component assemblies of the Beta 60 linear unit with spindle drive

Roller bearing and linear guidance system



Key	2	Carriage	9	Roller bearing guidance system
	6	Base profile	10	Recirculating ball bearing
	8	Thread drive	11	Guide rails

Figure 2: Guide elements

A mechanical linear unit converts rotational motion into linear motion and is used to move loads quickly, safely and precisely from one position to another. It consists of an aluminium base profile, a moving carriage supported by a guide element (recirculating ball bearing or roller bearing guidance system) and a drive element (screw or timing belt drive).

Depending on its design, the carriage is able to absorb forces and moments in all directions, and is positively connected to the guidance and drive elements by way of the so-called drivers.

The base profile is self-supporting up to a certain length, and is equipped with grooves for mounting.

As an option, the linear unit can be equipped with accessories such as a cover, screw supports, inductive or mechanical limit switches and other fittings (see section 6.3).

The effective range can be flexibly configured. Multiple linear units of the Alpha, Beta or Delta type can be arranged two-dimensionally (2 axes) or three-dimensionally (3 axes).
Driven linear units can be connected to non-driven units of the same type by a plate, to be able to take large-area loads for example.

5 Transportation and storage

The mechanical linear unit is a precision item. Its mechanism may be damaged by heavy jolting, resulting in impairment of its functions.

Risk of damage by heavy jolting or bending!
Transport the assembled linear unit only with the transit protection fitted.

To prevent damage during transportation and storage, protect the linear unit against shaking and sliding as follows:

- Stow it in a box of sufficient size.
- Use packing.

Section 3 lists the unit weights.

Protect the unit against:

- dirt;
- corrosion;
- water;
- and aggressive atmospheres.

6 Installation and adjustment

The linear unit can be attached by the following methods:

- On mounting rails
- By screws inserted into the sliding blocks
- By screws inserted into the factory-fitted tapped hole rails

☛ Install the linear unit on a flat surface. Unit parallelism < 0.2 mm/1,000 mm.

☛ Mounting by the rails with tapped holes in them is the preferable solution:
for highly dynamic applications;
where the linear unit has only two attachment points.

6.1 Installing the linear unit by mounting rails

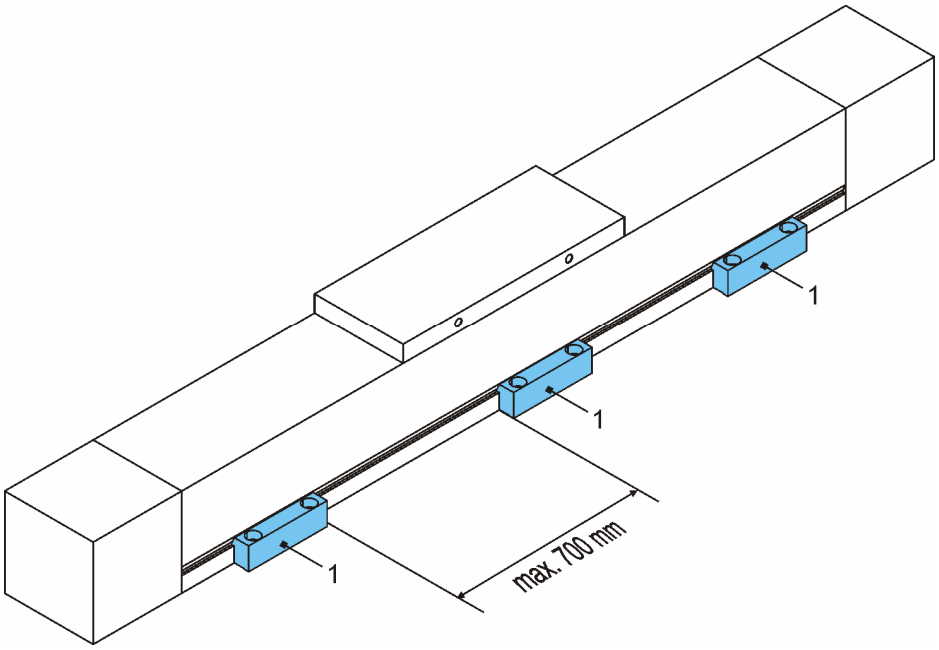


Figure 3: Mounting rails (1)

☛ The recommended maximum spacing between the mounting rails is 700 mm.

Procedure

1. Attach the mounting rails (1) loosely in position (figure 2).
2. Align the linear unit axially.
3. Tighten the mounting rails (1)
(for tightening torques see section 3).

6.2 Screwing the linear unit into place from below

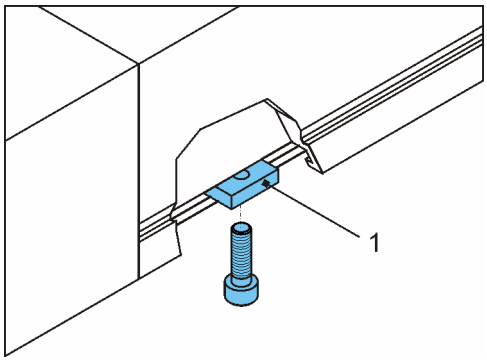


Figure 4: Sliding blocks (1) in the groove on the underside of the base profile

Attach the linear unit by the fixing screws from below using the sliding blocks or the tapped hole rails in the aluminium base profile (figure 3).

Procedure

1. Align the linear unit.
2. Align the sliding blocks (1)/tapped hole rails.
3. Tighten the linear unit
   (for tightening torques see section 3).

6.3 Setting maximum travel

DANGER

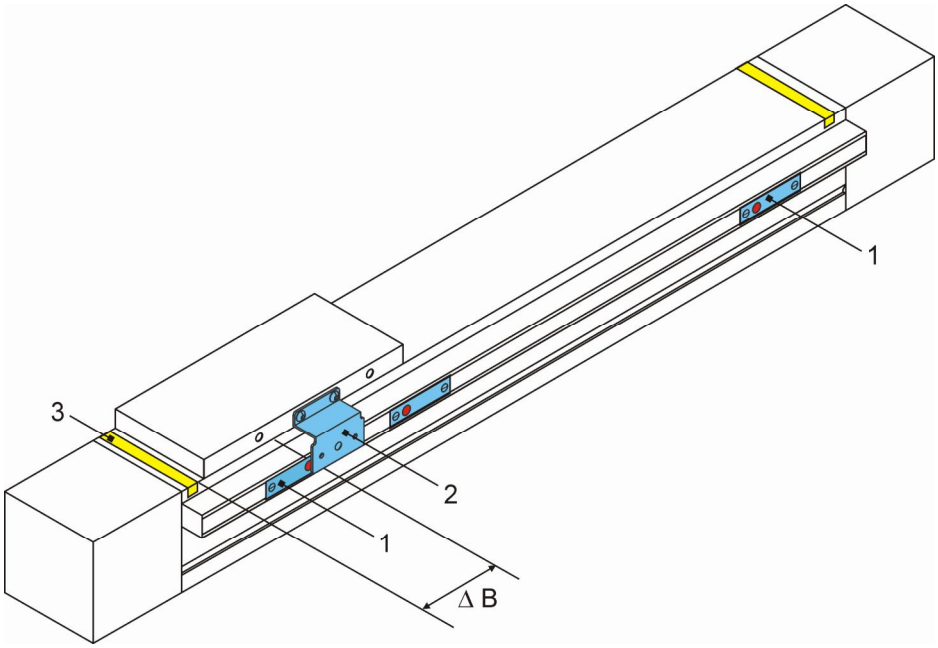
Serious injury may result if the transport carriers topple over.
If the carriage moves to its full extent beyond the safety zone, the transport carrier mounted on it may break away or topple over. The linear unit may be destroyed
During setup, observe the specified safety zone and set the limit switches accordingly.
Electrical switches may only be connected by qualified electricians.

☛ To stop the carriage promptly in the event of an emergency stop, allow for adequate braking distance.

6.3.1 Setting the positions of the inductive limit switches

The function of inductive proximity switches is to shut down the electric drive before the mechanical end position is reached.

The necessary braking distance (Δ B) depends on the velocity and deceleration of the carriage. The braking distance must be between the switching point of the proximity switch and the actual mechanical end position.



Key		
	1	Inductive limit switch
	2	Switching cam
	3	Band marking safety zone

Figure 5: Inductive limit switches

CAUTION

The limit switches must switch so that the carriage comes to a stop immediately before the safety zone. The safety zone is factory-marked on the unit by a band (3).

Procedure

1. Connect the power to the limit switches.
2. Slacken the limit switch fixing screws.
3. Run the carriage as far as the braking position.
4. Move the limit switch (NC contact) under the switching cam until it trips and the LED on the sensor goes out.
5. Move the carriage away.
6. Tighten the limit switch.
7. Check the correct position of the limit switch: Move the carriage manually and observe the switching operation.
8. Fit the limit switch array covering.

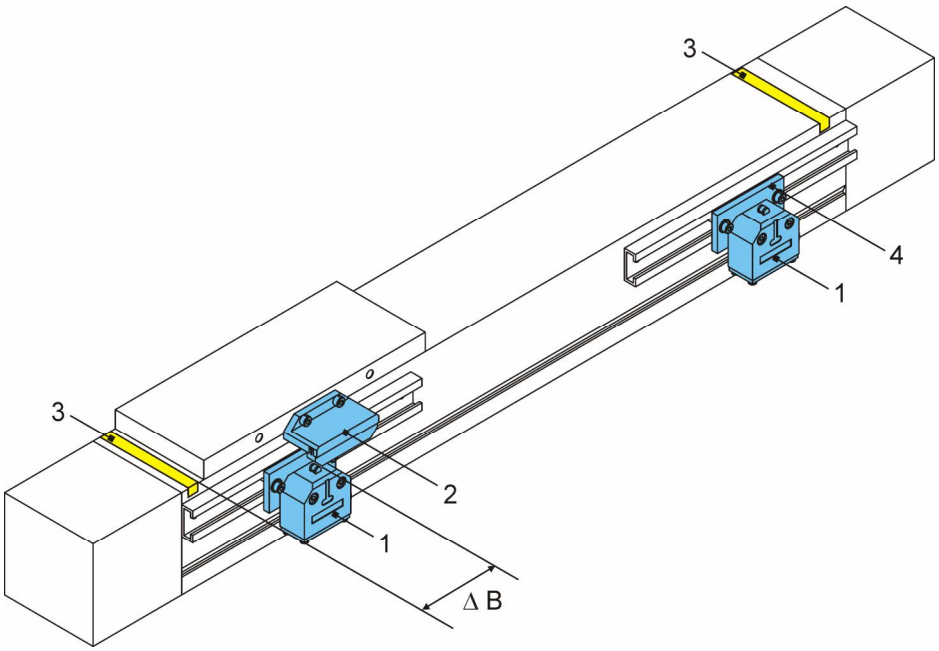
6.3.2 Setting the positions of the mechanical limit switches

Mechanical safety limit switches (NC contacts) must be used if a hazard is posed to personnel as soon as the electric drive fails to shut down.

The drive may only be started up when all limit switches are connected and correctly set!

A combination with inductive proximity switches is possible.

External shock-absorbers must be fitted to protect against mechanical destruction.
The necessary braking distance (Δ B) depends on the velocity and deceleration of the carriage. The braking distance must be between the switching point of the limit switch and the actual mechanical end position (figure 5).



Key		
	1	Mechanical limit switches
	2	Switching cam
	3	Band marking safety zone
	4	Bracket
	B	Braking distance

Figure 6: Mechanical limit switches

CAUTION

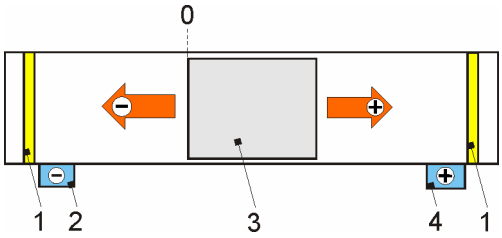
The limit switches must switch so that the carriage comes to a stop immediately before the safety zone. The safety zone is factory-marked on the unit by a band (3).

Procedure

1. Connect the power to the limit switches.
2. Slacken the bracket fixing screw (figure 5).
3. Run the carriage as far as the safety zone.
4. Move the limit switch until it trips.
5. Tighten the bracket fixing screw.
6. Check the correct position of the limit switch: Move the carriage manually and observe the switching operation.
   If the braking distance is too short, repeat the set-up.

6.4 Mounting a drive unit

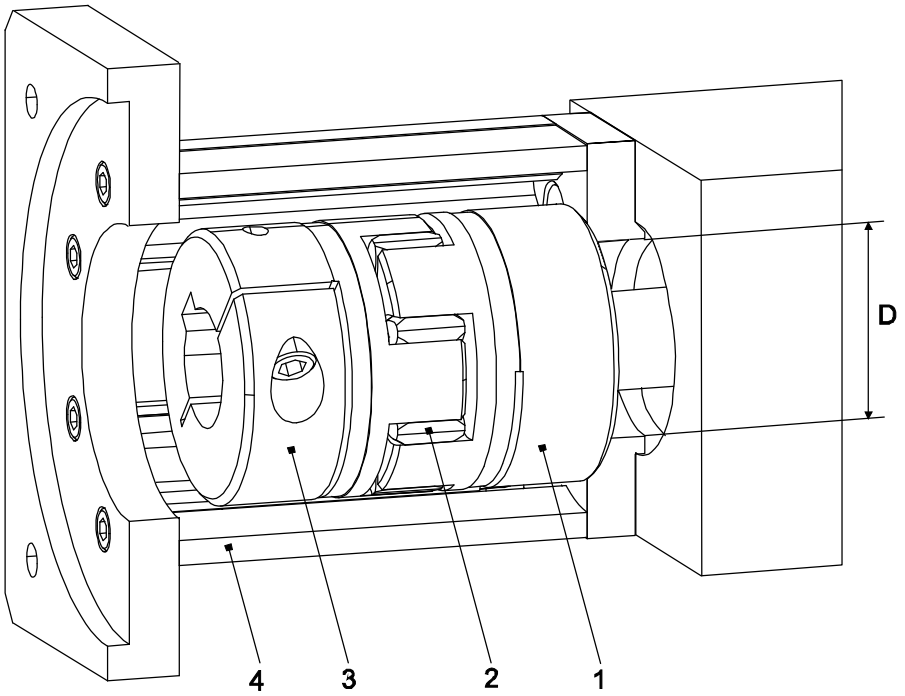
Make sure the direction of rotation of the external drive unit takes into account the direction of the spindle or timing belt so that the limit switches work correctly.



Key				
	1	Safety zone	3	Carriage with positive and negative directions from reference point 0
	2	Negative limit switch	4	Positive limit switch

Figure 7: Example of travel direction and limit switch configuration

6.4.1 Mounting a motor



Key				
	1	Clutch half 1	4	Motor housing
	2	Clutch ring	D	Diameter on motor housing
	3	Clutch half 2		

Figure 8 Motor housing with motor clutch on drive pin

Procedure

1. Place the motor and the clutch components in mounting position adjacent to the linear unit.
2. Check the direction of rotation of the motor. It must take into account the safety limit switches (figure 6). Alter the direction of the motor as necessary.
3. If the clutch diameter is less than the measure D on the motor housing (4), first mount clutch half 1 (1) (hole flush with drive shaft) and then the motor housing (4)
   (figure 7).

   If the clutch diameter is greater than the measure D on the motor housing (4), first mount the motor housing (4) and then the clutch half 1 (1) (hole flush with drive shaft). Tighten the clutch clamping screw through the mounting hole on the motor housing (4).
4. Slot the clutch ring (2) onto the clutch.
5. Mount clutch half 2 (3) on the motor pin.
6. Mount the motor on the motor housing.

7 Start-up

WARNING

Risk of personal injury or damage to other system components caused by rapid linear motion of the transport carrier, caused by thrown loads.
Only authorised specialist personnel may start up the linear unit.

WARNING

Risk of crushing if the transport carrier is moved in the wrong direction.
If the directions of rotation of the drive (motor or gearbox) and the carriage drive (spindle or timing belt) do not match, the mounted transport carrier may move in the wrong direction.
Only qualified electricians may carry out the electrical installation and check the direction of rotation.

Checks before start-up

Before starting the unit, check the following:

- Make sure the retaining fixtures conform to the mass and acceleration data provided by the manufacturers.
- Make sure the machine or line into which the linear unit is installed conforms to the EU Machinery Directive, the harmonised European standards or applicable national standards.
- Make sure the linear unit is correctly installed.
- Make sure the inductive and/or mechanical limit switches are correctly connected and working properly.
- Make sure the direction of rotation of the motor shaft and - where appropriate - of the interposed gearbox - matches that of the spindle or timing belt.

If the checks reveal any defects, prohibit start-up of the unit.

Trial run

To prevent accidents and collisions, run the linear unit along the extent of its travel at a speed slow enough for it to be stopped promptly in an emergency.

The line may be started up once it has been established that there is no risk of collision when the maximum travel is overrun.

8 Operation

Risk of damage from harmful environmental influences!
Operate the linear unit only under the ambient conditions approved by the manufacturers.

Ambient conditions

Operate the linear unit only within the permissible temperature range of 0 … 80 °C.

If the linear unit is operated in moist, abrasive medium, foreign bodies may penetrate it. To prevent that, the operating company must take appropriate measures to prevent intrusion of foreign bodies, such as by installing deflectors, baffle plates or air barriers.

Duty of inspection

The proper functioning of the linear unit must be checked periodically during operation.

The responsible personnel must check the linear unit and the line for external signs of damage and defects at least once every shift.

If changes occur which are detrimental to safety, shut down the line immediately.

9 Shutdown

Risk of personal injury or damage to other system components caused by falling system components.
Only authorised specialist personnel may disassemble the linear unit.

1. Cut the power to the machine/line.
2. Dismantle the drive from the linear unit.
3. Detach the linear unit from the machine/line.

10 Maintenance

- All installed ball bearings are sealed and maintenance-free.
- Remove excessive dust and dirt from the cover band and other components of the linear unit on a regular basis.
- Relubricate the thread drives of the linear axes on a regular basis.

10.1 Lubrication

Influencing factors

The following factors are key to determining the exact lubrication intervals required:

- Loading
- Velocity
- Motion
- Operating temperature
- Degree of dirtying

Short lubrication intervals

Short lubrication intervals are necessary:

- where there is susceptibility to dust and damp;
- under major loading;
- when running at high velocity (up to V_{max});
- when running over short travel distances.

Initial lubrication

☛ Carry out an initial lubrication after starting up the unit for the first time. A basic lubrication was applied at the factory.

Refer to the lubrication requirements set out in the following sections.

Lubrication points on linear units

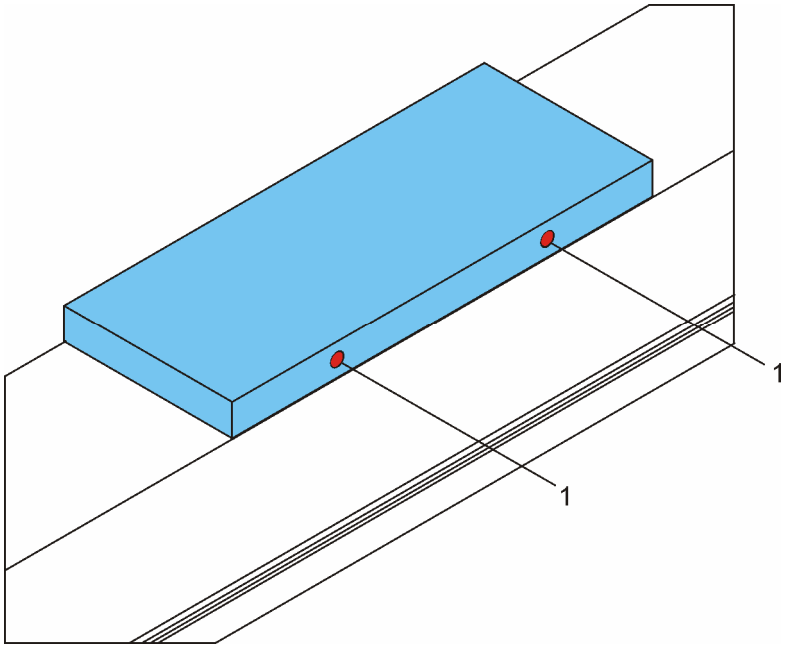


Figure 9: Possible lubrication points (1) on the carriage

The categories and positions of lubrication point depend on the model of linear unit. The categories of lubrication point are identified by the markings S, F, O on the unit.
There is a separate lubrication schedule for each lubrication point category.

Lubrication point category	Lubrication for…	Lubricant
S	Spindle	Grease
F	Guide elements	Grease
O	Guide elements	Oil

Lubrication method

Lubrication should, as far as possible, take place while the unit is running, so that the grease is distributed evenly and no pressure is built up.

Schedule for lubrication point S (for ball screw drive)

BSD* type	Lubrication intervals at roll-overs	Grease quantity [cm³] per ball screw nut	Grease type
1204	25.000.000**	0,50	Greases to DIN 51825-KPE1R-20, e.g. Klüberplex BE 31-102 ☛ If other greases are used, pay attention to manufacturers' specifications! ☛ Greases containing solid lubricant (e.g. graphite, MoS2) must not be used!
1205		0,55	
1605		1,70	
1610		1,80	
1620		1,90	
2005		2,00	
2020		2,30	
2050		4,50	
2505		2,60	
2510		3,40	
2525		3,10	
2550		4,80	
3205		4,20	
3210		13,10	
3220		8,40	
3232		5,30	
3240		3,00	
4005	15.000.000**	5,30	
4010		15,40	
4020		10,20	
4040		9,50	
BSD = Ball Screw Drive* * Or at least 2x per year. The lubrication interval depends on the ambient temperatures and on the loading (see figure 11). Relubrication "in motion"!*			

Schedule for lubrication point F (for linear guide)

Carriage size	Lubrication interval	Grease quantity [cm³] per carriage	Grease type
15 with ball chain	approx. 5,000 km*	approx. 0.4	Greases to DIN 51825-KPE1R-20, e.g. Klüberplex BE 31-102 ☛ If other greases are used, pay attention to manufacturers' specifications! ☛ Greases containing solid lubricant (e.g. graphite, MoS2) must not be used!
20 with ball chain		approx. 0.6	
25 with ball chain		approx. 1.2	
30 with ball chain		approx. 1.5	
35 with ball chain		approx. 1.7	
20 without ball chain	approx. 1.000 km*	approx. 0.7	
35 without ball chain		approx. 2.2	
** Or at least 2x per year. The lubrication interval depends on the ambient temperatures and on the loading (see figure 11). Relubrication "in motion"!*			

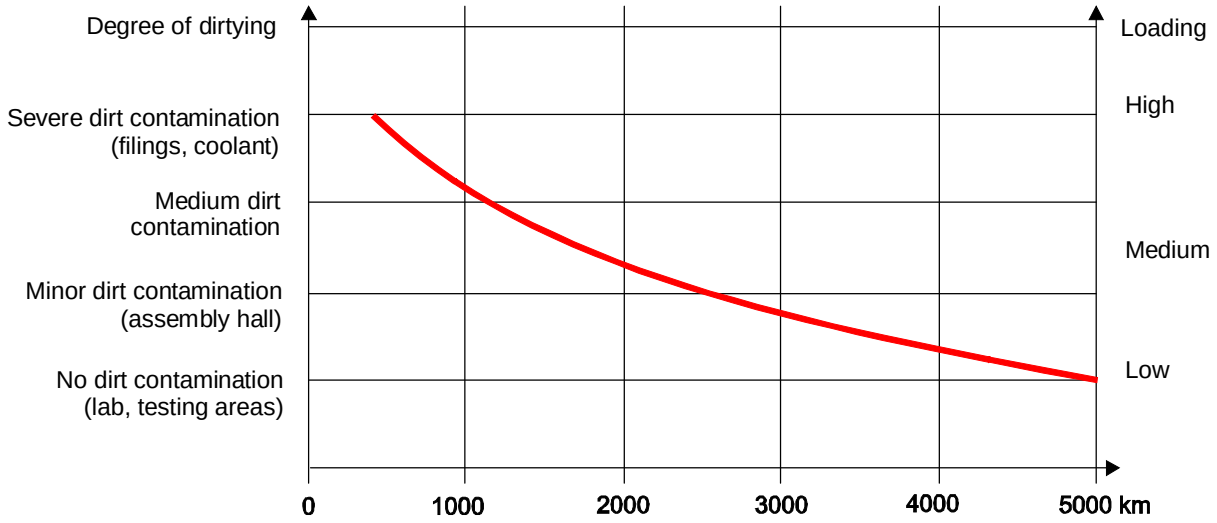


Figure 10: Relubrication intervals for the linear guidance system with recirculating linear ball bearings

Schedule for lubrication point O (for roller guideway)

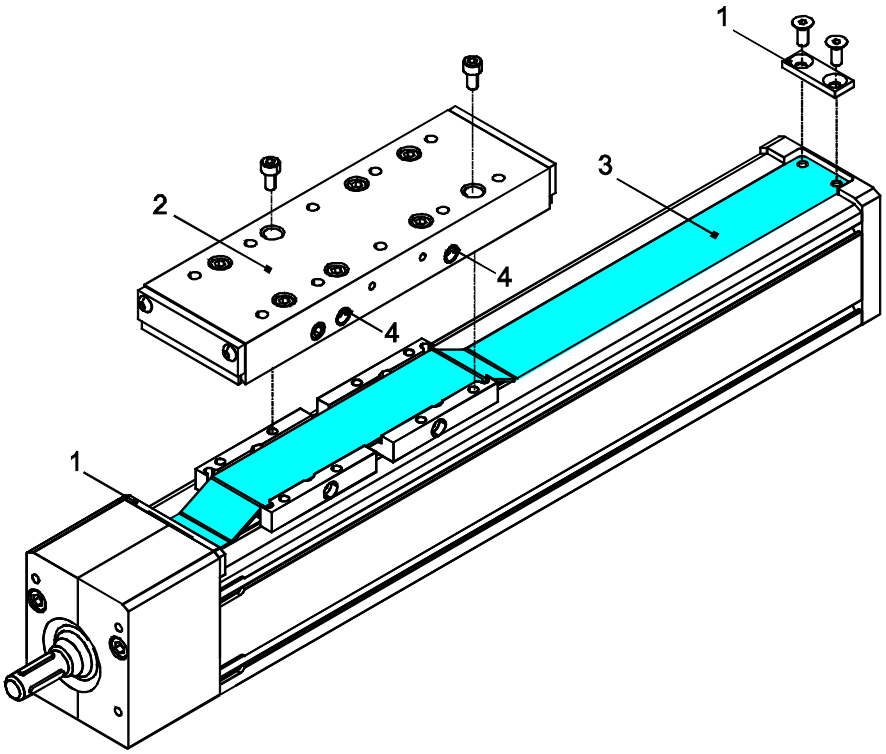
Lubrication interval	Oil quantity [cm³]	Oil type
Every 2,000 km*	approx. 0.4	Oil to DIN 51825-KPE1R-20, e.g. Febis K68 or INTERFLON fin super ☛ If other oils are used, pay attention to manufacturers' specifications!
** Or at least 2x per year. The lubrication interval depends on the ambient temperatures and on the loading.*		

10.2 Replacing cover bands

☛ To preserve the optimum running of the linear unit and prevent it from being damaged during operation, take care that no foreign bodies penetrate the base profile or other linear unit components during installation and assembly.

☛ Do not damage the standard parts (screws, pins, etc.) or the dismantled components; they will be refitted.

☛ If cover bands are worn, also replace the band guide elements. If cover bands are damaged, check the band guide elements for wear and replace them only as necessary.



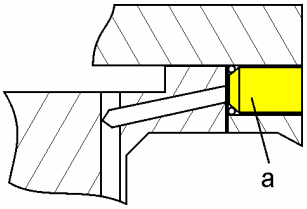
Key		
	1	Clamp fittings
	2	Carriage
	3	Cover band
	4	Lubricating nipple

Figure 11: Cover band based on the example of the Beta 60-SxS linear unit

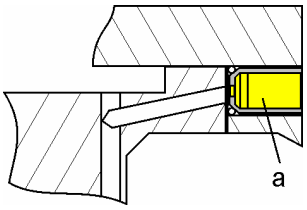
Procedure

1. Loosen the lubricating nipples:

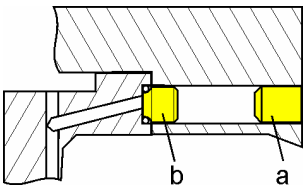
– On Beta 60 to 80
Unscrew all screw-fit lubricating nipples (a) about 2 turns so as not to damage the sealing faces.



– On Beta 60 to 80
Remove all conical lubricating nipples or the external lubrication ports and unscrew the lubricating adapters (a) about 2 turns so as not to damage the sealing faces.



– On Beta 100 to 180
Remove all screw-fit or conical lubricating nipples (a) or the external lubrication ports and unscrew the lubricating adapters (b) about 2 turns so as not to damage the sealing faces.



2. Move the carriage into the middle. Then unscrew it and lift it off. Caution! Do not rotate the carriage. It must be refitted in the same position!

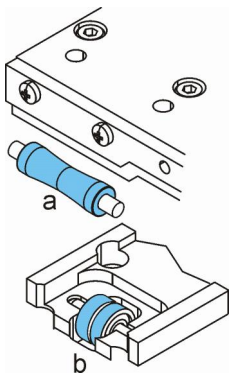
☛ Do not lose the O-rings fitted on the lubricating apertures on the inside of the carriage.

3. Detach the clamp fittings from the ends of the cover band and remove the cover band.

4. Check the band guide elements, such as the press rollers (a), lifting rollers (b) and locating pins, for wear.

– If the cover band is worn, be sure also to replace the band guide elements. Worn guide elements will damage the new cover band.

– If the cover band is damaged, only replace the band guide elements if they are damaged.
Fit press rollers (a) with the larger diameter on the outer.

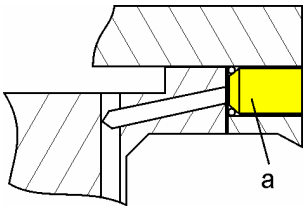


5. Insert the new cover band with its broader side (with the chamfered cutting edge) facing downwards and fix it at one end by the clamp fitting.

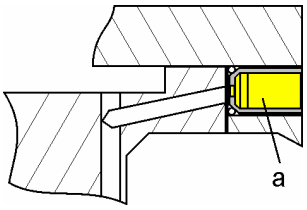
6. Carefully press the cover band into its guideway along its entire length until it audibly snaps into place. It must not stick out at any point, otherwise it will be damaged.

7. Stretch the cover band and fix it by the clamp fitting at the other end.
8. Make sure the O-rings are fitted on the lubricating apertures on the underside of the carriage and refit the carriage in the correct position.
9. To check that the carriage is correctly installed, run it slowly from one end of the linear unit to the other, ensuring the cover band is held all the time in its guideway.
10. Fit the lubricating nipples:

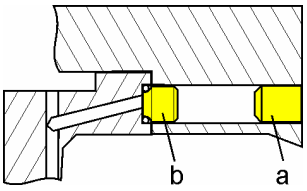
- On Beta 60 to 80
  Insert the screw-fit lubricating nipples.

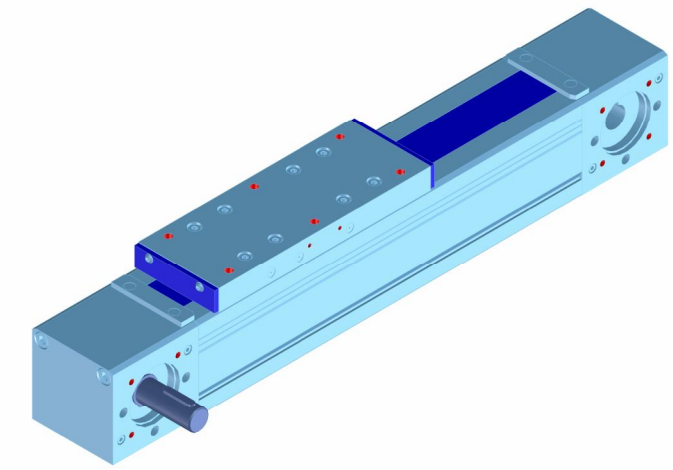


- On Beta 60 to 80
  Fit the lubricating adapters and then the conical lubricating nipples or the external lubrication ports.



- On Beta 100 to Beta 180
  Fit the lubricating adapter and then the screw-fit lubricating nipple.





Assembly and Maintenance Manual

Linear Unit

HSB-beta®

Types

Beta 60-ZSS
Beta 70-C-ZRS-ZSS
Beta 80-ZRS-ZSS
Beta 80-C-ZSS
Beta 100-ZRS-ZSS
Beta 100-D-ZSS
Beta 110-ZRS-ZSS
Beta 120-ZRS-ZSS
Beta 140-ZRS-ZSS
Beta 140-C-ZSS
Beta 165-ZSS
Beta 180-ZSS
Beta 180-C-ZRS-ZSS

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Contents

About this manual

Applicability

This manual applies to the following linear units with timing belt drive:

- Beta 60 - ZSS
- Beta 70-C-ZRS-ZSS
- Beta 80-ZRS-ZSS
- Beta 80-C-ZSS
- Beta 100-ZRS-ZSS
- Beta 100-D-ZSS
- Beta 110-ZRS-ZSS
- Beta 120-ZRS-ZSS
- Beta 140-ZRS-ZSS
- Beta 140-C-ZSS
- Beta 165 - ZSS
- Beta 180 - ZSS
- Beta 180-C-ZRS-ZSS

The drawings show the Beta 60-ZSS type and serve as examples for all other types, though some of the details may differ.

1 Safety

The Assembly and Maintenance Manual is a component element of the product package, and must always be kept to hand as a reference source.
The Manual must be passed on if the unit is sold on or given away.

If there is anything in this manual which you do not fully understand, please be sure to contact the manufacturers.

1.1 Symbols used

This manual employs the following symbols to indicate hazards as well as other types of symbol:

DANGER

Indicates immediate danger.
Failure to observe this notice entails risk of death or very serious injury.

WARNING

Indicates moderate risk.
Failure to observe this notice may result in death or serious injury.

CAUTION

Indicates minor risk.
Failure to observe this notice may result in light to moderate injury or damage to property.

☛ Note
Indicates tips on use of the machine and optimising its efficiency.

1.2 Regulation use

The mechanical linear unit is intended for installation in machines, and is used solely for manipulating, positioning, transporting, palletising , loading, unloading, clamping, clocking, tensioning, testing, measuring, handling and pushing workpieces or tools.

Pay attention to the basic applications of the linear unit set out in sections 4 and 3.

In order to comply with the EU Directive governing Electromagnetic Compatibility (EMC), the mechanical linear unit may only be used in industrial environments.

Any other use, or use for purposes beyond those stipulated, will be classed as illegitimate. The manufacturers accept no liability for any loss thereby incurred. The risk is borne solely by the operators.

1.3 General safety

Preconditions for operation

The linear unit must not be put into operation until the machine or line into which it is installed conforms to the following:

- Relevant accident prevention regulations
- Generally accepted safety standards
- EU directives
- Standards governing the electromagnetic compatibility of machinery
- Other applicable standards
- Applicable national legislation.

Safe operation

To ensure safe operation, refer to the following documents:

- This operating manual for the linear unit, particularly the technical data
- The operating manual for the line into which it is installed

1.4 Use in clean rooms (ISO 14644)

The linear units used in clean rooms are fitted with a vent hole (generally G1/8“) at the basic profile.

The following guidelines must be observed:

- The linear unit must be subjected to a negative pressure of 0.8 bar.
- The linear unit must be relubricated with a grease suitable for use in clean rooms (basic lubrication carried out using Klüberplex BE11-462).

1.5 Use in explosive environments

If the linear units are used in potentially explosive environments, operators must take steps to prevent explosions in accordance with ATEX Directives 94/9/EC and 1999/92/EC and ensure explosion-proofing is installed.

The following ATEX rules must be observed:

- Operators must check the linear unit at least once a week, and ideally every day. The checks should cover: smooth running, functionality of all seals, and adequate lubrication.
- After being in continuous service for approximately 5000 hours, the functionality of the linear unit must be checked by a qualified expert assigned by the manufacturer.

- The operator/manufacturer of the end-product must ensure that the linear unit is integrated into the potential equalisation system of the overall plant at the ports provided for the purpose. Where the unit is used in a dust-explosion hazard zone, the compressed air supply must additionally be connected to the linear unit.
- The limit switches must be supplied via an isolating amplifier. For the EX isolation an intrinsically safe input circuit is required. The isolating amplifier is not supplied by HSB.
- The linear unit may only be used under the conditions approved by the manufacturer. They include:
  - Ambient temperature
  - Maximum output
  - Speed < 1 m/s; When using a monitored central lubrication system up to 1.5 m/s, and where the unit is used in a dust-explosion hazard zone additionally with a monitored compressed air supply
  - Loading
  - Pressure
  - Frequency etc.

1.6 Technical condition of the linear unit

State of the art

The unit conforms to the current state of the art and applicable rules and regulations. The unit conforms to the EU Machinery Directive, harmonised European standards or corresponding national standards:

- Machinery Directive 2006/42/EC
- EN ISO 12 100-1 and 12 100-2 Safety of machinery, equipment and plant
- EN ISO 13850:2006: Safety of machinery; emergency-stop devices
- DIN EN 60 204-1:2006: Electrical equipment for industrial machines
- 2004/108/EC: EMC Directive
- EMVG: German law relating to the electromagnetic compatibility of equipment dated 26.02.2008 (Federal Gazette I p. 220)

1.7 Modifications to the linear unit

Modifications

The linear unit must not be modified, either in its basic design or in its safety components, without our written consent. Any such unauthorised modification will void our liability in respect of the unit.

The operating company may only carry out the maintenance and repair work detailed in this operating manual. Any other measures, such as to replace wearing parts and components, may be carried out only in consultation with our service engineers, by the service engineers themselves, or by us directly.

Installed safety devices must never be dismantled or disabled.

When fitting special attachments to the unit, follow the fitting instructions provided by the manufacturers!

1.8 Requirements for personnel

The linear unit has been designed and built in accordance with the state of the art and accepted safety standards. Hazards may nevertheless be posed when operating it. Consequently, the unit may only be installed and operated by trained, competent personnel.

All personnel assigned to install, operate, maintain, repair or dismantle a linear unit must have read and understood this operating manual, and in particular section 1, “Safety”.

Work on parts carrying live electrical current may be carried out only by trained electricians. Such work includes:

- Installing safety limit switches
- Mounting a drive unit
- Checking the direction of rotation of the drive

1.9 Obligations of the operating company

Instruction of personnel

In accordance with EU Health and Safety Directive 89/655/EEC articles 6(1) and 7 and with the Framework Directive 89/391/EEC articles 1(1) and 6(1), the company operating the linear unit must provide personnel assigned to install, operate, maintain, repair or dismantle the unit with appropriate instruction, in particular with regard to safety.
We recommend that companies require their personnel to provide written confirmation of having received such instruction.

Checking the unit

In accordance with EU Health and Safety Directive 89/655/EEC article 4a, the operating company must subject to the unit to thorough checking prior to putting it into operation, after carrying out repairs, and after malfunctions have occurred.

Legibility and maintenance of affixed notices and labels

The operating company must ensure that all notices and labels attached to the unit are fully legible (in particular details of the serial number) and must ensure compliance with all instructions contained on them. Damaged or illegible notices and labels must be replaced.

2 Warranty

The warranty conditions are laid down in the terms and conditions of delivery and payment issued at time of order. Warranty cover will be voided if:

- the unit is not operated in accordance with the stipulated regulation use;
- the instructions set out in this operating manual are not followed;
- the unit is modified without the consent of the manufacturers;
- screws sealed by locking varnish are unlocked.

The manufacturer's warranty in respect of maintenance and repair work applies only if original replacement parts are used.

3 Technical data – Standard model

Technical data - Linear unit Beta type with timing belt drive	Sizes								
	Beta 60	Beta 70-C		Beta 80		Beta 80-C	Beta 100		Beta 100-D
	ZSS	ZRS	ZSS	ZRS	ZSS	ZSS	ZRS	ZSS	ZSS
Drive element	Timing belt								
Stroke per revolution [mm]	160	175	175	220	220	210	200	200	160
Velocity max. [m/s]	5,00	8,00	5,00	8,00	5,00	5,00	8,00	5,00	5,00
Acceleration max. [m/s^2]	30	30	30	40	40	40	40	40	60
No-load torque [Nm]	1,10	1,20	1,20	1,50	1,50	1,80	2,50	2,50	2,50
Maximum travel (standard) [mm]	7620	7640	6840	7600	7600	7600	7420	7420	7720
Repeat accuracy [mm]	±0,08	±0,08	±0,08	±0,08	±0,08	±0,08	±0,08	±0,08	±0,08
Operating temperature [°C] (continuous operation)	0...80	0...80	0...80	0...80	0...80	0...80	0...80	0...80	0...80
Geometrical moment of inertia I_Y [mm^4]	400283	858283	563059	1294343	1303940		1782959		917779
Geometrical moment of inertia I_Z [mm^4]	521983	854713	852507	1732340	1680598		3507213		2328911
Length of standard carriage [mm]	190	190	190	210	210	210	280	280	210
Length of long carriage [mm]	230	240	240	270	270	270	400	400	270
Weight (without travel) [kg]	4,55	3,10	3,40	5,50	6,10	7,80	9,50	9,10	6,80
Weight (per 100 mm travel) [kg]	0,59	0,59	0,38	0,60	0,85	0.98	1,10	1,45	0,75
Weight of standard carriage [kg]	1,22	1,30	1,65	2,10	1,80	2,75	4,10	3,80	3,50
Weight of long carriage [kg]	1,72	1,65	2,10	2,70	2,30	3,25	5,85	5,43	4,10
Noise emission max. [dB A] [1)]	80	80	80	80	80	80	80	80	80

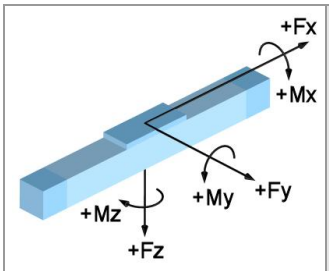
[1)] *The figure will vary based on assembly with other system components*

Technical data - Linear unit **Beta type with timing belt drive**	**Sizes**								
	Beta 110		**Beta 120**		**Beta 140**		**Beta 140-C**	**Beta 165**	
	ZRS	**ZSS**	**ZRS**	**ZSS**	**ZRS**	**ZSS**	**ZSS**	**ZSS**	
Drive element	Timing belt								
Stroke per revolution [mm]	300	300	240	240	220	220	220	440	
Velocity max. [m/s]	8,00	5,00	8,00	5,00	8,00	5,00	5,00	5,00	
Acceleration max. [m/s^2]	60	60	60	60	60	60	60	60	
No-load torque [Nm]	3,50	3,50	3,00	3,00	2,50	2,50	2,50	12,00	
Maximum travel (standard) [mm]	7520	7520	7520	7520	7540	7540	8100	6920	
Repeat accuracy [mm]	±0,08	±0,08	±0,08	±0,08	±0,08	±0,08	±0,08	±0,08	
Operating temperature [°C] (continuous operation)	0...80	0...80	0...80	0...80	0...80	0...80	0...80	0...80	
Geometrical moment of inertia I_Y [mm^4]	5114812	4974348	3095671		3159202		3127894	25391136	
Geometrical moment of inertia I_Z [mm^4]	6177042	5898662	7114115		9975915		9071334	31673479	
Length of standard carriage [mm]	320	320	320	320	320	320	320	400	
Length of long carriage [mm]	500	500	500	500	500	500	500	600	
Weight (without travel) [kg]	15,70	18,00	12,50	13,00	13,50	15,00	15,00	42,40	
Weight (per 100 mm travel) [kg]	1,50	2,10	1,30	1,70	1,30	1,70	1,70	3,50	
Weight of standard carriage [kg]	4,80	5,20	6,00	6,50	7,00	7,50	7,50	11,90	
Weight of long carriage [kg]	7,50	8,20	9,40	10,20	11,00	11,70	11,70	17,90	
Noise emission max. [dB A] [1)]	80	80	80	80	80	80	80	80	

[1)] *The figure will vary based on assembly with other system components*

Technical data - Linear unit **Beta type with timing belt drive**	**Sizes**								
	Beta 180		**Beta 180-C**						
	ZSS		**ZRS**	**ZSS**					
Drive element	Timing belt								
Stroke per revolution [mm]	320		320	320					
Velocity max. [m/s]	5,00		8,00	5,00					
Acceleration max. [m/s^2]	60		60	60					
No-load torque [Nm]	8,00		8,00	8,00					
Maximum travel (standard) [mm]	7500		7500	7500					
Repeat accuracy [mm]	±0,08		±0,08	±0,08					
Operating temperature [°C] (continuous operation)	0...80		0...80	0...80					
Geometrical moment of inertia I_Y [mm^4]	9236448								
Geometrical moment of inertia I_Z [mm^4]	23586987								
Length of standard carriage [mm]	380		380	380					
Length of long carriage [mm]	600		600	600					
Weight (without travel) [kg]	37,70		37,70	39,70					
Weight (per 100 mm travel) [kg]	2,40		1,90	2,60					
Weight of standard carriage [kg]	11,20		13,50	14,65					
Weight of long carriage [kg]	15,70		14,60	15,75					
Noise emission max. [dB A] [1)]	80		80	80					

[1)] *The figure will vary based on assembly with other system components*



Forces and moments - Beta linear unit with timing belt drive

Type designation	Dynamic forces [Nm]				Dynamic moments [Nm]			
	F_X	F_Y	F_Z	$-F_Z$	M_X	M_Y	M_Z	$M_{no\text{-}load}$
Beta 40-ZGS	500	80	150	75	6	6	8	0,30
Beta 40 - ZSS	500	500	600	300	12	30	30	0,30
Beta 50-C-ZRS	700	300	600	400	30	50	50	0,40
Beta 50-C-ARS	700	300	600	400	30	50	50	1,50
Beta 60 - ZSS	850	500	1400	800	50	160	100	1,10
Beta 70-A-ZRS	800	300	1000	400	35	120	50	1,00
Beta 70-C-ZRS	1100	300	1000	400	35	120	50	1,00
Beta 70-C-ZSS	1100	600	1800	1200	60	180	120	1,20
Beta 70-C-ARS	900	300	1000	400	35	120	50	1,00
Beta 70-C-ASS	900	600	1800	1200	60	180	120	1,20
Beta 80-ZRS	1350	500	1500	800	50	180	100	1,50
Beta 80 - ZSS	1350	800	3000	2000	100	250	250	1,50
Beta 80-C-ZSS	2200	1600	4000	3000	300	500	500	1,80
Beta 80-ARS	1000	500	1500	800	50	180	100	1,50
Beta 80-ASS	1000	800	3000	2000	100	250	250	1,50
Beta 100-ZRS	2800	1000	2500	1200	200	250	200	2,50
Beta 100 - ZSS	2800	1000	3000	2000	200	250	250	2,50
Beta 100-D-ZSS	2200	1800	4000	3000	350	750	750	3,00
Beta 110-ZRS	4000	2000	5000	2500	300	600	450	3,50
Beta 110 - ZSS	4000	3000	8000	4000	400	800	600	3,50
Beta 110-ARS	2000	2000	5000	2500	300	600	450	3,50
Beta 110-ASS	2000	3000	8000	4000	400	800	600	3,50
Beta 120-ZRS	4000	2500	5000	3000	350	700	700	3,50
Beta 120 - ZSS	4000	3000	8000	4000	400	800	600	3,50
Beta 140-ZRS	4000	2500	5000	3000	350	700	700	4,50
Beta 140 - ZSS	4000	2500	6000	4000	500	1000	1000	4,50
Beta 140-C-ZSS	4000	3200	7500	5000	600	1200	1200	4,50
Beta 140-ARS	1800	2500	5000	3000	350	700	700	4,50
Beta 140-ASS	1800	2500	6000	4000	500	1000	1000	4,50

Type designation	Dynamic forces [Nm]				Dynamic moments [Nm]			
	F_X	F_Y	F_Z	$-F_Z$	M_X	M_Y	M_Z	$M_{no\text{-}load}$
Beta 140-C-ASS	1800	3200	7500	5000	600	1200	1200	4,50
Beta 165 - ZSS	10000	5000	15000	8000	700	1400	1100	12,00
Beta 180-ASS	3500	6000	12000	6000	1500	3000	1500	8,00
Beta 180-ASS	3500	6000	12000	6000	1500	3000	1500	8,00
Beta 180 - AZSS	4500	8000	16000	8000	2000	4000	2000	10,00
Beta 180-C-ZRS	6000	6000	10000	6000	1200	2000	1200	8,00
Beta 180-C-ZSS	6000	8000	15000	8000	1800	3600	1800	8,00
Beta 180-C-ARS	3500	6000	10000	6000	1200	2000	1200	8,00
Beta 180-C-ASS	3500	8000	15000	8000	1800	3600	1800	8,00

Figures in ( ) relate to the long carriage.

$M_{no\text{-}load}$ = No-load torque ±30%

The forces and moments quoted are maximum values for the single load. In the event of combined loading or simultaneous occurrence of multiple moments or forces, the individual values must be reduced. In case of doubt consult Technical Support.

Dynamic load ratings of rail guides - Beta linear unit

Model	Size	Number of rails	Number of carriages	Load rating per carriage C_{dyn} [N] THK / Rex*	Preten-sion F_V THK / Rex*	M_t [Nm] THK / Rex*	Guide spacing in direction x (lx1) [mm]	Guide spacing in direction y (ly) [mm]
Beta 40	12	1	2	3175 / 1205	-	25 / 14	83 (163)	-
Beta 60	15	1	2	11271 / 7800	3% / 8%	60 / 74	106 (156)	
Beta 70	15	1	2	11271 / 7800	3% / 8%	60 / 74	124 (174)	-
Beta 80	20	1	2	17700 / 18800	3% / 8%	210 / 240	128 (188)	-
Beta 80-C	25	1	2	25160 / 22800	3% / 8%	340 / 320	122 (182)	-
Beta 100	20	1	2	17700 / 18800	3% / 8%	210 / 240	152 (272)	-
Beta 100-D-ZSS	15	2	4	11271 / 7800	3% / 8%	-	150 (210)	56
Beta 100-D-ASS	15	2	4	11271 / 7800	3% / 8%	-	192	56
Beta 100-D-SSS	15	2	4	11271 / 7800	3% / 8%	-	150 (210)	56
Beta 110	25	1	2	25160 / 22800	3% / 8%	340 /320	203 (383)	-
Beta 120	25	1	2	25160 / 22800	3% / 8%	340 / 320	144 (324)	-
Beta 120-C	30	1	2	35558 / 31700	3% / 8%	580 /540	184 (364)	-
Beta 140	15	2	4	11667 / 7800	3% / 8%	-	180 (330)	72
Beta 140-ASS	15	2	4	11667 / 7800	3% / 8%	-	242 (322)	72
Beta 140-C-ZSS	20	2	4	17700 / 18800	3% / 8%	-	200 (400)	76
Beta 140-C-ASS	20	2	4	17700 / 18800	3% / 8%	-	220 (300)	76
Beta 140-C-SSS	20	2	4	17700 / 18800	3% / 8%	-	210 (360)	76
Beta 165-ZSS	35	1	2	49448 / 41900	3% / 8%	985 / 890	198 (398)	-
Beta 165-SSS	35	1	2	49448 / 41900	3% / 8%	985 / 890	219 (329)	-
Beta 180-ZSS	20	2	4	17700 / 18800	3% / 8%	-	172 (392)	84
Beta 180-AZSS	20	2	8	17700 / 18800	3% / 8%	-	430	84
Beta 180-ASS	20	2	4	17700 / 18800	3% / 8%	-	306	84
Beta 180-SSS	20	2	4	17700 / 18800	3% / 8%	-	247 (467)	84
Beta 180-C-ZSS	25	2	4	25160 / 22800	3% / 8%	-	272 (492)	84
Beta 180-C-ASS	25	2	4	25160 / 22800	3% / 8%	-	307	84
Beta 180-C-SSS	25	2	4	25160 / 22800	3% / 8%	-	233 (453)	84

Figures in ( ) relate to the long carriage
The load rating and pre-tension figures relate to the standard linear guidance system with recirculating linear ball bearings
** Rex = Rexroth*

Static and dynamic load ratings of roller guides - Beta linear unit

Model	Size (∅) [mm]	Number of load-bearing rollers for Fz	Number of load-bearing rollers for Fy	Load rating per roller C_{stat} [N]	Load rating per roller C_{dyn} [N]	Guide spacing* in direction x [mm]		Guide spacing in direction y [mm]
						lx1	lx2	ly
Beta 50-C	20	4	2	600	1.500	86 (136)	86 (136)	30,5
Beta 70	20	4	2	600	1.500	74 (124)	138,5 (188)	41
Beta 80	20	4	2	600	1.500	95 (155)	156,5 (216)	41,5
Beta 100	28	4	2	1.300	3.200	136 (256)	223 (343)	47
Beta 110	28	4	2	1.300	3.200	175 (355)	262 (424)	66
Beta 120	35	4	2	3.000	6.800	148 (328)	148 (328)	70
Beta 140	35	4	2	3.000	6.800	202 (352)	202 (389)	98
Beta 180	35	4	2	3.000	6.800	272 (492)	272 (492)	121
Beta 180-C	47	4	2	6550	13500	224 (444)	224 (444)	125

The pre-tension per roller is approximately 5%

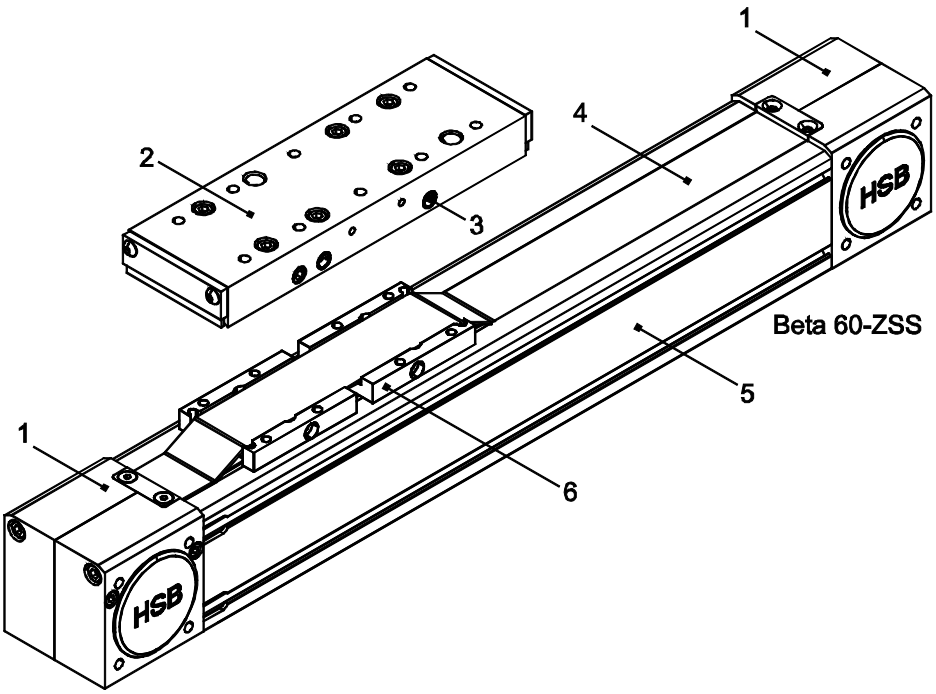
Tightening torques [Nm] for fixing screws						
Fixing screws	**M4**	**M5**	**M6**	**M8**	**M10**	The figures given are intended as guides. For shorter insertion depths, the figures must be adjusted accordingly.
DIN912/ISO4762-8.8	2,7	5,4	9,0	22,0	43,0	
DIN912/ISO4762-10.9	3,0	5,7	9,0	22,0	43,0	
DIN912/ISO4762-12.9	3,0	5,7	9,0	22,0	3438,0	

Tightening torques [Nm] for clutch with clamping hub					
Size	**14**	**19**	**24**	**28**	**38**
Clutch diameter [mm]	30	40	55	65	80
Screw size	M3	M6	M6	M8	M8
Tightening torque [Nm]	1,34	10,50	10,50	25,00	25,00

Tightening torques [Nm] for clutch with clamping ring hub					
Size	**14**	**19**	**24**	**28**	**38**
Clutch diameter [mm]	30	40	55	65	80
Screw size	M3	M4	M5	M5	M6
Tightening torque [Nm]	1,34	2,90	6,00	6,00	10,00

4 Product description

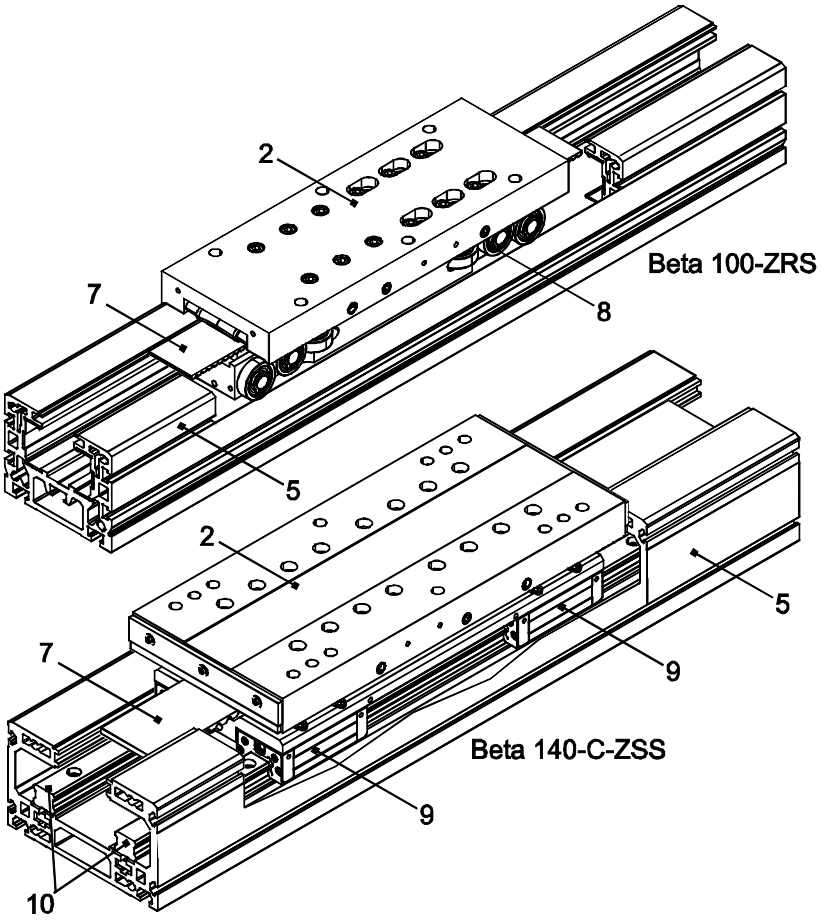
Linear unit with timing belt drive



Key				
	1	Bearing casing	4	Cover band
	2	Carriage	5	Base profile
	3	Lubricating nipple	6	Driver

Figure 1: Component assemblies of the Beta 60 linear unit with timing belt drive

Roller bearing and linear guidance system



Key	2	Carriage	8	Roller bearing guidance system
	5	Base profile	9	Recirculating ball bearing
	7	Timing belt	10	Guide rails

Figure 2: Guide elements

A mechanical linear unit converts rotational motion into linear motion and is used to move loads quickly, safely and precisely from one position to another. It consists of an aluminium base profile, a moving carriage supported by a guide element (recirculating ball bearing or roller bearing guidance system) and a drive element (screw or timing belt drive).

Depending on its design, the carriage is able to absorb forces and moments in all directions, and is positively connected to the guidance and drive elements by way of the so-called drivers.

The base profile is self-supporting up to a certain length, and is equipped with grooves for mounting.

As an option, the linear unit can be equipped with accessories such as a cover, screw supports, inductive or mechanical limit switches and other fittings(see section 6.3).

The effective range can be flexibly configured. Multiple linear units of the Alpha, Beta or Delta type can be arranged two-dimensionally (2 axes) or three-dimensionally (3 axes).
Driven linear units can be connected to non-driven units of the same type by a plate, to be able to take large-area loads for example.

5 Transportation and storage

The mechanical linear unit is a precision item. Its mechanism may be damaged by heavy jolting, resulting in impairment of its functions.

CAUTION

Risk of damage by heavy jolting or bending!
Transport the assembled linear unit only with the transit protection fitted.

To prevent damage during transportation and storage, protect the linear unit against shaking and sliding as follows:

- Stow it in a box of sufficient size.
- Use packing.

Section 3 lists the unit weights.

Protect the unit against:

- dirt;
- corrosion;
- water;
- and aggressive atmospheres.

6 Installation and adjustment

The linear unit can be attached by the following methods:

- On mounting rails
- By screws inserted into the sliding blocks
- By screws inserted into the factory-fitted tapped hole rails

☛ Install the linear unit on a flat surface. Unit parallelism < 0.2 mm/1,000 mm.

☛ Mounting by the rails with tapped holes in them is the preferable solution:
for highly dynamic applications;
where the linear unit has only two attachment points.

6.1 Installing the linear unit by mounting rails

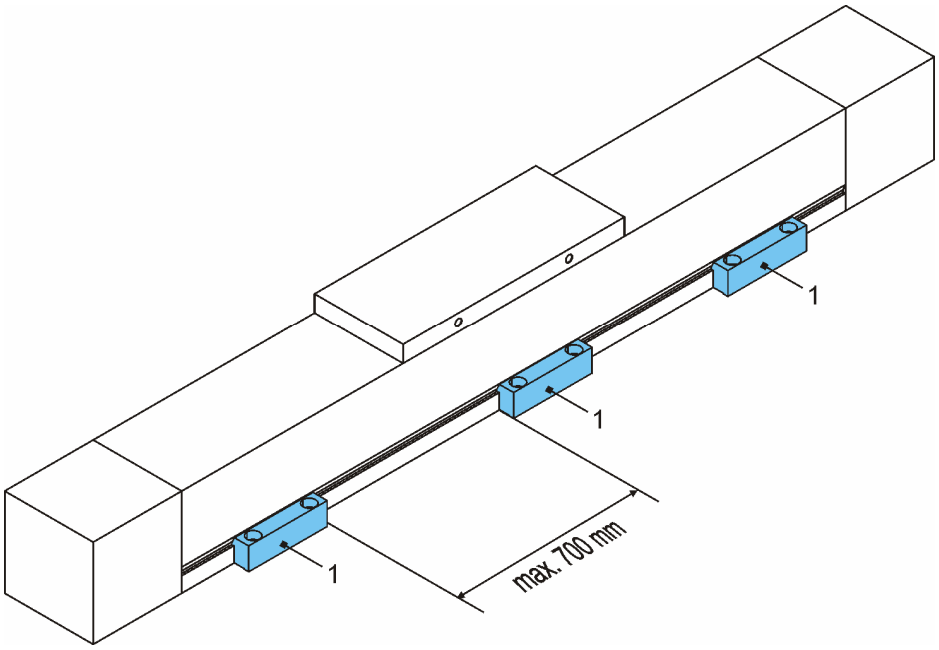


Figure 3: Mounting rails (1)

☛ The recommended maximum spacing between the mounting rails is 700 mm.

Procedure

1. Attach the mounting rails (1) loosely in position (figure 2).
2. Align the linear unit axially.
3. Tighten the mounting rails (1)
(for tightening torques see section 3).

6.2 Screwing the linear unit into place from below

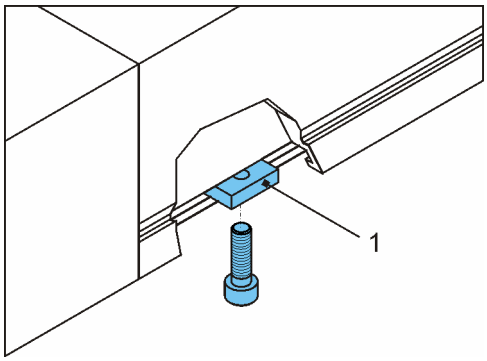


Figure 4: Sliding blocks (1) in the groove on the underside of the base profile

Attach the linear unit by the fixing screws from below using the sliding blocks or the tapped hole rails in the aluminium base profile (figure 3).

Procedure

1. Align the linear unit.
2. Align the sliding blocks (1)/tapped hole rails.
3. Tighten the linear unit
   (for tightening torques see section 3).

6.3 Setting maximum travel

DANGER

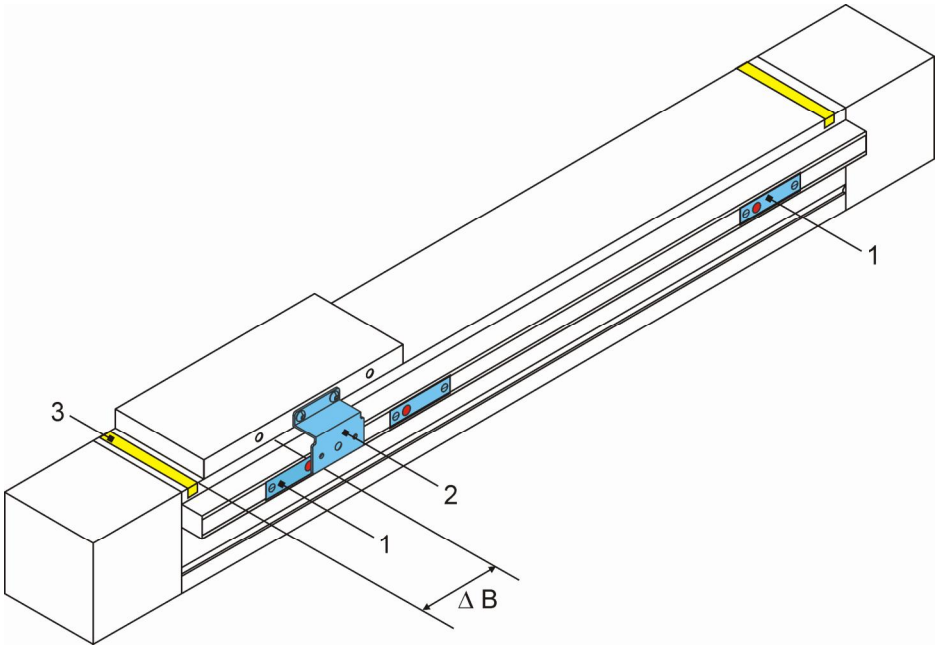
Serious injury may result if the transport carriers topple over.
If the carriage moves to its full extent beyond the safety zone, the transport carrier mounted on it may break away or topple over. The linear unit may be destroyed
During setup, observe the specified safety zone and set the limit switches accordingly.
Electrical switches may only be connected by qualified electricians.

☛ To stop the carriage promptly in the event of an emergency stop, allow for adequate braking distance.

6.3.1 Setting the positions of the inductive limit switches

The function of inductive proximity switches is to shut down the electric drive before the mechanical end position is reached.

The necessary braking distance (Δ B) depends on the velocity and deceleration of the carriage. The braking distance must be between the switching point of the proximity switch and the actual mechanical end position.



Key		
	1	Inductive limit switch
	2	Switching cam
	3	Band marking safety zone

Figure 5: Inductive limit switches

CAUTION

The limit switches must switch so that the carriage comes to a stop immediately before the safety zone. The safety zone is factory-marked on the unit by a band (3).

Procedure

1. Connect the power to the limit switches.
2. Slacken the limit switch fixing screws.
3. Run the carriage as far as the braking position.
4. Move the limit switch (NC contact) under the switching cam until it trips and the LED on the sensor goes out.
5. Move the carriage away.
6. Tighten the limit switch.
7. Check the correct position of the limit switch: Move the carriage manually and observe the switching operation.
8. Fit the limit switch array covering.

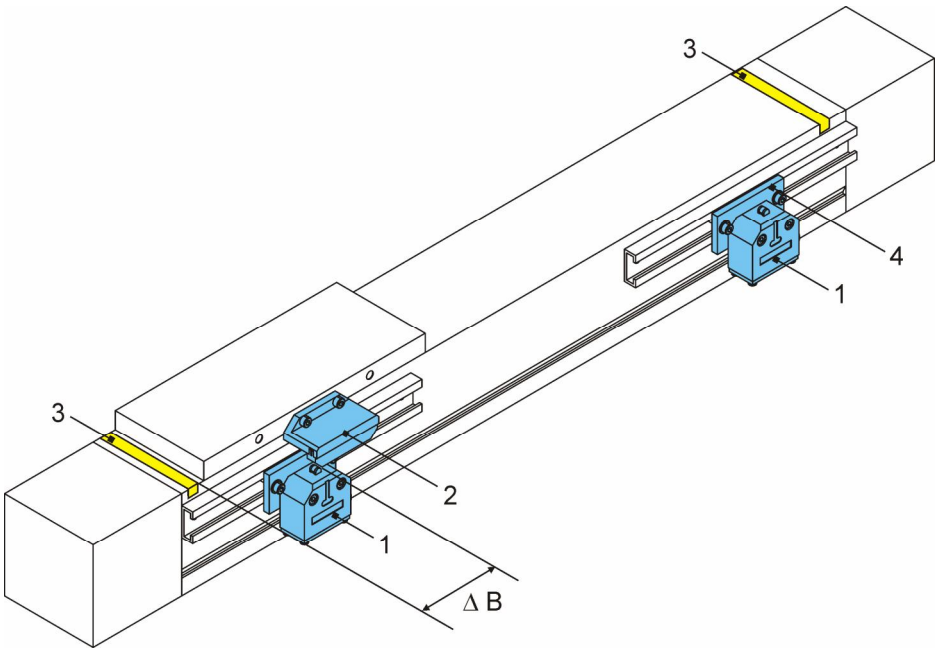
6.3.2 Setting the positions of the mechanical limit switches

Mechanical safety limit switches (NC contacts) must be used if a hazard is posed to personnel as soon as the electric drive fails to shut down.

The drive may only be started up when all limit switches are connected and correctly set!

A combination with inductive proximity switches is possible.

External shock-absorbers must be fitted to protect against mechanical destruction.
The necessary braking distance (Δ B) depends on the velocity and deceleration of the carriage. The braking distance must be between the switching point of the limit switch and the actual mechanical end position (figure 5).



Key		
	1	Mechanical limit switches
	2	Switching cam
	3	Band marking safety zone
	4	Bracket
	B	Braking distance

Figure 6: Mechanical limit switches

CAUTION

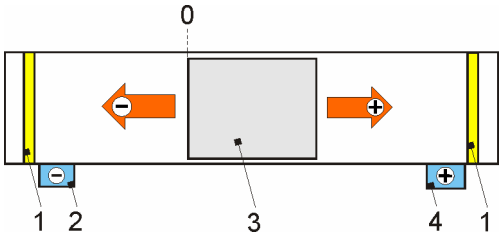
The limit switches must switch so that the carriage comes to a stop immediately before the safety zone. The safety zone is factory-marked on the unit by a band (3).

Procedure

1. Connect the power to the limit switches.
2. Slacken the bracket fixing screw (figure 5).
3. Run the carriage as far as the safety zone.
4. Move the limit switch until it trips.
5. Tighten the bracket fixing screw.
6. Check the correct position of the limit switch: Move the carriage manually and observe the switching operation.
   If the braking distance is too short, repeat the set-up.

6.4 Mounting a drive unit

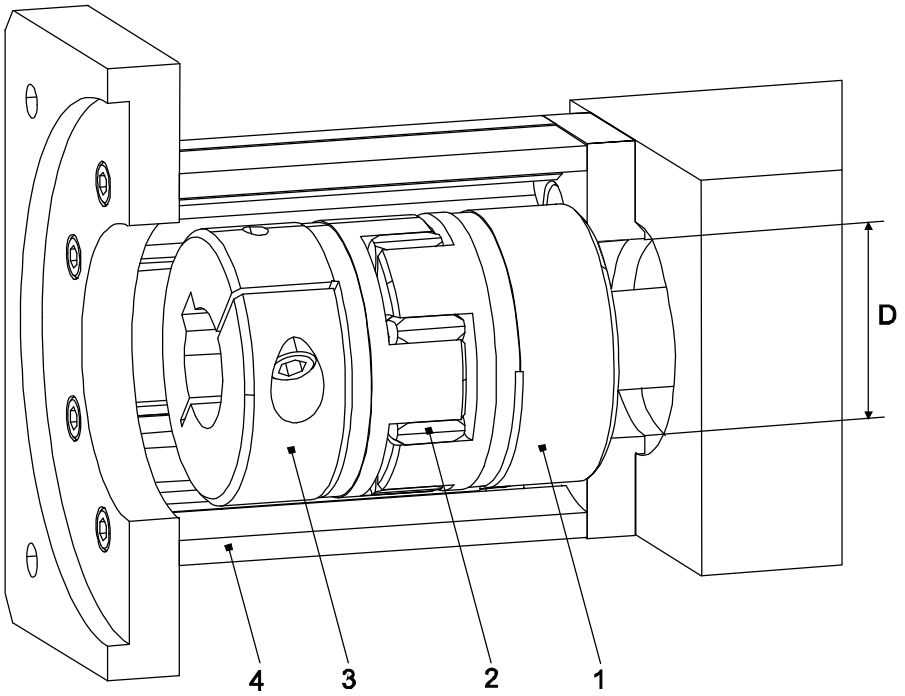
Make sure the direction of rotation of the external drive unit takes into account the direction of the spindle or timing belt so that the limit switches work correctly.



Key				
	1	Safety zone	3	Carriage with positive and negative directions from reference point 0
	2	Negative limit switch	4	Positive limit switch

Figure 7: Example of travel direction and limit switch configuration

6.4.1 Mounting a motor



Key				
	1	Clutch half 1	4	Motor housing
	2	Clutch ring	D	Diameter on motor housing
	3	Clutch half 2		

Figure 8 Motor housing with motor clutch on drive pin

Procedure

1. Place the motor and the clutch components in mounting position adjacent to the linear unit.
2. Check the direction of rotation of the motor. It must take into account the safety limit switches (figure 6). Alter the direction of the motor as necessary.
3. If the clutch diameter is less than the measure D on the motor housing (4), first mount clutch half 1 (1) (hole flush with drive shaft) and then the motor housing (4)
   (figure 7).

   If the clutch diameter is greater than the measure D on the motor housing (4), first mount the motor housing (4) and then the clutch half 1 (1) (hole flush with drive shaft). Tighten the clutch clamping screw through the mounting hole on the motor housing (4).
4. Slot the clutch ring (2) onto the clutch.
5. Mount clutch half 2 (3) on the motor pin.
6. Mount the motor on the motor housing.

7 Start-up

WARNING

Risk of personal injury or damage to other system components caused by rapid linear motion of the transport carrier, caused by thrown loads.
Only authorised specialist personnel may start up the linear unit.

WARNING

Risk of crushing if the transport carrier is moved in the wrong direction.
If the directions of rotation of the drive (motor or gearbox) and the carriage drive (spindle or timing belt) do not match, the mounted transport carrier may move in the wrong direction.
Only qualified electricians may carry out the electrical installation and check the direction of rotation.

Checks before start-up

Before starting the unit, check the following:

- Make sure the retaining fixtures conform to the mass and acceleration data provided by the manufacturers.
- Make sure the machine or line into which the linear unit is installed conforms to the EU Machinery Directive, the harmonised European standards or applicable national standards.
- Make sure the linear unit is correctly installed.
- Make sure the inductive and/or mechanical limit switches are correctly connected and working properly.
- Make sure the direction of rotation of the motor shaft and - where appropriate - of the interposed gearbox - matches that of the spindle or timing belt.

If the checks reveal any defects, prohibit start-up of the unit.

Trial run

To prevent accidents and collisions, run the linear unit along the extent of its travel at a speed slow enough for it to be stopped promptly in an emergency.

The line may be started up once it has been established that there is no risk of collision when the maximum travel is overrun.

8 Operation

Risk of damage from harmful environmental influences!
Operate the linear unit only under the ambient conditions approved by the manufacturers.

Ambient conditions

Operate the linear unit only within the permissible temperature range of 0 … 80 °C.

If the linear unit is operated in moist, abrasive medium, foreign bodies may penetrate it. To prevent that, the operating company must take appropriate measures to prevent intrusion of foreign bodies, such as by installing deflectors, baffle plates or air barriers.

Duty of inspection

The proper functioning of the linear unit must be checked periodically during operation.

The responsible personnel must check the linear unit and the line for external signs of damage and defects at least once every shift.

If changes occur which are detrimental to safety, shut down the line immediately.

9 Shutdown

Risk of personal injury or damage to other system components caused by falling system components.
Only authorised specialist personnel may disassemble the linear unit.

1. Cut the power to the machine/line.
2. Dismantle the drive from the linear unit.
3. Detach the linear unit from the machine/line.

10 Maintenance

- All installed ball bearings are sealed and maintenance-free.
- Remove excessive dust and dirt from the cover band and other components of the linear unit on a regular basis.
- The timing belt is maintenance-free. If the timing belt rips or is stretched beyond its elastic range, replace it.

10.1 Lubrication

Influencing factors

The following factors are key to determining the exact lubrication intervals required:

- Loading
- Velocity
- Motion
- Operating temperature
- Degree of dirtying

Short lubrication intervals

Short lubrication intervals are necessary:

- where there is susceptibility to dust and damp;
- under major loading;
- when running at high velocity (up to V_{max});
- when running over short travel distances.

Initial lubrication

☛ Carry out an initial lubrication after starting up the unit for the first time. A basic lubrication was applied at the factory.

Refer to the lubrication requirements set out in the following sections.

Lubrication points on linear units

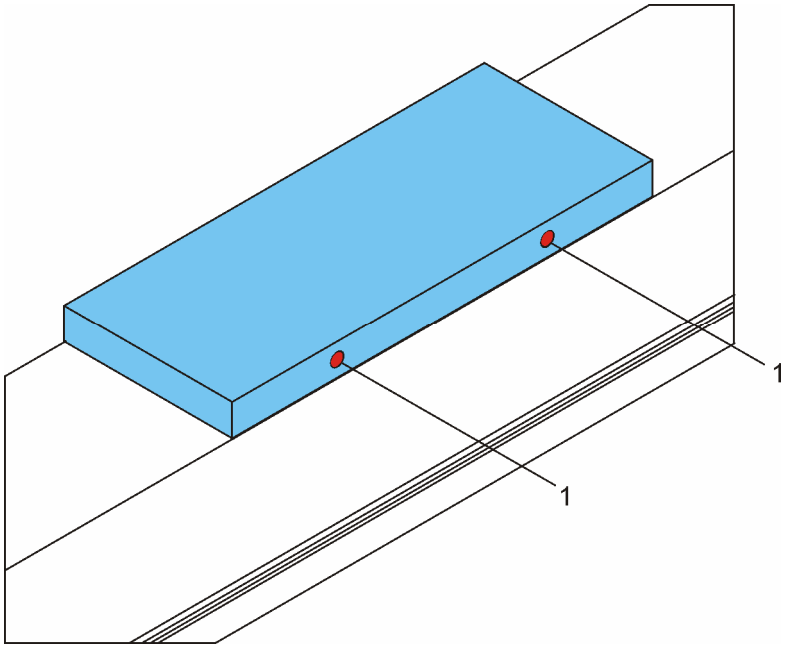


Figure 9: Possible lubrication points (1) on the carriage

The categories and positions of lubrication point depend on the model of linear unit. The categories of lubrication point are identified by the markings S, F, O on the unit.
There is a separate lubrication schedule for each lubrication point category.

Lubrication point category	Lubrication for…	Lubricant
S	Spindle	Grease
F	Guide elements	Grease
O	Guide elements	Oil

Lubrication method

Lubrication should, as far as possible, take place while the unit is running, so that the grease is distributed evenly and no pressure is built up.

Schedule for lubrication point F (for linear guide)

Carriage size	Lubrication interval	Grease quantity [cm³] per carriage	Grease type
15 with ball chain	approx. 5,000 km*	approx. 0.4	Greases to DIN 51825-KPE1R-20, e.g. Klüberplex BE 31-102 ☛ If other greases are used, pay attention to manufacturers' specifications! ☛ Greases containing solid lubricant (e.g. graphite, MoS2) must not be used!
20 with ball chain		approx. 0.6	
25 with ball chain		approx. 1.2	
30 with ball chain		approx. 1.5	
35 with ball chain		approx. 1.7	
20 without ball chain	approx. 1.000 km*	approx. 0.7	
35 without ball chain		approx. 2.2	
** Or at least 2x per year. The lubrication interval depends on the ambient temperatures and on the loading (see figure 11). Relubrication "in motion"!*			

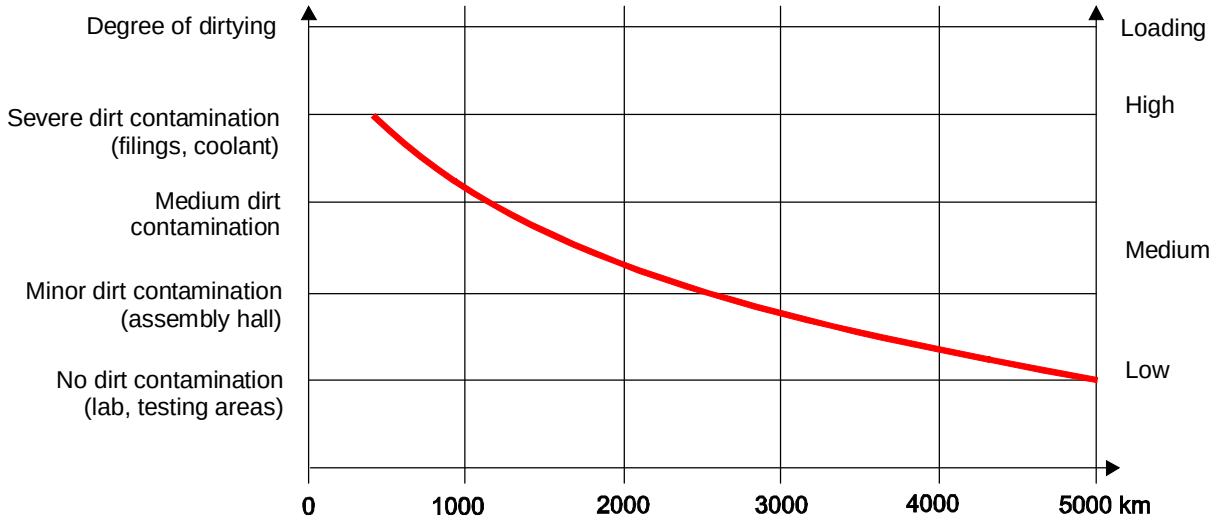


Figure 10: Relubrication intervals for the linear guidance system with recirculating linear ball bearings

Schedule for lubrication point O (for roller guideway)

Lubrication interval	Oil quantity [cm³]	Oil type
Every 2,000 km*	approx. 0.4	Oil to DIN 51825-KPE1R-20, e.g. Febis K68 or INTERFLON fin super ☛ If other oils are used, pay attention to manufacturers' specifications!
** Or at least 2x per year. The lubrication interval depends on the ambient temperatures and on the loading.*		

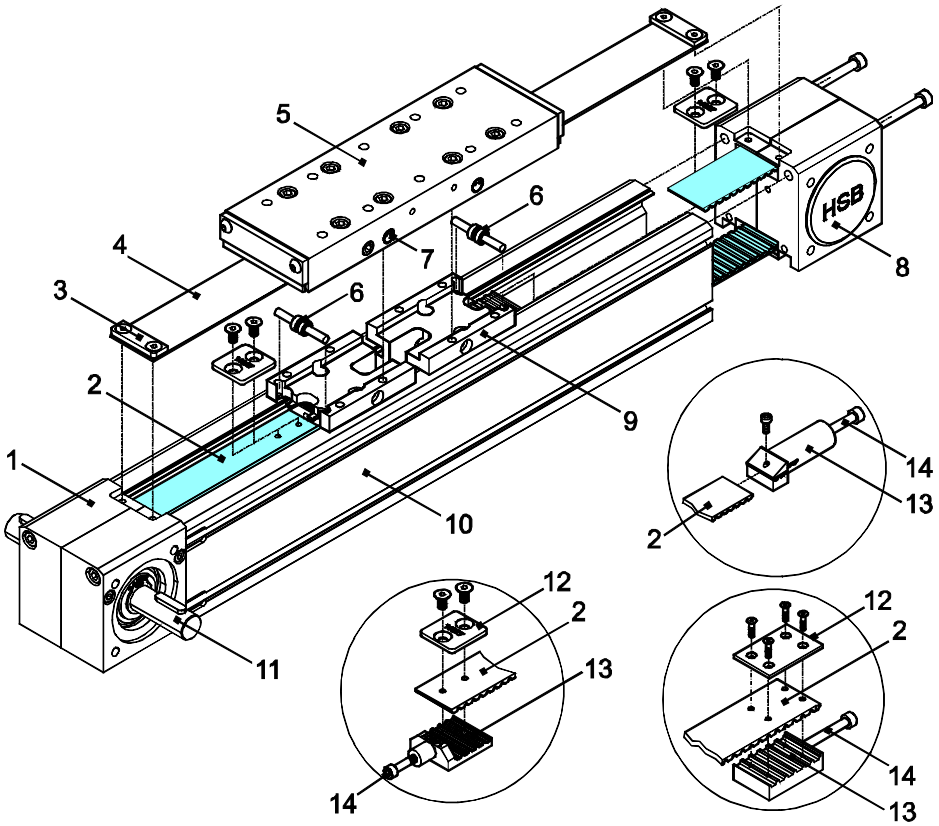
10.2 Replacing the timing belt

☛ To preserve the optimum running of the linear unit and prevent it from being damaged during operation, take care that no foreign bodies penetrate the base profile or other linear unit components during installation and assembly.

☛ Do not damage the standard parts (screws, pins, etc.) or the cover band and its elements; they will be re-used.

CAUTION

Risk of damage due to lack of lubrication!
Do not lose or damage the O-rings fitted on the lubricating apertures, otherwise component lubrication will not be guaranteed.



Key	1	Driven bearing casing	8	Non-driven bearing casing
	2	Timing belt	9	Driver
	3	Clamp fitting	10	Base profile
	4	Cover band	11	Drive shaft
	5	Carriage	12	Timing belt holder plate
	6	Lift roller	13	Timing belt holder
	7	Lubricating nipple	14	Clamping screws

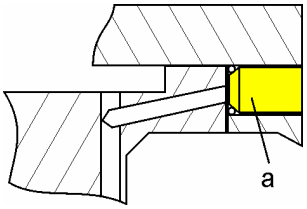
Figure 11: Exposing and replacing the timing belt

Procedure

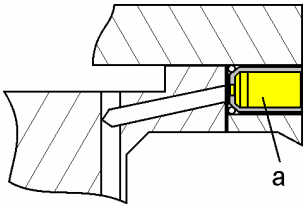
1. Dismantle the drive unit (motor, gearbox).

2. Loosen the lubricating nipples:

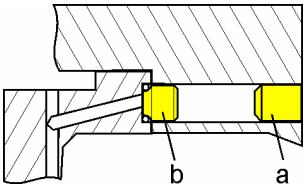
– On Beta 60 to 80
Unscrew all screw-fit lubricating nipples (a) about 2 turns so as not to damage the sealing faces.



– On Beta 60 to 80
Remove all conical lubricating nipples or the external lubrication ports and unscrew the lubricating adapters (a) about 2 turns so as not to damage the sealing faces.



– On Beta 100 to 180
Remove all screw-fit or conical lubricating nipples (a) or the external lubrication ports and unscrew the lubricating adapters (b) about 2 turns so as not to damage the sealing faces.



3. Run the carriage to the middle of the linear unit. Then unscrew it and lift it off.
Caution! Do not rotate the carriage. It must be refitted in the same position!

4. Unscrew the cover band clamp fittings.

5. Carefully lift the cover band over the timing belt out of its guideway and remove it.

6. Loosen the clamping screws and pull the two timing belt holders out of the driver. Do not lose the spacers, if fitted.

7. Unscrew the non-driven bearing casing.

8. With single-part timing belt holders: Unscrew the countersunk screws from the timing belt holders and detach the holders from the timing belt ends
With two-part timing belt holders: Unscrew the top parts.

9. Pull the defective timing belt out of the two bearing casings and remove it.

10. Insert the right-hand end of the new timing belt with its teeth facing upwards into the bottom slot on the non-driven bearing casing and push it out through the top slot.

11. Push the left-hand end of the new timing belt with its teeth facing upwards through the channel of the base profile.

12. Unscrew the driven bearing casing.

13. Push the left-hand end of the timing belt into the bottom slot on the driven bearing casing until the pulley engages.
14. Rotate the drive shaft by hand and push the timing belt out through the top slot in the bearing.
15. Secure the timing belt holders at the timing belt ends. Do not lock the screws with Loctite 243.
16. Attach both timing belt holders by the clamping screws (fitting spacers if available) to the driver but do not tighten them. Lock the clamping screws with Loctite 243.
17. Screw both bearings correctly onto the base profile. Lock the screws with Loctite 243.
18. Tighten the timing belt forcefully.
19. Set the precise specified tension using a tension meter (see meter operating instructions).

☛ Only by setting the correct tension as specified can optimum running be ensured.

20. The measurement position and the Hz figure applicable to the timing belt are provided along with the replacement belt. Tension the timing belt so that the specified Hz figure is indicated.
21. Insert the cover band over the timing belt with its broader side (with the chamfered cutting edge) facing downwards and fix it at one end by the clamp fitting.
22. Carefully press the cover band into its guideway along its entire length until it audibly snaps into place. Secure the loose end by the clamp fitting.

☛ The cover band must not stick out of its guideway at any point, otherwise it will be damaged.

23. Make sure the sealing rings are in the lubricating apertures on the inside of the carriage.
24. Mount the carriage in the original position on the driver(s) so that the holes of the plate precisely match the holes in the parts beneath.

    Tip:
    The correct alignment is indicated by the drilling template.
25. Screw the carriage to the drivers beneath. Use only the original screws. The screws must be centred in the holes.

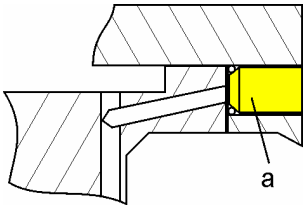
☛ If you do not use the original screws, make sure the screws you use are not too long, otherwise they will protrude on the base profile or the cover band and cause damage.

26. Replace the bands indicating the safety zones at the right and left ends of the linear unit as necessary.

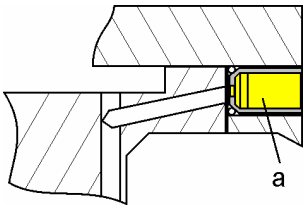
27. Only for linear units with cover bands above the timing belt: To ensure the cover band engages safely in its guideway, slowly move the carriage along its entire travel distance by hand.

28. Fit the lubricating nipples:

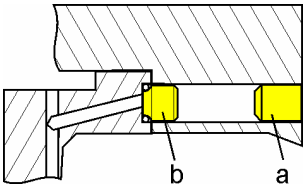
– On Beta 60 to 80
Insert the screw-fit lubricating nipples.



– On Beta 60 to 80
Fit the lubricating adapters and then the conical lubricating nipples or the external lubrication ports.



– On Beta 100 to Beta 180
Fit the lubricating adapter and then the screw-fit lubricating nipple.

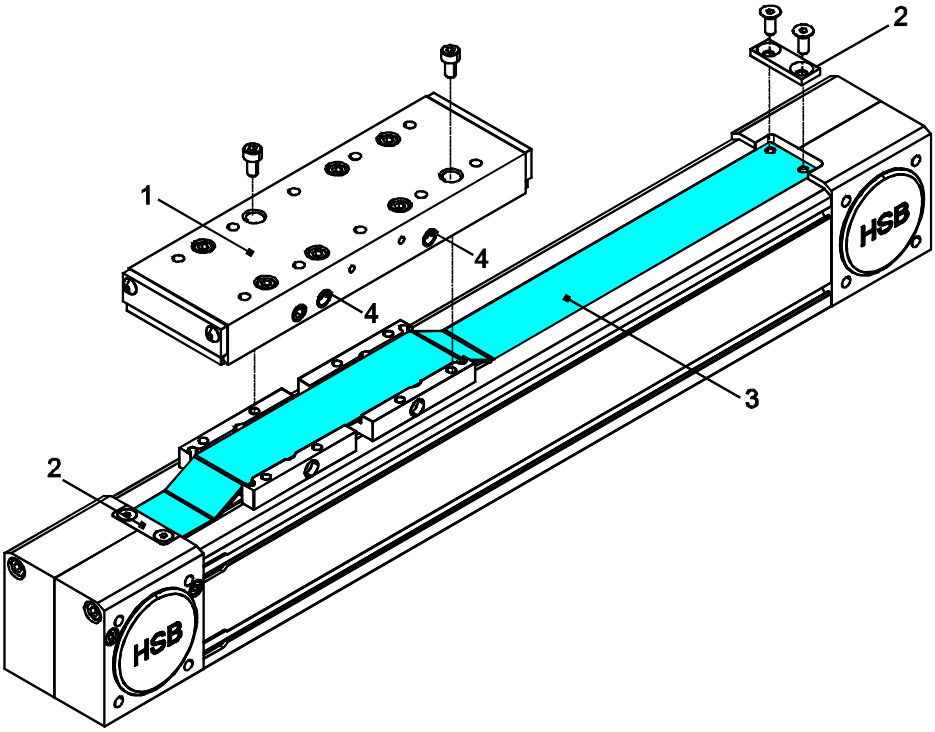


10.3 Replacing cover bands

☛ To preserve the optimum running of the linear unit and prevent it from being damaged during operation, take care that no foreign bodies penetrate the base profile or other linear unit components during installation and assembly.

☛ Do not damage the standard parts (screws, pins, etc.) or the dismantled components; they will be refitted.

☛ If cover bands are worn, also replace the band guide elements. If cover bands are damaged, check the band guide elements for wear and replace them only as necessary.



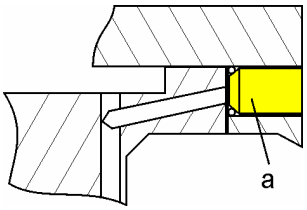
Key		
	1	Carriage
	2	Clamp fitting
	3	Cover band
	4	Lubricating nipple

Figure 12: Cover band based on the example of the Beta 60-ZxS linear unit

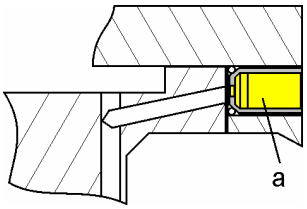
Procedure

1. Loosen the lubricating nipples:

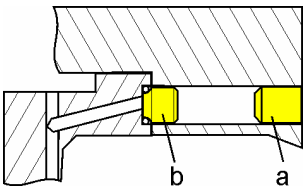
– On Beta 60 to 80
Unscrew all screw-fit lubricating nipples (a) about 2 turns so as not to damage the sealing faces.



– On Beta 60 to 80
Remove all conical lubricating nipples or the external lubrication ports and unscrew the lubricating adapters (a) about 2 turns so as not to damage the sealing faces.



– On Beta 100 to 180
Remove all screw-fit or conical lubricating nipples (a) or the external lubrication ports and unscrew the lubricating adapters (b) about 2 turns so as not to damage the sealing faces.



2. Move the carriage into the middle. Then unscrew it and lift it off. Caution! Do not rotate the carriage. It must be refitted in the same position!

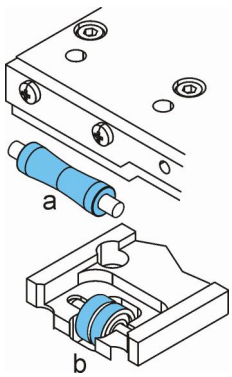
☛ Do not lose the O-rings fitted on the lubricating apertures on the inside of the carriage.

3. Detach the clamp fittings from the ends of the cover band and remove the cover band.

4. Check the band guide elements, such as the press rollers (a), lifting rollers (b) and locating pins, for wear.

– If the cover band is worn, be sure also to replace the band guide elements. Worn guide elements will damage the new cover band.

– If the cover band is damaged, only replace the band guide elements if they are damaged.
Fit press rollers (a) with the larger diameter on the outer.

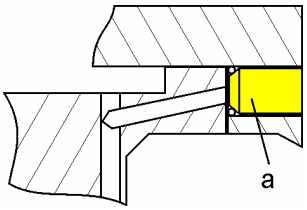


5. Insert the new cover band with its broader side (with the chamfered cutting edge) facing downwards and fix it at one end by the clamp fitting.

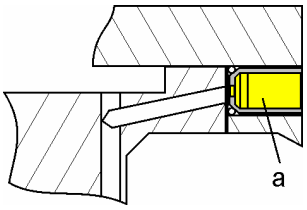
6. Carefully press the cover band into its guideway along its entire length until it audibly snaps into place. It must not stick out at any point, otherwise it will be damaged.

7. Stretch the cover band and fix it by the clamp fitting at the other end.
8. Make sure the O-rings are fitted on the lubricating apertures on the underside of the carriage and refit the carriage in the correct position.
9. To check that the carriage is correctly installed, run it slowly from one end of the linear unit to the other, ensuring the cover band is held all the time in its guideway.
10. Fit the lubricating nipples:

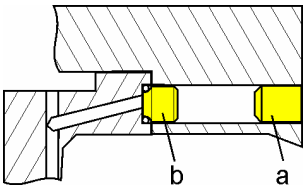
- On Beta 60 to 80
  Insert the screw-fit lubricating nipples.



- On Beta 60 to 80
  Fit the lubricating adapters and then the conical lubricating nipples or the external lubrication ports.



- On Beta 100 to Beta 180
  Fit the lubricating adapter and then the screw-fit lubricating nipple.



Appendix 2

Drive MSK

DE

Projektierungsanleitung
Rexroth IndraDyn S Synchronmotoren MSK

Die Projektierungsanleitung für Synchronmotoren MSK kann auf der Internetseite von Rexroth heruntergeladen werden.

www.boschrexroth.com

➔ Dokumentation und Downloads

➔ Suchbegriff: R911296288

EN

Project Planning Manual
Rexroth IndraDyn S Synchronous Motors MSK

The Project Planning Manual for Synchronous Motors MSK can be downloaded from the website of Rexroth.

www.boschrexroth.com

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