

Translation of the original instructions

# **Linear Carriage Systems**

**with roller bearing or sliding guide**

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# 1 Safety

## 1.1 Definition of Warning Notes



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**WARNING**

Indicates potential danger. Non-observance of the safety provisions may cause death or severe injury.

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**CAUTION**

Indicates potential danger. Non-observance of the safety provisions may cause property damage or injury.

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**NOTE** Offers additional information.

## 1.2 General Warning Notes

The linear carriage must only be commissioned by specialists who received safety-technical instruction and are able to assess potential dangers. Furthermore, all chapters of these operating instructions must have been read and understood completely.



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**WARNING**

**The linear carriage system must be powered down for all assembly, disassembly or repair work. There is a high danger of injury.**

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**WARNING OF HOT SURFACE**

During operation, heating of the motor, in particular of stepper motors, can cause the burns of the skin when touching the motor. Install a protective device, if possible! Do not touch the marked areas or wait for an adequate cooling time.

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**CAUTION**

Motor connectors must not be inserted or disconnected when live. Risk of burning of the contacts and risk of flying sparks.

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**CAUTION**

Linear carriage systems always have to be operated in connection with suitable safety devices (e.g., safety cell, protective room, protective housing, light curtain).

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**NOTE** Observe the Declaration of Incorporation (see section *Declaration of Incorporation*, page 37).

### 1.3 Special Hazard Warnings

In addition, this Original User's Manual also contains the following special hazard warning:

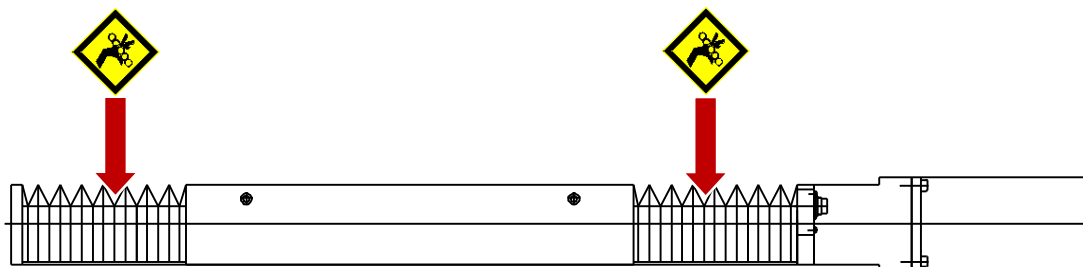


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**DANGER FROM CRUSHING**

These points of the components pose the danger of crushing limbs in operation.

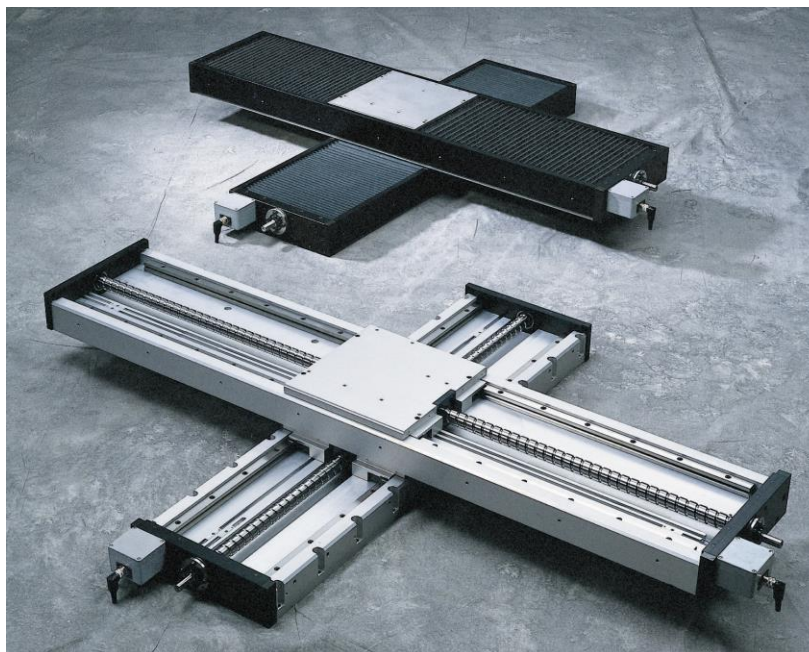
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**Figure 1: Crushing points of a linear carriage system**

## 2 Intended Use

The linear carriage systems (see, e.g. *Figure 2*) are precise, linear adjustment units with spindle drive (ball thread spindle or roller thread drive). The linear carriage systems named are used as installation parts in connection with other components in the commercial area. In combination with the other modules of the IEF-Werner GmbH, complex multi-axis systems can be built as well.



**Figure 2: Example linear carriage systems**

The areas of use of these linear carriage systems are accordingly diverse. The areas of use range from, e.g., stop adjustments, equipment systems for components, joining and press-in processes, loading and unloading stations of tool machines, infeed units for milling and drilling spindles and swash rivet units.

### 2.1 Reasonably Foreseeable Misuse

The linear carriage systems are **not** to be used for certain applications such as the transport of persons and animals or as a pressing/bending device for cold working of metal.

Use of the linear carriage systems without additional measures are also **not** possible in special fields of application, such as the chemical or food industry or in explosive atmospheres.

In case of doubt, consult the manufacturer.

### 3 Assembly Instructions

#### 3.1 Installation Position

The linear carriage systems are suitable for horizontal as well as for vertical use. For the vertical use case, observe that vertical cages and vertical end screws are used for roller carriage guides.



#### CAUTION

In the vertical installation position, use only motors with spring-operated brake to prevent the lowering of the drive in de-energized condition!

#### 3.2 Attachment

##### 3.2.1 Single Linear Carriage System

The linear carriage system must be clamped onto a level assembly area. The process accuracy and function of the linear carriage system essentially depends on the subconstruction. The bore distances may be freely chosen by the customer. The bore distances depend on the build size and guide type (see *Figure 3*).

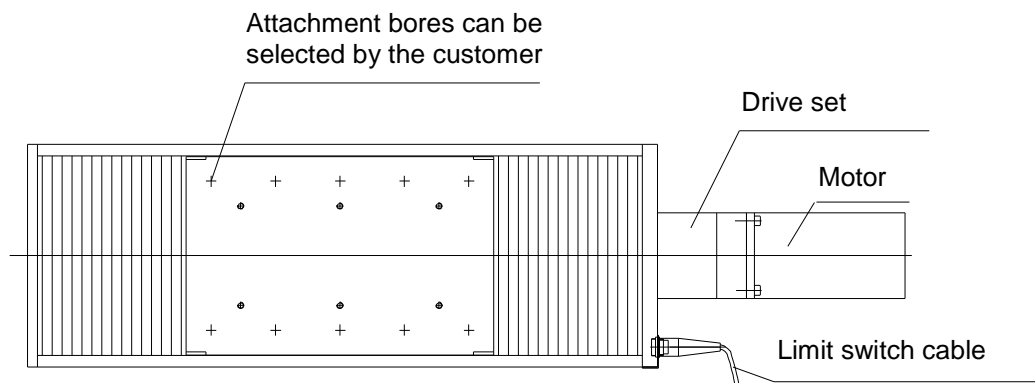
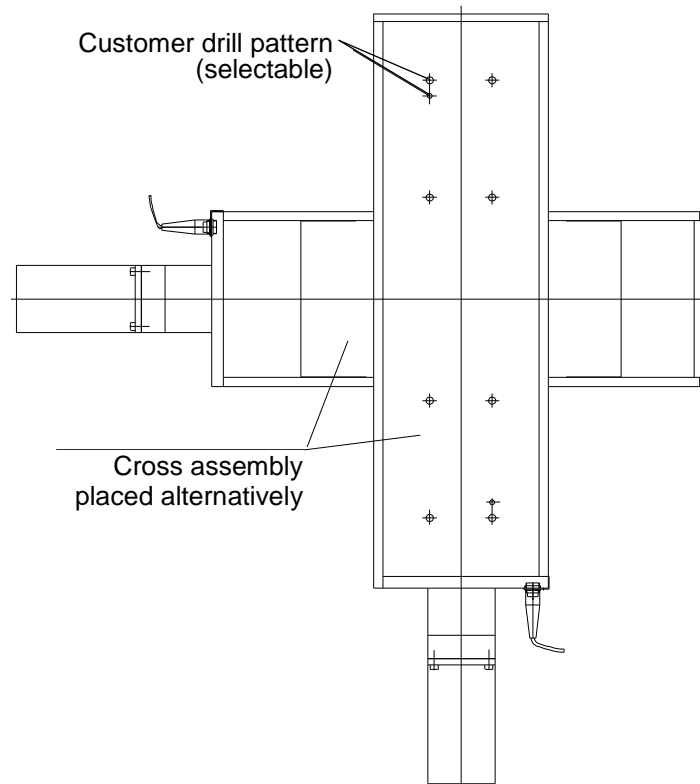


Figure 3: Linear carriage system



### 3.2.2 Cross Assembly of Linear Carriage Systems

The cross assembly of linear carriage systems is performed according to customer request. The cross assembly is performed using 4 attachment screws and 2 diagonally placed cylindrical pins (see *Figure 4*).



**Figure 4: Linear carriage systems cross-assembled with attachment bores**

### 3.3 Wiring

#### 3.3.1 Motors



#### CAUTION

The electrical connection of the motors is performed according to the motor data sheet. For customer-specific motors, the data sheet must be requested from the respective manufacturer and the motor connected accordingly.

#### 3.3.2 Initiators

Inductive proximity switches (PNP normally closed contacts) (see *Figure 6*). These switches are no safety limit switches pursuant to EN60204-1. Optionally, (also subsequently) an additional reference point switch (PNP normally open contact, see *Figure 7, page 11*) may also be installed in the linear carriage system: The active button is marked with a coloured circle. Normally closed contacts are marked with a green, normally open contacts with a red dot. The proximity switches and their supply line are protected in the bellows guide plate. The linear carriage systems must not be operated at disassembled limit switch strip.

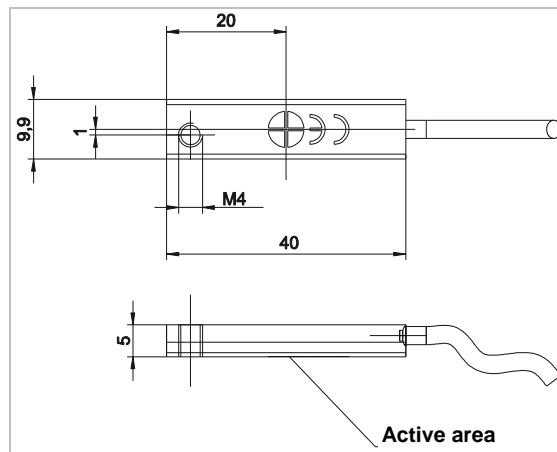


Figure 5: Scaled sketch of inductive proximity switch (initiator)

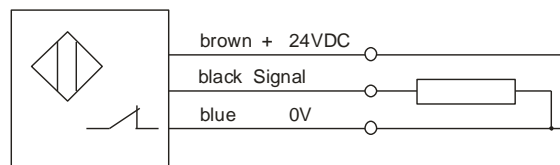
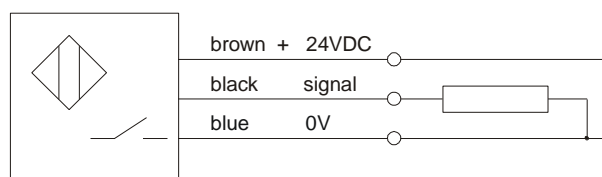


Figure 6: Connection allocation PNP normally closed contact



**Figure 7: Connection allocation PNP normally open contact**

### 3.3.2.1 Technical Data of Initiators

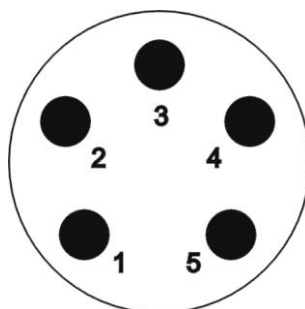
Parameter	Value
Operating voltage incl. residual ripple	(10 ... 30) VDC $\leq$ 15 %
Current load capacity	$I_a \leq$ 200 mA
Voltage drop at $I_a$ max.	$\leq$ 2.5 V
Switching frequency	$\leq$ 1,000 Hz
Own current consumption	$\leq$ 15 mA
Nominal switching distance on steel	1.5 mm $\pm$ 10 %
Switching hysteresis	(3 ... 20) %
Reproducibility (U = const.)	$\pm$ 0.01 mm
Operating temperature	- 25 °C ... + 70 °C
Protection class	IP 65
Short-circuit proof	yes
Protected against polarity reversal	yes

**Figure 8: Technical data of initiators**

### 3.3.2.2 Plug for End Position Switch

The plug of the end position switch is assigned as follows (see *Figure 9*):

Pin-No.	Assignment	IEF-Werner cables
1	+ 24 VDC	brown
2	Limit switch negative direction	green
3	0 V	white
4	Limit switch positive direction	yellow
5	Reference switch	grey



**Figure 9: Connection assignment plug end position switch, pins, male**

### 3.3.3 Cable Routing

For all moving cables, suitable cable routing has to be used to effectively prevent cable breaks.

The minimum radius  $r_{\min}$  for cable routing chains is calculated for IEF-Werner cables according to the following formula:

$$r_{\min} \geq 10 \times \text{cable diameter}$$

When different cables are used, EN 60204 must be observed. In addition, it must be ensured that a space reserve of 30% is kept free within the routing chains. A strain relief for the cables has to be attached at the outlet of the cable routing chain.

We recommend to order cables from IEF-Werner GmbH right away.

### 3.4 Technical Data

For carriage units with spindle drive, observe the maximum permissible spindle rotating speed. The spindle rotating speed determines the maximum possible movement speed mainly at longer strokes. The movement speed is calculated from the spindle speed according to the following equation:

$$v = n \text{ (speed in 1/min)} \cdot h \text{ (in mm); (unit result = mm/min)}$$

$$v = n / 60 \text{ (speed in 1/s)} \cdot h \text{ (in mm); (unit result = mm/s)}$$

- $v$  = movement speed [mm/s]
- $n$  = spindle speed [rpm]
- $h$  = spindle pitch [mm]

#### 3.4.1 Type Label

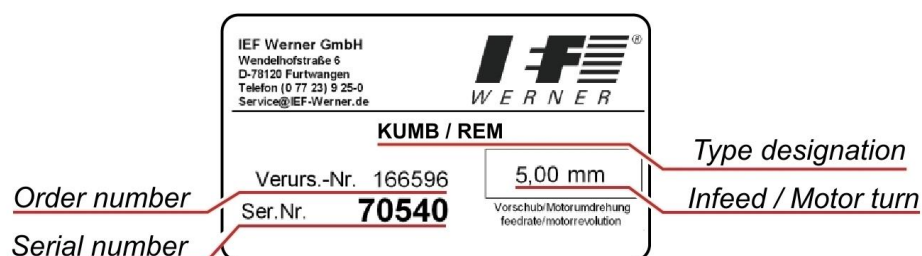


Figure 10: Type label (example)

## 4 Maintenance

During the design of the linear carriage systems, great importance was placed on the use of low-maintenance components. All roller elements were provided with lifetime lubrication in the factory.

However, to achieve a high service life of the guides, we recommend cleaning the guides and moistening them with special grease at regular intervals. Proceed accordingly when using a ball screw. The lubricant (e.g. Klüber-grease, type Isoflex NCA 15) can be purchased from IEF-Werner GmbH in tubes of 50 gram each (IEF-Werner item no.: 729148).

If a bellows is used, it should also be regularly cleaned from gross contamination. Never use compressed air for cleaning.

The recommended maintenance intervals of a linear carriage system add up to approx. 200 operating hours under regular ambience conditions. Under difficult conditions (high dust share, high humidity, high temperature), the maintenance intervals should be reduced.

When using a dovetail guide without coated guide surfaces, regular lubrication with oil or grease is required. Ideally, we recommend connection to a central lubrication unit via the present connections. The lubricant amount essentially depends on the carriage size and load, as well as the movement speed. Plastic-coated guides are lubricated with the good slideway oil (e.g. Febis K 68). In spite of the good dry running properties of this guide type, the lubrication should not be forgotten.

### 4.1 Lubrication Instructions

#### 4.1.1 Cross Rolls, Ball or Needle Roll Guides

IEF-Werner (cross)rolls, ball or needle roll guides should not be lubricated too much. The first lubrication may be sufficient for several years depending on usage conditions. Generally, lubrication is performed with roller bearing grease (e.g. Arcanol L 71 or lubrication grease LGMT 3). At higher temperatures, e.g. FAG Arcanol L 12, which may be used in an application range of - 30°C to +175°C, may be used. In this context, not that higher temperatures (in excess of 80°C) may cause changes to the guide properties. For smallest roll resistance, we recommend lubrication with ISO VG 15-100 according to DIN 51519.

Cutting oils or water-soluble cooling lubricants are **not** suitable for the guide. Lubricants with solids additions are also **unsuitable**. The relubrication intervals depend on different influences such as the load or ambience conditions.

It is sufficient when the lubricant is applied to the guide rails with a cloth/rag.

#### 4.1.2 Sliding Guides, Dovetail and TV-Guides

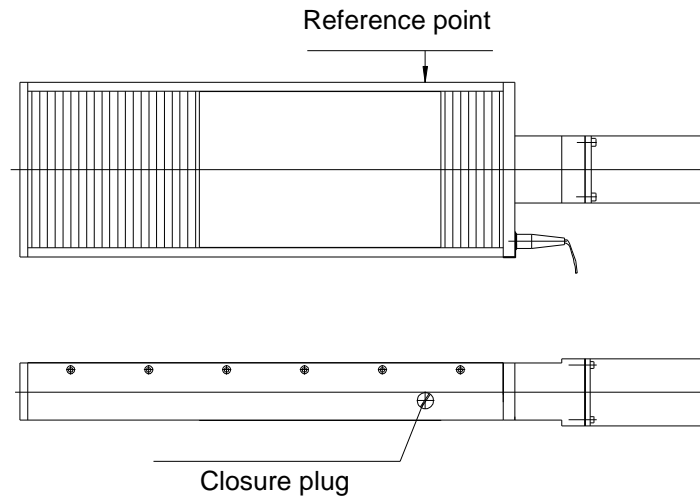
For uncoated dovetail guides, interval lubrication is mandatory. The interval time depends on the movement cycles, loads and outer influences. The coated sliding guides have certain emergency running properties. Under certain conditions, the sliding guides can be operated in dry operation.

The TV-guide system is delivered without lubrication connection by default. However, the same conditions apply for maintenance/lubrication as for coated plain bearings.

#### 4.1.2.1 Connection and Position of the Lubrication Points in Sliding or Dovetail Guides

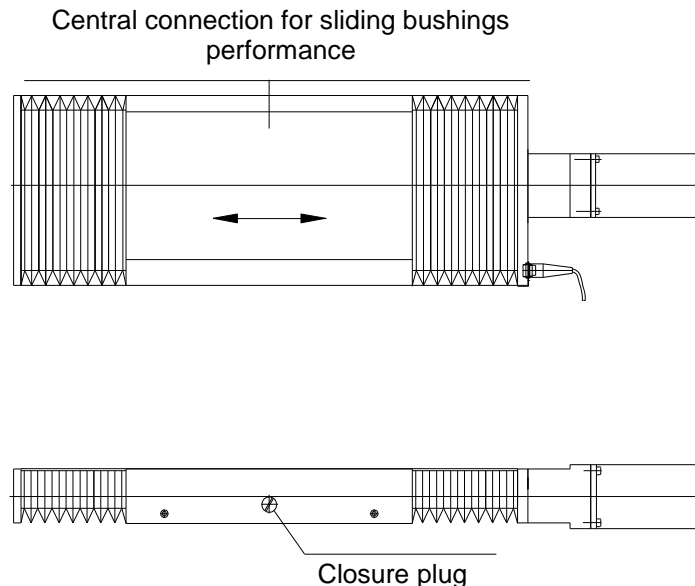
The connections are attached in the short, moving carriage part and designed as lubrication nipples for nozzle pipe points according to DIN3405 or as a thread M8x1 for a possible central lubrication connection.

When performing the linear carriage system with lateral cover or bellows guide plates, the lateral lubrication must be implemented by a defined lubrication/maintenance position (bore with closure plug) (see *Figure 11*).



**Figure 11: Lubrication linear carriage system with bellows**

For the design with U bellows cover, the lateral lubrication connection is freely accessible in every position (see *Figure 12*). You can also relatively simply implement a central lubrication connection.



**Figure 12: Lubrication linear carriage system with U-bellows**

A special construction permits implementing other lubrication connection points in the moving, short carriage part as well in coordination with the customer.

## 5 Troubleshooting

Interference	Reason	Correction
Increased running noise	Nominal service life of linear guide exceeded	Replace all linear guides and roller cages (see section <i>Replace Roller Guide or Needle Guide, Guide Play Settings, page 30</i> ).
	Linear guide worn from overload (too-high torque, etc.)	Replace all linear guides and roller cages (see section <i>Replace Roller Guide or Needle Guide, Guide Play Settings, page 30</i> ). Reduce load!
	Ball thread spindle worn	Replace ball thread spindle (see section <i>Replace Spindle, page 28</i> ).
	Motor (motor bearing) defective	Replace motor (see section <i>Replacing the Motor and Coupling, page 20</i> and <i>Replace Motor with Angled Motor Attachment, page 21</i> )
	Motor with brake, brake does not open	Apply current to brake; if the brake still does not release, replace motor (see section <i>Replacing the Motor and Coupling, page 20</i> and <i>Replace Motor with Angled Motor Attachment, page 21</i> )
Linear unit does not reach intended position.	Clutch between motor output shaft and spindle shaft slips.	Check and tighten the coupling clamp on the motor output shaft and the spindle shaft (see section <i>Replacing the Motor and Coupling, page 20</i> ).
	Motor "loses" steps, Motor "goes off"	Check and correct dynamic values like acceleration and max. movement speed
Linear drive unit does not move	Limit switch cable not connected.	Connect the cable.
	Limit switch defective	Replace end switch (see section <i>Replacing the Initiator, page 24</i> ).
	Limit switch cable defective	Check limit switch cable.
	Solder connection on socket has come loose	Solder on wires.
	Motor connected incorrectly	Check and change connector assignment, if required.
	Motor defective	Replace motor (see section <i>Replacing the Motor and Coupling, page 20</i> and <i>Replace Motor with Angled Motor Attachment, page 21</i> )
	Error in power electronics or control unit	Check the power electronics or the control unit.
	Motor cable defective	Check motor cable, replace cable, if required.
Play on reversal	Ball thread spindle worn	Replace ball thread spindle (see section <i>Replace Spindle, page 28</i> ).
	The ball thread spindle nut in the inner part of the carriage has play.	Retighten threaded rings (B; see <i>Figure 25, page 29</i> ) (see section <i>Replace Spindle, page 28</i> ).
	The axial bearing unit has play.	Retighten inner threaded ring and outer threaded ring or groove nut (see section <i>Axial, page 26</i> ).
	Clutch between motor output shaft and spindle shaft slips.	Check and tighten the coupling clamp on the motor output shaft and the spindle shaft (see section <i>Replacing the Motor and Coupling, page 20</i> ).
Guide Play	Overload from too-high forces and torques Increased wear	Check load and correct it if required. Readjust guide play. Replace all linear guides and roller cages if there is any damage or wear (see section <i>Replace Roller Guide or Needle Guide, Guide Play Settings, page 30</i> ).
Linear drive unit moves mechanically against the stop during the reference run.	Incorrect direction of rotation	Change motor direction of rotation.
	Broken motor cable	Replace cable.



## 6 Repair



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### WARNING

**Always power down the system before starting repairs.**

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### WARNING

**Any repairs must only be performed by specialist personnel who have read and understood the operating instructions.**

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### CAUTION

**Only use original replacement parts, otherwise IEF-Werner GmbH will not accept any warranty.**

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## 6.1 Replacing Bellows Apron

Generally, the bellows aprons are attached to the end plates or carriage interior with hook-and-loop tape. For special application cases, the bellows may also be screwed on.

Proceed as follows to replace the bellows apron (see *Figure 13*):

- (1) Loosen the bellows apron from the two hook-and-loop tapes (at the carriage inside and the respective end plate) and push the corresponding bellows apron into a block.
- (2) Then the compressed bellows apron 'over the corner' and completely remove the bellows apron from the bellows plates.

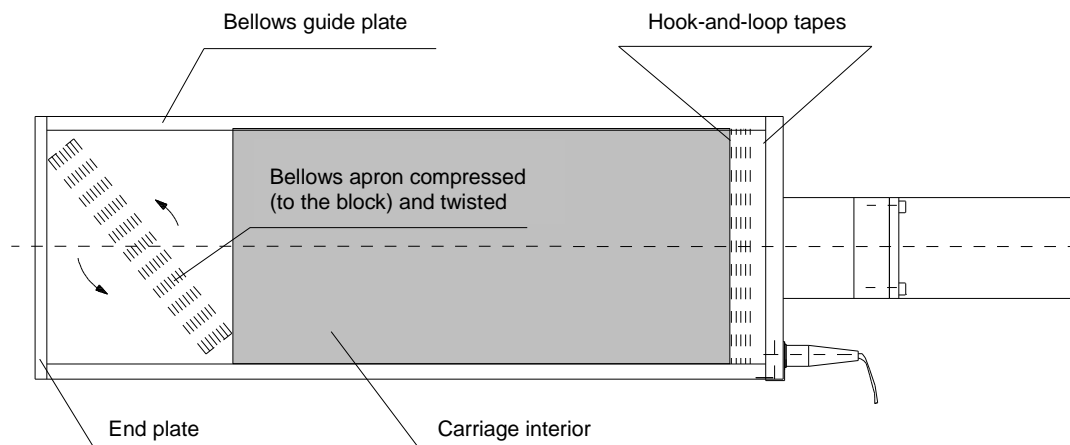
**NOTE** The carriage inside must be in the opposite end position.

- (3) Apply the bellows apron with two new hook-and-loop tapes.

**NOTE** If the counterpieces are contaminated (hook-and-loop tapes at the carriage inside and the end plate), replace these hook-and-loop tapes as well. In this case, observe that the adhesive points are clean and free of grease.

- (4) Slightly grease the running faces of the bellows guide plates.
- (5) Insert the bellows apron with two new hook-and-loop tapes "across the corner".
- (6) Close the hook-and-loop tapes.

**NOTE** Observe that there are no contaminations/particles between the hook-and-loop tapes.



**Figure 13: Linear carriage system with bellows apron**

## 6.2 Replace U-Bellows

Generally, the U-bellows are, like the bellows aprons, attached to the end plates or carriage interior with hook-and-loop tape.

Proceed as follows to replace the U bellows (see *Figure 14*):

- (1) Loosen the U bellows from the two hook-and-loop tapes (at the carriage inside and the respective end plate) and push the corresponding U bellows into a block.
- (2) Completely take out the U-bellows from the bellows balancer plates.

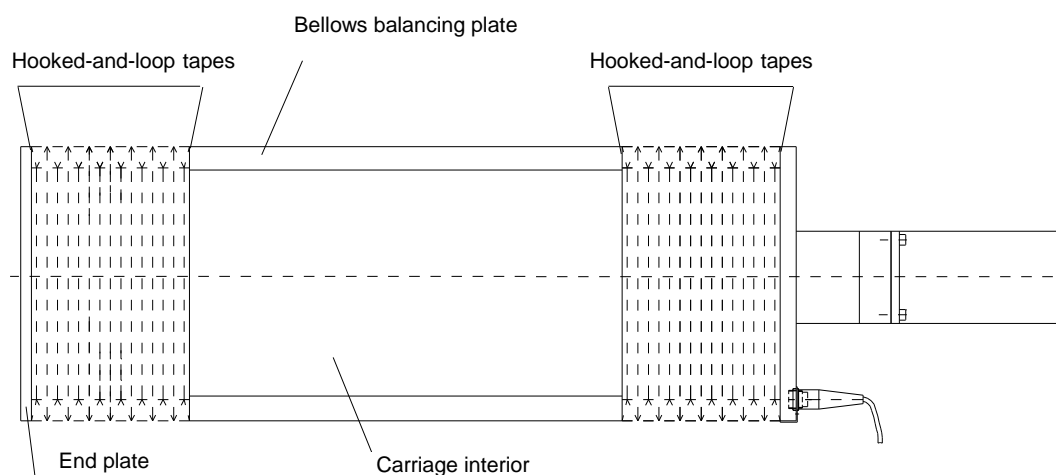
**NOTE** The carriage inside must be in the opposite end position.

- (3) Apply the U bellows with two new hook-and-loop tapes.

**NOTE** If the counterpieces are contaminated (hook-and-loop tapes at the carriage inside and the end plate), replace these hook-and-loop tapes as well. In this case, observe that the adhesive points are clean and free of grease.

- (4) Insert the U bellows again with two new hook-and-loop tapes.
- (5) Close the hook-and-loop tapes.

**NOTE** Observe that there are no contaminations/particles between the hook-and-loop tapes.



**Figure 14: Linear carriage system with U-bellows**

### 6.3 Replacing the Motor and Coupling

Proceed as follows to replace the motor/coupling (see *Figure 15*):

- (1) remove the PG-closure plugs.

**NOTE** The now freed bores permit reaching the clamping screw E.

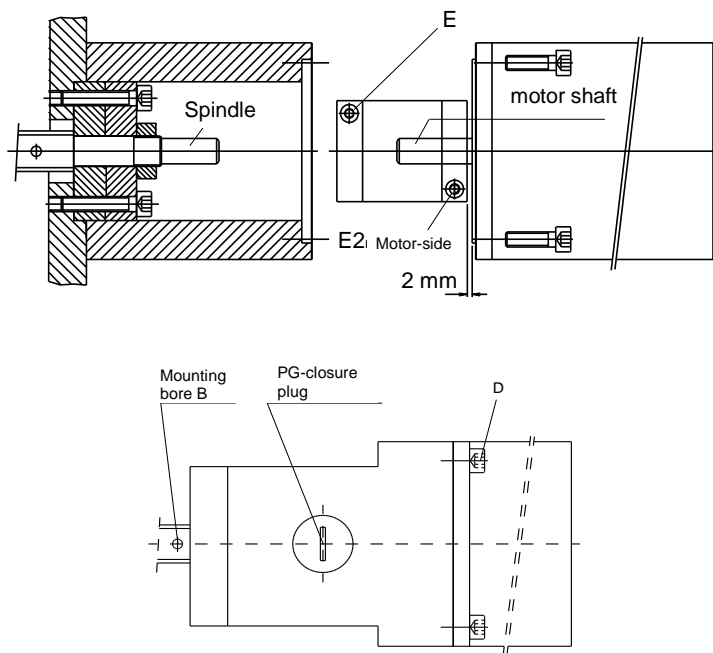
- (2) Turn the spindle (if required with the end-plate-side assembly bore B), to put the clamping screw E in position.
- (3) Loosen the clamping screw E.
- (4) Loosen and remove the attachment screws D.
- (5) Remove the motor.
- (6) Loosen the motor-side clamping screw E2 (motor-side) and remove the coupling from the motor.
- (7) Place a new coupling on the motor shaft (at least 2 mm distance from the front face!) and tighten the clamping screw E2 of the coupling to avoid slipping of the clutch on the motor shaft.



#### CAUTION

Install the coupling on the motor shaft with at least 2 mm distance from the front face of the motor!  
Do not hit the motor/motor shaft!  
Do not apply any axial, lateral or angular offset on the coupling.

- (8) Wind up the motor with the installed coupling on the sliding seat.
- (9) Tighten the attachment screws well (D)
- (10) Tighten the clamping screw E well to prevent slipping of the clutch on the spindle end.
- (11) Turn in the PG-closure plugs into the motor flange.

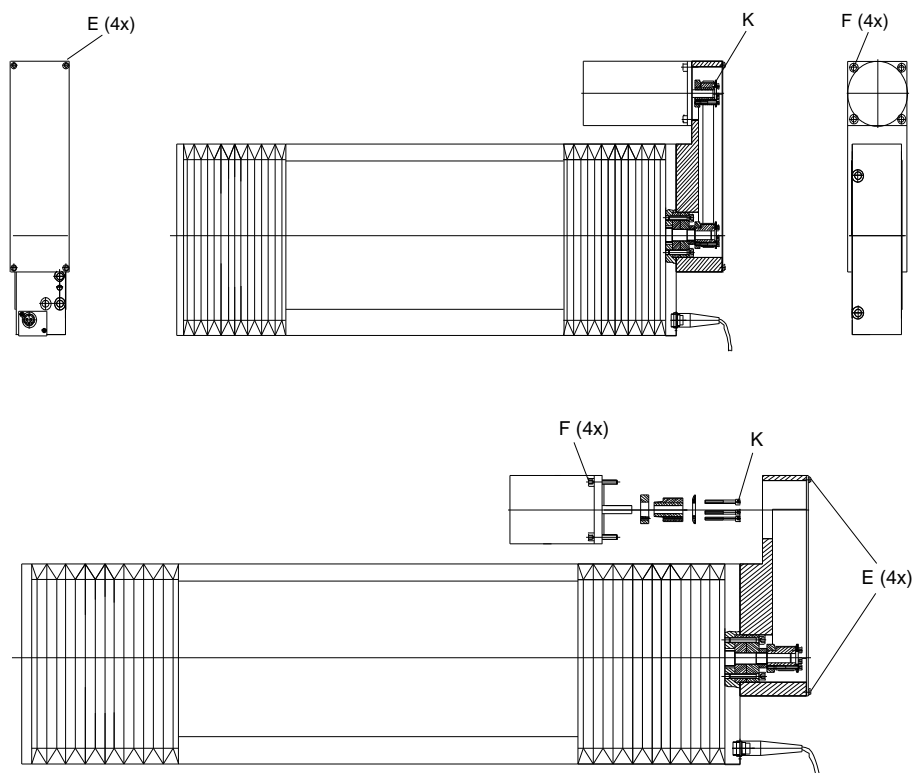


**Figure 15: Replacing the Motor and Coupling**

## 6.4 Replace Motor with Angled Motor Attachment

Proceed as follows to replace the motor with angled assembly (see *Figure 16*):

- (1) Loosen the four connection screws E of the gearbox/gear lid.
  - (2) Remove the lid of the gearbox.
  - (3) Loosen the four connection screws F of the motor.
- The motor is loosened, the toothed belt is relived.
- (4) Remove the toothed belt.
  - (5) Remove the motor gear that is performed as a clamping set from the motor shaft as follows:
    - Loosen the clamping screw K
    - Loosen conus element with a pressure screw (note: Clamping and push-off threads have the same size)
  - (6) Apply the new motor gear to the motor shaft as follows:
    - Slightly tighten the clamping screws and axially align the motor gear
    - Tighten the screws equally and crosswise to a consistent torque
    - Secure the clamping screws by threadlocker varnish
  - (7) Wire the new motor according to the motor datasheet and test the rotating direction.
  - (8) Place the motor to the motor flange.
  - (9) Apply the toothed belt.
  - (10) Push the motor away from the linear carriage guide to tension the toothed belt and firmly tighten the attachment screws (F).
  - (11) Reinstall the lid of the gearbox.

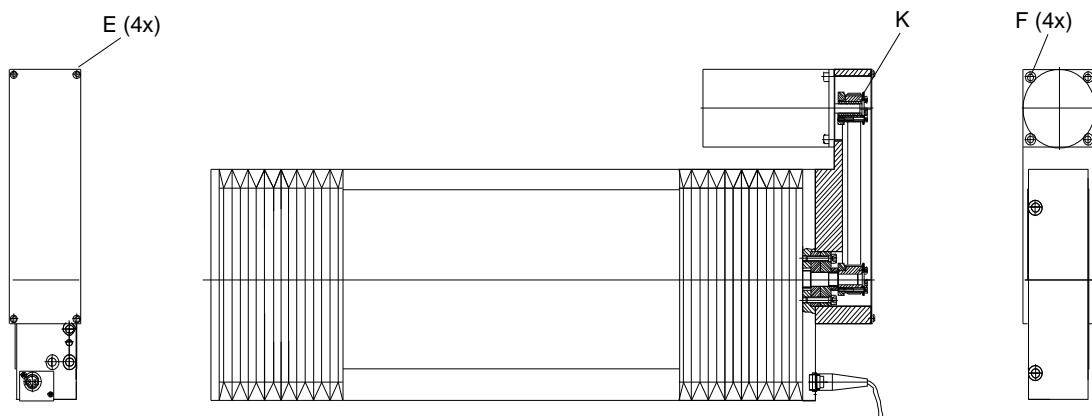


**Figure 16: Replace motor with angled motor attachment**

## 6.5 Replacing the Drive Toothed Belt

Proceed as follows to replace the drive toothed belt (see *Figure 17*):

- (1) Loosen the four connection screws E of the gearbox/gear lid.
- (2) Remove the lid of the gearbox.
- (3) Loosen the four connection screws F of the motor.
- The motor is loosened, the toothed belt is relieved.
- (4) Apply the new toothed belt.
- (5) Push the carriage away from the motor to tension the new toothed belt.
- (6) Screw on the motor.
- (7) Reinstall the lid of the gearbox.

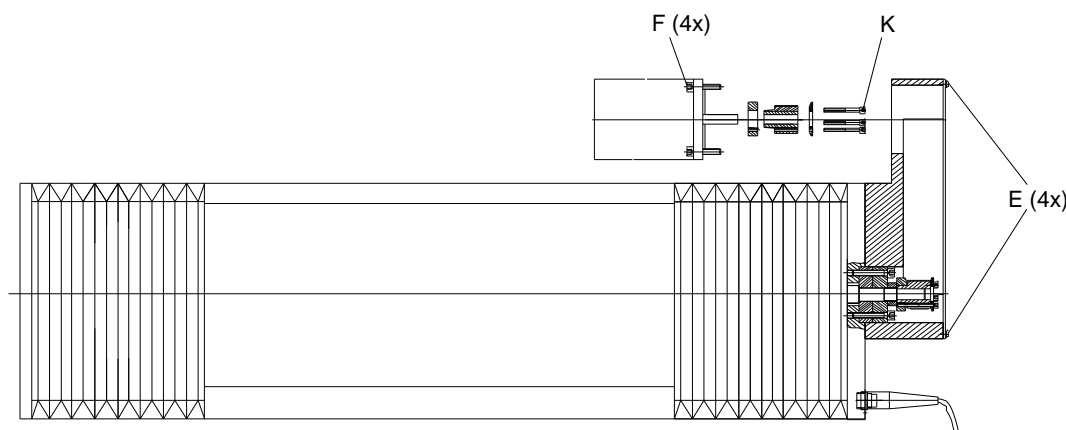


**Figure 17: Replacing the drive toothed belt**

## 6.6 Replace Spindle Gear and Motor Gear

Proceed as follows to replace the gear: *Figure 18*

- (1) Loosen the four connection screws E of the gearbox/gear lid.
  - (2) Remove the lid of the gearbox.
  - (3) Loosen the four connection screws F of the motor.
- The motor is loosened, the toothed belt is relieved.
- (4) Remove the toothed belt.
  - (5) Remove the spindle and motor gears that are performed as clamping sets from the spindle end or motor shaft as follows:
    - Loosen the clamping screw K
    - Loosen conus element with a pressure screw (note: Clamping and push-off threads have the same size)
  - (6) Apply the new spindle gear or motor gear to the spindle end or motor shaft as follows:
    - Slightly tighten the clamping screws and axially align the gear
    - Tighten the screws equally and crosswise to a consistent torque
    - Secure the clamping screws by threadlocker varnish
  - (7) Apply the toothed belt.
  - (8) Push the motor away from the linear carriage guide to tension the toothed belt and firmly tighten the attachment screws (F).
  - (9) Reinstall the lid of the gearbox.



**Figure 18: Replace spindle gear and motor gear**

## 6.7 Replacing the Initiator



### CAUTION

The linear carriage system must not be operated without initiator and switching strip!

Proceed as follows to replace the proximity switch (reference point switch, end limit switch) (see Figure 19 to Figure 22, page 25):

- (1) Remove the bellows cover (see either section *Replacing Bellows Apron, page 18* and *Replace U-Bellows, page 19*)
- (2) Remove the bellows balancing plates or bellows guide plates.
- (3) Loosen the connection screws F and remove the angle sheet with the end switch wiring socket to be able to replace the proximity switch.
- (4) Solder off the initiator cable from the socket.
- (5) Remember/mark the position of the current (installed) proximity switch.
- (6) Loosen the threaded pin of the defective proximity switch to be taken out and push the cover strip and the defective proximity switch out of the switching strip.
- (7) Shorten the cable of the new proximity switch to the cable length of the defective (replaced) proximity switch.
- (8) Push the new proximity switch into the position of the defective (replaced) proximity switch and put the cover strip in the original position.
- (9) Check the new proximity switch for function.
- (10) Solder on the initiator cable according to the wiring plan.
- (11) Install the switching strip and bellows balancing or bellows guide plates.
- (12) Install the bellows covers again.

### NOTE

Observe that there are no contaminations/particles between the hook-and-loop tapes.



### CAUTION

If the reference point switch of the linear axis is used as machine zero point, a new adjustment of the zero point is required.

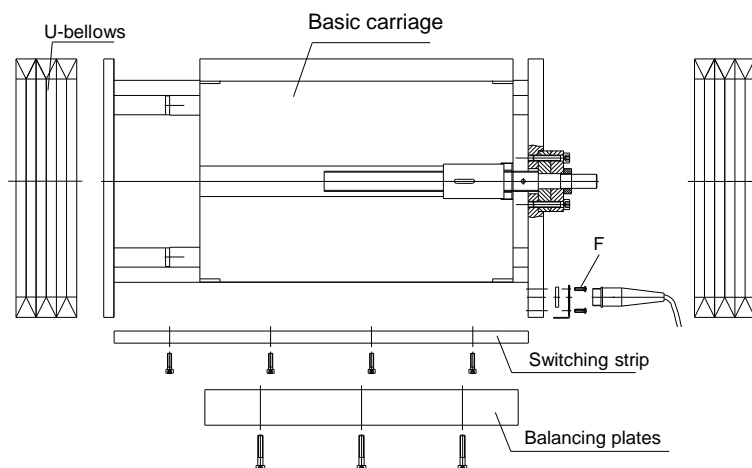
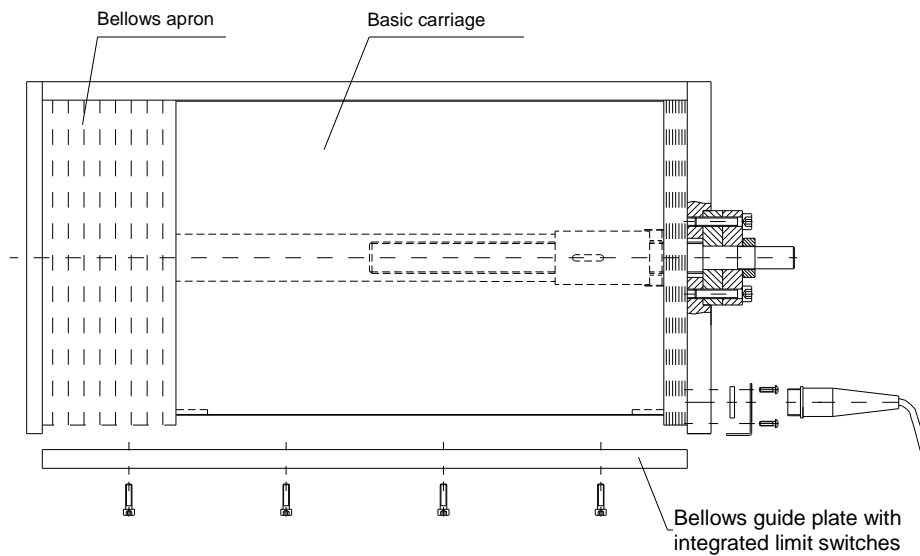


Figure 19: Replacing the proximity switch (figure 1 of 4)

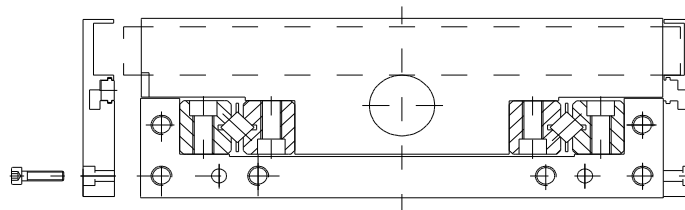


Continuation of figures from section "Replace proximity switch"



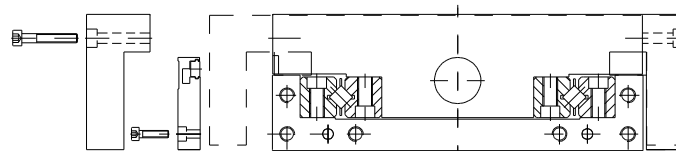
**Figure 20: Replacing the proximity switch (figure 2 of 4)**

Replace proximity switch  
in carriage guide with  
bellows cover



**Figure 21: Replacing the proximity switch (figure 3 of 4)**

Replace proximity switch  
in carriage guide with  
U-bellows cover



**Figure 22: Replacing the proximity switch (figure 4 of 4)**

## 6.8 Axial Bearing Replacement

The motor must be removed to be able to replace the axial bearing unit.

Proceed as follows to replace the axial bearing (see *Figure 23*):

- (1) Remove the PG-closure plugs (see *Figure 15*, page 20).

**NOTE** The now freed bores permit reaching the clamping screw E.

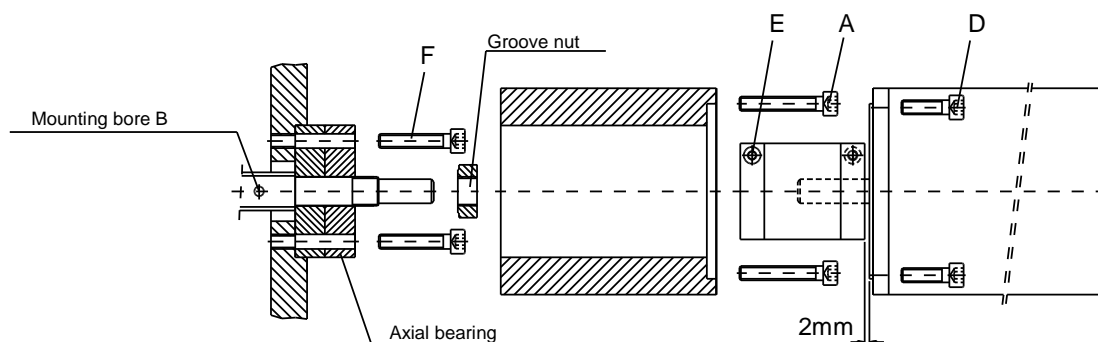
- (2) Turn the spindle (if required with the end-plate-side assembly bore B), to put the clamping screw E in position.
- (3) Loosen the clamping screw E.
- (4) Loosen and remove the attachment screws D.
- (5) Remove the motor with the coupling.
- (6) Loosen the connection screws A between the motor flange and end plate and remove the motor flange.
- (7) Loosen the counter-threaded pins in the groove nuts with a hexagon socket (2x) to remove the groove nut (end-plate-side assembly bore B in the spindle for countering).
- (8) Remove the connection screws F.
- (9) Remove the actual bearing unit (poss. with a wiper).
- (10) Install the new axial bearings (axial angular ball bearings).



### CAUTION

When installing the axial angular ball bearings, the assembly forces must only be applied on the bearing ring to be installed. Never guide assembly forces across rolling bodies or sealing rings. Tighten the attachment screws F crosswise! Do not hit the motor and spindle!

- (11) Tighten the groove nut for pre-tension on the bearings or remove the axial play.
- (12) Tighten the two counter-threaded pins in the groove nut to secure the threaded ring with a hexagon socket wrench.
- (13) Install the motor flange.
- (14) Turn in the PG-closure plugs into the motor flange.



**Figure 23: Replacing the Axial Bearing**

## 6.9 Replace Counterbearing of the Spindle

Proceed as follows to replace the spindle counterbearing (see *Figure 24*):

- (1) Loosen the bellows covers of the hook-and-loop tapes.
- (2) Move the carriage interior in the motor-side end position
- (3) Loosen the connection screws A.
- (4) Remove the end plate.
- (5) Press the counterbearing out of the end plate with a suitable tool.
- (6) Press the counterbearing out into the end plate with a suitable tool.

**NOTE** Observe the installation provisions for groove ball bearings / for the corresponding groove ball bearing.

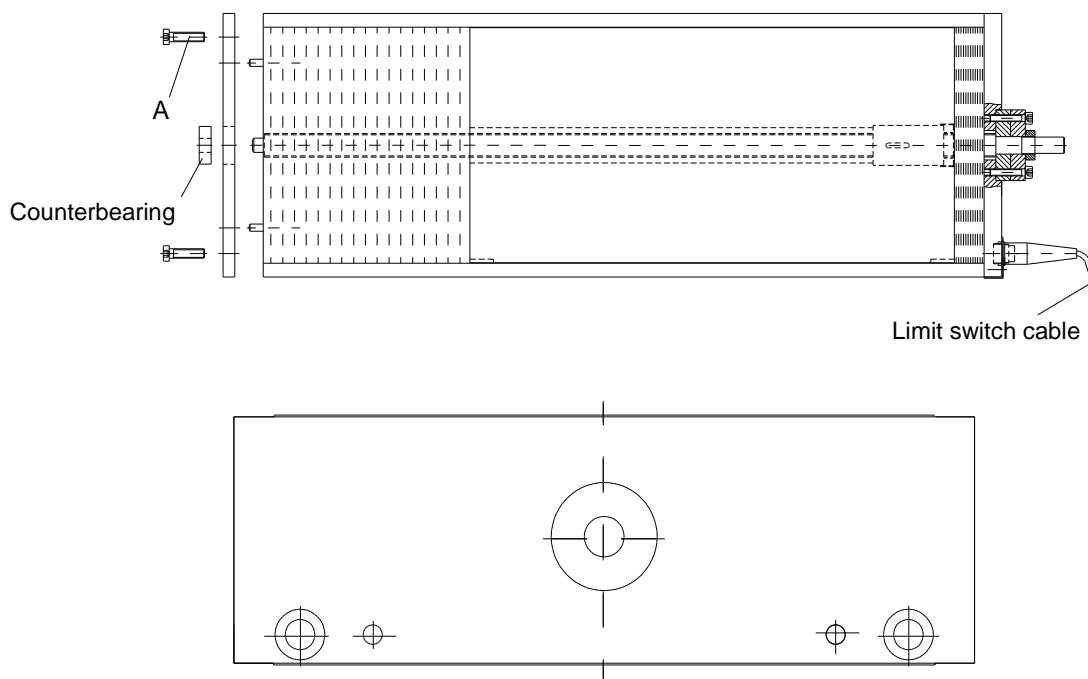


### CAUTION

Do not hit the motor and spindle!

- (7) Fasten the end plate above the fitting pins and tighten the connection screws A.
- (8) Insert the bellows covers again and close the hook-and-loop tapes.

**NOTE** Observe that there are no contaminations/particles between the hook-and-loop tapes.



**Figure 24: Spindle with counterbearing**

## 6.10 Replace Spindle

To replace the spindles, the bellows must be removed on the motor side.

Proceed as follows to replace the spindle (see *Figure 25, page 29*):

- (1) Loosen the bellows cover on the motor side from the hook-and-loop tapes and remove the bellows cover entirely.
- (2) Remove the PG-closure plugs in the motor flange.

**NOTE** The now freed bores permit reaching the clamping screw E.

- (3) Turn the spindle (if required with the end-plate-side assembly bore B), to put the clamping screw E in position.
- (4) Loosen the clamping screw E.
- (5) Disassembly the motor with the coupling by loosening the attachment screws D.
- (6) Loosen the connection screws A and remove the motor flange.
- (7) Loosen the counter-threaded pins in the groove nuts with a hexagon socket (2x) in the groove nut with a hexagon socket key to remove the groove nut (end-plate-side assembly bore B in the spindle for counterering).
- (8) Remove the motor-side end plate by loosening the connection screws C.
- (9) Loosen the threaded ring B with a special tool.

**NOTE** If no special tool is present, the threaded ring may also be loosened with Seeger ring pliers!

- (10) Pull the spindle from the carriage interior with the groove nut.



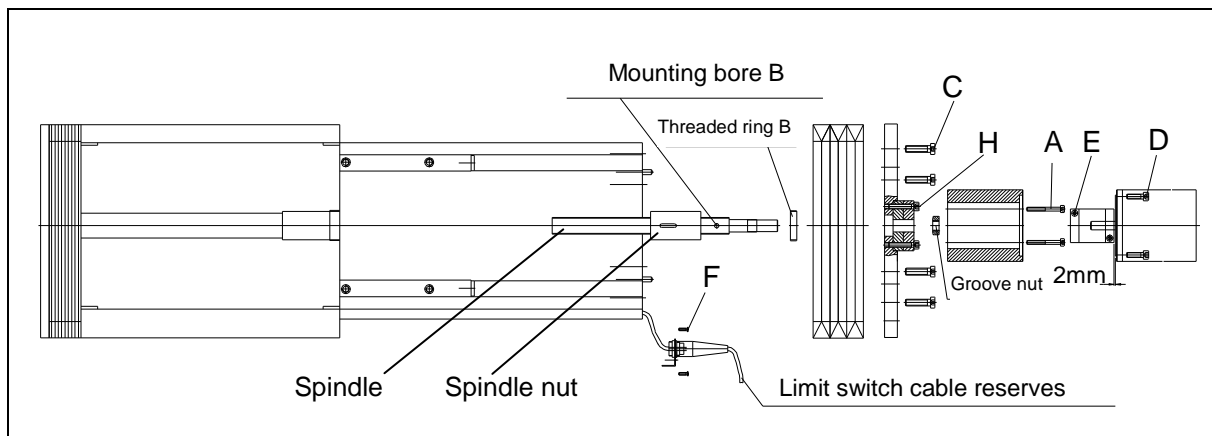
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### CAUTION

Never turn the spindle nut completely off of the spindle.  
Do not hit the spindle, bearing and motor.

---

- (11) Use the feather key again for the new (replaced) spindle.
- (12) Put the new spindle with groove nut into the interior of the linear carriage guide.
- (13) Tighten the threaded ring B and secure the turned-in threaded ring with threadlocker varnish.
- (14) Install the motor-side end plate again. Observe that the cylindrical pins are present in the end plate and carriage outside.
- (15) Pretighten the axial bearings by tightening the groove nut.
- (16) Tighten the two counter-threaded pins alternatively with a hexagon socket wrench.
- (17) Install the motor flange again.
- (18) Reinstall the motor with the coupling.
- (19) Tighten the clamping screw of the coupling well.
- (20) Turn in the PG-closure plugs into the motor flange.



- A = Connection screws motor flange
- B = Assembly bores (in spindle); threaded ring
- C = Attachment screws end plate
- D = Attachment screws for motor/coupling
- E = Clamping screw (motor side)
- F = Connection screws for holding sheet end switch

**Figure 25: Replacing the Spindle**

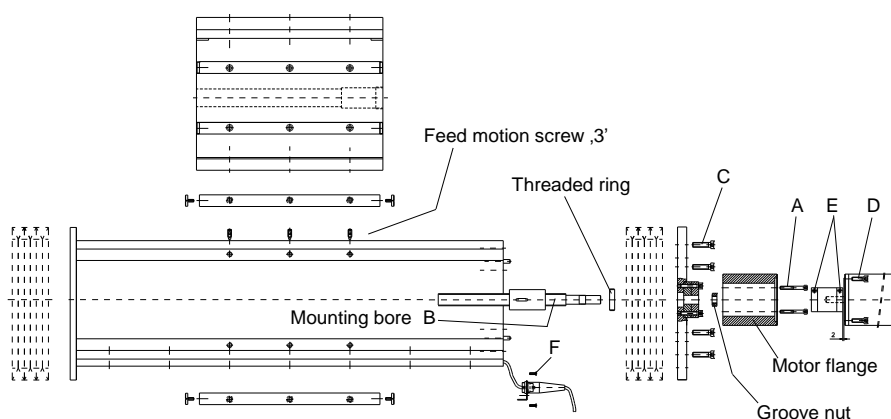
## 6.11 Replace Roller Guide or Needle Guide, Guide Play Settings

To be able to replace the roller guide, all attachments that are not part of the linear carriage unit must be removed.

The linear carriage unit must be in the horizontal position to be able to replace the guides.

Proceed as follows to replace the guide (see *Figure 26*):

- (1) Remove the bellows covers. The corresponding bellows (bellows apron or U-bellows) is loosened from the hook-and-loop tapes and removed (see sections *Replacing Bellows Apron*, page 18 or *Replace U-Bellows*, page 19).
- (2) Remove the PG-closure plugs in the motor flange.
- (3) Turn the spindle (if required with the end-plate-side assembly bore B), to put the clamping screw E in position.
- (4) Loosen the spindle-side screw E.
- (5) Loosen the attachment screws D.
- (6) Remove the motor with the coupling.
- (7) Loosen the connection screws A and remove the motor flange.
- (8) Loosen the counter-threaded pins in the groove nuts with a hexagon socket (2x) in the groove nut with a hexagon socket key to remove the groove nut (end-plate-side assembly bore B in the spindle for counterering).
- (9) Turn the groove nut from the spindle with a special wrench.
- (10) Loosen the attachment screws F and put away the end switch wiring socket to the side.
- (11) Loosen the attachment screws C and remove the motor-side end plate.
- (12) Remove the bellows balancing plates or bellows guide plates.
- (13) Remove the spindle when the spindles have counterbearings to achieve a better adjustment when installing the new guides (for spindle removal, see section *Replace Spindle*, page 28).
- (14) Remove the end screws to extend the interior from the outer part.
- (15) Extend the interior from the outer part now.
- (16) Loosen the feed screws "3" specified for setting of the guide play by 2-3 turns.
- (17) Now replace the guide rails. Observe the installation provisions for longitudinal guides (see section *Installation Provision for Longitudinal Guides*, page 32).



**Figure 26: Replace roller guides**

This page was kept empty on purpose.

### 6.11.1 Installation Provision for Longitudinal Guides

The longitudinal guides are cleaned and protected from corrosion by slight oiling.

Proceed as follows to install a longitudinal guide (see *Figure 27* to *Figure 29*, page 33):

- (1) Push again the support when installing the guide rails 1 (see item 1, 2 in *Figure 29*, page 33) and tighten the attachment screws. Then check the parallelism of the rails 1 to the application area.
- (2) Install the rails 2 and tighten the attachment screws slightly.
- (3) Retract the cages. Observe that the end positions of the rails must not exceed the cages.
- (4) Set the guide/play with the feed screws 3. Advice: The play-free setting of the guide can be performed more sensitively if the dead weight is balanced out by lifting.
- (5) Ensure even feed to the right and left. Feed must take place from the centre of the table. Feed is only permitted where the cage interlocks.
- (6) Tighten the attachment screws of the guide rails well.
- (7) Apply a certain pre-tension to the guide. The pretension essentially depends on the construction's stiffness. Observe that a high pre-tension will essentially impair the service life.
- (8) Attach the end screws and end pieces after you have reviewed the set guide.
- (9) Push the axial bearing unit with end plate onto the spindle seat without force application.
- (10) Tighten the groove nut well, secure the groove nut and tighten the screw C (see *Figure 27*, page 33).
- (11) Test the alignment of the pin bores of the end plate to the carriage outer part.
- (12) Apply new pins when the pin bore of the end plate is not aligned with the outer part of the carriage.
- (13) Place the end switch cable reserves in the end plate. Observe that the cable is not bent or crushed.
- (14) Screw the end switch wiring socket to its attachment sheet with screw F (see *Figure 27*, page 33) an.
- (15) Install the bellows balancing plates or bellows guide plates.
- (16) Install the motor flange.
- (17) Apply the motor with the coupling.



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#### CAUTION

Do not apply any lateral or angular offset of the coupling.

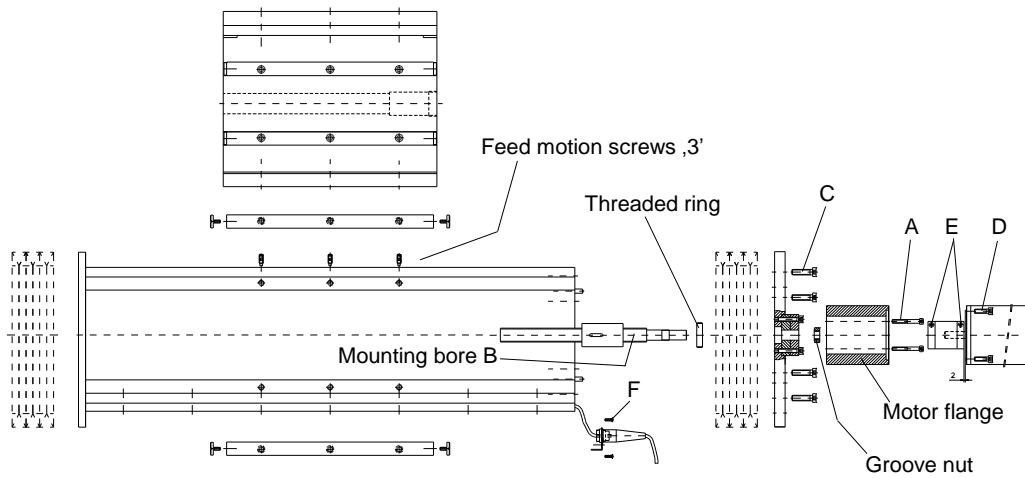
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- (18) Tighten the attachment screws D (see *Figure 27*, page 33) well.
- (19) Tighten the clamping screws E (see *Figure 27*, page 33) well.
- (20) Install the PG screw to the motor flange.
- (21) Insert the bellows. Observe that there are no contaminations between the hook-and-loop tapes.

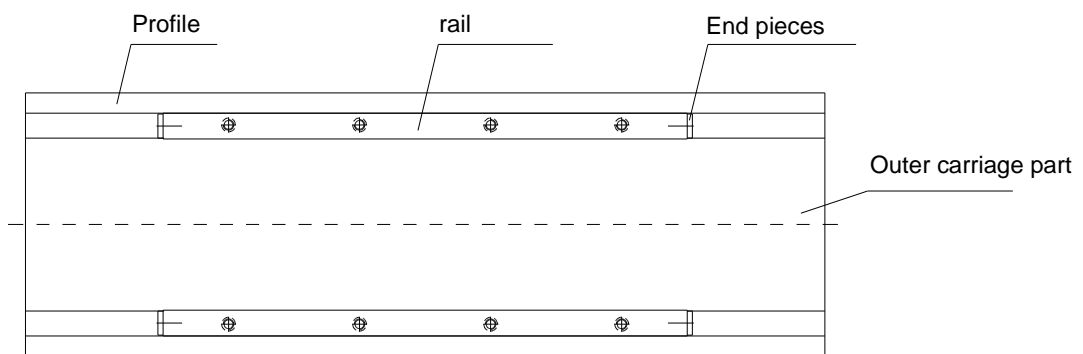
Inspection:

The set guide must be inspected for freeness from play and process accuracy.

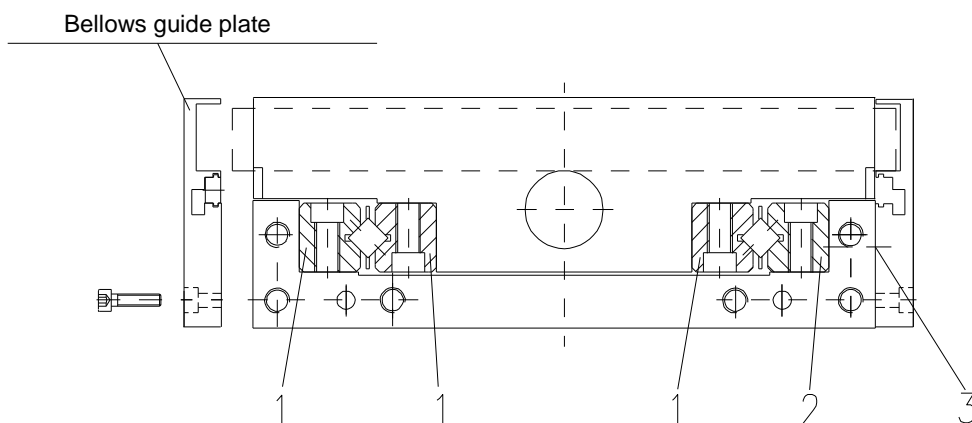




**Figure 27: Installation provision for longitudinal guides**



**Figure 28: Replacing roller guide (figure 1/2)**



**Figure 29: Replacing roller guide (figure 2/2)**

### 6.11.2 Replace TV-Guides, Set Guide Play

Procedure as for roller guide and needle guide (see section *Replace Roller Guide or Needle Guide, Guide Play Settings, page 30*).

The play setting is also performed via the adjustment screws 3. Again, the feed screws must only be set up where the plastic-coated M-rail is at the moment. Then tighten the attachment screws of the guide rail 2, mount the entire carriage unit.

### 6.11.3 Setting the Guide Play in a Dovetail Carriage Guide

The play-free setting is made with the adjustment screws 3 (see *Figure 30*). The feed is performed evenly to the right and left from the centre of the table. Adjust only where the carriage interior is interlocked. This leads to a play-free and even run. Secure feed screws if required. Install carriage unit cpl. together.

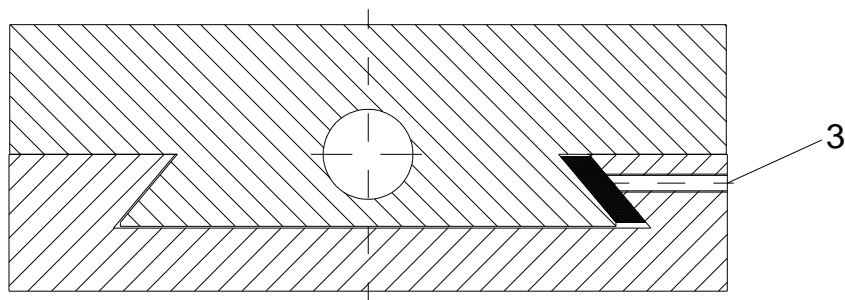
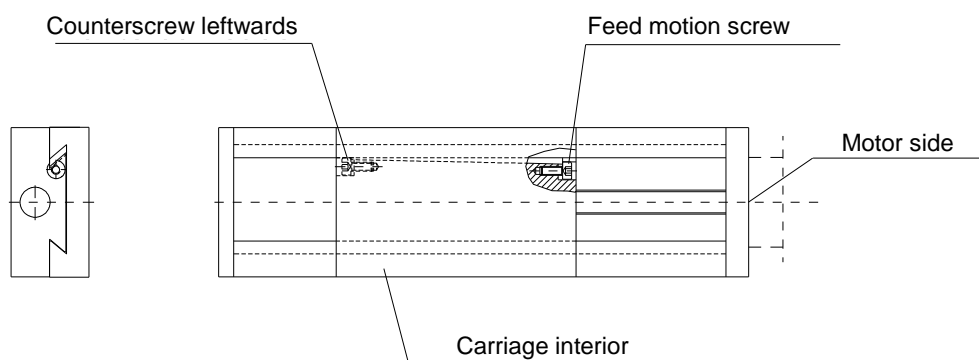


Figure 30: Setting the guide play in a dovetail carriage guide

Setting of the guide play in dovetail guides with conical adjustment strip usually takes place at the two front faces of the interior. The conical feed strip is fastened with clamping screws on either side. The feed, i.e. reduction of the guide play is performed with the feed screw on the side of the spindle nut, i.e. usually on the motor side.

Play setting:

- Before the play settings, the guide must be "released" to be able to adjust sensitive adjustment. This means that the drive elements like motor, axial bearing unit or end plates must be removed. See section *Repair*, from page 17.
- Loosen counterscrew (left thread) with key and turn back slightly.
- Adjust the conical feed strip by feed screw, i.e. reduce the guide play, increase the pre-tension.



**Figure 31: Set guide play of dovetail guide, conical strip**



**CAUTION**

The guide must not be pretensioned too strongly since the unit otherwise can no longer be operated with the specified parameters and the drive elements are subject to increased wear and even destroyed!

It should be possible to move the guide manually without high application of force (across the entire guide length).

- After the play setting was made, the feed strip must be clamped again with the counter screw.



**CAUTION**

Always fasten the feed strip before commissioning the guide, or the guide can seize. There is a danger of damage of the guide.

## **7 Spare and Wear Parts List**

An order-related spare- and wearing part list will be attached.

## 8 Declaration of Incorporation

EC declaration of incorporation in the sense of the EC directive 2006/42/EC (machinery), Annex II, 1. B.

The manufacturer:  
IEF-Werner GmbH  
Wendelhofstraße 6  
78120 Furtwangen - Germany

hereby declares that the following products (the incomplete machine/partial machine):

Designation	IEF-Werner parts group number
Linear carriage system (Types: KUMB, MS60, REM, NEM, TVEM, SEM, RUMB)	- - -

where possible based on the scope of delivery, corresponds to the following basic requirements of the directive on **Machinery (2006/42/EC)**:

- Annex I, item: 1.1.2; 1.1.3; 1.1.5; 1.3.2; 1.3.4; 1.5.1; 1.7.3;

The incomplete machine also corresponds to the following further directives:

- Directive **2014/30/EU** of the council, dated 15 December 2004, for harmonisation of the legal provisions of the member states on electromagnetic compatibility.
- Directive **2014/35/EU** of the council, dated 12 December 2006, for harmonisation of the legislation of the member states regarding electrical equipment for use within specified voltage thresholds.

The technical documents were generated according to Annex VII part B and may be electronically submitted to the national authorities upon justified request.

List of some applied harmonised standards:

- EN ISO 12100-1,-2 / EN ISO 13857 / EN ISO 13850 / EN 60201-1

Commissioning of the incomplete machine delivered by us is not permitted until it has been determined that the overall system into which the incomplete machine is installed meets the basic safety and health protection requirements according to Annex I of the above EC directive 2006/42/EC.

Name of the documentation officer: Frank Reichelt, technical editor

Address of the documentation officer: see manufacturer's address



Furtwangen, January 27<sup>th</sup>, 2018

Manfred Bär (manager)