

## Installation and operating instructions for Rail Brake HR 130/185 FHM

E 09.798e



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| <b>RINGSPANN</b>  | <b>Installation and operating instructions for<br/>Rail Brake HR 130/185 FHM<br/>spring activated – hydraulically released</b> | <b>E 09.798e</b> |               |           |         |
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## Important

Please read these instructions carefully before installing and operating the product. Your particular attention is drawn to the notes on safety.

These installation and operating instructions are valid on condition that the product meets the selection criteria for its proper use. Selection and design of the product is not the subject of these installation and operating instructions.

Disregarding or misinterpreting these installation and operating instructions invalidates any product liability or guarantee by RINGSPANN; the same applies if the product is taken apart or changed.

These installation and operating instructions should be kept in a safe place and should accompany the product if it is passed on to others -either on its own or as part of a machine- to make it accessible to the user.

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## Safety Notice

- Installation and operation of this product should only be carried out by skilled personnel.
- Repairs may only be carried out by the manufacturer or accredited RINGSPANN agents.
- If a malfunction is indicated, the product or the machine into which it is installed, should be stopped immediately and either RINGSPANN or an accredited RINGSPANN agent should be informed.
- Switch off the power supply before commencing work on electrical components.
- Rotating machine elements must be protected by the purchaser to prevent accidental contact.
- Supplies abroad are subject to the safety laws prevailing in those countries.

**This is a translation of the German original version!**

In case of inconsistencies between the German and English version of this installation and operating instruction, the German version shall prevail.

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## 1 Description of the rail brake

### 1.1 Principle

The rail brake HR 130/1850 FHM are hydraulic fail-safe brake, the braking force is applied by spring washers and hydraulic pressure is necessary to hold the brake released. The stack of spring washers is adjusted in factory. This adjustment, combined with adjustment of the pads gap, determines the braking torque value.

There is a type plate on the brake with a 16-digit article number. The exact design of the brake is defined by this article number only.

As well as these instructions, please also consider the catalogue data for the brake at [www.ringspann.com](http://www.ringspann.com) and the drawings in the individual sections.

The rail brake is describe as “manually readjusted”. This means that the pad wear must be compensated for by manual adjustment of the pad gap to avoid any loss of braking force.

The rail brake have a manual release device mechanically holding the caliper open, without any need for a hydraulic pressure. This release is useful for installation and maintenance work when there is no hydraulic pressure available.

### 1.2 Delivery condition

The rail brake is delivered in the following conditions:

- In manual release position, i.e. manually locked in open position,
- With pads installed,
- The holding force adjusted according to customer’s specifications.
- Mechanical contacts adjusted,
- With bleed screw in correct position.
- As well as these instructions, please also consider the catalogue data for the brake at [www.RINGSPANN.de](http://www.RINGSPANN.de) and the drawings in the individual sections.

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**Life-threatening danger!**

**Rail must be absolutely degreased before all contact with the brakes linings.**

**In case of lining pollution with grease, the nominal brake force is not guaranteed.**

**Rail Brake are fail-safe components. The rail brake is intended for purely static uses. Dynamic braking requires a replacement of the pads. All setting and repairs must be performed by skilled operators.**

**BE CAREFUL: The rail brake is delivered in " manual release" position and the holding force is adjusted in the factory. Instructions in this manual must be followed up to chapter 2 inclusive (GENERAL OPERATIONAL CHECK) to ensure that the Rail brake is operational.**

**When assembling, operating and maintaining the brake it is to be ensured that the entire drive train is secured against being switched on unintentionally. Moving parts can cause severe injury. Rotating parts (e.g. brake disc) must be secured by the operator against unintentional touching.**

**Strongly pre-loaded pressure springs are installed in the springed thrusters of the brake. The spring thruster may only be disassembled by the factory.**

## **2 Installation**

### **2.1 Preparing the positioning area**

Ensure that the positioning surface is clean and dry.

Make sure that there is sufficient space around the brake.

Check that the mounting holes are in conformity (center distances, sizes and numbers).

Rail brake HR 130 FHM-200

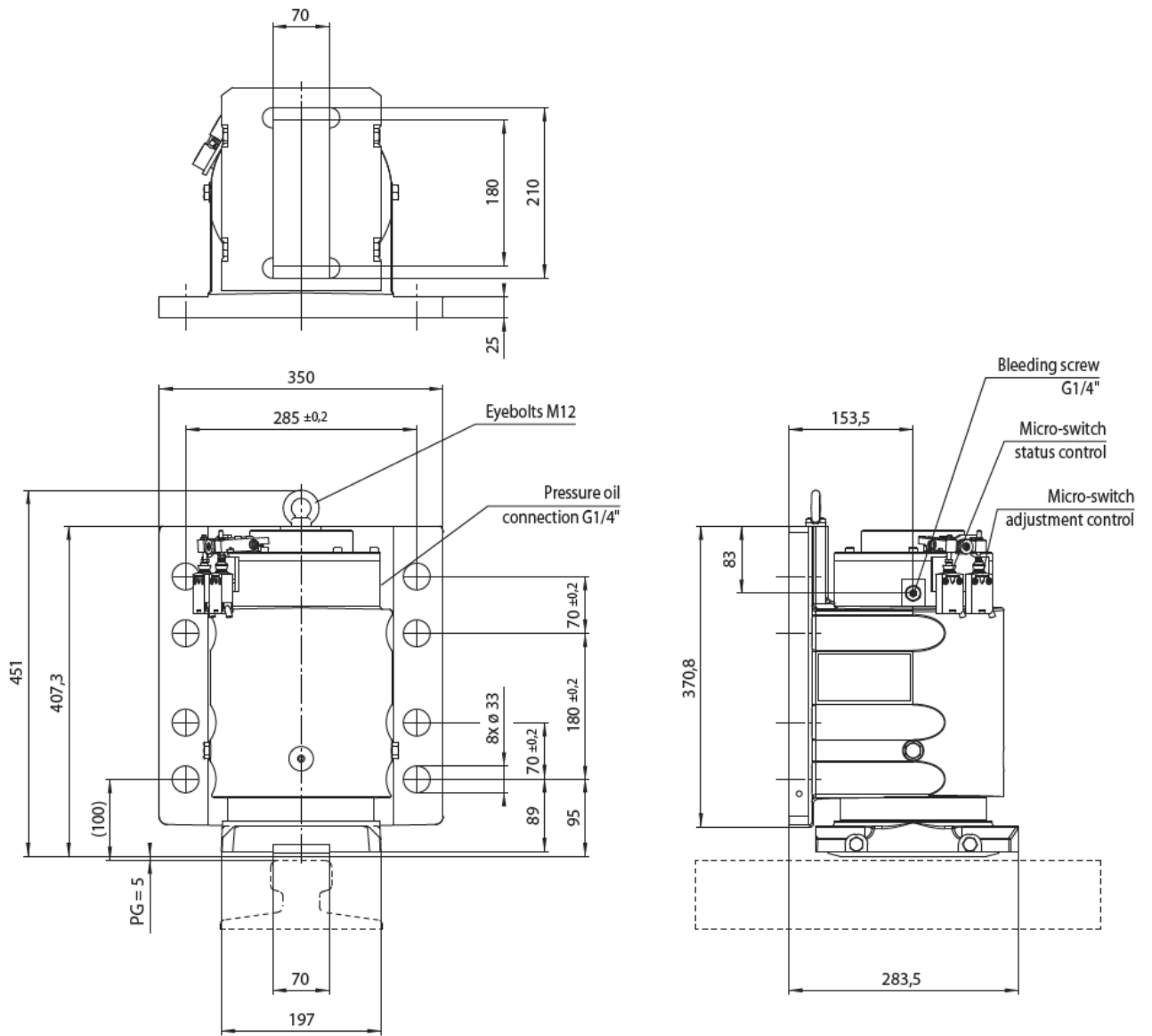


Fig. 2.1

Rail brake HR 185 FHM-530

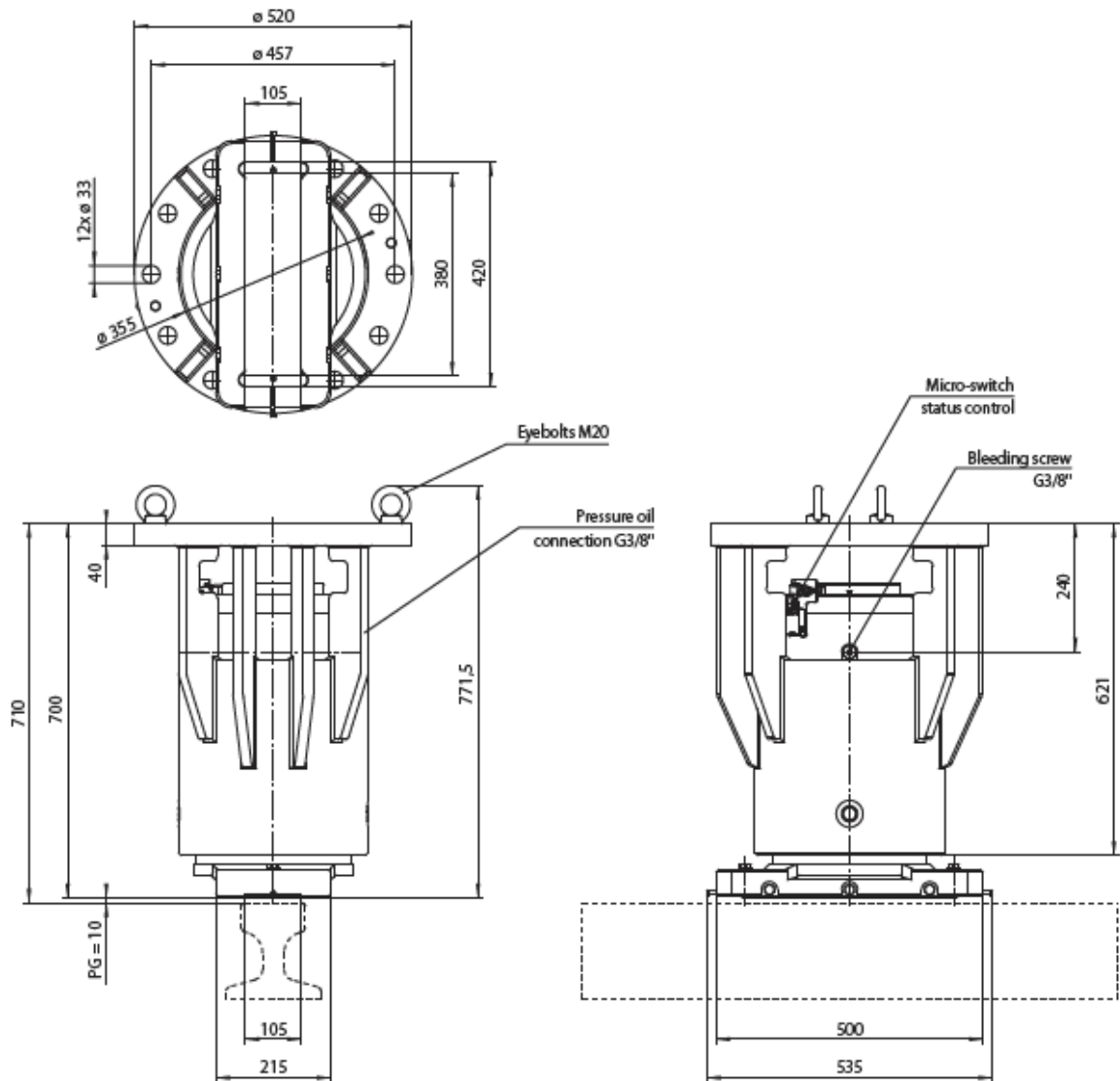


Fig. 2.2

2.2 Installing the rail

Make sure that the rail is accurately positioned  
 Check that the rail parallelism tolerance of 0,5mm widthwise  
 Check that the rail parallelism tolerance 02 mm lengthwise



**Important!**

**If these conditions are not complied with, the rail brake cannot be assembled or will not operate to standard. Contact RINGSPANN for more details.**

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First clean the rail tracks with the degreasing agent:

- Quick drying degreaser (CRC / KF)



**Important!**

**BE CAREFUL: The disc must be degreased and free of any deposits so as not to decrease the friction coefficient.**

## 2.3 Installing the rail brake

### 2.3.1 List of tools

1. Torque wrench up to 1500Nm, socket measuring 46mm across flats (base plate attachment).
2. AF spanner 46mm across
3. AF spanner + Flexible pipe inside Ø6mm (Bleed).

### 2.3.2 Rail brake handling

Put the assembly in position on the rail, raising it with lifting eyes Fig 2.1 and Fig. 2.2.  
Weight for one caliper: HR 130 FHM-200 = 130kg HR 185 FHM-530 = 430kg

### 2.3.3 Alignment procedure

1. Rail brake make sure that the support surface is clean and dry.
2. Make sure that there is sufficient space around the rail brake.
3. Check that the attachment holes are compliant (spacers, dimensions and number).
4. Rail brake HR 130 Observe the spacer dimensions indicated and the dimension of 100+/-2.5mm see Fig. 2.1.
5. Rail brake HR 185 Observe the spacer dimensions indicated and the dimension of 710+/-2.5mm see Fig. 2.2.
6. Check the correct parallelism between the pad and the rail parallelism tolerance of 0.5mm widthwise. Parallelism tolerance of 2mm lengthwise.
7. When the rail brake is placed to its bracket. Insert the fixing screws of the rail brake and tighten them to the torque. Quantity size and torque like describe in the RINGSPANN datasheet of the brake.
8. Max. min. pressure of the rail brake is also describe in the RINGSPANN Datasheet of the brake.



**Important!**

**Do not adjust the height of the pad holder with the clearance adjustment screw until the rail brake is correctly fixed on its bracket and above a rail. To adjust the clearance, refer to Section 2.**



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**Important!**

The delivery condition of the rail-brake (piston at the lower stop) means that it must be mounted outside the rail. If the rail-brake cannot be mounted outside the rail, use a hand pump (not supplied) to supply the actuator with pressure and raise the pad to reduce the vertical space. Energize the actuator so that the piston reaches the travel limit. Check the tightening torque.



**Important!**

Do not switch off the pressure until the installation is complete.

Rail brake HR 130 FHM-200

8 screws M30 class 8.8

The tightening torque (Cs) which has to be applied on the screws M30 class 8.8 rows for each nut is: **Cs = 1280Nm ±5% μ=0,15** with greased screws.

Rail brake HR 185 FHM-530

12 screws M30 class 8.8

The tightening torque (Cs) which has to be applied on the screws M20 class 10.9 rows for each nut is: **Cs = 1350Nm ±5% μ=0,15** with greased screws.



**Important!**

**Check the tightening torque**

Check, after having tightened to torque, that the whole part has not moved.

#### 2.3.4 Hydraulic connection



**Important!**

**HR 130 FHM-200 Opening pressure: 210bar  
HR 130 FHM-200 MAX PRESSURE: 230bar**

**HR 185 FHM-530 Opening pressure: 230bar  
HR 185 FHM-530 MAX PRESSURE: 250bar**

For an ambient temperature range from 0 through 60°C, recommended oil is ISO HM32. By instance, RINGSPANN uses FUCHS RENOLIN EXTRA 32S.

Use a mineral oil with a viscosity range between 10 and 380mm<sup>2</sup>/s (optimal range between 12 and 100mm<sup>2</sup>/s) while allowing for the ambient temperature conditions

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**Important!**

***This oil must be clean  
(maximum permitted level of pollution as per NAS 1638: 10µm).  
Use only new fluid and never mix several types all brands of fluid.***

The rail brake must be connected to its source at a hydraulic connection by threaded plug

Rail brake HR 130 FHM G1/4" see Fig. 2.1 or  
Rail brake HR 185 FHM G3/8" see Fig. 2.2.

Do not use hemp, mastic, Teflon (etc.) and use flexible hoses exclusively. It is preferable to use liquid joints.

Clean the pipes and couplings while ensuring that they are perfectly clean (soiling, scale, swarf, etc.).

For rail brake with hydraulic power unit refer to instructions of the hydraulic power unit for more information of the electrical connection.



**Important!**

**Power units are normally delivered filled with oil and ready to operate. However, check that the level is correct and that transport has not caused any leakage.**

2.3.5 Electrical connection

Standard contact:

Bipolar switch  
Mechanical contact output by  
cable 5 wire x 0.75mm<sup>2</sup>  
Standard length of the cable: 2m.

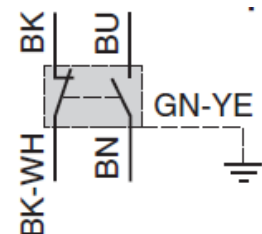
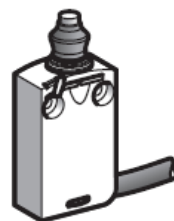


Fig. 2.3

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## 2.4 Initial start-up

### 2.4.1 Hydraulic circuit bleed

Tools: Spanner, 6mm ID flexible hose.



#### **Important!**

**Take the necessary precautions to avoid the oil being sprayed onto the rail.**

1. Connect the bleed screw to a 6mm ID flexible hose and put the end of the hose into a container.
2. Feed oil to the caliper from the power pack, then from the hand pump.
3. Loosen slightly the bleed screw.
4. When the oil pours out continuously and there are no more air bubbles at the end of the hose, tighten the bleed screw.
5. Operate the bleed with the hand pump
6. Disconnect the flexible hose beware of any oil remaining in the hose.
7. Check the oil level in the hydraulic unit.
8. Check that the bleed screw is leak-tight.



#### **Important!**

**This file must be clean  
(maximum permitted level of pollution as per NAS 1638: 10µm).  
Use only new fluid and never mix several types all brands of fluid.**

### 2.4.2 Adjusting the pad clearance

The rail brakes are supplied with the pad holder **02** fully retracted, by manually loosening the wear adjustment screw **10**.



#### **Important!**

**To ensure proper operation of the brake, the hand release must be deactivated.**



**Important!**

**THE PAD CLEARANCE "PG" IS THEREFORE NOT FACTORY-SET.  
TO MAKE THIS SETTING, FOLLOW THE PROCEDURE BELOW**

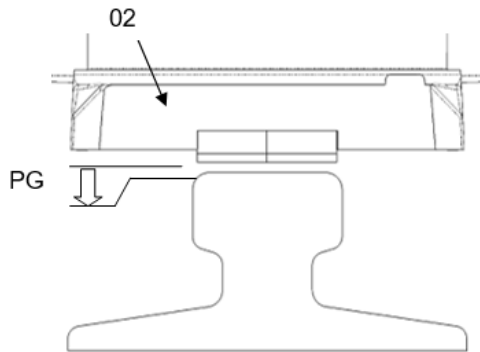


Fig. 2.4

#### 2.4.3 Adjustments of pad rail clearance

Supply the rail brake with min. opening pressure and maintain this pressure throughout the operation.

For greater ease, it is possible to disconnect the connectors from the switches see Fig. 2.5. With a flat screwdriver, loosen by a quarter turn and then insert the screwdriver into the slot on the side to release the connector.

**In the ATEX version, the plugs cannot be removed.**

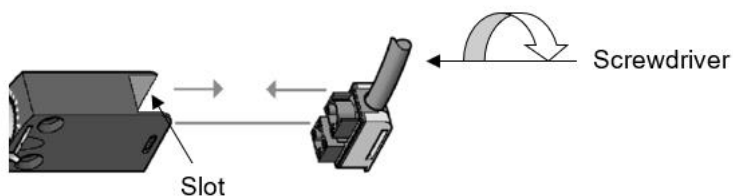


Fig. 2.5

Note: Do not remove the detector assembly as this will cause the factory setting to be lost.



**Important!**

**The electrical contacts are set at the factory and do not need to be  
adjusted. If necessary, follow the procedure described in chapter 5.**

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## Rail brake HR 130 FHM-200 adjusting the pad rail clearance point 1-6

Tooling: 15mm A/F wrench - 10mm A/F wrench - Electrician's flat screwdriver.

1. Remove lid **09** using its 6 screws **V09** with a 5 A/F 6-sided wrench.

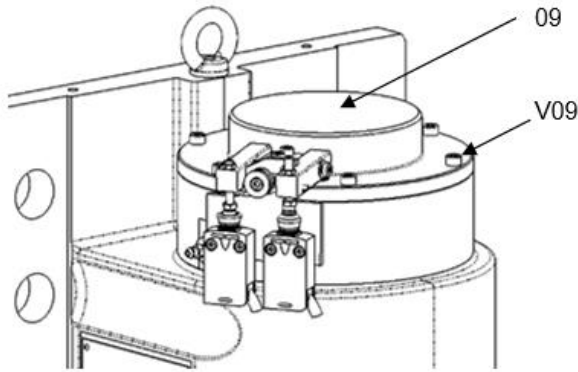


Fig. 2.6

2. Remove the safety washer by removing the 3 screws **V10** and 3 washers **V11** with a 10 flat wrench A/F.

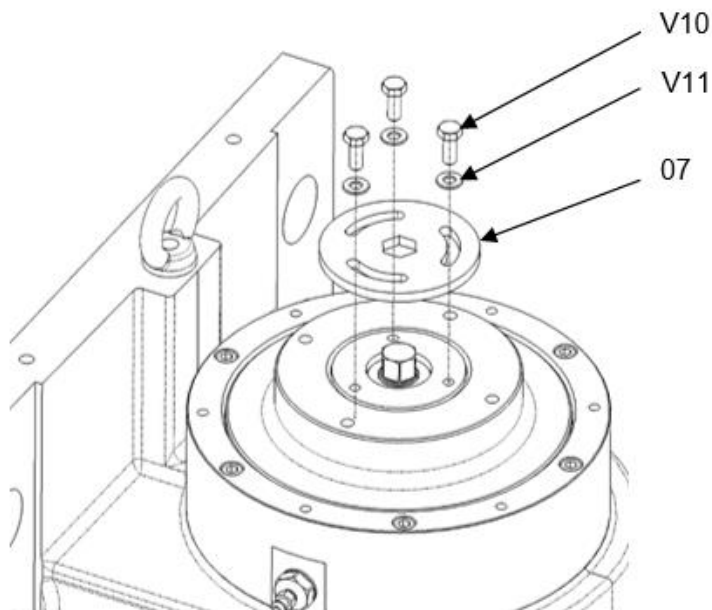


Fig. 2.7

3. Turn the wear adjustment screw **10** see Fig. 2.8 with a 15 A/F wrench clockwise until the pads are slightly tightened on the rail and then loosen by 2 and a half turns to obtain the nominal pad clearance "PG" see Fig. 2.4.

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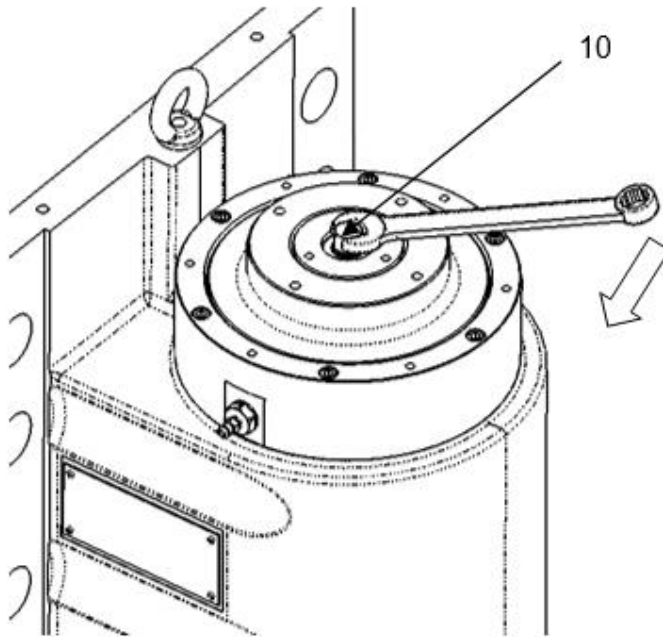


Fig. 2.8

4. Reinstall the washer **07** with its 3 screws and washers, the lid **09** and tighten the 6 screws again **V09** (torque 16 N.m.).
5. Push the connectors back into the switches and lock them by turning a flat screwdriver clockwise 1/4 turn.
6. Disconnect the pressure.

### **Rail brake HR 185 FHM-530 adjusting the pad rail clearance point 1-7**

Tooling: 5mm A/F hexagon wrench - 22mm A/F wrench - 13mm A/F wrench - Electrician's flat screwdriver.

1. Remove lid **09** using its 6 screws **V09** with a 5 A/F hex wrench

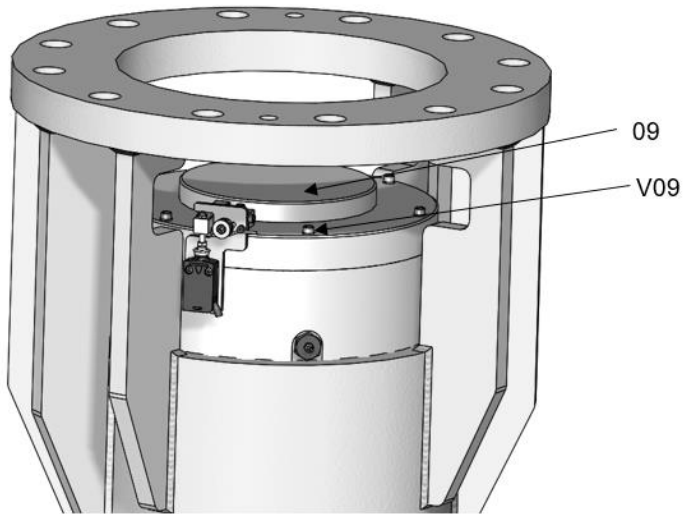


Fig. 2.9

- Remove the locking washer **07** using its 4 screws **V10** with a 13 A/F flat wrench.

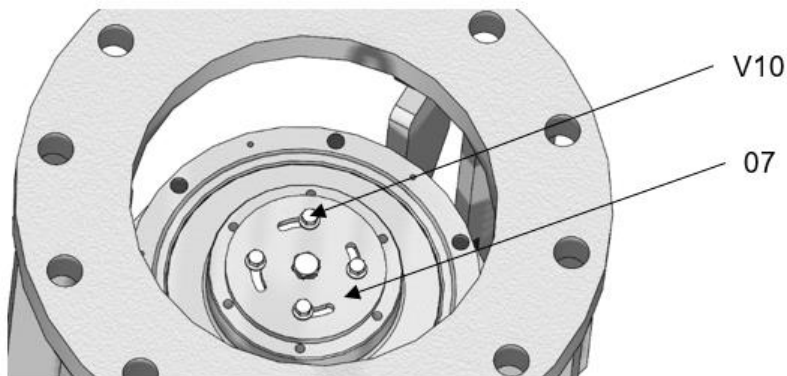


Fig. 2.10

- Turn the wear adjustment screw **10** see Fig. 2.11 with a 22 A/F wrench clockwise until the pad abuts the pad on the rail and then loosen by **3** and a half turns to obtain the nominal pad rail clearance "PG" see Fig. 2.4.

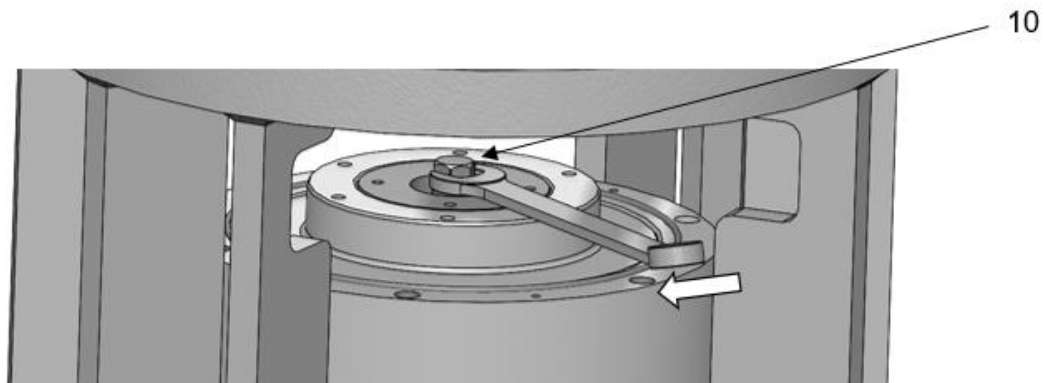


Fig. 2.11

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4. Check that the clearance is correctly adjusted by measuring dimension H (distance between the lower side of the body and the upper side of the pad holder) see Fig. 2.12. If necessary, readjust the screw **10**.

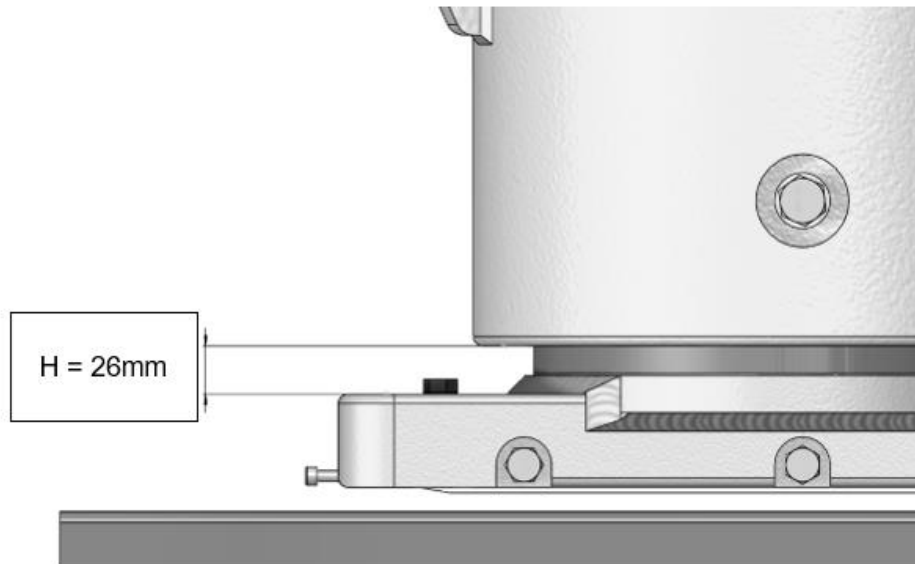



Fig. 2.12

5. Reinstall the washer **07** with its 4 screws and washers, the lid **09** and tighten the 6 screws again **V09** (torque 16 N.m.).
6. Push the connectors back into the switches and lock them by turning a flat screwdriver clockwise 1/4 turn.
7. Disconnect the pressure.

HR Rail brakes very strong brakes please attention!

|   |  |
|---|--|
|  | <p><b>Danger!</b></p> <p><b>BE CAREFUL ABOUT THE LOWERING OF THE PAD HOLDER ONTO THE RAIL WHEN DISCONNECTING THE PRESSURE.</b></p> |
|---|--|

Do a few opening/closing cycles of the rail brakes to check that the assembly is functioning properly.

Check that the pad is positioned correctly on the rail.

Check the nominal pad rail clearance, if necessary using a shim.

Check the well running of the electrical contacts.



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### **Important!**

**Be careful not to interchange the plugs for the two sensors. Check that the electrical switches are operating properly.**

**It is necessary, follow the procedure chapter 2**



### **Information!**

**THE SYSTEM IS NOW OPERATIONAL**

## **3 Operational RUNNING**

### **3.1 Releasing the rail brake**

The support force is generated by the relaxation of the stacking of spring washers when hydraulic supply is cut.

### **3.2 Loosing the rail brake**

Apply hydraulic pressure to release the rail brake. Comply with the nominal supply value and do not exceed the maximum pressure.

### **3.3 Manual released mode of the rail brake**

Manual release keeps the caliper open without hydraulic pressure.  
Refer to chapter 5.

### **3.4 Manual operation with power unit**

Use the hand pump if supplied to open the rail brake by hand without electric current.  
Refer to the manual of the hydraulic power unit for more information.


## **4 PERIODIC MAINTENANCE**

Every two months, check:

- As a general rule, inspect the entire system for correct operation.
- Check that there is not any leakage.
- Make sure that the rail brake is free to move and the pad gap is correct.
  
- To ensure that the rail brakes are working properly, each time the pads are changed, or at least once per year, it is essential to check the following points:

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- Check that the pad gap is correct.
- Check the rail and the rail brake for tightness.

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|  | <p><b>Attention!</b></p> <p><b>The rail brake is intended for purely static uses. Dynamic braking requires a replacement of the diamond tipped pads.</b></p> <p><b>The rail must be degreased and free from any deposits so as not to decrease the friction coefficient.</b></p> |
|---|--|

Every two years, replace:

- Oil in the *power pack* (refer to the power pack instructions)

Every five years or 1/2 million cycles:

- Plan complete overhaul of the entire unit (replace worn parts, seals, spring washers, flexible hoses...)

## 5 Maintenance

Tools: spanner, Allen key, slotted screwdriver

### 5.1 Manual release: activation

1. Apply the release pressure to open the rail brake and maintain the pressure throughout the operation.
2. For greater ease, it is possible to disconnect the connectors from the switches Fig. 2.5.
3. Remove the lid **09** and the locking washer **07** see chapter 2.
4. Turn the wrench anti-clockwise rail brake HR 130/185 to push the pad holder up **02** Fig. 5.1 fully. Be careful not to force it to the extreme position.

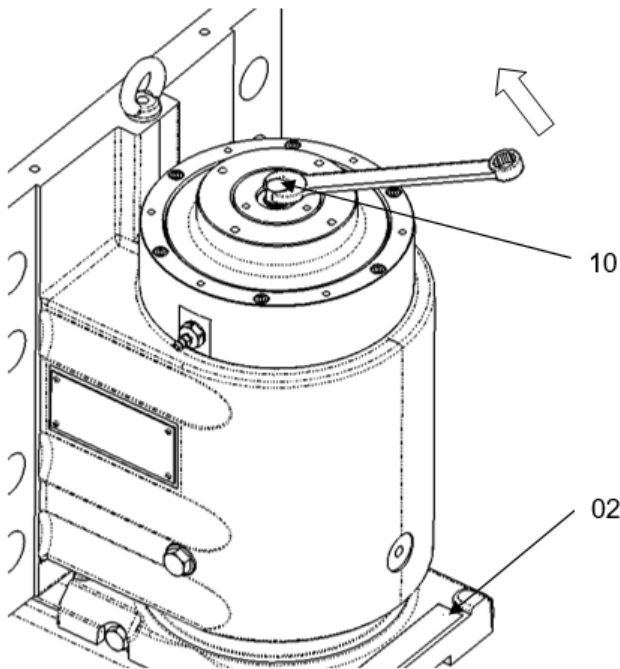


Fig. 5.1



**Attention!**

**MOVEMENT IS STILL POSSIBLE AFTER CUTTING OFF THE PRESSURE.**

**When the pressure is disconnected, the pad holder moves down by about 20 mm. There is then sufficient clearance between the pads and the rail for replacing the pads.**

5.2 Manual release: deactivation

1. Apply the release pressure to open the brake and maintain the pressure throughout the operation.
2. Adjust the pad clearance see chapter 2.



**Attention!**

**Manual release mode must be deactivated for the rail brake to operate correctly.**

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**Attention!**

**MOVEMENT IS STILL POSSIBLE AFTER CUTTING OFF THE PRESSURE.**

### 5.3 Adjustment of brake pad clearance

See chapter 2



**Attention!**

**Do not use manual release to perform this operation; hydraulic pressure must be maintained.**

### 5.4 Replacement of worn brake pads



**Attention!**

**The rail brake is intended for purely static uses. Dynamic braking requires a replacement of the diamond tipped pads.**

**The pad clearance must be adjusted after this operation chapter 2.**



**Attention!**

**When the remaining lining thickness reaches 2mm, proceed to pad exchange as per chapter 5. If this rule is not observed, a loss of braking force may occur.**

**Only original RINGSPANN brake pads may be used.**



**Attention!**

**NEVER PUT YOUR HANDS UNDER THE RAIL-BRAKE PAD. TO HANDLE THE PAD, USE THE HANDLING TOOLS PROVIDED.**

|                   |  |                  |               |                       |
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### Procedure rail brake HR 130:

1. Activate the manual release mode chapter 5.1 => Min. dimension of pad clearance PG = 20mm to ensure sufficient clearance for removing the pads **05**.
2. Remove the 4 screws **V12** Fig. 5.2.
3. Using a screwdriver, release the 2 shafts **20** that maintain the 2 pad.
4. Fit 2 new pads in the cavity of the pad holder (chamfers downwards)
5. Push the 2 shafts back through the pad holder **02** and the 2 pads **05**.
6. Tighten the 4 cap screws **V12**.
7. Deactivate the manual release mode see chapter 5.2.

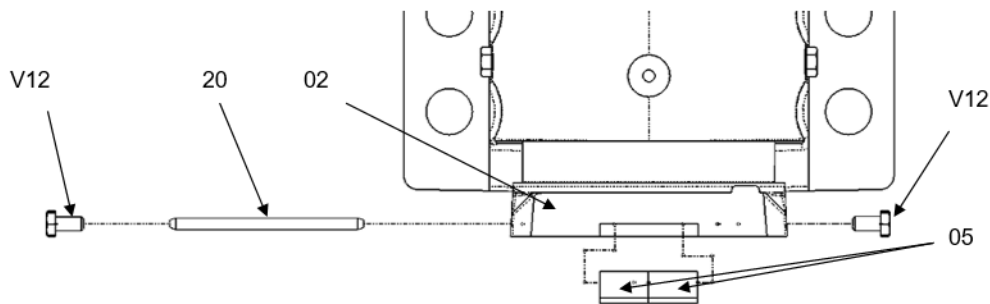


Fig. 5.2

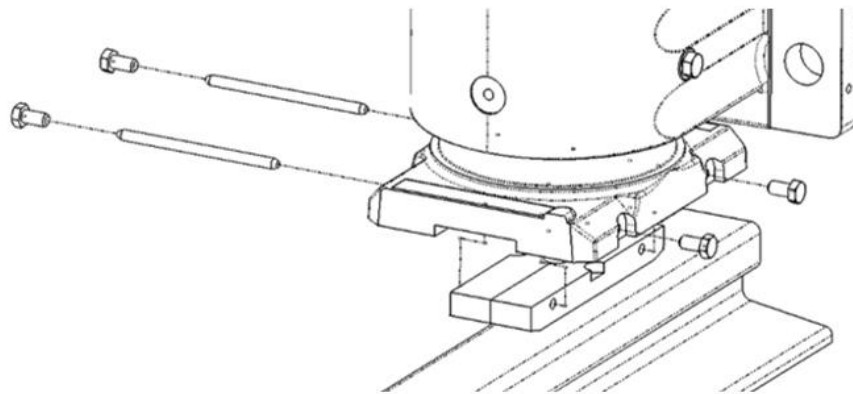


Fig. 5.3

|                   |  |             |               |                  |          |
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### Procedure rail brake HR 185:

1. Switch off the hydraulic supply. Supply the rail-brake with min release pressure using a hand pump in order to release it. Maintain the pressure during the entire operation.
2. For greater ease, it is possible to disconnect the connectors from the switches see Fig. 2.5
3. Remove the lid **09** and the locking washer **07** see chapter 2.
4. Turn the wear adjustment screw **10** with a 22 mm A/F wrench anticlockwise to raise the pad holder, until there is enough space to remove the pad easily see Fig. 5.4. Be careful not to force it to the extreme position.
5. Remove the 6 **H** screws retaining the pad.
6. Bring the transport trolley (supplied) under the rail-brake by sliding it until it stops on the pad holder see Fig. 5.6. Place the pad on it see Fig. 5.5. Always grip the pad using the two handling screws. If necessary, use the two release screws to facilitate removal of the pad from its cavity see Fig. 5.7. Attention never put your hands under the rail-brake.

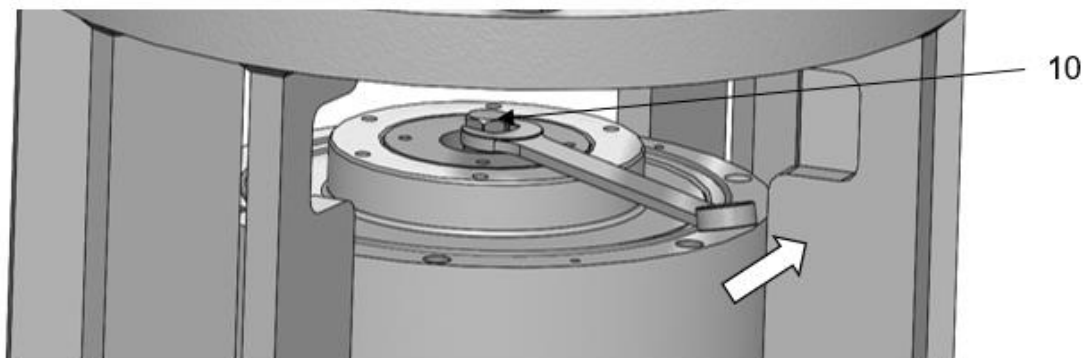


Fig. 5.4

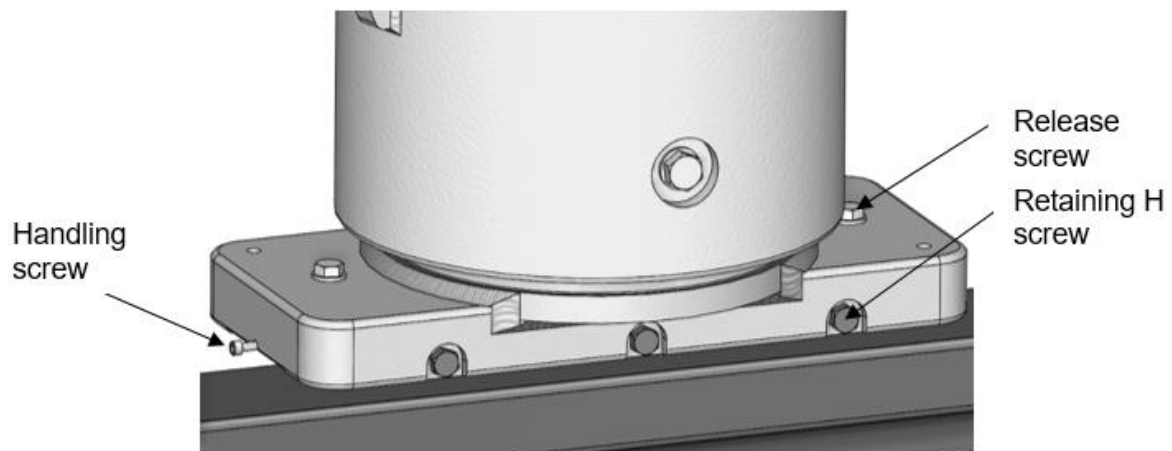


Fig. 5.5

|                   |  |                  |               |                      |
|-------------------|--|------------------|---------------|----------------------|
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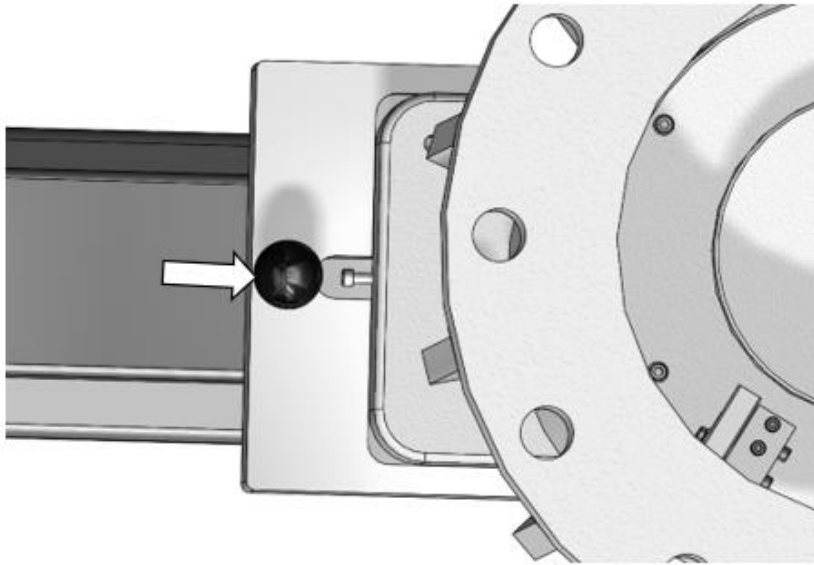


Fig. 5.6

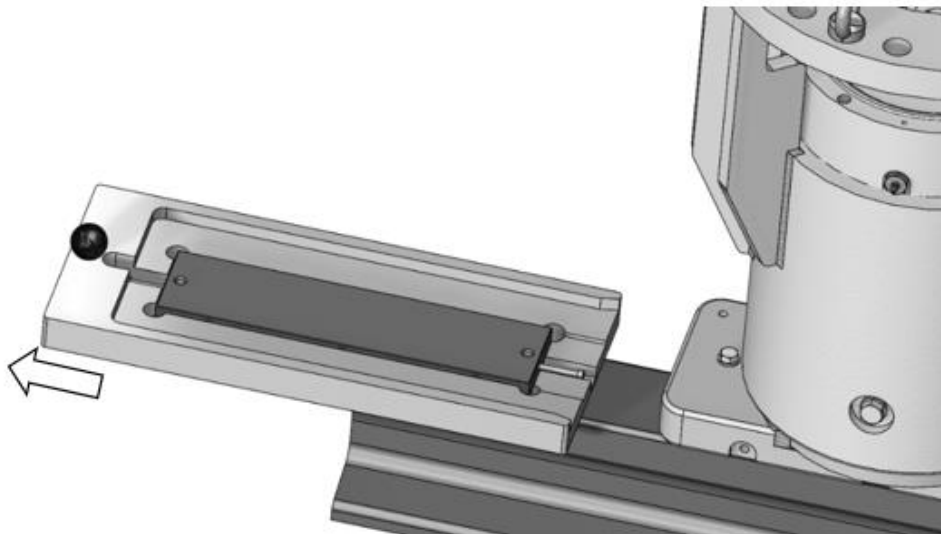


Fig. 5.7

7. Place the new pad with its handling screws in the trolley (chamfers downwards) and bring it into the pad holder with the two handling screws.
8. Replace the 6 retaining screws.

|                   |  |                  |               |                       |
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## 5.5 Setting the braking force



### Information!

**The braking force is factory set and checked using a test bench.**

Force value may be adjusted, giving more or less strain to the stack of spring washers.



### Attention!

**This operation can interfere with safety and must be performed only if fully aware of the consequences. If necessary, ask our engineers for the procedure.**

## 5.6 Opening and adjustment contacts (mechanicals) adjustment



### Information!

**Check that the pad clearance conforms, otherwise carry out all operations in chapter 2.**



### Information!

**Contacts are factory set and do not need any adjustment. If necessary, follow this procedure.**

Verify the gap for the pad at each caliper, otherwise perform all the operations in chapter 5. Refer to the datasheet for the nominal clearance "PG" Pad Gap.

Tools: Male wrench 2.5 mm A/F + Wrench 8 mm A/F.



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### 5.6.1 Adjusting the opening switch HR 130

This switch monitors the state of the rail brake (closed or released). It closes when the rail brake is released and pressurised.

- Supply the rail brake with min. release pressure.
- Loosen the locknut **V11** (8 mm A/F) see Fig. 5.8 and Fig 5.9.
- Make sure that the liaison axis **22** is in contact on lever **41**.
- Tighten the screw **V02** until the switch is engaged. Check that the switch status is: "Open".
- Disconnect the pressure. When the rail brake is closed, check the switch status (Position "Closed"). If this is not the case, loosen the screw **V02** until the status changes.
- Supply the rail brake with min. release pressure bar again.
- Check that the switch status is: "Open". Carry out the operation until the information is obtained for the two statuses: "Open"and"Closed".
- Once the adjustment is complete, do not forget to lock the locknut **V11** on the screw **V02**.

### 5.6.2 Adjusting the adjustment switch HR 130

This switch is permanently closed and opens as soon as the setting changes by 1mm.

- Supply the rail brake with min. release pressure.
- Make sure that the pad clearance is set, otherwise adjust the pad clearance.
- With the rail brake open, make sure that the liaison axis **22** is in contact on lever **42** see Fig. 5.8 and Fig 5.9.
- Release the pressure to close the rail brake.
- Loosen the locknut **V11** (8 mm A/F) then loosen the screw **V02** (2.5 mm A/F) to clear the switch head (put the screw as close as possible to the lever).
- Move the screw **V02** until the switch is engaged, the switch must change status travel distance 1mm. (worn pads).
- If the pad clearance needs to be adjusted, the switch will be disengaged (the switch hysteresis is 1 mm).
- Once the adjustment is complete, do not forget to lock the locknut **V11** on the screw **V02**.

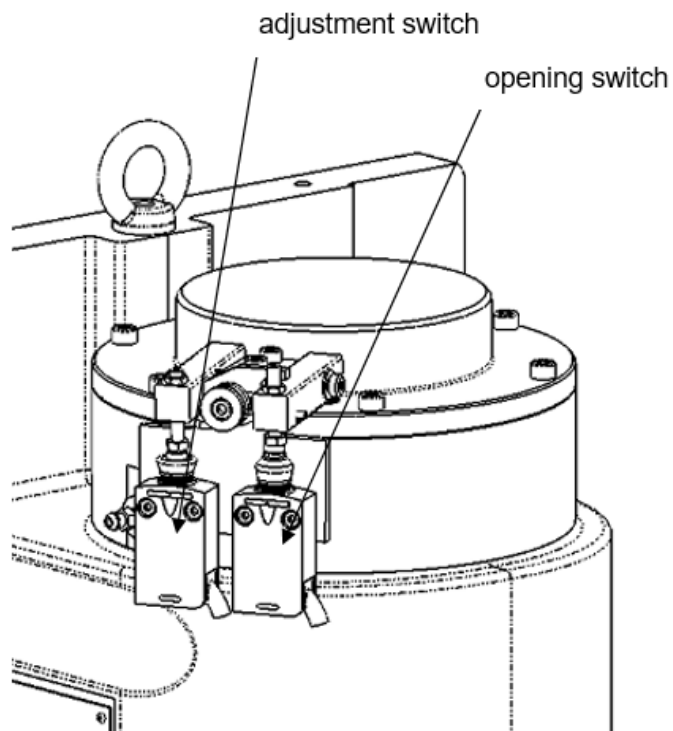


Fig. 5.8

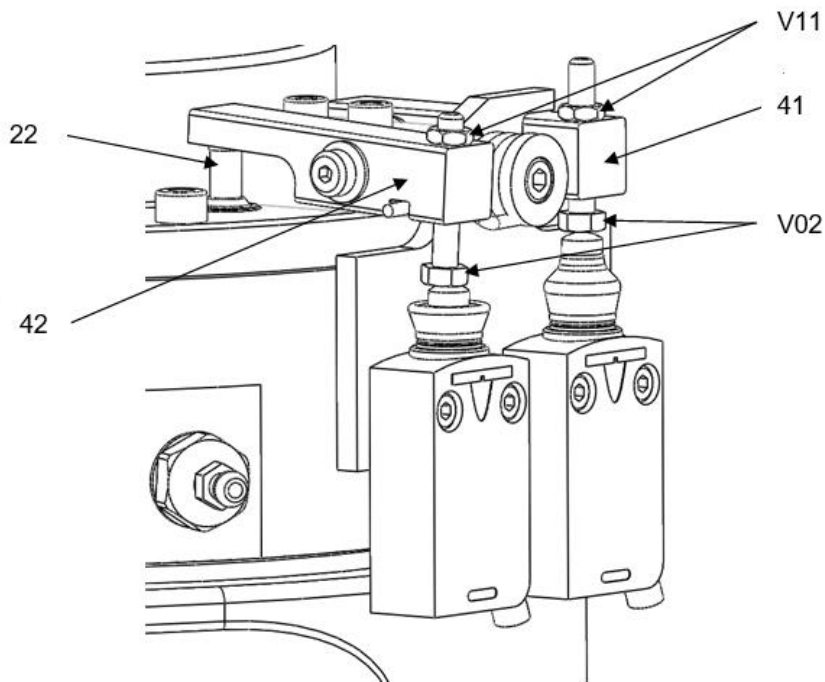


Fig. 5.9

|                   |  |             |               |                  |          |
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### 5.6.3 Adjusting the opening switch HR 185

This switch monitors the state of the rail brake (closed or released). It closes when the rail brake is released and pressurised.

- Loosen the locknut **V11** (8 mm A/F) see Fig. 5.10.
- Make sure that the link pin **22** is in contact on lever **41**.
- Tighten the screw **V02** such that the head is in contact with the lever **41**.
- Supply the rail-brake with min. release pressure.
- Loosen the screw **V02** until the switch is engaged (characteristic “click” sound), then loosen by one more turn. Check that the switch status is: “Rail-brake Released”.
- Disconnect the pressure. When the rail-brake is closed, check the switch status (Position “Rail-brake Closed”).
- Once the adjustment is complete, do not forget to lock the locknut **V11** on the screw **V02**.

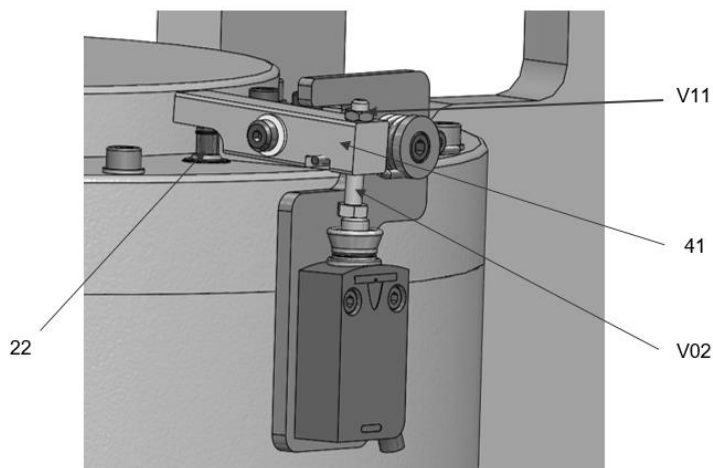


Fig. 5.10

|                   |  |             |               |                  |          |
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## 6 Spare parts

### Rail brake HR 130

Monitoring switches (Opening/adjustment) Ref.: CON XCM D2111 L2-HW130/185

Pad static Ref.: JG-12654-HR130 RINGSPANN

Set of seals HR 130 item Nr. JEUJOI-HR130

Set of spring washers HR 130 item Nr. FOUROND140-HR130

### Rail brake HR 185

Monitoring switch (Opening) Ref.: CON XCM D2111 L2-HW130/185

Pad static Ref: GAR-12746-025-HR185 RINGSPANN

1 Rod seal item Nr. JOIPIS-120-128.4 E-HR185

1 Upper piston seal item Nr. JOIPIS-240-219 E-HR185

1 Static seal item Nr. JOITIG-120 135Z-HR185

1 Lid cover seal item Nr. JOITOR-253-353 0-HR185

Set of spring washers HR 185 item Nr. FOUROND139-HR185

In case of order, please specify:

Type, Nr. of the caliper and item Nr. of the part.

There is a type plate on the brake with a 16-digit article number. The exact design of the brake is defined by this article number only.

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## 7 Troubleshooting

| KIND OF DEFECT                            | CHECK   | SOLUTION                      |
|---|---|-------------------------------|
| The rail brake does not release           | The power supply voltage  | Replace<br>Reverse<br>Top up  |
|   | The fuses   |                               |
|   | The phases are in the right direction                                 |                               |
|   | The fluid level   |                               |
|   | Pressure present  | Restore pressure              |
| The rail brake does not remain open.      | Tightness of the hydraulic unit / hose / fittings / cylinder / piston | Replace the defective element |
| The opening time is long                  | Check the pump rate and the circuit bleed                             | Change the pump               |
|   |   | Bleed the circuit             |
| Locking force is not provided             | Check the pad rail clearance  | Adjust the pad rail clearance |
|   | Check the condition of the pad  | Replace the pad               |
| The power unit starts up too often        | Tightness of the circuit  | Correct the tightness         |
|   | Impurities allow the oil to leak out                                  | Bleed according               |
| The rail brake releases and closes slowly | There may be air in the circuit                                       | Bleed according               |