



Linear actuator with linear recirculating ball bearing and guideway assembly and toothed belt drive

**MKUVE20-B-ZR, MKUE25-ZR,
MKUVE25-ZR, MKUSE25-ZR**
Fitting and maintenance manual

Safety guidelines and symbols

High product safety

Our products correspond to the current level of research and technology. If the bearing arrangement is designed correctly, the products are handled and fitted correctly and as agreed and if they are maintained as instructed, they do not give rise to any direct hazards.

Follow instructions

This publication describes standard products. Since these are used in numerous applications, we cannot make a judgement as to whether any malfunctions will cause harm to persons or property. It is always and fundamentally the responsibility of the designer and user to ensure that all specifications are observed and that all necessary safety information is communicated to the end user. This applies in particular to applications in which product failure and malfunction may constitute a hazard to human beings.

Definition of guidelines and symbols

The warning and hazard symbols are defined along the lines of ANSI Z535.6-2006.

The meaning of the guidelines is as follows.

Warning 

In case of non-compliance, death or serious injury may occur.

Caution 

In case of non-compliance, minor or slight injury will occur.



Note!

In case of non-compliance, damage or malfunctions in the product or the adjacent construction will occur.

There follows additional or more detailed information that must be observed.



Numbers within a circle are item numbers.



Squares with a shaded border are placed in front of instructions.



Ticks indicate preconditions.

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About this manual

The purpose of this manual

This fitting and maintenance manual is valid exclusively for the linear actuators stated on the title page.

It describes the secure fitting and maintenance of the linear actuators stated.

How to use the manual

- ☐ This manual should be read carefully in full before starting any fitting or maintenance work.
- ☐ The manual must be stored throughout the life of the linear actuator.
- ☐ Please ensure that the manual is accessible at all times to the target group.
- ☐ The manual must be forwarded to each subsequent owner or operator of the linear actuator or the machine or equipment in which the linear actuator is fitted.

Note!

The text and illustrations in this manual cover, by way of an example, the linear actuator MKUVE20-B-ZR-N. For an explanation of the design, see page 10.

The information in this manual can be applied analogously to all variants of the linear actuators stated on the title page.

Target group

The target group of this manual comprises the operator and trained skilled personnel charged with the fitting and maintenance of the linear actuators described.

Safety guidelines for linear actuators

Use for the intended purpose

All the linear actuators named on the title page are intended exclusively for moving machine components connected to the carriage.

Any other use is not for the intended purpose and is therefore impermissible. The Schaeffler Group accepts no liability for any damage or loss arising therefrom.

General safety guidelines

- ☐ Any actions and methods that endanger the safety of human beings must not be carried out.
- ☐ In all fitting and maintenance work, the following must be observed:
 - all nationally valid and relevant specifications for the prevention of accidents
 - all generally recognised rules of safety practice and occupational medicine.

The linear actuators named on the title page are constructed in accordance with the current level of technology and the recognised rules of safety practice. Nevertheless, while they are being used the user or third parties may be put at risk or the linear actuator and other material assets may be impaired.

Risk reduction

Risks can be reduced by observing the following points:

- ☐ The linear actuator should only be operated if it is free from technical defects.
- ☐ The linear actuator should only be used for the intended purpose and with an awareness of safety and hazards.
- ☐ If any malfunctions occur that have safety implications, the linear actuator must be stopped immediately and the malfunction rectified by a person with appropriate responsibility.

Fundamental instructions

The assembly and fitting of the linear actuator as well as the fitting and dismantling of the individual components must only be carried out as described in this manual:

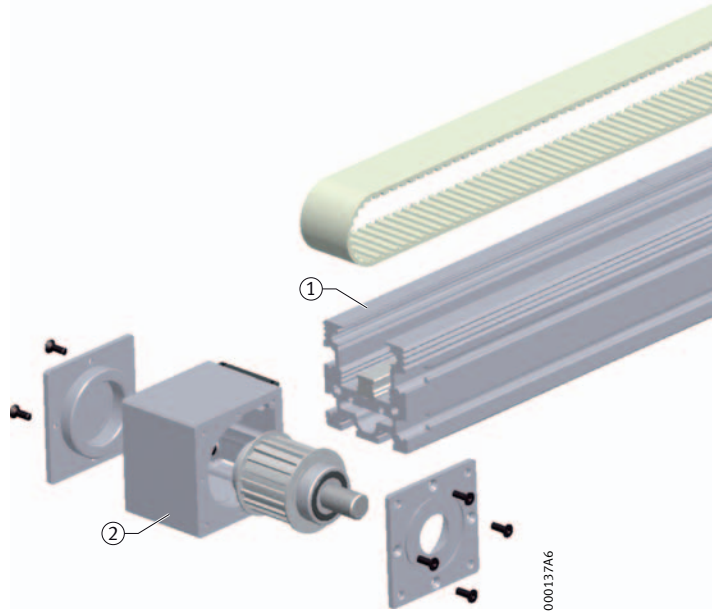
- ☐ Carry out the operations in the specified sequence.
- ☐ Use the listed tools and fitting accessories correctly.
Tools and fitting accessories that are unsuitable, damaged or contaminated will impair the function of the linear actuator.
- ☐ Screws must only be tightened using a torque wrench and the specified torques must be observed.
- ☐ Use rubber hammers only, not metal hammers.
- ☐ Do not use pointed or sharp-edged tools.

Personnel selection and qualification	Persons charged with the fitting and maintenance of the linear actuator must have adequate qualification. They must receive appropriate training and instruction before carrying out fitting or maintenance work.
Providing information to personnel	The fitting and maintenance manual must be available in a suitable form to the nominated persons (for example as a printout). This includes drawing explicit attention to the hazard and safety guidelines in this manual.
Disclaimer of liability	<p>The Schaeffler Group does not accept any liability for harm to human beings, the linear actuator and the adjacent construction that can be attributed to:</p> <ul style="list-style-type: none"> ■ incorrect fitting ■ incorrect or inadequate maintenance ■ incorrect communication of the content to third parties or a failure to communicate the content.
Use of replacement parts	<p>Special INA replacement parts have been developed for the linear actuators named on the title page. These ensure the reliable and long term function of the linear actuators.</p> <p><input type="checkbox"/> Do not use replacement parts other than original replacement parts from INA, see page 46.</p>
Use of products from other sources	<p>The use of products from other sources instead of INA replacement parts can:</p> <ul style="list-style-type: none"> ■ change the characteristics of the linear actuator in a negative manner ■ endanger users or third parties ■ cause impairment to the linear actuator and other material assets.
Disclaimer of liability	The Schaeffler Group accepts no liability for any damage or loss arising from the use of products from other sources.

Overview of the linear actuator

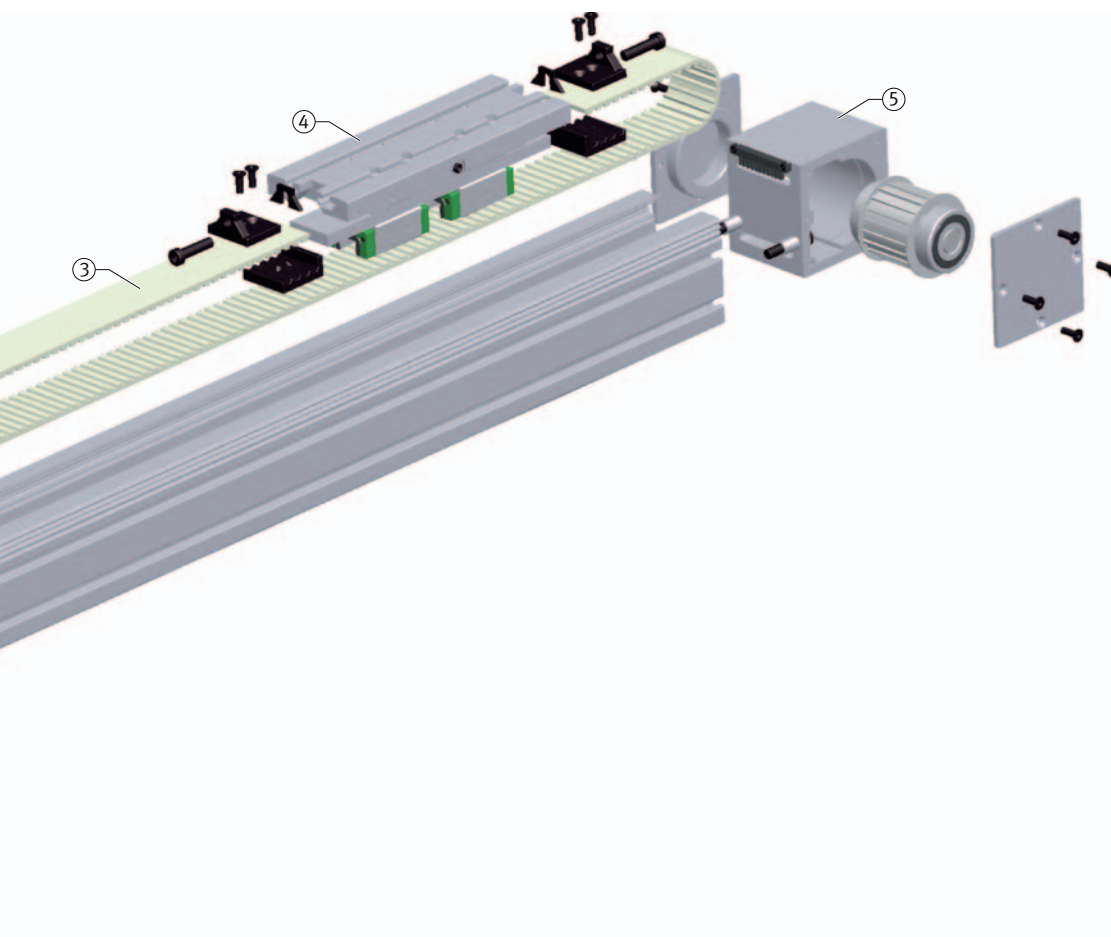
- ① Support rail with guideway
- ② Drive unit
(return mechanism on driven side)
- ③ Toothed belt unit
- ④ Carriage with linear recirculating ball bearing and guideway assemblies
- ⑤ Return unit
(return mechanism on non-driven side)

Figure 1
Subassemblies of
linear actuator MKUVE20-B-ZR-N



Scope of delivery

- Support rail with guideway ①
If supplied in several pieces, see section Variants, page 40
- Drive unit ②



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Scope of delivery – continued

- Toothed belt unit ③
Toothed belt and toothed belt clamping devices:
The toothed belt is fixed to the carriage by means of the two clamping devices
- Carriage with linear recirculating ball bearing and guideway assemblies ④
- Return unit ⑤

Overview of the linear actuator

Available designs

Linear recirculating ball bearing and guideway assembly

The linear actuators are available in different designs.

Linear recirculating ball bearing and guideway assembly	Series
Two-row design	MKUE
Four-row design	MKUVE
Six-row design	MKUSE

Carriage

Carriage	Suffix in ordering designation
Number of driven carriages	
1	–
2	Variants, see page 42
Length	
250 mm	–
500 mm	500
Location method	
T-slots	N
Threaded holes	–

Drive system

Drive system	Suffix in ordering designation
Without drive	OA
Drive shaft on right side	AR
Drive shaft on left side	AL
Drive shaft on both sides (right and left)	RL
Without drive shaft	OZ

Support rail

Support rail	Suffix in ordering designation
Single-piece	–
Multi-piece	Variants, see page 42

Note!

The text and illustrations in this manual cover, by way of an example, the following design of linear actuator:

- four-row linear recirculating ball bearing and guideway assemblies (MKUVE)
- a driven carriage 250 mm long and T-slots (N)
- drive shaft on the left side (AL).

The information in this manual can be applied analogously to all variants of the linear actuators stated on the title page.

The precise design of your linear actuator is dependent on your order.

Ordering designation	The ordering numbers can be found engraved on the drive unit or return unit.	
Ordering example	Series with four-row linear recirculating ball bearing and guideway assembly	MKUVE
Design	Size	20
	Type	B
	Length of carriage	250 mm
	Drive system	ZR
	Drive shaft	AL
	Number of carriages	1
	Carriage with T-slots	N
	Support rail	Single-piece
	Total length of actuator	3 000 mm
	Stroke length of actuator	2 494 mm
Ordering number	MKUVE20-B-ZR-AL-N/3 000-2 494	
Variants	Variants of the standard designs are shown in the section Variants, see page 42.	

Fitting to the adjacent construction

The linear actuator is fitted in two steps:

- the support rail is fixed to the adjacent construction
- the carriage is fixed to the adjacent construction.

Note! Linear actuators more than 8 m long have a **multi-piece** support rail. They are supplied in several pieces.

- If the linear actuator is supplied in several pieces, please observe the section Variants, see page 40.

Location of the support rail on the adjacent construction

The support rail can be located on the adjacent construction using the following accessories:

- clamping lugs, see page 13
- fixing brackets, see page 13
- T-nuts to DIN 508, see page 14
- T-bolts to DIN 787, see page 14
- T-strips, see page 14
- hexagonal nuts to DIN 934, see page 14.

Note! Under normal loads, location by means of clamping lugs, fixing brackets or T-nuts, T-bolts etc. is normally sufficient.

INA connecting brackets

Multi-axis handling systems comprising INA linear actuators can be constructed using INA connecting brackets.

Detailed information on the connecting brackets can be found in INA publication Fasteners and connecting brackets for linear actuators (TPI 153).



If linear actuators are located incorrectly, this can damage the linear actuator itself and the adjacent construction.

- Note the maximum tightening torques for the fixing screws.
- Note the maximum spacings for the fasteners.
- Ensure that the adjacent construction has adequate strength.

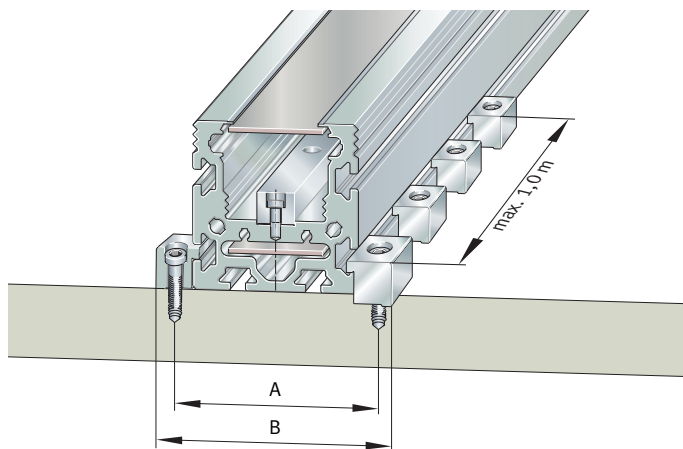
Location of the support rail using clamping lugs or fixing brackets

- If the support rail is fully in contact with the adjacent construction, clamping lugs or fixing brackets should be fitted on the left and right sides of the support rail at intervals of max. 333 mm.

A = 113 mm
B = 138 mm

Figure 2

Location using clamping lugs



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- Under high loads, the support rail should be located at shorter intervals or additionally by means of T-nuts or other accessories named on page 12.

Fitting to the adjacent construction

Location of the support rail using T-nuts

- If the support rail is fully in contact with the adjacent construction, T-nuts should be fitted in both profiled slots at intervals of max. 300 mm.

Note!

The following accessories can be used instead of T-nuts:

- T-bolts
- T-strips with appropriate spacing of the screws
- hexagonal nuts.

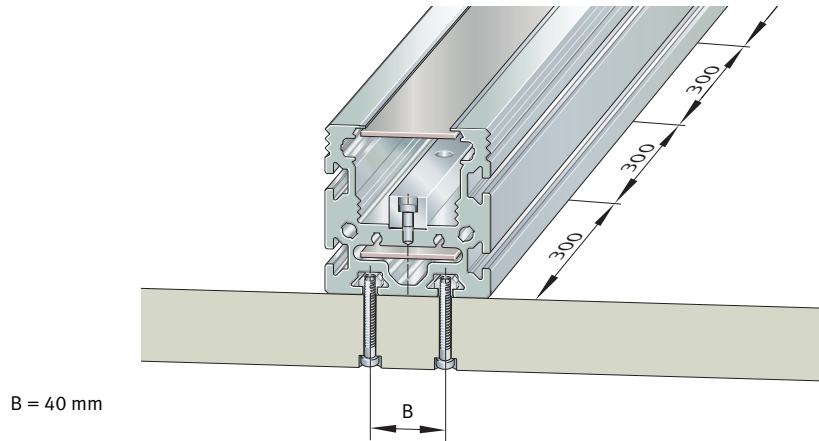


Figure 3

Location by means of T-nuts

- Under high loads, the support rail should be located at shorter intervals or additionally by means of clamping lugs or fixing brackets.

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Location of the carriage on the adjacent construction

Carriages with T-slots

A carriage with T-slots is located by means of:

- T-nuts to DIN 508
- T-bolts to DIN 787
- T-strips
- hexagonal nuts to DIN 934.

Carriages with threaded holes

A carriage with threaded holes is located by means of:

- stud bolts
- threaded screws.



If linear actuators are located incorrectly, this can damage the linear actuator itself and the adjacent construction.

- ☐ Note the maximum tightening torques for the fixing screws.
- ☐ Ensure that the adjacent construction has adequate strength.
- ☐ Protect the carriage against contamination.

Location of carriages

- ☐ Carriages must be located on the adjacent construction in accordance with the loads and the forces acting on them.

Fitting and mounting of accessories

For the linear actuators stated in the title, INA offers specially developed accessories, see section Appendix, page 49.

This section shows the fitting of the following accessories:

- coupling
- coupling housing.

Coupling

The following tools are required:

- torque wrench
- Allen keys.

Warning

Sudden start of the machine.

Crushing of fingers between the linear actuator and machine parts.

- ☐ Before starting work, disconnect the machine from the power supply.
- ☐ Secure the main switch of the machine against switching on.

Fitting the coupling

- ☐ Slide the coupling onto the drive shaft of the drive unit. There must be a gap of approx. 1 mm left between the coupling and the bearing cover.
- ☐ Tighten the fixing screw fully. The fixing screw and tightening torque will differ according to the coupling used, for information see INA publication ALE, Driven Linear Units.



Figure 4

Screw mounting of the coupling

Removing the coupling

- ✓ Coupling housing removed.
- ☐ Loosen the fixing screw.
- ☐ Remove the coupling in the direction of the drive shaft.

Coupling housing

The following tools are required:

- torque wrench
- Allen keys.

Warning

Sudden start of the machine.

Crushing of fingers between the linear actuator and machine parts.

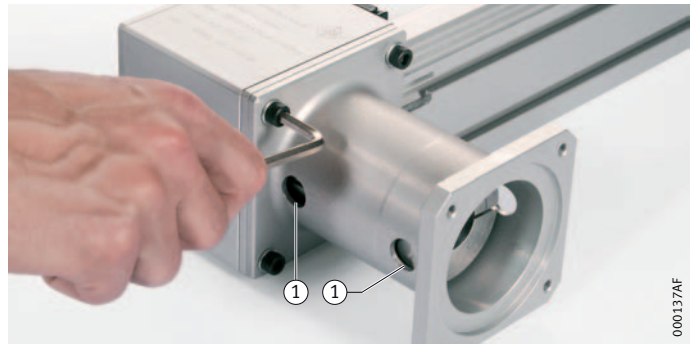
- ☐ Before starting work, disconnect the machine from the power supply.
- ☐ Secure the main switch of the machine against switching on.

Fitting the coupling housing

- ✓ Coupling fitted.
- ☐ Slide the coupling housing over the coupling.
The end face with the bevelled corners must face towards the adjacent construction.
- ☐ Screw mount the coupling housing to the drive unit by means of the fixing screws.
 - MKUVE20-B-ZR: M6/9,5 Nm
 - MKUE25-ZR, MKUVE25-ZR, MKUSE25-ZR: M6/9,5 Nm

① Holes in the coupling housing

Figure 5
Screw mounting of the coupling housing



Note!

The holes in the coupling housing are used to locate and detach the drive shaft (motor or actuator side).

Removing the coupling housing

- ☐ Loosen the fixing screws.
- ☐ Remove the coupling housing in the direction of the drive shaft.

Maintenance

Maintenance requirements

Maintenance work is restricted to:

- relubrication
- cleaning.

Maintenance work may require the removal and refitting of components, see page 22 onwards.

Visual inspection

In order to ensure exact function and a long operating life of the linear actuator, it must be visually inspected for damage and contamination at regular intervals.

Maintenance intervals

Maintenance intervals, especially the intervals between relubrication, are influenced by:

- the travel speed/drive torque
- the load
- the temperature
- the stroke length
- the environmental conditions (cleanliness etc.).

Maintenance according to operating conditions

It is not possible to calculate all the influences on maintenance intervals. The intervals can therefore only be determined precisely under operating conditions.

Note!

The interval lengths stated in the following sections are **maximum** maintenance intervals. They must be shortened for each individual case depending on the types of influences present.

Relubrication

Relubrication is necessary for:

- carriages.

When should relubrication be carried out?

The relubrication interval is dependent on the environmental conditions. Relubrication times and quantities can only be determined precisely under operating conditions.

Relubrication must be carried out:

- as a function of the application.
This must be determined in accordance with the operating conditions.
- as soon as fretting corrosion¹⁾ occurs.

Note!

If fretting corrosion occurs, the lubrication intervals should definitely be reduced.

What should be used for relubrication?

The linear actuator is supplied with an initial greasing of high quality lithium complex soap grease KP2P–35, DIN 51 825. Relubrication may only be carried out with greases that are miscible with the grease used for initial greasing.

Note!

Detailed information on recommended greases can be found in the INA publication ALE, Driven Linear Units. The INA publication can be requested through info.linear@schaeffler.com.

What is the relubrication quantity?

Guide values for the required quantity of grease are shown in the table.

Relubrication quantity Carriage

Series	Relubrication quantity for carriage (guide values)
MKUVE20-B-ZR	approx. 4 g to 5 g
MKUE25-ZR	approx. 4 g to 5 g
MKUVE25-ZR	approx. 4 g
MKUSE25-ZR	approx. 6 g to 7 g

Note!

It is more advisable to carry out relubrication at several points during the maintenance interval, using partial quantities in each case, than relubrication at the end of the intervals using the entire quantity.

¹⁾ Fretting corrosion can be identified by a reddish discolouration of the raceways on the guideway.

Maintenance

Relubrication of carriages

Funnel type lubrication nipples

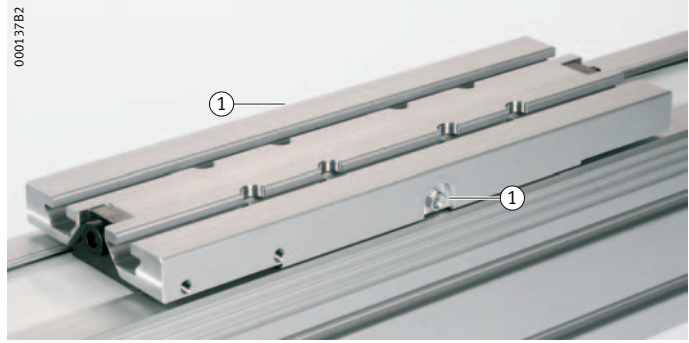
The carriage is relubricated via funnel type lubrication nipples to DIN 3 405-A-M6. These are located on the longitudinal sides of the carriage.

The lubrication connector can also be replaced in order to allow connection to a central lubrication system.

① Funnel type lubrication nipple

Figure 6

Funnel type lubrication nipples



Relubrication can be carried out from either the left or right side of the carriage.

Warning

Sudden start of the machine.

Crushing of fingers between the carriage and machine parts.

- ☐ Before starting work, disconnect the machine from the power supply.
- ☐ Secure the main switch of the machine against switching on.

Relubrication of carriages

- ✓ Linear actuator warm from operation.
- ✓ Funnel type nipples clean and accessible.
- ☐ Pump the required lubricant quantity into one of the funnel type lubrication nipples.
- ☐ If possible, move the carriage by hand during lubrication in order to distribute the grease evenly.

Cleaning

When should cleaning be carried out?

Cleaning must be carried out if heavy contamination is present. The cleaning requirements are dependent on the environmental and application conditions and can only be determined in the operational state.

Cleaning of components after removal

If components must be removed or the linear actuator must be dismantled, the components should be cleaned before refitting.



Damage due to unsuitable cleaning tools or cleaning agents.

- ☐ Do not use pointed, hard or abrasive objects.
- ☐ Do not dampen lubricated components during cleaning.
- ☐ Do not use abrasives, petroleum spirit, oil etc.

What should be used for cleaning?

Suitable cleaning tools are:

- paint brush
- soft brush
- soft cloths.

Removal and dismantling of components

Linear actuator

The linear actuator is dismantled in the following sequence:

- remove the toothed belt, see page 23
- remove the drive unit or return unit, see page 25
- remove the carriage, see page 28.

Note!

It is only necessary in exceptional cases to completely disassemble the linear actuator.

Toothed belt unit

The toothed belt unit comprises the toothed belt and two clamping devices. The clamping devices connect the toothed belt to the carriage.

- ① Toothed belt
- Clamping device:
- ② Lower clamping piece
 - ③ Upper clamping piece
 - ④ Fixing screws
 - ⑤ Spacer
 - ⑥ Adjusting screw

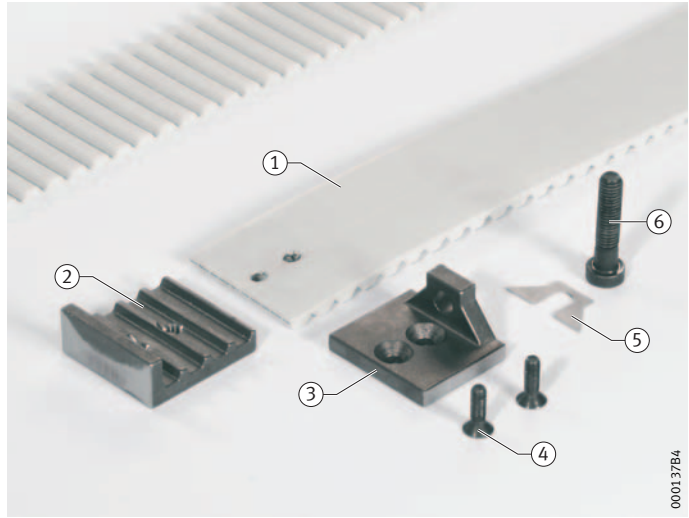


Figure 7

Overview of toothed belt unit



Warning

Sudden start of the machine.

Crushing of fingers between the carriage and machine parts.

- ☐ Before starting work, disconnect the machine from the power supply.
- ☐ Secure the main switch of the machine against switching on.

Removing the toothed belt

The following tools are required:

- torque wrench
- Allen key or hex key inserts.

Note!

The toothed belt is supplied with a factory-specified preload. If the toothed belt is refitted after removal, it must be set to the same preload as before removal, see page 36.

Detaching the clamping device
from the carriage

- ☐ Loosen and remove the adjusting screw.



Figure 8
Loosening the adjusting screw

- ☐ Remove the clamping device and the spacers from the carriage.
- ☐ If the same toothed belt is refitted:
Store the spacers carefully and reuse them when fitting the clamping device in order to achieve the original preload.

Detaching the clamping device
from the toothed belt

- ☐ Loosen and remove the fixing screw of the clamping device.



Figure 9
Loosening the fixing screw

- ☐ Remove the upper and lower clamping pieces from the toothed belt.

Removal and dismantling of components

Detaching the second clamping device from the carriage

Note!

- ❑ Detach the second clamping device from the carriage, but do **not** remove the clamping pieces from the toothed belt. The second clamping device must only be removed from the toothed belt if the clamping device itself or the toothed belt must be replaced. Dismounting of the second clamping device is not necessary in order to remove the toothed belt unit.

Removing the toothed belt

- ❑ Grip the toothed belt by the clamping device and pull it out of the support rail.



Figure 10

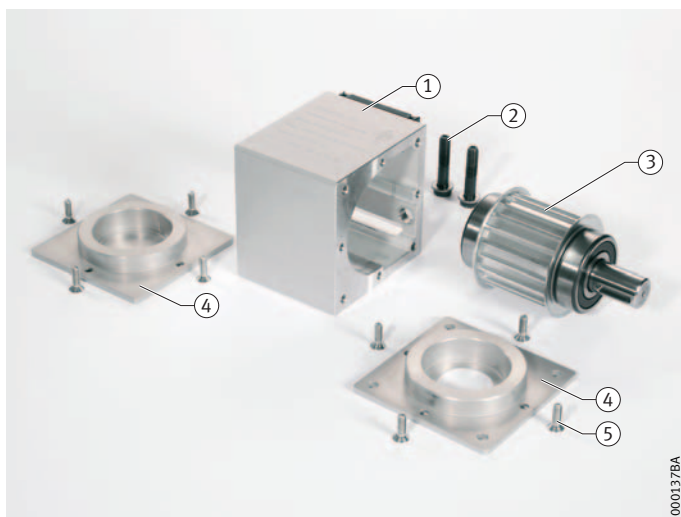
Removing the toothed belt

Drive and return unit

The drive unit and return unit differ in their design. However, both components are dismantled in the same way.

- ① Housing
- ② Fixing screws for housing
- ③ Toothed belt pulley with bearing
- ④ Bearing cover
- ⑤ Fixing screws for bearing cover

Figure 11
Overview of drive unit



Removing the drive or return unit

The following tools are required:

- torque wrench
- Allen key or hex key inserts.

- ✓ Toothed belt removed, see page 23.
- ✓ In the case of the drive unit:
Motor, coupling and coupling housing removed,
see page 16 and page 17.

Removing the toothed belt pulley

- ☐ Loosen the fixing screws for one bearing cover on the drive or return unit as appropriate.
- ☐ Loosen the bearing cover from the housing and remove it in the direction of the shaft axis.

Figure 12
Removing the bearing cover



Removal and dismantling of components

- ❑ If the toothed belt pulley was not slid completely out of the housing with the bearing cover, remove the toothed belt pulley completely from the housing with the bearing.



Figure 13

Removing the toothed belt pulley

Removing the housing

- ❑ Remove the second bearing cover from the housing.
- ❑ Loosen the fixing screws for the housing.



Figure 14

Unscrewing the housing

- ❑ Remove the housing from the support rail.

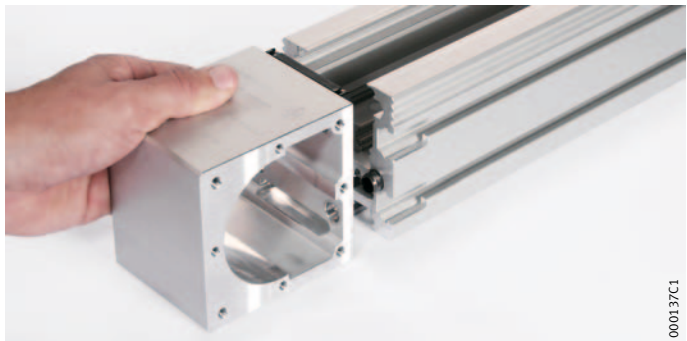


Figure 15

Removing the housing

Carriage

Carriages differ in their design. However, they are all dismantled in the same way.

- ① Funnel type lubrication nipple
- ② Linear recirculating ball bearing and guideway assemblies
- ③ Dummy guideway (only required for removal)

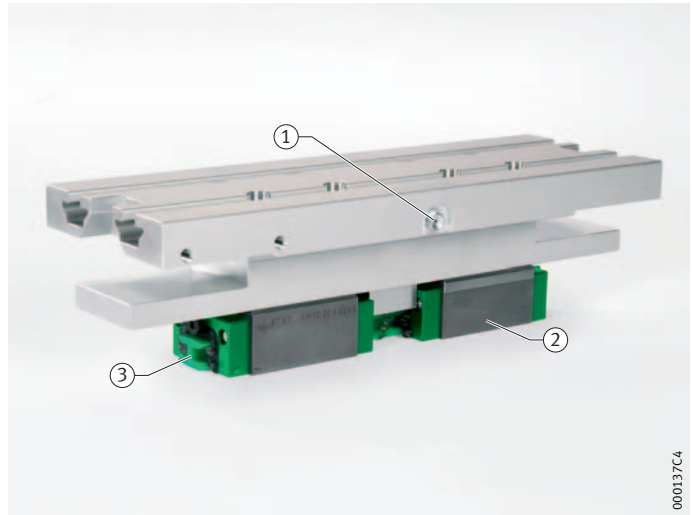


Figure 16
Overview of carriage



Damage due to contaminated grease.

The characteristics of grease may change due to contamination.

- ☐ The workstation must be cleaned before removing the carriage.
- ☐ Elements with grease must be laid only on a clean, lint-free underlay.

Removal and dismounting of components

Removing the carriage

- ✓ Drive unit or return unit removed, see page 25.
- ✓ Dummy guideway clean and dry.



Damage due to incorrect removal.

- ❑ Hold the end faces of the guideway and dummy guideway together ensuring the correct fit.
- ❑ Hold the carriage concentric and parallel to the support rail.

Removing the carriage

- ❑ Press the dummy guideway flush against the end face of the guideway.
- ❑ Draw the carriage carefully from the guideway onto the dummy guideway.

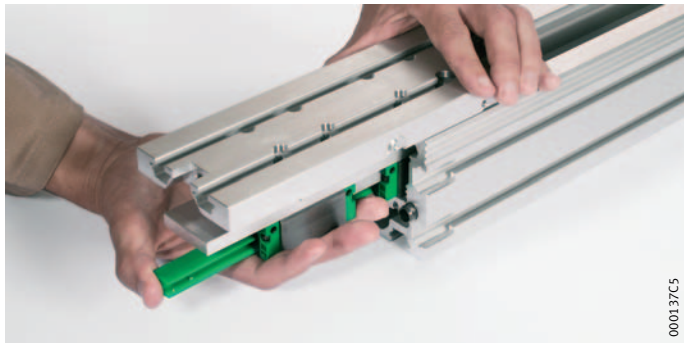


Figure 17

Removing the carriage

Fitting and mounting of components

Linear actuator

A completely disassembled linear actuator is reassembled in the following sequence:

- slide the carriage into place, see page 29
- insert the toothed belt, see page 30
- fit the return unit, see page 31 to page 32
- fit the drive unit, see page 33 to page 34
- fix the toothed belt to the carriage, see page 34 to page 35
- preload the toothed belt, see page 36 to page 37.

Carriage

A component overview is shown in *Figure 16*, page 27.



Damage due to incorrect fitting.

- ☐ Hold the end faces of the guideway and dummy guideway together ensuring the correct fit.
- ☐ Hold the carriage concentric and parallel to the support rail.
- ☐ Hold the dummy guideway flush against the end face of the guideway.
- ☐ Slide the carriage carefully from the dummy guideway onto the guideway.

Sliding the carriage onto the guideway

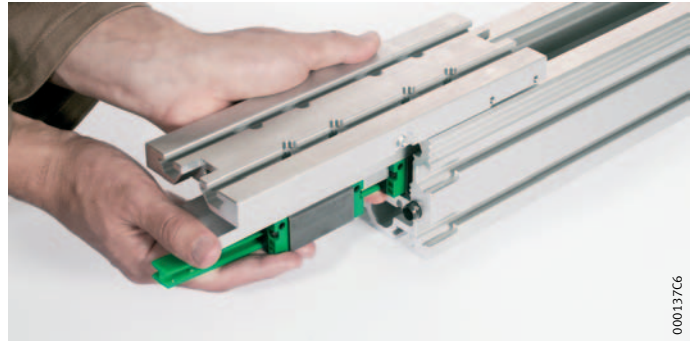


Figure 18

Sliding the carriage onto the guideway

Fitting and mounting of components

Toothed belt unit

A component overview is shown in *Figure 7*, page 22.

Overview of fitting

The toothed belt is fitted in 5 steps:

- insert the toothed belt
- fit the return unit
- fit the drive unit
- fix the toothed belt to the carriage
- preload the toothed belt.

The following tools are required:

- rubber hammer
- torque wrench
- Allen key or hex key inserts
- screwdriver.

Note!

If the toothed belt is refitted after removal, it must be set to the same preload as before removal, see page 36.

Starting point

The following instructions are based on the assumption that both the return unit and the drive unit have been removed, see page 25. If only one of the two units has been removed, go directly to Fitting the drive unit housing, see page 33. In this case, the instructions also apply for fitting of the return unit.

✓ Carriage slid onto guideway, see page 29.

Inserting the toothed belt

- ☐ Insert the toothed belt into the lower hollow section at the open end of the support rail. The teeth of the toothed belt must face upwards.

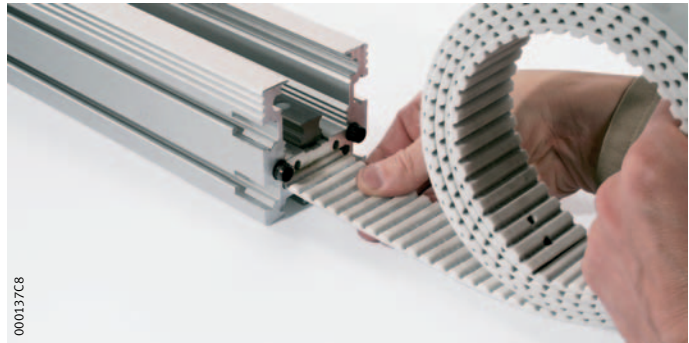


Figure 19

Inserting the toothed belt in the support rail

- ☐ Continue inserting the toothed belt until only 1 or 2 teeth protrude from the end of the support rail.

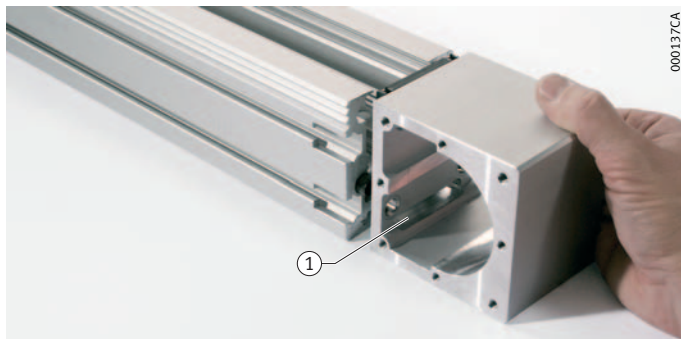
Fitting the return unit housing

- ❑ Locate the return unit housing on the two dowel pins and push it onto the support rail until it stops.
Ensure that the toothed belt slides through the lower opening into the housing.

① Opening for toothed belt

Figure 20

Locating the housing



- ❑ Screw mount the housing to the support rail using fixing screws:
 - MKUVE20-B-ZR: M8/23 Nm, two pieces
 - MKUE25-ZR, MKUVE25-ZR, MKUSE25-ZR: M6/9,5 Nm, four pieces

Figure 21

Screw mounting of the housing



- ❑ Screw mount 1 bearing cover to the housing:
 - MKUVE20-B-ZR: M6/9,5 Nm
 - MKUE25-ZR, MKUVE25-ZR, MKUSE25-ZR: M6/9,5 Nm

Fitting and mounting of components

Fitting the toothed belt pulley

- ❑ Insert the toothed belt pulley into the housing.



Figure 22

Inserting the toothed belt pulley



Damage to the toothed belt and return unit due to unsuitable tools.

- ❑ Do not use pointed or sharp-edged tools.

Inserting the toothed belt

- ❑ Feed the toothed belt into the teeth on the toothed belt pulley with the aid of a screwdriver. Hold the screwdriver flat between two teeth on the toothed belt.



Figure 23

Feeding the toothed belt onto the toothed belt pulley

- ❑ Guide the toothed belt over the toothed belt pulley and pull it approx. 200 mm out of the top of the return unit.

Closing the return housing

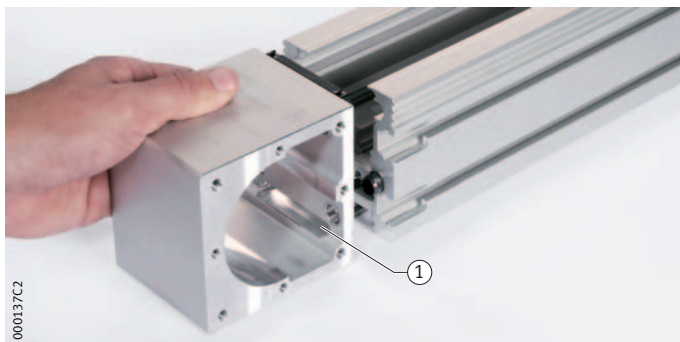
- ❑ Locate the bearing cover and screw mount using fixing screws:
 - MKUVE20-B-ZR: M6/9,5 Nm
 - MKUE25-ZR, MKUVE25-ZR, MKUSE25-ZR: M6/9,5 Nm

Fitting the drive unit housing

- ☐ Draw the toothed belt out of the return unit until its other end protrudes by only 1 or 2 teeth from the open end of the support rail.
- ☐ Locate the drive unit housing on the two dowel pins and push it onto the support rail until it stops.
Ensure that the toothed belt slides through the lower opening into the housing.

① Opening for toothed belt

Figure 24
Locating the housing

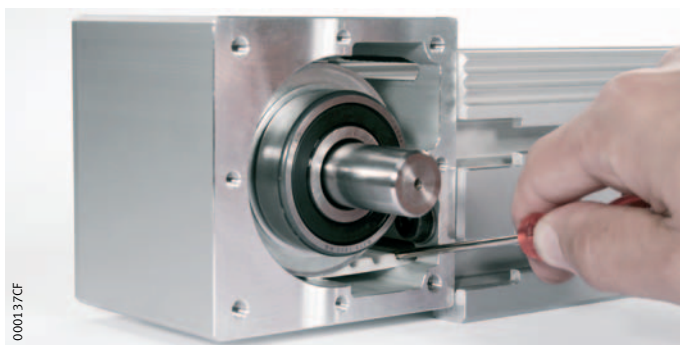


- ☐ Screw mount the housing to the support rail using fixing screws:
 - MKUVE20-B-ZR: M8/23 Nm, two pieces
 - MKUE25-ZR, MKUVE25-ZR, MKUSE25-ZR: M6/9,5 Nm, four pieces
- ☐ Screw mount 1 bearing cover to the housing:
 - MKUVE20-B-ZR: M6/9,5 Nm
 - MKUE25-ZR, MKUVE25-ZR, MKUSE25-ZR: M6/9,5 Nm
- ☐ Insert the toothed belt pulley into the housing.

Inserting the toothed belt

- ☐ Feed the toothed belt onto the teeth of the toothed belt pulley.

Figure 25
Feeding the toothed belt
onto the toothed belt pulley



- ☐ Guide the toothed belt over the toothed belt pulley and pull it approx. 200 mm out of the top of the drive unit.

Fitting and mounting of components

Closing the drive unit housing

- ❑ Locate the bearing cover on the drive axis and slide it against the housing. If necessary, carefully knock the bearing cover into place using a rubber hammer.
- ❑ Insert fixing screws into the (central) holes and screw mount the bearing cover:
 - MKUVE20-B-ZR: M6/9,5 Nm
 - MKUE25-ZR, MKUVE25-ZR, MKUSE25-ZR: M6/9,5 Nm

Note!

The holes at the corners of the drive unit are intended for the coupling housing.

Fixing the toothed belt to the carriage

- ❑ Screw mount or clamp the upper and lower clamping pieces of the first clamping device to the toothed belt:
 - MKUVE20-B-ZR: M5/5,5 Nm
 - MKUE25-ZR, MKUVE25-ZR, MKUSE25-ZR: clamp in place



Figure 26

Screw mounting the clamping device to the toothed belt

- ❑ Screw mount the clamping device to the carriage using the adjusting screw:
 - MKUVE20-B-ZR: M8/23 Nm
 - MKUE25-ZR, MKUVE25-ZR, MKUSE25-ZR: M8/23 Nm



Figure 27
Screw mounting the clamping
device to the carriage

- ❑ Screw mount or clamp the second clamping device to the toothed belt:
 - MKUVE20-B-ZR: M5/5,5 Nm
 - MKUE25-ZR, MKUVE25-ZR, MKUSE25-ZR: clamp in place
- ❑ Screw mount the clamping device to the carriage loosely enough so that the toothed belt is **not** yet tensioned.

Fitting and mounting of components

Preloading the toothed belt during refitting

When refitting a toothed belt that has been removed:

- ☐ Reinsert the stored spacers between the clamping device and the carriage.
- ☐ Tighten the clamping device with a torque of M8/23 Nm to the hard stop.

Preloading a new toothed belt

When fitting a new toothed belt:

- ☐ Mark a measurement length of 1 000 mm on the untensioned toothed belt. In order to improve the measurement accuracy, the measurement length can be increased on longer linear actuators (2 000 mm, 3 000 mm etc.).

Figure 28

Measurement length marked
(not to scale)



- ☐ Tighten the adjusting screw on the second clamping device until the measurement length is extended by the preload elongation. The preload is:
 - MKUVE20-B-ZR: 1,3 mm/1 000 mm
 - MKUE25-ZR, MKUVE25-ZR, MKUSE25-ZR: 1,2 mm/1 000 mm

Figure 29

Measurement length preloaded
(not to scale)



- Inserting the spacers
- ☐ Measure the gap between the clamping device and carriage using a vernier.

MKUVE20-B-ZR:

- ☐ Select 2 or more spacers that **together** correspond to the width of the gap.
- ☐ Loosen the adjusting screw on the first clamping device by a few revolutions.
- ☐ Distribute the spacers evenly over both gaps between the carriage and clamping devices.
- ☐ Tighten both clamping devices with a torque of M8/23 Nm to the hard stop.

MKUE25-ZR, MKUVE25-ZR, MKUSE25-ZR:

- ☐ Select one spacer corresponding to the width of the gap.
If a single spacer is not sufficient, select 2 or more spacers that **together** correspond to the width of the gap.
- ☐ Insert the spacers between the carriage and the clamping device.
- ☐ Tighten the clamping device with a torque of M8/23 Nm to the hard stop.

Fitting and mounting of components

Drive and return unit

A component overview is shown in *Figure 11*, page 25.

The following tools are required:

- rubber hammer
- torque wrench
- Allen key or hex key inserts.

✓ Toothed belt inserted in the profiled section, see page 30.

Fitting the drive unit or return unit

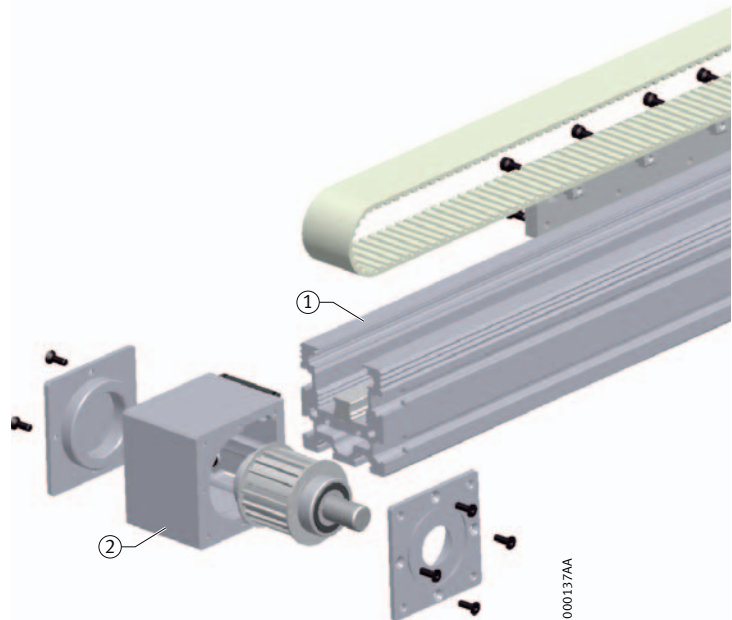
☐ For fitting of the drive unit, see page 33.

☐ For fitting of the return unit, see page 31.

Variants

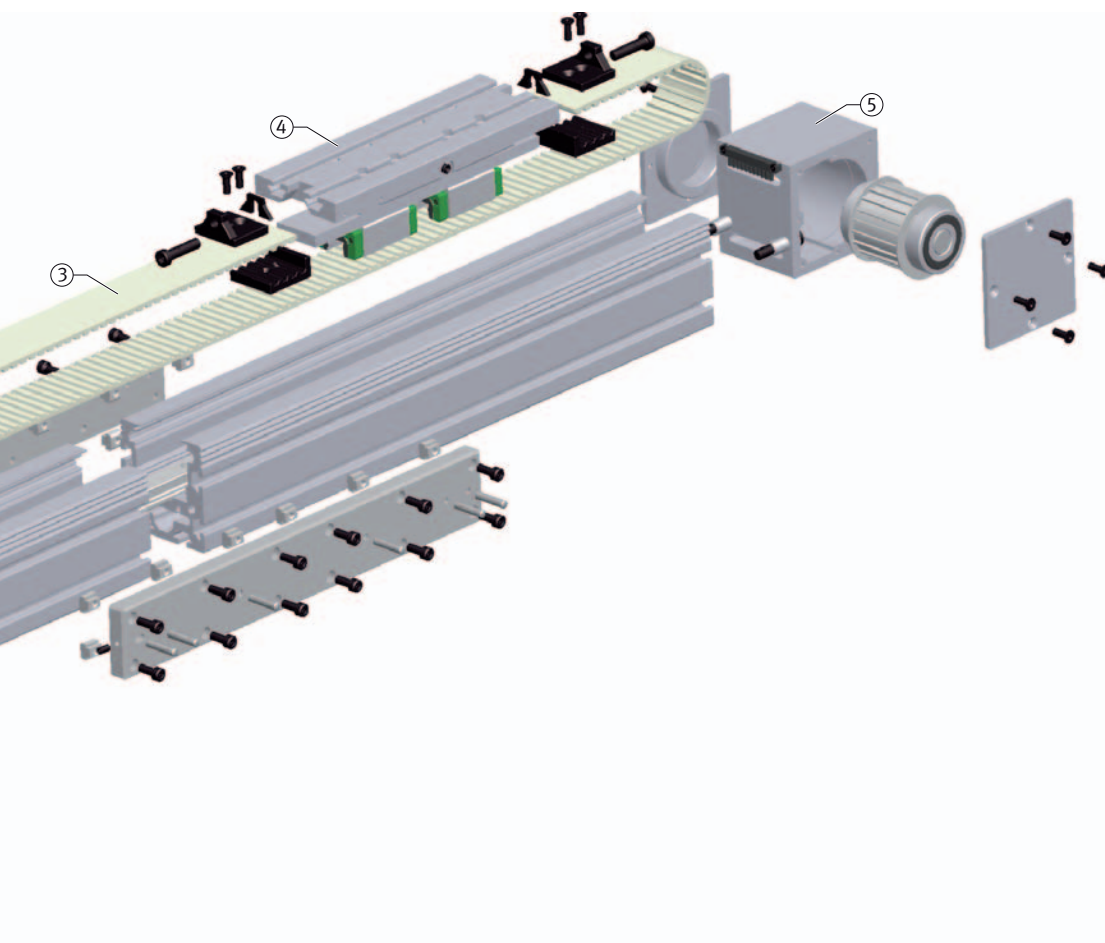
- ① Multi-piece support rail with guideway and retaining plates
- ② Drive unit (return mechanism on driven side)
- ③ Toothed belt unit
- ④ Carriage with linear recirculating ball bearing and guideway assemblies
- ⑤ Return unit (return mechanism on non-driven side)

Figure 30
Subassemblies of
linear actuator MKUVE20-B-ZR-N,
multi-piece design



Subassemblies

- Multi-piece support rail with guideway and retaining plates ①, two retaining plates supplied per profile joint
- Drive unit ②



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Subassemblies – continued

- Toothed belt unit ③
Toothed belt and toothed belt clamping devices:
The toothed belt is fixed to the carriage by means of the two clamping devices
- Carriage with linear recirculating ball bearing and guideway assemblies ④
- Return unit ⑤

Variants

Available variants

Carriage	Suffix in ordering designation
2 driven carriages	W2
Support rail	Suffix in ordering designation
Multi-piece	FA517.X ¹⁾

¹⁾ X = number of support rail joints

Ordering example Design

Series with six-row linear recirculating ball bearing and guideway assembly	MKUSE
Size	25
Length of carriage	500 mm
Drive system	ZR
Drive shaft	RL
Number of carriages	W2
Carriages with T-slots	N
Support rail	FA517.1
Total length of actuator	10 000 mm
Stroke length of actuator	9 494 mm

Ordering designation

MKUSE25-500-ZR-RL-W2-N-FA517.1/10 000-9 494

Multi-piece support rail

Linear actuators more than 8 m long are supplied in several pieces. They must be assembled before fitting to the adjacent construction.

Note!

If a delivery includes two or more multi-piece linear actuators, the individual pieces of each actuator are identified by the same letter on the joints of the profiled sections.

Example

Linear actuator 1: A1, A2, A3, etc.
Linear actuator 2: B1, B2, B3, etc.

Assembling the support rail

The following tools are required:

- rubber hammer
- torque wrench
- Allen key or hex key inserts.



Risk of injury due to falling support rails.

- ☐ Ensure that support rails cannot drop from the working area.

Positioning of individual pieces

- ☐ The individual pieces of the support rail must be arranged consecutively in the correct sequence.
The combinations of letters and numbers must match, see *Figure 32*.

Example

Correct: profiled section joint A1 – A1

Incorrect: profiled section joint A1 – A2



Figure 31

Arranging the support rails

- ☐ Slide the T-nuts for the retaining plates into the T-slots in the sides.
- ☐ Slide the individual pieces of the support rail together.



Figure 32

Example of letter and number combination for profiled section joint

Variants

Joining the individual pieces

- ❑ Locate the retaining plates at the centre of the profiled section joints using the fixing screws M6.



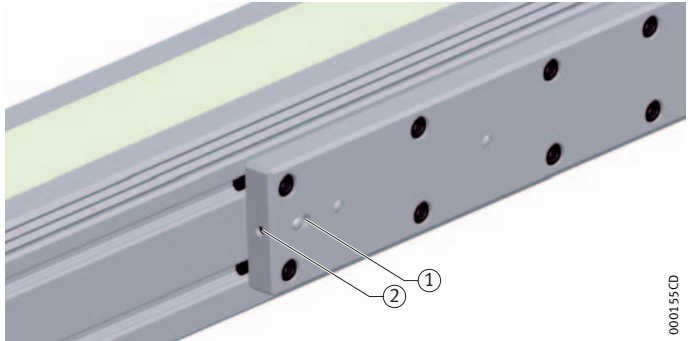
Figure 33

Locating the retaining plates

- ❑ Check whether the guideways in the individual sections abut each other.
If necessary, correct the position of the individual pieces.
- ❑ Fix the retaining plates to the support rail by dowels using the two outermost dowel holes.
Use the dowel holes in the support rail for this purpose.

Note!

The dowel hole at one end of the retaining plate is designed as a slot.



- ① Slot
- ② Grub screw

Figure 34

Slot and grub screw

- ❑ Tighten the grub screws at the slots to the abutment point.
- ❑ Check the joint location again.
- ❑ Fasten the fixing screws in the retaining plates to a torque of 9,5 Nm.
- ❑ Drill through the remaining dowel holes in the retaining plates to a diameter 6 H7 approx. 20 mm deep.
- ❑ Knock in the dowel pins.

Fitting the components

- ❑ For fitting of further components, see section Fitting and mounting of components, page 29.

Multiple carriages

If the linear actuator has more than one carriage, these are linked by individual pieces of toothed belt.

Fitting of multiple carriages

The following tools are required:

- rubber hammer
- torque wrench
- Allen key or hex key inserts
- screwdriver.

✓ All carriages slid onto guideway, see page 29.

Locating the toothed belt between the carriages

□ Fit short pieces of toothed belt with clamping devices and use these to link the carriages, see page 34.



Figure 35

Linking carriages using separate piece of toothed belt

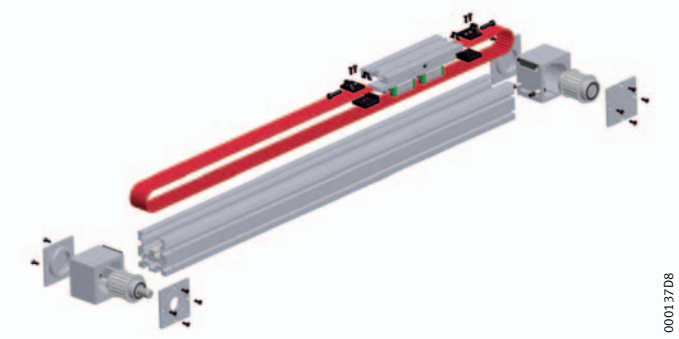
Fitting of toothed belt

□ Fit the long piece of toothed belt, see page 30 onwards.

Replacement parts

Note! The precise design of your linear actuator is dependent on your order. When ordering replacement parts, please indicate the ordering number of your linear actuator. The ordering numbers can be found engraved on the drive unit or return unit.

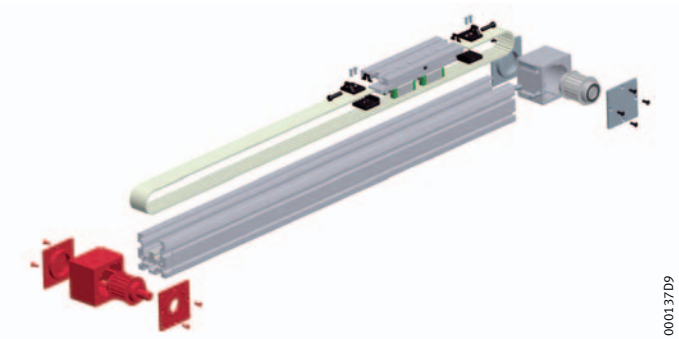
Toothed belt



Replacement parts list for toothed belt

Linear actuator	Designation	MATNR
MKUVE20-B-ZR	ZHRI50-AT-10	000255084-0000
MKUE25-ZR		
MKUVE25-ZR		
MKUSE25-ZR		

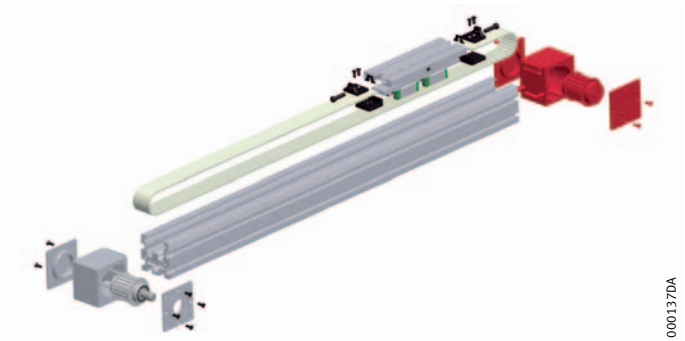
Drive unit



Replacement parts list for drive unit

Linear actuator	Designation	MATNR
Drive shaft on left or right side		
MKUVE20-B-ZR	UML.MLFI-50-B-ZR-AR-7500	004279220-0000
MKUE25-ZR	UML.MKUE25-ZR-AR-7500	000254606-0000
MKUVE25-ZR		
MKUSE25-ZR		
Drive shaft on both sides		
MKUVE20-B-ZR	UML.MLFI-50-B-ZR-RL-7500	004279409-0000
MKUE25-ZR	UML.MKUE25-ZR-RL-7500	000533750-0000
MKUVE25-ZR		
MKUSE25-ZR		

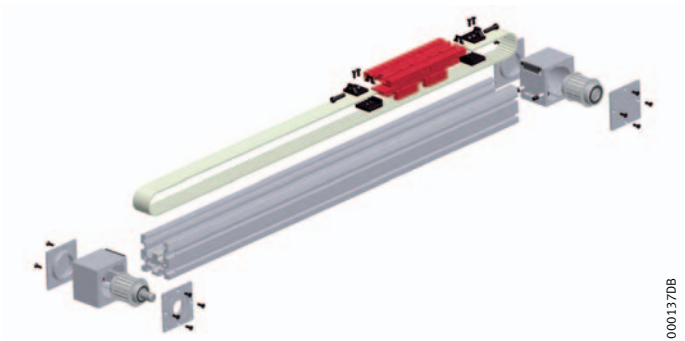
Return unit



Replacement parts list
for return unit

Linear actuator	Designation	MATNR
MKUVE20-B-ZR	UML.MLFI-50-B-ZR-7500	004279328-0000
MKUE25-ZR	UML.MKUE25-ZR-7500	000254045-0000
MKUVE25-ZR		
MKUSE25-ZR		

Carriage

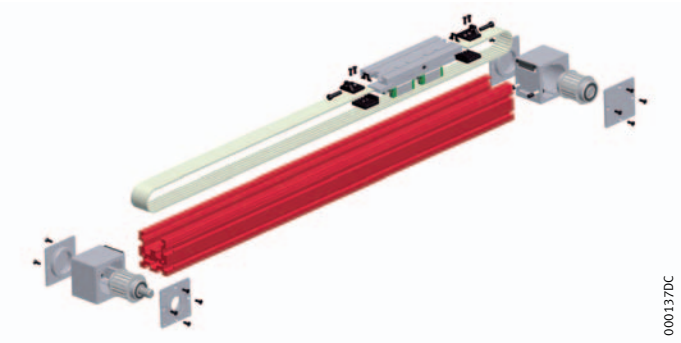


Replacement parts list
for carriage

Linear actuator	Designation	MATNR
Carriage length 250 mm		
MKUE25-ZR	LAW.MKUE25-ZR-4400	000263818-0000
MKUVE25-ZR	LAW.MKUVE25-ZR-4400	005001773-0000
MKUSE25-ZR	LAW.MKUSE25-ZR-4400	003352161-0000
Carriage length 250 mm, with slot		
MKUVE20-B-ZR	LAW.MKUVE20-250-ZR-4400	005267960-0000
MKUE25-ZR	LAW.MKUE25-ZR-N-4400	000705039-0000
MKUVE25-ZR	LAW.MKUVE25-ZR-N-4400	009723048-0000
MKUSE25-ZR	LAW.MKUSE25-ZR-N-4400	002583747-0000
Carriage length 500 mm		
MKUE25-ZR	LAW.MKUE25-500-ZR-4400	016289455-0000
MKUSE25-ZR	LAW.MKUSE25-500-ZR-4400	009683925-0000
Carriage length 500 mm, with slot		
MKUE25-ZR	LAW.MKUE25-500-ZR-N-4400	003656217-0000
MKUSE25-ZR	LAW.MKUSE25-500-ZR-N-4400	003811344-0000

Replacement parts

Support rail



Replacement parts list for support rail

Linear actuator	Designation	MATNR
MKUVE20-B-ZR	MTKVD.MKUVE20-B-ZR-5500	004319044-0000
MKUE25-ZR	MTKD.MKUE25-ZR-5400	000264016-0000
MKUVE25-ZR	MTKVD.MKUVE25-ZR-5500	009724729-0000
MKUSE25-ZR	MTKSD.MKUSE25-ZR-5600	003119076-0000

Appendix

Accessories Special INA replacement parts have been developed for the linear actuators. These ensure the reliable and long term function of the linear actuators.

Location

Accessory	Article number
Clamping lugs ¹⁾	SPPR23x30
	SPPR28x30
Fixing brackets ¹⁾	WKL48x35
	WKL98x35
T-strips (steel)	Leis-M6-T-Nut
	Leis-M8-T-Nut
T-nuts	MU-DIN508-M4x8
	MU-DIN508-M6x8
	MU-M4x8-Rhombus
	MU-M6x8-POS
	MU-M6x8-Rhombus
	MU-M8x8-POS
T-bolts	SHR-DIN787-M8x8x32
Slot covers	NAD8x11,5
Connecting brackets	See INA publication Fasteners and connecting brackets for linear actuators (TPI 153)

¹⁾ Clamping lugs can support higher forces. They should be used in preference over fixing brackets.

Appendix

Coupling, gearbox, motor

Couplings, gearboxes and motors are shown in the tables, subdivided by series

MKUVE20-B-ZR, MKUVE25-ZR

Coupling housing	Coupling	Gearbox	Motor
KGEH. MLFI50-B-ZR-60/75/M5	KUP560- 56-20H7-16H7	PL 70	MOT-SMH60
			MOT-SMHA60-BR
KGEH. MLFI50-B-ZR-80/100/M6	KUP560- 56-20H7-20H7	PL 90	MOT-SMH82
			MOT-SMHA82-BR

MKUE25-ZR, MKUSE25-ZR

Accessory	Article number
Coupling housings	KGEH.MLF52-ZR-110/130/M8
	KGEH.MLF52-ZR-80/100/M6
Couplings	KUP560-66-20H7-24H7
	KUP560-66-20H7-25H7
Planetary gearboxes, single stage/twin stage	PL115
	PL90
Economy planetary gearboxes, single stage/ twin stage (only for MKUE25-ZR with carriage with threaded holes)	PLE120/115
	PLE80/90
Servomotors	MOT-HDY115-A6-64S
	MOT-HDY115-C6-88S
	MOT-HDY115-E6-130S
	MOT-HDY115-C6-88S (only for MKUE25-ZR with carriage with threaded holes)
	MOT-HDY92-E4-44S

Comprehensive information can be found in INA publication ALE, Driven Linear Units and on the Internet at www.schaeffler.com

Tightening torques The correct tightening torques are shown in the table.

Screw	Grade	Tightening torque Nm
M4	8.8	2,7
	10.9	4,3
	12.9	5,1
M5	8.8	5,5
	10.9	8,4
	12.9	10,2
M6	8.8	9,5
	10.9	14,7
	12.9	17,6
M8	8.8	23
	10.9	35,3
	12.9	42,2
M10	8.8	46
	10.9	67
	12.9	78
M12	8.8	80
	10.9	115
	12.9	135

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