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Preface

Notes on these instructions

This repair manual includes information and instructions on how to perform repair work on the seat suspension MSG97EL of GRAMMER seats.

The repair of the upper seat part is described in the respective repair manual for the upper seat part to which a reference is made, if required (see repair manual for upper seat part).

Example:
Remove the cable of the seat occupancy detection system at the upper seat part (see repair manual for upper seat part).

The seat suspension MSG97EL forms the basis for illustrations in this repair manual. In the case of technical deviations in work procedures (due to different seat suspension designs), refer to the current text or individual chapters of the manual.

Each chapter starts with a list of all preparatory work to be completed before starting repair. This work is described in separate chapters and shall be carried out without the preparatory steps described there.

For spare part orders, please use the numbers stated in the latest issue of the relevant spare parts catalogue.

The description of the work procedures refers to the removed seat suspension and the dismounted upper part of seat.

Depending on the individual installation situation, some work may also be performed on the installed seat suspension and/or with upper seat part. For this reason, check the environment of the installed seat suspension for this possibility before starting work. The safety instructions of the specific vehicle manufacturer and those stated in Chapter 1 of this repair manual must be strictly observed.

This repair manual also includes some information on delivery options, if these require further explanation. Since the scope of delivery depends on the specific customer order, the actual seat suspension design may deviate from the descriptions and illustrations in this manual.

Basic information on the seat suspension

For the removal and installation of the seat suspension, the removal and installation of the upper seat part is described in the repair manual of the upper seat part.

Note:
For the removal and installation of the seat suspension at the vehicle, ask the vehicle manufacturer for the necessary assembly work to be carried out.

The seat suspension is provided with a long-lasting lubrication (approx. 10 years). The lubricating points must be re-greased only after repair work, using an acid-free multi-purpose lubricant.

In the description of the present repair manual, not all fastening parts might be mentioned. After repair, it might be necessary to check fastening parts regarding their factory-made laying, support and securing and to correct them respectively, if required.

The illustrated repair steps refer to the seat suspension for left-hand drive. Different work steps are to be performed laterally reversed when repairing vehicle models with right-hand drive.

If not stated otherwise, the directional indications "front, back" and "right, left" refer to the installed seat suspension regarded in the driving direction of the vehicle.

The document layout is suitable for later use of this repair manual via CD-ROM / INTERNET / INTRANET.
Bowden pull wires, cables and air hoses may only be fastened with cable ties at the defined spots by hand (loose). Make sure that Bowden pull wires, cables and air hoses cannot be squeezed or distorted when the seat suspension is adjusted and the seat moved.

Replace all removed old parts with enclosed new ones. If there is no new part included, the old one is to be cleaned and checked for its suitability for re-use. Defective parts and worn parts must be replaced by new ones.

GRAMMER AG rejects any warranty claims if damaged or worn parts and assemblies are not replaced by spare parts released by GRAMMER AG.

Qualified personnel

These instructions offer basic information on proper technical seat repair. The contents of the work procedures described are intended for professionally educated technicians with profound product knowledge. This level of knowledge is an imperative requirement when performing the work and procedures described in this document.

In order to avoid bodily injury, reduced operational safety of the seat suspension or damage to it resulting from improperly performed work, all information and instructions, in particular the safety instructions stated in Chapter 1, must be read carefully and strictly observed.

As an inevitable matter of fact, GRAMMER AG cannot evaluate all situations and consequences that may bear a risk of injury for the persons involved in the described work procedures. For this reason it is absolutely necessary that every person who carries out repair work at the seat suspension uses his/her professional knowledge to make sure that his/her own safety will not be put at risk and that the selected type of repair will not cause any negative effects, in particular with regard to technical safety. For this reason, GRAMMER AG disclaims liability for any possible damage of this kind.

We point out explicitly that all work steps and procedures described are to be performed with consideration to the applicable directives and regulations stipulated by the relevant local authorities and in compliance with the provisions on health protection, prevention of accidents and environmental protection.

Change notification and copyright

The seat suspensions are subject to continuous development. Please understand that we must reserve the right to make changes in shape, equipment and technical design. For this reason, the contents of this repair manual cannot be used to substantiate any possible claims. Reprint, translation and copies of this manual or parts thereof are admissible only after written approval.

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1.1 Safety instructions
1.2 Rating plate

Note:
Please refer to the applicable seat operating instructions for further details.
1.1 Safety instructions

1 All inspection, test and repair work must be performed exclusively by adequately trained personnel.

2 All work steps and procedures described are to be performed taking into consideration the applicable directives and regulations stipulated by the relevant local authorities and in compliance with the provisions on health protection, prevention of accidents and environmental protection.

3 Special notes in this repair manual are highlighted as follows:

⚠️ WARNING ...
indicates possible risks for persons and their prevention.

⚠️ ATTENTION ...
indicates possible damage or deterioration of material and their prevention.

Note: ...
introduces an additional explanation for better understanding of the work to be carried out.

Installation note: ...
introduces an additional explanation for better understanding of the installation work to be carried out.

4 Prior to all repair work, the following work has to be carried out:
   • Disconnect the seat suspension from the power supply.
   • Move the seat suspension down to the end stops.

5 Prior to working on the pneumatic system, reduce the pressure in the pneumatic system to 0 bar.

⚠️ ATTENTION Hydrostatic test!
The hydraulic test of the seat suspension should be performed after having working on the pneumatic system. To do this, apply a 60 kg load to the seat suspension for 24 hours without actuating the seat occupancy detection system. The lowering within this time must not exceed 15 mm.

6 When using oil, grease and other chemical substances, the relevant safety regulations for the handling and use of these products must be observed.
The rating plate is located on the rear upper cover of the seat suspension.

The rating plate shows the following information (example):

(A) Country of manufacture = MADE IN XXXXXXX

(B) DESIGNATION = MSG97EL/741 12V

(C) MATERIAL NO. = 1227653

(D) Year / CW / Assembly
   12  11  141:
   • Year of manufacture = 12 (2012)
   • Built in week = 11 (March)
   • Assembly = 141

(E) ORDER NO. = XX 97690070018
   • Country indicator = XX

Note:
When orders are placed, the correct MATERIAL NO. (C) on the rating plate is always to be quoted.
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   ● Pneumatic modules and connecting diagram (pages 1-2)
     - Compressed-air supply via internal compressor (page 1)
     - External compressed-air supply via the compressed-air system of the vehicle (page 2)
   ● Level control – pin assignment of electrical connection (page 3)
   ● Compressor, compressor cable and pin assignment (page 4) *
   ● Solenoid valve of external compressed-air supply, solenoid valve cable and pin assignment (page 5) *
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2.2 Overview of faults – Pointing out possible faults that might occur (pages 1-4)

2.3 Troubleshooting – Locating the fault (pages 1-12)
   1 Inspection of the level control (pages 2-3)
   2 Inspection of the compressor and of the compressor cable (page 4) *
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   5 Inspection of the solenoid valve of the external compressed-air supply and the solenoid valve cable (page 12) *

* Delivery option
2.1 Components overview

Pneumatic modules and connecting diagram

Compressed-air supply via internal compressor

(1) Additional air supply
(2) Compressed-air hose (red) from the solenoid valve of the level control (4) to the additional air supply (1)
(3) Compressed-air hose (grey) from the solenoid valve of the level control (4) to the additional air supply (1)
(4) Level control
(5) Air spring
(6) Catch spring
(7) Quick coupling at the compressed-air hose (9)
(8) Quick coupling at the compressed-air hose (10)
(9) Compressed-air hose (white) from the compressor (12) to the air spring (5)
(10) Compressed-air hose (black) from the air spring (5) to the additional air supply (1)
(11) Nozzle
(12) Compressor
2.1 Components overview

External compressed-air supply via the compressed-air system of the vehicle

(1) Additional air supply

(2) Compressed-air hose from additional air supply (1) to solenoid valve in level control (4)

(3) Compressed-air hose from additional air supply (1) to solenoid valve in level control (4)

(4) Level control

(5) Air spring

(6) Compressed-air hose from air spring (5) to additional air supply (1)

(7) Compressed-air hose from solenoid valve (8) to air spring (5)

(8) Solenoid valve

(9) Compressed-air hose between angle connection of external compressed air supply (10) and quick coupling on solenoid valve (8)

(10) Angle connection of external compressed air supply
2.1 Components overview

Level control – pin assignment of electrical connection

(1) Level control
(2) Webbing
(3) Compressed-air hose (blue) from the solenoid valve of the level control (1) to the retractor (8)
(4) Compressed-air hose (red) from the solenoid valve of the level control (1) to the additional air supply
(5) Compressed-air hose (grey) from the solenoid valve of the level control (1) to the additional air supply
(6) Socket of cable harness for seat suspension (15-pin)
(7) Plug of level control (15-pin)
(8) Retractor
(9) Cable harness for seat suspension
(10) Pin assignment for control at the plug of the level control (7)
    Pin: P8 (ground) and P14 (voltage 12V / 24V)
(11) Pin assignment for seat occupancy detection system at the plug of the level control (7)
    Pin: P1 (signal)
    P2 (ground)
(12) Pin assignment for height adjustment in upward direction at the plug of level control (7)
    Pin:
    P4 (signal)
    P5 (ground)
(13) Pin assignment for height adjustment in downward direction at the plug of the level control (7)
    Pin:
    P5 (ground)
    P7 (signal)
(14) Pin assignment for the compressor (delivery option) at the plug of the level control (7)
    Pin:
    P12 (voltage 12V / 24V)
    P15 (ground)
(15*) Pin assignment for climate control system:
    Contact:
    P3 (voltage 12V)
    P2 (ground)

Electrical plug and socket connection:
(A) Electrical connection between level control (1) and cable harness for seat suspension (9)

* Pin assignment for variant 24V.
At variant 12V no assignment of P3.
2.1 Components overview

Compressor, compressor cable and pin assignment (delivery option)

(1) Level control
(2) Compressor
(3) Compressor cable (cable harness for seat suspension)
(4) Socket of cable harness for seat suspension (15-pin)
(5) Plug of level control (15-pin)
(6) Cable harness for seat suspension
(7) Right-angle plug
(8) Compressed-air hose between Compressor (2) and air spring
(9) Pin assignment for compressor at the socket of the cable harness for seat suspension (4)

Contact:
K12 (voltage 12V / 24V)
K15 (ground)

Cable colours:
gn = green
br = brown

Electrical plug and socket connections:
(A) Electrical connection between level control (1) and cable harness for seat suspension (6)
(B) Electrical connections between compressor cable (3) and compressor (2)
2.1 Components overview

Solenoid valve of external compressed-air supply, solenoid valve cable and pin assignment (delivery option)

(1) Level control
(2) Cable harness of seat suspension
(3) Socket of cable harness of seat suspension (15-pin)
(4) Pin assignment for solenoid valve (8) at socket of solenoid valve cable (5)
   Contact:
   1 (voltage 12V)
   2 (ground)
(5) Socket of solenoid valve cable (3-pin)
(6) Solenoid valve cable (cable harness of seat suspension)
(7) Compressed-air hose between solenoid valve (8) and air spring
(8) Solenoid valve
(9) Pin assignment for solenoid valve (8) at socket of cable harness of seat suspension (3)
   Contact:
   K12 (voltage 12V)
   K15 (ground)

Electrical plug and socket connections:

(A) Electrical connection between level control (1) and cable harness of seat suspension (2)

(F) Electrical connections between solenoid valve cable (6) and solenoid valve (8)
2.1 Components overview

Cable harness for seat suspension, electrical connections and pin assignment

Cable harness of seat suspension with compressed-air supply via internal compressor

1. Cable harness for seat suspension
2. Plug of cable harness for seat suspension (8-pin)
3. Right-angle plug (green line) voltage at the compressor
4. Right-angle plug (brown line) ground at the compressor
5. Corrugated pipe support
6. Plug of cable harness for seat suspension (6-pin)
7. Cable connector
8. Compressed-air hose (black) from the air spring to the additional air supply
9. Cable clamp
10. Plug of cable harness for seat suspension (12-pin)
11. U-shaped profile
12. Fuse (Si = 15A at 12V/DC)
   (Si = 10A at 24V/DC)
13. Socket of cable harness for seat suspension (15-pin)

Electrical plug and socket connections:

(A) Electrical connection between level control and cable harness for seat suspension
(B) Two electrical connections between compressor and cable harness for seat suspension
(C) Electrical connection between cable harness for seat suspension and cable harness for upper seat part
(D) Electrical connection between cable harness for seat suspension and cable harness for vehicle connection
(E) Electrical connection between cable harness for seat suspension and cable harness for upper seat part
2.1 Components overview

Pin assignment of the socket of cable harness for seat suspension (13):

(14) Pin assignment for control
Contact:
K8 (ground) and K14 (voltage 12V / 24V)

(15) Pin assignment for height adjustment in downward direction
Contact:
K5 (ground) K7 (signal)

(16) Pin assignment for height adjustment in upward direction
Contact:
K4 (signal) K5 (ground)

(17) Pin assignment for seat occupancy detection system
Contact:
K1 (signal) K2 (ground)

(18) Pin assignment for compressor
Contact:
K12 (voltage 12V / 24V) K15 (ground)

(19**) Pin assignment for climate control system:
Contact:
K3 (voltage 12V) K2 (ground)

Pin assignment of the plug of cable harness for seat suspension (10):

(20) Pin assignment for seat occupancy detection system
Pin:
P10 (signal A) P11 (signal C) P12 (signal B)

(21) Pin assignment for belt buckle contact
Pin:
P9 (belt buckle contact signal)

(22) Pin assignment for heater
Pin:
P3 (ground) P6 (voltage 12V / 24V)

(23) Pin assignment for lumbar support
Pin:
P3 (ground) P5 (voltage 12V / 24V)

(24*) Pin assignment for climate control system
Pin:
P3 (ground) P4 (voltage 12V)

(25) Pin assignment for control
Pin:
P1 (ground) P2 (voltage 12V / 24V)

* Pin assignment for variant 12V. At variant 24V no assignment of P4.
** Pin assignment for variant 24V. At variant 12V no assignment of K3.
## 2.1 Components overview

<table>
<thead>
<tr>
<th>Pin assignment of the plug of cable harness for seat suspension (2 and 6):</th>
<th>Pin assignment for lumbar support</th>
</tr>
</thead>
<tbody>
<tr>
<td>(26) Pin assignment for control of height adjustment signal in downward direction Pin: P5 (ground) P6 (signal)</td>
<td>Pin: P6 (ground) P7 (voltage 12 V / 24V)</td>
</tr>
<tr>
<td>(27) Pin assignment for control of height adjustment signal in upward direction Pin: P4 (signal UP) P5 (ground)</td>
<td></td>
</tr>
<tr>
<td>(28) Pin assignment for seat occupancy detection system Pin: P2 (ground) P3 (signal)</td>
<td>Pin: P6 (ground) P8 (voltage 12 V / 24V)</td>
</tr>
<tr>
<td>(29) Pin assignment for climate control system Pin: P3 (voltage 12 V) P6 (ground)</td>
<td>Pin: P6 (ground) P8 (voltage 12 V / 24V)</td>
</tr>
<tr>
<td>(30) Pin assignment for belt buckle contact Pin: P2 (belt buckle contact signal)</td>
<td></td>
</tr>
</tbody>
</table>
2.1 Components overview

Cable harness of seat suspension with external compressed-air supply via the compressed-air system of the vehicle

- (1) Cable harness of seat suspension
- (2) Plug of cable harness of seat suspension (12-pin)
- (3) U-profile
- (4) Fuse (Si = 15A at 12V/DC)
- (5) Plug of cable harness of seat suspension (8-pin)
- (6) Socket of solenoid valve cable (3-pin)
- (7) Plug of cable harness of seat suspension (6-pin)
- (8) Socket of cable harness of seat suspension (15-pin)

Electrical plug and socket connections:

- (A) Electrical connection between level control and cable harness of seat suspension (1)
- (C) Electrical connection between cable harness of seat suspension (1) and cable harness of upper seat part
- (D) Electrical connection between cable harness of seat suspension (1) and cable harness of vehicle connection
- (E) Electrical connection between cable harness of seat suspension (1) and cable harness of upper seat part
- (F) Electrical connections between solenoid valve cable and solenoid valve
2.1 Components overview

Pin assignment of socket of cable harness of seat suspension (5 and 7):

(9) Pin assignment for control of height adjustment signal in downward direction
Pin:
P5 (ground)
P6 (signal)

(10) Pin assignment for control of height adjustment signal in upward direction
Pin:
P4 (signal UP)
P5 (ground)

(11) Pin assignment for seat occupancy detection system
Pin:
P2 (ground)
P3 (signal)

(12) Pin assignment for climate control system
Pin:
P3 (voltage 12 V)
P6 (ground)

(13) Pin assignment for belt buckle contact
Pin:
P2 (belt buckle contact signal)

(14) Pin assignment for seat occupancy detection system
Pin:
P1 (signal B)
P4 (signal A)
P5 (signal C)

(15) Pin assignment for lumbar support
Pin:
P6 (ground)
P7 (voltage 12 V / 24V)

(16) Pin assignment for heater
Pin:
P6 (ground)
P8 (voltage 12 V / 24V)
2.1 Components overview

Pin assignment of plug of cable harness of seat suspension (2):

(17) Pin assignment for seat occupancy detection system
Pin:
P10 (signal A)
P11 (signal C)
P12 (signal B)

(18) Pin assignment for RS 232
Pin:
P7 (transmit)
P8 (receive)

(19) Pin assignment for belt buckle contact
Pin:
P9 (belt buckle contact signal)

(20) Pin assignment for heater
Pin:
P3 (ground)
P6 (voltage 12 V)

(21) Pin assignment for lumbar support
Pin:
P3 (ground)
P5 (voltage 12 V)

(22) Pin assignment for climate control system
Pin:
P3 (ground)
P4 (voltage 12 V)

(23) Pin assignment for control
Pin:
P1 (ground)
P2 (voltage 12 V / 24V)
## 2.2 Overview of faults – Pointing out possible faults that might occur

This chapter contains notes on possible faults of the seat suspension. The notes and information provided in Chapter 2.3 “Troubleshooting – Locating the fault” are intended to ease troubleshooting of faults. The upper seat part has been inspected and found OK with respect to the faults described here (see Diagnosis in the repair manual for the upper part of the seat).

Faults caused due to insufficient maintenance or improper repair are not covered here.

**Note:** The components mentioned above are illustrated in Chapter 2.1 and the functional components are illustrated in the repair manual of the upper seat part, if not stated otherwise in this text.

Further possible seat-specific faults which might occur for different delivery options of the seat are listed on page 4 ff.

<table>
<thead>
<tr>
<th>Fault description</th>
<th>Possible cause</th>
<th>Troubleshooting</th>
</tr>
</thead>
</table>
| Seat suspension does not respond when operating the handle for height adjustment in upward or downward direction. | • Compressor is not active.  
• Air system is leaky.  
• Level control is defective.  
• Cable harness for seat suspension is defective.  
• No voltage.  
• Seat switch is defective. | Check the compressor and the compressor cable (Chap. 2.3, inspection step no. 2.1).  
Check pneumatic air system (Chap. 2.3, inspection step 4.1).  
Check the level control (Chap. 2.3, inspection step 1.1).  
Check the cable harness for seat suspension (Chap. 2.3, inspection step no. 3.1).  
Check the fuse and electrical connections and replace the fuse, if necessary.  
Replace the seat switch (see repair manual for the upper seat part). |
| Seat suspension responds when the handle for seat height adjustment is operated, but then returns to its original position. | • Level control is defective. | Check the level control (Chap. 2.3, inspection step 1.1). |
## 2.2 Overview of faults – Pointing out possible faults that might occur

<table>
<thead>
<tr>
<th>Fault description</th>
<th>Possible cause</th>
<th>Troubleshooting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seat suspension changes its position while driving, deflates and lowers down.</td>
<td>• Compressed-air hose connections are leaky.</td>
<td>Check all compressed-air hose connections for air leakage and, if necessary, seal leaky connections professionally.</td>
</tr>
<tr>
<td></td>
<td>• Air spring, compressed-air hoses or additional air supply are leaky.</td>
<td>Check pneumatic air system (Chap. 2.3, inspection step 4.1).</td>
</tr>
<tr>
<td></td>
<td>• Compressor is leaky (return valve).</td>
<td>Replace the compressor (see Chapter 3.9).</td>
</tr>
<tr>
<td>It is possible to set the seat suspension to the highest position, but it does not deflate any longer.</td>
<td>• Level control is defective.</td>
<td>Check the level control (Chap. 2.3, inspection step 1.1).</td>
</tr>
<tr>
<td>Height adjustment in upward direction: compressor runs, but seat suspension is not lifted.</td>
<td>• Air system is leaky.</td>
<td>Check pneumatic air system (Chap. 2.3, inspection step 4.1).</td>
</tr>
<tr>
<td></td>
<td>• Compressor does not work.</td>
<td>Check the compressor (Chap. 2.3, inspection step 1.1).</td>
</tr>
<tr>
<td>Seat moves up automatically (compressor does not switch off).</td>
<td>• Cable break or short-circuit (e.g. caused by abrasion at the cable harness).</td>
<td>Replace the cable harness of the seat suspension (see Chapter 3.15).</td>
</tr>
<tr>
<td></td>
<td>• Level control is defective.</td>
<td>Check the level control (Chap. 2.3, inspection step 1.1).</td>
</tr>
<tr>
<td>Compressor is not running.</td>
<td>• No voltage at the compressor.</td>
<td>Check the compressor and the compressor cable (Chap. 2.3, inspection step 2.1).</td>
</tr>
<tr>
<td></td>
<td>• Seat switch is defective.</td>
<td>Replace the seat switch (see repair manual for the upper seat part).</td>
</tr>
<tr>
<td></td>
<td>• Level control is defective.</td>
<td>Check the level control (Chap. 2.3, inspection step 1.1).</td>
</tr>
</tbody>
</table>
### 2.2 Overview of faults – Pointing out possible faults that might occur

<table>
<thead>
<tr>
<th>Fault description</th>
<th>Possible cause</th>
<th>Troubleshooting</th>
</tr>
</thead>
</table>
| Seat suspension travels up and down and hits the upper and lower end stop. | • Vertical shock absorber is defective.  
• Air spring is untight.  
• Additional air supply is leaky.  
• Compressed-air hose connections are leaky.  
• Compressed-air hoses are leaky.  
• Compressor is defective. | Replace the vertical shock absorber (see Chap. 3.4).  
Replace the air spring (see Chapter 3.12).  
Replace the additional air supply (see Chapter 3.13).  
Check all air hose connections for air leakage and replace the component showing a defective air connection with a new one, if necessary.  
Check pneumatic air system (Chap. 2.3, inspection step 4.1).  
Check the compressor (Chap. 2.3, inspection step 1.1). |
# 2.2 Overview of faults – Pointing out possible faults that might occur

## Seat suspension with external compressed-air supply via the compressed-air system of the vehicle

<table>
<thead>
<tr>
<th>Fault description</th>
<th>Possible cause</th>
<th>Troubleshooting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seat suspension does not respond when operating the handle for height adjustment in upward or downward direction.</td>
<td>• No external compressed air supply.</td>
<td>Check the vehicle’s compressed-air system.</td>
</tr>
<tr>
<td></td>
<td>• External compressed-air connection is leaky.</td>
<td>Replace the external compressed-air connection (see Chapter 3.19).</td>
</tr>
<tr>
<td></td>
<td>• Solenoid valve is defective.</td>
<td>Check the solenoid valve and solenoid valve cable (Chap. 2.3, inspection step 5).</td>
</tr>
<tr>
<td>Seat suspension changes its position while driving, deflates and lowers down.</td>
<td>• Solenoid valve is leaky (return valve).</td>
<td>Replace the solenoid valve (see Chapter 3.20).</td>
</tr>
</tbody>
</table>
2.3 Troubleshooting – Locating the fault

Preconditions for fault diagnosis for each test:

- The individual functions are activated in compliance with the instructions of the seat operating instructions.
- The electrical system of the vehicle has been inspected and found to be OK and in compliance with the vehicle operating instructions.
- Electrical connection at the components produced according to instruction and locked, if possible.
- Cable harness for seat suspension has been inspected with regard to arcing spots and broken leads (kinks) and found to be OK.
- Ignition switched off (no voltage that might cause a current flow must be applied to the seat suspension).
- Bellows at the upper suspension part removed (see Chapter 3.3) and pressed down.

Note:

- The components mentioned above are illustrated in Chapter 2.1.
- The work steps required during diagnosis are described in Chapter 3.
- Repeat the inspection after defective assemblies have been replaced.
- Assemble the seat after ending inspection or before repeating inspection (e.g. re-establish electrical connections).
## 2.3 Troubleshooting – Locating the fault

### 1 Inspection of the level control

**Preconditions for fault diagnosis:**
See “Preconditions for fault diagnosis for each test”.

<table>
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<tbody>
<tr>
<td>1.1</td>
<td>• Apply load to the seat suspension.</td>
<td>Air escapes at the level control.</td>
<td>Replace the level control (see Chapter 3.10).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The level control is tight.</td>
<td>Proceed with inspection step 1.2.</td>
</tr>
<tr>
<td>1.2</td>
<td>• Disconnect the electrical connection (A) between the level control and the cable harness for seat suspension.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Measure the resistance at the pins P8 and P14 in the plug of the level control (pin assignment for control):</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>P8 Ω P14</td>
<td>= 2.86 kΩ (± 1%)</td>
<td>Proceed with inspection step 1.3.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;&gt; 2.86 Ω (∞) (interruption) or</td>
<td>Replace the level control (see Chapter 3.10).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>= 2.86 Ω (→ ∞) (interruption) or</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;&lt; 2.86 Ω (0) (short-circuit)</td>
<td></td>
</tr>
<tr>
<td>1.3</td>
<td>• Measure the resistance at the pins P4 and P5 in the plug of the level control (pin assignment for height adjustment in upward direction):</td>
<td>= 3.41 kΩ (± 1%)</td>
<td>Proceed with inspection step 1.4.</td>
</tr>
<tr>
<td></td>
<td>P4 Ω P5</td>
<td>&gt;&gt; 3.41 kΩ (∞) (interruption) or</td>
<td>Replace the level control (see Chapter 3.10).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>= 3.41 kΩ (→ ∞) (interruption) or</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;&lt; 3.41 kΩ (0) (short-circuit)</td>
<td></td>
</tr>
</tbody>
</table>
## 2.3 Troubleshooting – Locating the fault

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</thead>
</table>
| 1.4      | • Measure the resistance at the pins P5 and P7 in the plug of the level control (pin assignment for height adjustment in downward direction): | $\Omega = 3.41 \, k\Omega \, (\pm \, 1\%)$  
$\gg 3.41 \, k\Omega \, (\rightarrow \, \infty) \, (\text{interruption})$  
$\ll 3.41 \, k\Omega \, (\rightarrow \, 0) \, (\text{short-circuit})$ | Proceed with inspection step 1.5.  
Replace the level control (see Chapter 3.10). |
|          | P5 $\Omega$ P7 | | |
| 1.5      | • Measure the resistance at the pins P1 and P2 in the plug of the level control (pin assignment for seat occupancy detection system): | $\Omega = 3.41 \, k\Omega \, (\pm \, 1\%)$  
$\gg 3.41 \, k\Omega \, (\rightarrow \, \infty) \, (\text{interruption})$  
$\ll 3.41 \, k\Omega \, (\rightarrow \, 0) \, (\text{short-circuit})$ | Proceed with inspection step 1.6.  
Replace the level control (see Chapter 3.10). |
|          | P1 $\Omega$ P2 | | |
| 1.6      | • Measure the resistance at the pins P12 and P15 in the plug of the level control (pin assignment for compressor): | $\Omega = 17.36 \, k\Omega \, (\pm \, 1\%)$  
$\gg 17.36 \, k\Omega \, (\rightarrow \, \infty) \, (\text{interruption})$  
$\ll 17.36 \, k\Omega \, (\rightarrow \, 0) \, (\text{short-circuit})$ | End of inspection.  
Reconnect the electrical connection (A).  
Replace the level control (see Chapter 3.10). |
|          | P12 $\Omega$ P15 | | |
| 1.7      | • Measure the resistance at the pins P2 and P3 in the plug of the level control (pin assignment for the climate control system for the seat version 24 V / DC): | $\Omega = 92 \, k\Omega \, (\pm \, 1\%)$  
$\gg 92 \, k\Omega \, (\rightarrow \, \infty) \, (\text{interruption})$  
$\ll 92 \, k\Omega \, (\rightarrow \, 0) \, (\text{short-circuit})$ | End of inspection.  
Reconnect the electrical connection (A).  
Replace the level control (see Chapter 3.10). |
|          | P2 $\Omega$ P3 | | |
2.3 Troubleshooting – Locating the fault

2 Inspection of the compressor and compressor cable (delivery option)

Preconditions for fault diagnosis:
- See “Preconditions for fault diagnosis for each test”.
- The pneumatic air system has been inspected and found to be OK.

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</table>
| 2.1     | • Disconnect the electrical connection (A) between the level control and the cable harness for seat suspension.  
          • Measure the resistance at the contacts K12 and K15 of the socket of the entire cable harness (pin assignment for compressor):  
                        \[
                        \begin{align*}
                        K12 & \quad \Omega \\
                        K15 & \quad \Omega 
                        \end{align*}
                        \]  | \( \geq 1.8 \Omega \ (\pm 10\%) \) (total resistance of compressor cable and compressor) \( >> 1.8 \Omega \ (\rightarrow \infty) \) (interruption) or \( \ll 1.8 \Omega \ (\rightarrow 0) \) (short-circuit) | End of inspection.  
Reconnect the electrical connection (A).  
Proceed with inspection step 2.2. |
| 2.2     | • Disconnect the electrical connections (B) between the compressor cable and the compressor.  
          • Measure the resistance at the contacts of the compressor (2-pin):  
                        \[
                        \begin{align*}
                        \text{Contact} & \quad \Omega \\
                        \text{contact} & \quad \Omega 
                        \end{align*}
                        \]  | \( \geq 1.4 \Omega \ (\pm 10\%) \) (total internal resistance of compressor) \( >> 1.4 \Omega \ (\rightarrow \infty) \) (interruption) or \( \ll 1.4 \Omega \ (\rightarrow 0) \) (short-circuit) | Replace the cable harness of the seat suspension (see Chapter 3.15).  
Reconnect the electrical connection (A and B).  
Replace the compressor (see Chapter 3.9).  
Reconnect the electrical connection (A and B). |
# 2.3 Troubleshooting – Locating the fault

## 3 Inspection of the cable harness for seat suspension

**Preconditions for fault diagnosis:**
- See “Preconditions for fault diagnosis for each test”.
- Upper seat part removed at the seat suspension and put aside.
- Level control has been inspected and found to be OK.
- Compressor and current path have been inspected and found to be OK (delivery option).
- The solenoid valve and solenoid valve cable have been inspected and found to be OK (delivery option)

<table>
<thead>
<tr>
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</table>
| 3.1      | • Disconnect the electrical connection (A) between the level control and the cable harness for seat suspension.  
• Disconnect the electrical connection (D) between the cable harness plug for seat suspension and the cable harness socket for vehicle connection.  
• Disconnect the electrical connection (C and E) between the cable harness plug for seat suspension and the cable harness socket for the upper seat part.  
• Measure the resistance at the pins P1 and P2 in the plug of the cable harness for seat suspension (pin assignment for control):<br><br>\[
P1 \quad \Omega \quad P2
\]
\[
= \infty \Omega
\]
\[
\ll \infty \Omega \ (\rightarrow 0) \text{ (short-circuit)}
\] | Proceed with inspection step 3.2.  
Replace the cable harness of the seat suspension (see Chapter 3.15). |
## 2.3 Troubleshooting – Locating the fault

<table>
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<tr>
<th>Step no.</th>
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<tbody>
<tr>
<td></td>
<td>• Bridge the pins P8 and P14 in the socket of the cable harness for seat suspension (13).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.2</td>
<td>• Measure the resistance at the pins P1 and P2 in the plug of the cable harness for seat suspension (10) (pin assignment for control):</td>
<td>P1 $\Omega$ P2 $\ll 1 \Omega$ ($\rightarrow 0$) (pass) $\geq 1 \Omega$ ($\rightarrow \infty$) (interruption)</td>
<td>Proceed with inspection step 3.3. Replace the cable harness of the seat suspension (see Chapter 3.15).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.3</td>
<td>• Measure the resistance at the pins P3 and P4 in the plug of the cable harness for seat suspension (10) (pin assignment for the climate control system for the seat version 12V / DC):</td>
<td>P3 $\Omega$ P4 $\ll \infty \Omega$ (short-circuit) $\geq \infty \Omega$ ($\rightarrow 0$) (pass)</td>
<td>Proceed with inspection step 3.4. Replace the cable harness of the seat suspension (see Chapter 3.15).</td>
</tr>
<tr>
<td></td>
<td>• Bridge the pins P3 and P6 in the plug of the cable harness for seat suspension (2).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.4</td>
<td>• Measure the resistance at the pins P3 and P4 in the plug of the cable harness for seat suspension (10) (pin assignment for the climate control system for the seat version 12V / DC):</td>
<td>P3 $\Omega$ P4 $\ll 1 \Omega$ ($\rightarrow 0$) (pass) $\geq 1 \Omega$ ($\rightarrow \infty$) (interruption)</td>
<td>Proceed with inspection step 3.5. Replace the cable harness of the seat suspension (see Chapter 3.15).</td>
</tr>
</tbody>
</table>
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<tr>
<td>3.5</td>
<td>• Measure the resistance at the pins P3 and P5 in the plug of the cable harness for seat suspension (10) (pin assignment for the lumbar support): P3 Ω P5</td>
<td>= ∞ Ω</td>
<td>Proceed with inspection step 3.6. Replace the cable harness of the seat suspension (see Chapter 3.15).</td>
</tr>
<tr>
<td>3.6</td>
<td>• Bridge the pins P6 and P7 in the plug of the cable harness for seat suspension (2). • Measure the resistance at the pins P3 and P5 in the plug of the cable harness for seat suspension (10) (pin assignment for the lumbar support): P3 Ω P5</td>
<td>&lt;&lt; 1 Ω (→ 0) (pass)</td>
<td>Proceed with inspection step 3.7. Replace the cable harness of the seat suspension (see Chapter 3.15).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥ 1 Ω (→∞) (interruption)</td>
<td></td>
</tr>
<tr>
<td>3.7</td>
<td>• Measure the resistance at the pins P3 and P6 in the plug of the cable harness for seat suspension (10) (pin assignment for the heater): P3 Ω P6</td>
<td>= ∞ Ω</td>
<td>Proceed with inspection step 3.8. Replace the cable harness of the seat suspension (see Chapter 3.15).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;&lt; ∞ Ω (→ 0) (short-circuit)</td>
<td></td>
</tr>
</tbody>
</table>
# Troubleshooting – Locating the fault

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</table>
| 3.8     | • Bridge the pins P6 and P8 in the plug of the cable harness for seat suspension (2).  
          • Measure the resistance at the pins P3 and P6 in the plug of the cable harness for seat suspension (10) (pin assignment for the heater):  
            P3 H Omega H P6 | <= 1 Ω (→ 0) (pass)  
          >= 1 Ω (→∞) (interruption) | Proceed with inspection step 3.9.  
          Replace the cable harness of the seat suspension (see Chapter 3.15). |
| 3.9     | • Measure the resistance at the pins P1 and P2 in the socket of the cable harness for seat suspension (13) (pin assignment for seat occupancy detection system):  
            P1 H Omega H P2 | = ∞ Ω  
          <= ∞ Ω (→ 0) (short-circuit) | Proceed with inspection step 3.10.  
          Replace the cable harness of the seat suspension (see Chapter 3.15). |
| 3.10    | • Bridge the pins P2 and P3 in the plug of the cable harness for seat suspension (6).  
          • Measure the resistance at the pins P1 and P2 in the socket of the cable harness for seat suspension (13) (pin assignment for seat occupancy detection system):  
            P1 H Omega H P2 | <= 1 Ω (→ 0) (pass)  
          >= 1 Ω (→∞) (interruption) | Proceed with inspection step 3.11.  
          Replace the cable harness of the seat suspension (see Chapter 3.15). |
### 2.3 Troubleshooting – Locating the fault

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<tbody>
<tr>
<td>3.11</td>
<td>• Measure the resistance at the pins P4 and P5 in the socket of the cable harness for seat suspension (13) (pin assignment for height adjustment in upward direction):</td>
<td>= ∞ Ω &lt; 1 Ω (→ 0) (pass) ≥ 1 Ω (→ ∞) (interruption)</td>
<td>Proceed with inspection step 3.12. Replace the cable harness of the seat suspension (see Chapter 3.15).</td>
</tr>
<tr>
<td></td>
<td>P4 Ω P5</td>
<td>≥ 1 Ω (→ ∞) (interruption)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Bridge the pins P4 and P5 in the plug of the cable harness for seat suspension (6).</td>
<td>Proceed with inspection step 3.13. Replace the cable harness of the seat suspension (see Chapter 3.15).</td>
<td></td>
</tr>
<tr>
<td>3.12</td>
<td>• Measure the resistance at the pins P4 and P5 in the socket of the cable harness for seat suspension (13) (pin assignment for height adjustment in upward direction):</td>
<td>Proceed with inspection step 3.13. Replace the cable harness of the seat suspension (see Chapter 3.15).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P4 Ω P5</td>
<td>≥ 1 Ω (→ ∞) (interruption)</td>
<td></td>
</tr>
<tr>
<td>3.13</td>
<td>• Measure the resistance at the pins P5 and P7 in the socket of the cable harness for seat suspension (13) (pin assignment for height adjustment in downward direction):</td>
<td>Proceed with inspection step 3.14. Replace the cable harness of the seat suspension (see Chapter 3.15).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P5 Ω P7</td>
<td>= ∞ Ω &lt; 1 Ω (→ 0) (pass)</td>
<td></td>
</tr>
</tbody>
</table>
## 2.3 Troubleshooting – Locating the fault

<table>
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</thead>
</table>
| 3.14    | • Bridge the pins P5 and P6 in the plug of the cable harness for seat suspension (6).  
• Measure the resistance at the pins P5 and P7 in the socket of the cable harness for seat suspension (13) (pin assignment for height adjustment in downward direction):  
\[
\begin{array}{ccc}
P5 & \Omega & P7 \\
\end{array}
\]
| & \(< 1 \ \Omega \ (\rightarrow 0)\) (pass)  
\(\geq 1 \ \Omega \ (\rightarrow \infty)\) (interruption)                                                                 | Proceed with inspection step 3.15. \ Replace the cable harness of the seat suspension (see Chapter 3.15).                                                                                                                                                      |                                                                                                                                                                                                             |
| 3.15    | • Measure the resistances between the pins P9, P10, P11 and P12 in the plug of the cable harness for seat suspension (10) and the pins P2, P4, P5 and P1 in the plug of the cable harness for seat suspension (2) (pin assignments for belt buckle contact and seat occupancy detection system):  
\[
\begin{array}{ccc}
P9 & \Omega & P2 \\
P10 & \Omega & P4 \\
P11 & \Omega & P5 \\
P12 & \Omega & P1 \\
\end{array}
\]
| & \(< 1 \ \Omega \ (\rightarrow 0)\) (pass)  
\(\geq 1 \ \Omega \ (\rightarrow \infty)\) (interruption)                                                                 | Proceed with inspection step 3.16. \ Replace the cable harness of the seat suspension (see Chapter 3.15).                                                                                                                                                      |                                                                                                                                                                                                             |
| 3.16    | Measure the resistance at the pins P2 and P3 in the socket of the cable harness for seat suspension (13) (pin assignment for climate control system for the seat version 24V / DC):  
\[
\begin{array}{ccc}
P2 & \Omega & P3 \\
\end{array}
\]
| & \(< 1 \ \Omega \ (\rightarrow 0)\) (Durchgang)  
\(\geq 1 \ \Omega \ (\rightarrow \infty)\) (Unterbrechung)                                                                 | End of inspection. \ Reconnect the electrical connection (A, C, D and E). \ Replace the cable harness of the seat suspension (see Chapter 3.15).                                                                 |                                                                                                                                                                                                             |
## 4 Inspection of the pneumatic air system

Preconditions for fault diagnosis:
- See “Preconditions for fault diagnosis for each test”.
- Compressor and current path have been inspected and found to be OK (delivery option).
- The solenoid valve and solenoid valve cable have been inspected and found to be OK (delivery option).
- Carry out a leak test by means of leak detection spray.

<table>
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<th>Result/Specified status</th>
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</tr>
</thead>
</table>
| 4.1      | Apply load to the seat suspension and check compressed-air hoses for kinks and leakage. | Compressed-air hoses are tight.  
Compressed-air hose is leaky.  
Air hose connection is leaky. | Proceed with inspection step 4.2.  
Replace the compressed-air hose (see Chapter 3.11).  
Professionally seal the connection or replace it (see Chapter 3.11). |
| 4.2      | Check the air spring for visible damage (e.g. abrasion) and tightness. | Air spring is tight.  
Air spring is untight. | Proceed with inspection step 4.3.  
Replace the air spring (see Chapter 3.12). |
| 4.3      | Apply load to the seat suspension and check the additional air supply for leakage. | Additional air supply is tight.  
Air escapes at the additional air supply. | Proceed with inspection step 4.4.  
Replace the additional air supply (see Chapter 3.13). |
| 4.4      | Apply load to the seat suspension and check the level control for leakage. | Air escapes at the level control.  
The level control is tight. | Replace the level control (see Chapter 3.10).  
End of inspection. |
## 5 Inspection of the solenoid valve of the external compressed air supply and the solenoid valve cable (delivery option)

### Preconditions for fault diagnosis:
- See “Preconditions for fault diagnosis for each test”.
- The pneumatic air system has been inspected and found to be OK.

<table>
<thead>
<tr>
<th>Step no.</th>
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</tr>
</thead>
</table>
| 5.1      | • Disconnect the electrical connection (A) between the level control and the cable harness of the seat suspension.  
          • Measure the resistance at contacts K12 and K15 of the socket of the cable harness of the seat suspension:  
            \[
            \begin{align*}
            \text{K12} &\quad \Omega &\quad \text{K15} \\
            \end{align*}
            \] |
|          |                                                                                   | = 32 $\Omega$ ($\pm$ 10%) (total resistance of solenoid valve and solenoid valve cable) | End of inspection. Re-establish the electrical connection (A). Proceed with inspection step 5.2. |
|          |                                                                                   | $>>$ 32 $\Omega$ ($\rightarrow \infty$) (interruption) or $<<$ 32 $\Omega$ ($\rightarrow 0$) (short-circuit) |                                                                                   |
| 5.2      | • Disconnect electrical connections (F) between solenoid valve cable and solenoid valve  
          • Measure the resistance at contacts 1 and 2 of the solenoid valve: |
|          |                                                                                   | = 32 $\Omega$ ($\pm$ 10%) (total internal resistance of solenoid valve)                | Replace the cable harness of the seat suspension (see Chapter 3.15). Re-establish the electrical connection (A and F). |
|          |                                                                                   | $>>$ 32 $\Omega$ ($\rightarrow \infty$) (interruption) or $<<$ 32 $\Omega$ ($\rightarrow 0$) (short-circuit) | Replace the solenoid valve (see Chapter 3.20). Re-establish the electrical connection (A and F). |
## 3 Repair work

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3.19 External compressed-air connection – removal and installation *  
3.20 Solenoid valve of external compressed-air supply – removal and installation *

* Delivery option
3.1 Top and rear cover – removal and installation

Removal and installation

1. Remove the upper seat part at the seat suspension and put it aside.

   **Notes:**
   - Cable ties at cable harness for upper seat part do not need to be removed and the electrical connections do not need to be disconnected.
   - Do not overstretch the cable harness and Bowden pull wire for the upper seat part when putting it aside.

2. Pull out the bellows pin (3) at the rear.

   **Note:**
   The rear cover (2) is fastened together with the top cover (1).

3. Detach the hook (5) of the rear cover (2) at the U-shaped profile (4) and remove the rear cover (2).

   **Installation note:**
   Make sure that the bellows (6) runs underneath the rear cover (2).

4. Pull out two bellows pins (3) at the front.

5. Remove the top cover (1).

6. Re-install the components in the reverse order of their removal.
3.2 Covers on the right and left side – removal and installation

Removal and installation

⚠️ WARNING Risk of injury!

Always install the left and right covers (1) as they provide protection against crushing at the seat fore/aft adjustment.

1. Remove the upper seat part at the seat suspension and put it aside.

**Notes:**
- Cable ties at cable harness for upper seat part do not need to be removed and the electrical connections do not need to be disconnected.
- Do not overstretch the cable harness and Bowden pull wire for the upper seat part when putting it aside.

2. Bore out two rivet heads on each cover (1) and drive out the blind rivets (2).

3. Remove the left and right covers (1).

**Installation note:**
Make sure that the bellows (3) runs underneath the left and right covers (1). If necessary, press the bellows (3) under the covers (1) by means of suitable tools, e.g. a screwdriver.

4. Re-install the components in the reverse order of their removal.
3.3 Bellows – removal and installation

Removal and installation

1 Remove the seat.

2 Pull out two bellows pins (4) at the U-shaped profile (5).

3 Detach eleven keyhole nubs (11) at the upper suspension part (3).
   **Installation note:**
   Press the bellows (1) under the left and right covers (2) by means of suitable tools, e.g. a screwdriver.

4 Detach the bellows (1) at the hook (7).

5 Pull the bellows (1) over the L-bar (6) and the handle for the fore/aft isolator (8).
   **Installation note:**
   When installing a new bellows (1), tear open the predetermined breaking points for the L-bar (6) and for the handle of the fore/aft isolator (8) in the bellows (1), if there are no pre-cut apertures.

6 Detach eleven keyhole nubs (12) at the lower suspension part (9).

7 Pull the bellows (1) in downward direction over the lower suspension part (9) and remove it.

8 If the wire insert (10) is defective:
   Remove the wire insert (10) at the bellows (1).
   **Installation notes:**
   • Place the wire insert (10) in the middle fold of the bellows (1).
   • The welding joint (arrow) of the wire insert (10) must be located on the right of the bellows (1).

9 Re-install the components in the reverse order of their removal.
3.4 Bowden pull wire for vertical shock absorber adjustment – removal and installation

Removal and installation

1. Remove the upper seat part from the seat suspension.

2. Remove the top cover (see Chapter 3.1).

3. **WARNING** Risk of crushing!

   Move the seat suspension to the highest position and secure it at the rear between the swinging structure and the lower suspension part by means of suitable spacers.

4. Press off the fixing (5) at the adjusting lever (6) of the vertical shock absorber (7).

5. Compress the compression spring (3) (arrow direction) and take off the wire of the Bowden pull wire (1) at the bearing (2).

6. Detach the Bowden pull wire (1) at the fork (4) and remove the fork (4) and the compression spring (3).

7. Mark the installation position of the Bowden pull wire (1) and remove the Bowden pull wire from the seat suspension in upward direction.

8. Re-install the components in the reverse order of their removal.
3.5 Vertical shock absorber with bearing – removal and installation

Removal and installation

1 Remove the upper seat part from the seat suspension.
2 Remove the top cover (see Chapter 3.1).
3 Remove the Bowden pull wire at the vertical shock absorber (see Chapter 3.5).
4 Remove the bellows at the upper suspension part (see Chapter 3.3) and press it down.
5 **WARNING** Risk of crushing!
   Move the seat suspension to the highest position and secure it at the rear between the swinging structure and the lower suspension part by means of suitable spacers.
6 Loosen the lock washer (2) at the stud (7).
7 Pull the stud (7) out of the swinging structure (1), the vertical shock absorber (5) and the bearing (3).
   **Installation note:** Apply acid-free multi-purpose lubricant to the entire surface (F) of the stud (7).
8 Loosen the lock washer (6) at the stud (4).
9 Remove the stud (4) from the swinging structure (1) and the vertical shock absorber (5).
   **Installation note:** Apply acid-free multi-purpose lubricant to the entire surface (F) of the stud (4).
10 Remove the vertical shock absorber (5) in upward direction and remove the bearing (3).
   **Installation note:** When installing the vertical shock absorber (5), the marking must point upwards.
11 Re-install the components in the reverse order of their removal.
3.6 Longitudinal horizontal shock absorber – removal and installation

Removal and installation

1. Remove the upper seat part at the seat suspension and put it aside.
   **Notes:**
   - Cable ties at cable harness for upper seat part do not need to be removed and the electrical connections do not need to be disconnected.
   - Do not overstretch the cable harness and Bowden pull wire for the upper seat part when putting it aside.

2. Remove the top cover (see Chapter 3.1).

3. Remove the bellows from the front upper suspension part (see Chapter 3.3).

4. **WARNING** Risk of crushing!

   Move the seat suspension to the highest position and secure it at the rear between the swinging structure and the lower suspension part by means of suitable spacers.

5. Lock the fore/ aft isolator.

6. Loosen the lock washer (5) at the left (6) and right axle (7) of the upper suspension part (2) and remove the clearance spacers (4).

7. Lift off the longitudinal horizontal shock absorbers (1) at the tube of the swinging structure (3).
   **Installation note:**
   Press the longitudinal horizontal shock absorbers (1) onto the tube of the swinging structure (3) without using driving or hammering tools.

8. Pull the longitudinal horizontal shock absorbers (1) down at the left (6) and right axle (7) of the upper suspension part (2).
   **Installation note:**
   Apply acid-free multi-purpose lubricant to the mounting surfaces (F) of the longitudinal horizontal shock absorbers (1).

9. Re-install the components in the reverse order of their removal.
3.7 Fore/aft isolator unit – removal and installation

Removal and installation

1 Remove the upper seat part at the seat suspension and put it aside.

Notes:
- Cable ties at cable harness for upper seat part do not need to be removed and the electrical connections do not need to be disconnected.
- Do not overstretch the cable harness and Bowden pull wire for the upper seat part when putting it aside.

2 Remove the top cover (see Chapter 3.1).

3 Remove the bellows at the upper suspension part (see Chapter 3.3) and press it down.

4 WARNING Risk of crushing!

Move the seat suspension to the highest position and secure it at the rear between the swinging structure and the lower suspension part by means of suitable spacers.

5 If the longitudinal horizontal shock absorber is defective:
Remove the longitudinal horizontal shock absorber (Chapter 3.6).

6 If the longitudinal horizontal shock absorber is not defective:
Lift off the longitudinal horizontal shock absorber at the tube of the swinging structure (see Chapter 3.6).

7 Turn the handle of the fore/aft isolator (9) backwards to unlock the locking mechanism of the fore/aft isolator.

8 Unscrew two collar screws (8).

Installation notes:
- Collar screw (8), 25 ± 5 Nm.
- During installation, the tension spring (5) is screwed on under tension.
- Apply acid-free multi-purpose lubricant to the entire surface (F) of the collar screw (8).

9 Remove the additional air supply and put it aside (see Chapter 3.13).

Note:
The compressed-air hoses do not have to be removed from the additional air supply.
3.7 Fore/aft isolator unit – removal and installation

10 Push the upper suspension part (1) forwards until the right (arrow) and left cut-outs at the guiding rails (2) are located at the same height as the front rollers.

**Note:**
Press the compressed-air hoses at the leveling valve downwards, if necessary.

11 Lift off the upper suspension part (1) over the front rollers and lay it down.

**Installation note:**
Apply acid-free multi-purpose lubricant to two guiding rails (2) at the side surfaces (F) of the front rollers.

12 Press off the clamp (7) at the swinging structure (3).

**Installation note:**
Apply acid-free multi-purpose lubricant to the clamp (7) at the running surface of the swinging structure (F).

13 Remove the buffer (4) and two bushings (6) from the legs of the tension spring (5).

14 Remove the tension spring (5) from the clamp (7).

15 Re-install the components in the reverse order of their removal.
3.8 Locking mechanism for fore/aft isolator – removal and installation

Removal and installation

1 Remove the upper seat part from the seat suspension.

2 Remove the top cover (see Chapter 3.1).

3 Remove the bellows at the upper suspension part (see Chapter 3.3) and press it down.

4 WARNING Risk of crushing!

Move the seat suspension to the highest position and secure at the back between the swinging structure and the lower suspension part by means of suitable spacers.

5 Tilt the seat suspension to the right.

6 Mark the installation position and screw positioning diagram for fitting the tension springs (8, 9, 13).

Installation note:
Install the tension springs (8, 9, 13) according to the marking.

7 Turn the handle of the fore/aft isolator (2) forwards to release the tension spring.

8 Detach the tension spring (9) at the linkage rod (6) and at the upper suspension part (1).

9 Detach the tension spring (8) at the stop lever (7) and at the upper suspension part (1).

10 Detach the tension spring (13) at the stop lever (12) and at the upper suspension part (1).

11 Unscrew the rounded head screw (4) at the handle for the fore/aft isolator (2) and pull off the handle (2) at the L-bar (3).

Installation note:
Rounded head screw (4), 2.25 Nm.

12 Detach the linkage rod (6) at the stop lever (7) and the linkage rod (10) at the stop lever (12).

Installation note:
Place the linkage rod (10) for the right stop lever (12) behind the guiding plate at the upper suspension part (1).

13 Separate the linkage rods (6 and 10).

14 Mark the drill hole for the clamping sleeve (5) in the handle of the fore/aft isolator (2), knock out the clamping sleeve (5) at the handle (2) and remove the linkage rod (6).

Installation note:
Install the clamping sleeve (5) according to the marking.
3.8 Locking mechanism for fore/aft isolator – removal and installation

15 Unscrew two collar screws (11) and remove the stop levers (7 and 12).

**Installation note:**
Apply acid-free multi-purpose lubricant to the front surface and to the locking surfaces (F) of the stop levers (7 and 12).

16 Re-install the components in the reverse order of their removal.
3.9 Compressor – removal and installation

Removal and installation

**WARNING** Hydrostatic test!

The hydraulic test of the seat suspension should be performed upon installation of the compressor (1). To do this, apply 60 kg load to the suspension for 24 hours. The lowering within this time must not exceed 15 mm.

1. Remove the seat.
2. Remove the bellows at the lower suspension part (see Chapter 3.3), push it upwards and fix it in this position.

**WARNING** Risk of crushing!

Move the seat suspension to the highest position and secure it at the rear between the swinging structure and the lower suspension part by means of suitable spacers.

**WARNING** The pressure in the pneumatic system might cause injury!

The pneumatic system is to be vented before removing the compressor (1).

5. Mark and remove two right-angle plugs (8).

**Installation notes:**
- Reconnect the electrical connection according to the marking.
- When connecting the electrical connection, the cable output of the compressor cable (7) at the right-angle plug (8) must point downwards.

6. Mark the points where the compressor (1) is secured to the lower suspension part (5) with two cable ties (6) and remove the cable ties (6).

**Installation notes:**
- Run cable ties (6) through the corresponding cut-outs in the lower suspension part (5) in such a way that the locking head of the cable ties (6) points forwards (arrow).
- Loosely close the cable ties (6) in such a way that the compressor (1) can still be moved.
- Align the compressor (1) in such a way that a collision with the swinging structure (9) is avoided and then use pliers to tighten the locking head of the cable ties (6) to 360 ± 30 N.
3.9 Compressor – removal and installation

7 Pull off the hose nozzle (2) at the connection (10) of the compressor (1) and push it backwards at the compressed-air hose (3).

⚠️ ATTENTION Do not damage the connection (10) at the compressor (1)!

Do not use e.g. a screwdriver or similar tools to lift off the compressed-air hose (3) at the connection (10) of the compressor (1).

8 Cut off the compressed-air hose (3) with a sharp knife in a clean and straight way directly behind the connection (10) of the compressor (1).

Notes:
- The compressed-air hose (3) can be cut off only once.
- After cutting off, mark the compressed-air hose (3) in order not to cut it several times.

Installation note:
Push the compressed-air hose (3) completely onto the connection (10) of the compressor (1).

9 Pull off the nozzle (2) at the compressed-air hose (3).

10 Remove the compressor (1) in forward direction and remove the rest of the hose at the connection (10).

11 Remove the pad (6) from the lower suspension part (5).

Installation note:
Place the pad (6) between the lower suspension part (3) and the compressor (1) so that the compressor (1) cannot come into contact with the lower suspension part (5).

12 Re-install the components in the reverse order of their removal.
### 3.10 Level control – removal and installation

#### Removal and installation

**WARNING** Hydrostatic test!

The hydraulic test of the seat suspension should be performed upon installation of the level control (1). To do this, apply 60 kg load to the suspension for 24 hours. The lowering within this time must not exceed 15 mm.

1. Remove the upper seat part at the seat suspension and put it aside.
   **Notes:**
   - Cable ties at cable harness for upper seat part do not need to be removed and the electrical connections do not need to be disconnected.
   - Do not overstretch the cable harness and Bowden pull wire for the upper seat part when putting it aside.

2. Remove the top and rear covers (Chapter 3.1).

3. Remove the bellows at the upper suspension part (see Chapter 3.3) and press it down.

4. **WARNING** Risk of crushing!
   Move the seat suspension to the highest position and secure it at the rear between the swinging structure and the lower suspension part by means of suitable spacers.

5. **WARNING** The pressure in the pneumatic system might cause injury!
   The pneumatic system is to be vented before removing the level control (1).

6. **ATTENTION** Do not damage the connection (arrows) at the additional air supply (11)!
   Do not use a screwdriver or similar tools to lift off the compressed-air hose (4 and 5) at the connection (arrows) of the additional air supply (11).

7. Remove the compressed-air hose (4 and 5) from the additional air supply (11) (see Chapter 3.13).
3.10 Level control – removal and installation

7 Pull two air hoses (4 and 5) inwards to the level control (1).
   **Note:**
   The cable tie by means of which the two air hoses (4 and 5) are attached to the level control (1) does not have to be removed.
   **Installation notes:**
   • The air hoses (4 and 5) have to be guided out through the cable tie at the level control (1) to the additional air supply (11).
   • Do not bend the air hoses (4 and 5).

8 Disconnect the electrical connection between the socket of the cable harness for the seat suspension (8) and the plug of the level control (15).

9 Pull two plastic clips (10) out of the level control (1) on the left and right side.

10 Unscrew two hexagon nuts (12).
   **Installation note:**
   Replace the hexagon nuts (12), 25 Nm.

11 Pull out the plate (14) at the lower suspension part (3) while holding the webbing (7) in position and slowly guiding it upwards.

12 Pull out the plate (14) at the webbing (7).

13 Unscrew two hexagon nuts (6).
   **Installation note:**
   Replace the hexagon nuts (6), 25 Nm.

14 Pull out the level control (1) at the upper suspension part (2) and remove it from the seat suspension.

15 Re-install the components in the reverse order of their removal.
3.11 Compressed-air hose – removal and installation

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3.11.2 Compressed-air hose for air spring – removal and installation of additional air supply
3.11.1 Compressed-air hose at compressor – removal and installation of air spring

Removal and installation

⚠️ WARNING Hydrostatic test!

The hydraulic test of the seat suspension should be performed upon installation of the compressed-air hose (2). To do this, apply 60 kg load to the suspension for 24 hours. The lowering within this time must not exceed 15 mm.

1 Remove the seat.

2 Remove the bellows at the lower suspension part (see Chapter 3.3), push it upwards and fix it in this position.

3 ⚠️ WARNING Risk of crushing!

Move the seat suspension to the highest position and secure it at the rear between the swinging structure and the lower suspension part by means of suitable spacers.

4 ⚠️ WARNING The pressure in the pneumatic system may cause injury!

The pneumatic system is to be vented before removing the compressed-air hose (2).

5 Remove the compressed-air hose (2) from the compressor (1) (see Chapter 3.9).

6 Remove the compressed-air hose (2) from the air spring (3) (see Chapter 3.12).

7 Re-install the components in the reverse order of their removal.
3.11.2 Compressed-air hose for air spring – removal and installation of additional air supply

Removal and installation

⚠️ WARNING Hydrostatic test!

The hydraulic test of the seat suspension should be performed upon installation of the compressed-air hose (1). To do this, apply 60 kg load to the suspension for 24 hours. The lowering within this time must not exceed 15 mm.

1. Remove the seat.
2. Remove the bellows (Chapter 3.3).
3. ⚠️ WARNING Risk of crushing!

Move the seat suspension to the highest position and secure it at the rear between the swinging structure and the lower suspension part by means of suitable spacers.

4. ⚠️ WARNING The pressure in the pneumatic system might cause injury!

The pneumatic system is to be vented before removing the compressed-air hose (1).

5. Mark the points where the compressed-air hose (1) is attached by means of the corrugated pipe support (3) and the cable clamp (5).

6. Remove the compressed-air hose (1) from the additional air supply (4) (see Chapter 3.13).

7. Remove the compressed-air hose (1) from the air spring (2) (see Chapter 3.12).

8. Open the corrugated pipe support (3) and press the compressed-air hose (1) out of the cable clamp (5) and the cable connector.

9. Mark the installation position of the compressed-air hose (1) and remove the compressed-air hose from the seat suspension.

Installation note:
Install the compressed-air hose (1) according to the marking.

10. Re-install the components in the reverse order of their removal.
3.12 Air spring – removal and installation

Removal and installation

⚠️ WARNING Hydrostatic test!

The hydraulic test of the seat suspension should be performed upon installation of the air spring (1). To do this, apply 60 kg load to the suspension for 24 hours. The lowering within this time must not exceed 15 mm.

1. Remove the seat.
2. Remove the bellows at the upper suspension part (see Chapter 3.3) and press it down.

⚠️ WARNING Risk of crushing!

Move the seat suspension to the highest position and secure it at the rear between the swinging structure and the lower suspension part by means of suitable spacers.

⚠️ WARNING The pressure in the pneumatic system might cause injury!

The pneumatic system is to be vented before removing the air spring (1).

5. Pull the catch spring (7) out of the air spring (1).

6. Pull the quick couplings (3) of the compressed-air hoses (4, 5) out of the air spring (1).

Installation notes:
- First, plug the catch spring (7) into the air spring (1) and then plug the quick couplings (3) into the air spring (1) with an audible click.
- Connection at the front (6):
  - Compressed-air hose for compressor – air spring (5).
- Connection at the back (2):
  - Compressed-air hose for air spring – additional air supply (4).

7. Unscrew the countersunk screw (10) from the air spring (1).

Installation notes:
- Countersunk screw (10), 6 Nm.
- The internal thread collar (arrow) at the bottom of the air spring (1) must lie flush on the cone (arrow) of the lower suspension part (9).

8. Turn the air spring (1) by 90° until the bayonet catch fits through the longitudinal hole in the swinging structure (8).
3.12 Air spring – removal and installation

9 Press the air spring (1) down and pull out of the swinging structure (8).

10 Remove the air spring (1) from the seat suspension.

**Installation note:**
The step (11) at the bottom of the air spring (1) must click into place in the cut-out of the lower suspension part (9).

11 Re-install the components in the reverse order of their removal.
3.13 Additional air supply – removal and installation

Removal and installation

⚠️ WARNING Hydrostatic test!

The hydraulic test of the seat suspension should be performed upon installation of the additional air supply (1). To do this, apply 60 kg load to the suspension for 24 hours. The lowering within this time must not exceed 15 mm.

1. Remove the seat.
2. Remove the cover on the right side (see Chapter 3.2).
3. Remove the bellows at the upper suspension part (see Chapter 3.3) and press it down.

⚠️ WARNING Risk of crushing!

Move the seat suspension to the highest position and secure it at the rear between the swinging structure and the lower suspension part by means of suitable spacers.

5. ⚠️ WARNING The pressure in the pneumatic system might cause injury!

The pneumatic system is to be vented before removing the additional air supply (1).

6. Mark the compressed-air hoses (3, 4, 5) and cut them off with a sharp knife in a clean and straight way directly behind the connections (2) of the additional air supply (1).

**Notes:**
- The compressed-air hoses (3, 4, 5) can be cut off only once.
- After cutting, mark the compressed-air hoses (3, 4, 5) in order not to cut them several times.

**Installation notes:**
- Install the compressed-air hoses (3, 4, 5) according to the marking.
- Slightly heat the compressed-air hoses (3, 4, 5) and then push them completely onto the corresponding connections (2) of the additional air supply (1) by exerting pressure.
3.13 Additional air supply – removal and installation

7 Heat the residual pieces of the air hoses (3, 4, 5) at the connection of the additional air supply (1) by means of a soldering iron and remove them.

8 Bore out the rivet head and drive out the blind rivet (9).

9 Hang out the additional air supply (1) at the upper suspension part (6) and remove it.
   **Installation note:**
   The nose (arrow) at the top part of the support (7) must click into place in the longitudinal hole (arrow) of the upper suspension part (6).

10 Pull off the sealing ring (10) at the additional air supply (1).

11 **If the support (7) is defective:**
   Unscrew the rounded head screw (8) and remove the support (7) at the additional air supply (1).
   **Installation note:**
   Rounded head screw (8), 2.5 Nm.

12 Re-install the components in the reverse order of their removal.
3.14  Cable harness of vehicle connection – removal and installation

Removal and installation

1  Remove the rear cover (see Chapter 3.1).

2  Detach the bellows (2) on the rear right side of the upper suspension part (3) (see Chapter 3.3) and press it down.

3  Detach the cable harness for vehicle connection (1) at the clamp (6).

4  Disconnect the electrical connection between the plug of the cable harness for the seat suspension (4) and the socket of the cable harness for vehicle connection (5).

5  Remove the cable harness for vehicle connection (1).
   **Installation note:**
   The cable harness for vehicle connection (1) is guided out of the seat suspension in the middle (arrow) between the bellows (2) and the upper suspension part (3).

6  Re-install the components in the reverse order of their removal.
3.15 Cable harness for seat suspension – removal and installation

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### 3.15.1 Cable harness of seat suspension with compressed-air supply via internal compressor
– removal and installation

#### Removal and installation

1. Remove the upper seat part from the seat suspension.
2. Remove the top cover (see Chapter 3.1).
3. Remove the bellows at the upper suspension part (see Chapter 3.3) and press it down.

**WARNING** Risk of crushing!

Move the seat suspension to the highest position and secure it at the rear between the swinging structure and the lower suspension part by means of suitable spacers.

4. Disconnect the electrical connection (A) at the level control (see Chapter 3.10).
5. Disconnect two electrical connections (B) at the compressor (see Chapter 3.9).
6. Disconnect the electrical connection (D) at the cable harness for vehicle connection (see Chapter 3.14).
7. Mark the points where the cable harness (1) is attached to the seat suspension.
   - 4 Corrugated pipe support (5)
   - 1 Cable connector (4)
   - 3 Cable clamps (3)
8. Remove the corrugated pipe support (5) and the cable connector (4).
9. Press the cable harness (1) out of the cable clamps (3).
10. Bore out four rivet heads (9) and drive out the remaining blind rivets at the holding plates (8) and at the upper suspension part (10).
11. Lay down the plugs (2 and 7) with the angle plates (8).
12. Bore out the rivet head (12) and drive out the remaining blind rivet at the U-shaped profile (11) and at the upper suspension part (10).
13. Detach the U-shaped profile (11) at the upper suspension part (10) and lay it down with the cable harness.
14. Remove the cable harness from the seat suspension.
15. Re-install the components in the reverse order of their removal.
3.15.2 Cable harness of seat suspension with external compressed-air supply via the compressed-air system of the vehicle – removal and installation

Removal and installation

1. Remove the upper seat part at the seat suspension.

2. Remove the top and rear covers (see Chapter 3.1).

3. Remove the bellows at the upper suspension part (11) (see Chapter 3.3) and press it down.

4. **WARNING** Risk of crushing!
   Move the seat suspension to the highest position and secure at the back between the swinging structure and the lower suspension part by means of suitable spacers.

5. Disconnect the electrical connection (A) at the level control (see Chapter 3.10).

6. Disconnect the electrical connection (F) at the solenoid valve (see Chapter 3.20).

7. Disconnect the electrical connection (D) at the cable harness for vehicle connection (see Chapter 3.14).

8. Mark the points where the cable harness (1) is attached to the seat suspension.
   - 4 corrugated pipe supports (6)
   - 1 cable connector (9)
   - 3 cable clamps (3)
   - 3 cable ties with clamp (4)

9. Remove the corrugated pipe support (6), cable ties with clamp (4) and cable connector (9).

10. Press the cable harness (1) out of the cable clamps (3).

11. Bore out four rivet heads (10) and drive out the remaining blind rivets at the holding plates (7) and at the upper suspension part (11).

12. Lay the plugs (2 and 8) with the angle plates (7) down.

13. Bore out the rivet head (12) and drive out the remaining blind rivet at the U-profile (5) and at the upper suspension part (11).
3.15.2 Cable harness of seat suspension with external compressed-air supply via the compressed-air system of the vehicle – removal and installation

14 Detach the U-profile (5) at the upper suspension part (11) and lay it down with the cable harness.

15 Remove the cable harness from the seat suspension.

16 Re-install the components in the reverse order of their removal.
3.16 Upper suspension part – removal and installation

Removal and installation

Notes:
• The locking mechanism for the fore/aft isolator is preassembled on the upper suspension part (1).
• Moreover, a buffer is preassembled on the upper suspension part (1).
• Reuse or convert assemblies which are not included in the scope of delivery of the new upper suspension part (1).

1 Remove the upper seat part from the seat suspension.

2 Remove the top and rear covers (Chapter 3.1).

3 Remove the left and right covers (Chapter 3.2).

4 Remove the bellows at the upper suspension part (see Chapter 3.3) and press it down.

5 ! WARNING Risk of crushing!
   Move the seat suspension to the highest position and secure it at the rear between the swinging structure and the lower suspension part by means of suitable spacers.

6 Remove the additional air supply and put it aside (see Chapter 3.13).
   Note: The compressed-air hoses do not have to be removed from the additional air supply.

7 Remove the fore/aft isolator unit from the upper suspension part (1) (see Chapter 3.7).
   Note: The clamp remains at the swinging structure.

8 Remove the longitudinal horizontal shock absorber from the upper suspension part (1) (see Chapter 3.6).

9 Remove the level control from the upper suspension part (see Chapter 3.10) and lay it down.
   Notes:
   • The electrical connections at the level control do not need to be disconnected.
   • The cable harness of the seat suspension does not have to be removed from the level control.

10 Remove the cable harness for vehicle connection (Chapter 3.14).

11 Mark the points at the upper suspension part (1) where compressed-air hoses and cable harnesses are attached.
3.16 Upper suspension part – removal and installation

12 Remove compressed-air hoses and cable harnesses from the upper suspension part (1).

13 Remove two angle plates from the upper suspension part (1) (see Chapter 3.16).
   **Note:** Do not separate the plug and the angle plate.

14 Remove the U-shaped profile from the upper suspension part (see Chapter 3.16).
   **Note:** Do not release the plug at the U-shaped profile.

15 Push the upper suspension part (1) forwards (arrow A) until the cut-outs (arrows D) on the left and right sides at the guiding rails (2) are located at the same height as the front rollers (3).

16 Lift out the upper suspension part (1) over the front rollers (3).

17 Laterally turn the upper suspension part (1) by approx. 45° (arrow B) and then lift it off the rear rollers (5) in upward direction (arrow C).
   **Installation note:** Apply acid-free multi-purpose lubricant to the two guiding rails (2) at the side surfaces (F) of the rollers (3, 5).

18 If the rollers (3, 5) are defective: Pull off the two front rollers (3) and the two rear rollers (5) at the axles of the swinging structure (4).

19 Re-install the components in the reverse order of their removal.
3.17 Lower suspension part – removal and installation

Removal and installation

1 Remove the seat.

2 Remove the bellows from the lower suspension part (1) (see Chapter 3.3), push it upwards and fasten it to the upper suspension part.

WARNING Risk of crushing!

Move the seat suspension to the highest position and secure it at the rear between the swinging structure and the lower suspension part by means of suitable spacers.

4 Unscrew the countersunk screw from the air spring at the lower suspension part (see Chapter 3.12).

5 Remove the compressor from the lower suspension part (1) (see Chapter 3.9).

   Note:
   • Do not remove the compressed-air hose between the compressor and the air spring as well as the two right-angle plugs.
   • To be protected against shocks and impacts, fix the compressor to the air spring (e.g. by means of adhesive tape).

6 Remove the webbing of the level control at the lower suspension part (1) (see Chapter 3.10).

7 Unscrew two hexagon nuts (10).

   Installation note:
   Replace the hexagon nut (10), 25 Nm.

8 Remove two countersunk screws (11) from the fixed bearing (5) and drive out the lower suspension part (1).

   Installation note:
   The cam (arrow) at the head of the countersunk screw (11) must engage in the groove (arrow) of the lower suspension part (1).

9 WARNING Risk of crushing!

   Do not touch the suspension or reach into the swinging structure.

10 Push the swinging structure (6) backwards (arrow A) until the two fixed bearings (5) at the swinging structure (6) fit through the cut-out (arrow D) of the left and right guiding rail (2) of the lower suspension part (1).

11 Lift the swinging structure (6) with the two fixed bearings (5) out of the guiding rails (2) of the lower suspension part (1) at the front.
3.17 Lower suspension part – removal and installation

12 Unscrew two collar screws (9) and remove the end stops (3) with the buffer (4) from the guiding rails (2).

**Installation note:**
Collar screw (9), 6 Nm.

13 Laterally turn the swinging structure (6) with the attached upper suspension part (8) by approx. 45° (arrow B) to pull the two rollers (7) out of the guiding rails (2) and then lift it off in upward direction (arrow C).

14 Remove the lower suspension part (1).

**Installation note:**
Apply acid-free multi-purpose lubricant to the side surfaces (F) of the two guiding rails (2) in the area where rollers are moved.

15 *If the rollers (7) are defective:
Pull off the two back rollers (7) at the axles of the swinging structure (6).

16 Re-install the components in the reverse order of their removal.
## 3.18 Worn parts – replacement

### Removal and installation

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Perform preparatory works for the respective components (see Chapter for components).</td>
</tr>
<tr>
<td>2</td>
<td>Remove the hexagon nut (1) (see Chapters 3.10, 3.16 and 3.17).</td>
</tr>
<tr>
<td>3</td>
<td>Remove the buffer (2) at the front of the upper suspension part.</td>
</tr>
<tr>
<td>4</td>
<td>Remove the fixed bearing (3) (see Chapter 3.17).</td>
</tr>
<tr>
<td>5</td>
<td>Remove the roller (4) (see Chapters 3.16 and 3.17).</td>
</tr>
<tr>
<td>6</td>
<td>Remove the clearance spacers (5) (see Chapter 3.6).</td>
</tr>
<tr>
<td>7</td>
<td>Remove the blind rivet, 5 x 10 (6) (see Chapters 3.15 and 3.16).</td>
</tr>
<tr>
<td>8</td>
<td>Remove the blind rivet, 4.8 x 11.5 (7) (see Chapter 3.13).</td>
</tr>
<tr>
<td>9</td>
<td>Remove the buffer (8) (see Chapter 3.7).</td>
</tr>
<tr>
<td>10</td>
<td>Remove the socket (9) (see Chapter 3.7).</td>
</tr>
<tr>
<td>11</td>
<td>Remove the countersunk screw (10) (see Chapter 3.12).</td>
</tr>
<tr>
<td>12</td>
<td>Press the buffer (11) off the support at the swinging structure (28).</td>
</tr>
<tr>
<td>13</td>
<td>Remove the collar screw, inner race (12) (see Chapter 3.17).</td>
</tr>
<tr>
<td>14</td>
<td>Remove the end stop (13) (see Chapter 3.17).</td>
</tr>
<tr>
<td>15</td>
<td>Remove the buffer (14) (see Chapter 3.17).</td>
</tr>
<tr>
<td>16</td>
<td>Remove the countersunk screw (15) (see Chapter 3.17).</td>
</tr>
<tr>
<td>17</td>
<td>Remove the cable ties, 3.6 x 200 (16) (see Chapters 3.10 and 3.15).</td>
</tr>
<tr>
<td>18</td>
<td>Remove the cable ties, 7.6 x 387 (17) (see Chapter 3.9).</td>
</tr>
<tr>
<td>19</td>
<td>Remove the bellows pin (18) (see Chapters 3.1 and 3.3).</td>
</tr>
</tbody>
</table>

![Diagram of GRAMMER seat suspension MSG97EL](image-url)
3.18 Worn parts – replacement

20 Remove the cap screw, M8 x 12 (19) (see repair manual for the upper seat part).

21 Remove the cap screw, M8 x 16 (20) (see repair manual for the upper seat part).

22 If necessary, push clearance spacers (22) onto the axles of the swinging structure (28).

23 Remove the compression spring (23) (see Chapter 3.5).

24 Remove the push mount ties with wings (24) (see Chapter 3.15).

25 Remove the cap screw (25), socket (26) and plate (27) (see repair manual for the upper seat part).

26 Re-install the components in the reverse order of their removal.

**Note:**
If the swinging structure (28) is defective, the complete seat suspension has to be replaced.
3.19 External compressed-air connection – removal and installation (delivery option)

Removal and installation

ATTENTION Hydrostatic test!

The hydraulic test of the seat suspension should be performed upon installation of the external compressed-air connection. To do this, apply a 60 kg load to the seat suspension for 24 hours. The lowering within this time must not exceed 15 mm.

1. Remove the seat.
2. Remove the bellows from the lower suspension part (5) (see Chapter 3.3), push it upwards and fasten it to the upper suspension part.
3. Remove the compressed-air hose (1) from the solenoid valve (6) (see Chapter 3.20).
4. WARNING Risk of crushing!

Move the seat suspension to the highest position and secure at the back between the swinging structure and the lower suspension part by means of suitable spacers.

5. WARNING The pressure in the pneumatic system may cause injury!

Vent the pneumatic system before removing the external compressed-air connection.

6. Push the retaining ring (4) of the quick coupling and pull out the compressed-air hose (1) from the quick coupling.

Installation note:
Push the compressed-air hose (1) completely into the quick coupling by exerting pressure.

7. Unscrew the flange nut (3) and remove the angle connection (2) from the lower suspension part (5).

Installation note:
Flange nut (3), 3.5 ± 0.5 Nm.

8. Mark the point where the compressed-air hose (1) is fastened to the swinging structure using cable ties with clamp (7), remove the cable ties with clamp (7) and extract the compressed-air hose (1) from the seat suspension.
3.19 External compressed-air connection – removal and installation (delivery option)

9 Check the compressed-air hose (1) for damage (scoring).

10 Compressed-air hose (1) with scoring:
   Cut off the compressed-air hose with a sharp knife in a clean and straight way directly behind the scoring.

   **Notes:**
   - Make sure that following repeated cutting the compressed-air hose is not bent or damaged by moving parts after being laid.
   - If this is the case, the compressed-air hose must be replaced.

11 Re-install the components in the reverse order of their removal.
### 3.20 Solenoid valve of external compressed-air supply – removal and installation (delivery option)

**Removal and installation**

**ATTENTION** Hydrostatic test!

The hydraulic test of the seat suspension should be performed upon installation of the solenoid valve (1). To do this, apply a 60 kg load to the seat suspension for 24 hours. The lowering within this time must not exceed 15 mm.

1. Remove the seat.
2. Remove the bellows from the lower suspension part (2) (see Chapter 3.3), push it upwards and fasten it to the upper suspension part.

**WARNING** Risk of crushing!

Move the seat suspension to the highest position and secure at the back between the swinging structure and the lower suspension part by means of suitable spacers.

**WARNING** The pressure in the pneumatic system may cause injury!

Vent the pneumatic system before removing the solenoid valve.

3. Drill out the blind rivet (3) and remove the solenoid valve (1) from the lower suspension part (2).
4. Re-install the components in the reverse order of their removal.

5. Unscrew the rounded head screw (10).  
   **Installation note:**  
   Rounded head screw (10), 0.4 Nm.

6. Disconnect the electrical connection between the socket of the solenoid valve cable (9) and the plug at the solenoid valve (1) and remove the seal (8).

7. Push the retaining ring (5) of the quick coupling and pull out the compressed-air hose (4) from the quick coupling.  
   **Installation note:**  
   Push the compressed-air hose (4) completely into the quick coupling by exerting pressure.

8. Push the retaining ring (6) of the quick coupling and pull out the compressed-air hose (7) from the quick coupling.  
   **Installation note:**  
   Push the compressed-air hose (7) completely into the quick coupling by exerting pressure.

9. Drill out the blind rivet (3) and remove the solenoid valve (1) from the lower suspension part (2).