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Preliminary remarks

Notes on these instructions

This repair manual includes information and instructions on how to perform repair work on the seat spring system MSG 85 of GRAMMER seats and the most important delivery options.

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

At the beginning of each description for repair you will find an overview diagram. All parts included in these overview diagrams within one chapter are consecutively numbered starting with “1”. Each part is referred to by the same item number throughout the document.

With the help of these overview diagrams an experienced technician will gain a quick overview.

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

The description of the work steps refers to the dismounted seat. The upper seat part is always dismounted.

Note: If the technician has the relevant knowledge, the upper seat part can stay mounted.

Depending on the individual installation position, some work may also be performed while the seat remains installed. For this reason, check the environment of the installed seat for this possibility before starting work. The safety notes of the specific vehicle manufacturers and those stated in chapter 1 of this repair manual must be strictly observed.
Preliminary remarks

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 equipment may deviate from the descriptions and illustrations in this manual.

If not stated otherwise, the directional indications “front, back” and “right, left” refer to the installed seat regarded in forward travel direction of the vehicle.

The document layout is suitable for later use of this repair manual via CD-ROM / INTERNET / INTRANET. For this reason a navigation line has been added beneath the title. This navigation line includes some chapter titles and it allows the user to jump directly to these chapters after the corresponding hyperlinks have been set.

Basic information about the seat

The seat 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 multiple-purpose lubricant.

Cables must be fixed only to the defined spots by hand (loose) with cable ties. Make sure that in the case of seat adjustment, the cables cannot be squeezed or distorted when the seat is moved.
Preliminary remarks

After removal, all parts must be cleaned and checked for their suitability for re-use. Defective parts and worn parts must be replaced.

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

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 or damage to the seat resulting from improperly performed work, all information and instructions, in particular the safety notes 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 a seat 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 seats 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.
1 Description

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**Note:**
Please refer to the applicable seat operation manual for further details.
1.1 Safety notes

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 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.

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.

4 Before any repair works
   • with a seat switch installed, separate the connection between the electric supply network and the seat switch and set the lowest driver’s weight.

5 When using oil, grease and other chemical substances the relevant safety regulations for the handling and use of these materials must be observed.
1.2 Rating Plate

The rating plate is fixed at the back of the seat frame.

The rating plate shows the following information (example):

(A) **BENENNUNG (DENOMINATION)**  
   = MSG85/731

(B) **SACHNUMMER (INVENTORY - No.)**  
   = 1 017 193

(C) **Year / KW / Assembly**  
   = 0323 041
   - Model  
   = 03 (2003)
   - Built in week  
   = 23 (June)
   - Assembly  
   = 041

(D) **AUFTRAGS NR. (ORDER No.)**  
   = DE 42844300080

**Note:**
The inventory number must always be stated for orders.
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2.1.1 Bellows attached to the upper part of the spring system – removal, installation

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(2) Bellows
(3) Bellows pins
(4) Wire insert
(5) Lower part of the spring system
(6) Toggle for weight adjustment
2.1.1 Bellows attached to the upper part of the spring system –
removal, installation

Removal, installation

1. Remove nine bellows pins (3) in the upper part of the spring system (1) in the front and back. 
   **Installation note:** Stick a mandrel (size 3) through the opening in the bellows (2) into the bellows pin to the limit stop. For stretching the bellows pin (3), pull the bellow (2) slightly towards the mandrel while sticking the bellow pin (3) into the hole in the upper part of the spring system (1).

2. Unhook eight bellows pins (3) from the sides of the upper part of the spring system (1).
3 Release twelve bellows pins (3) from the lower part of the spring system (5).

**Note:**
Tilt the lower part of the spring system (5) to the side for easier release of the bellows pins (3).

4 Pull the bellows (2) over the weight adjustment toggle (6) and lay them down on the lower part of the spring system (5).

**Installation note:**
If there is a knob or a crank for weight adjustment (6), tear open the predetermined breaking point in the bellows (2).

5 Pull the back part of the bellows (2) down over the lower part of the spring system (5).
2.1.1 Bellows attached to the upper part of the spring system – removal, installation

6 Lift front part of the bellows (2) over the lower part of the spring system (5) and remove the bellows (2) downwards.

7 Remove wire insert (4) from the bellows (2).

Installation notes:
- The welding joint (arrow) of the wire insert (4) must be inside the bellows (2).
- Install wire insert (4) in the middle fold of the bellows (2).

8 Re-install the components in the reverse order of their removal.
2.1.2 Bellows screwed to the upper part of the spring system – removal, installation

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(1) Upper part of the spring system
(2) Bellows
(3) Bellows pin
(4) Replace the micro-encapsulated cap screw ......................... 25 Nm
(5) Washer
(6) Strip
(7) Hexagon nut
(8) Lower part of the spring system
(9) Toggle for weight adjustment
(10) Wire insert

1 Remove upper seat part (see repair manual for upper seat part).
2.1.2 Bellows screwed to the upper part of the spring system – removal, installation

Removal, installation

2 Remove two front hexagon nuts (7) and remove the micro-encapsulated cap screws (4).

Installation note:
Replace the micro-encapsulated cap screws (4) by new ones, 25 Nm.

3 Remove two back hexagon nuts (7) and remove micro-encapsulated cap screws (4) with washers (5) and strips (6).

Installation notes:
• Replace the micro-encapsulated cap screws (4) by new ones, 25 Nm.
• Collar (arrow) of the holes in the strip (6) must show upwards.
4 Remove seven bellows pins (3) in the upper part of the spring system (1) in the front and back.

5 Remove eleven bellows pins (3) from the lower part of the spring (8).

**Note:**
Tilt the lower part of the spring system (8) to the side for easier removal of the bellows pins (3).

6 Pull the bellows (2) over the weight adjustment toggle (9) and lay them down on the lower part of the spring system (8).

**Installation note:**
If there is a weight adjustment knob or crank (9), tear open the pre-determined breaking point in the bellows (2).

7 Remove bellows (2) over the spring system.
2.1.2 Bellows screwed to the upper part of the spring system – removal, installation

REMOVAL/INSTALLATION

8 Remove wire insert (10) from the bellows (2).

**Installation notes:**
- The welding joint (arrow) of the wire insert (10) must be in the bellows (2) at the front.
- Install wire insert (10) in the second fold of the bellows (2).

9 Re-install the components in the reverse order of their removal.
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(1) Upper part of the spring system
(2) Bellows
(3) Swinging structure
(4) Vertical shock absorber
(5) Circlip
(6) Stud
(7) Circlip
(8) Stud
(9) Washer compensating for clearance
(10) Lower part of the spring system

1. Remove upper part of the seat (see repair manual upper seat part).

2. Unhook the bellows (2) from the upper part of the spring system (1) and lay them down.
Removal, installation

3 Move the seat to the highest position and secure it.

⚠️ **WARNING** Risk of crushing!
Secure the swinging structure on the front plastic rollers in the lower part of the spring system with suitable spacers.

4 Pull off the circlip (5) from the swinging structure (3) and remove the stud (6).

5 Pull off the circlip (7) on the lower part of the spring system (10) and remove the stud (8) and the washers (9) – if any.
2.2.1 Vertical shock absorber (oval tube shock absorber) – removal, installation

6 Remove vertical shock absorber (4). **Installation note:** Install the vertical shock absorber (4) with the lettering at the top. The rounded side of the fastening eye must point downwards (see arrow).

7 Re-install the components in the reverse order of their removal.
2.2.2 Vertical shock absorber (separating piston shock absorber) – removal, installation

REMOVAL/INSTALLATION

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(1) Upper part of the spring system
(2) Bellows
(3) Vertical shock absorber
(4) Circlip
(5) Stud
(6) Circlip
(7) Stud
(8) Lower part of the spring system

1 Remove upper part of the seat (see repair manual upper seat part).

2 Loosen the bellows (2) on the upper part of the spring system (1) and lay them down.
Removal, installation

3 Move the seat to the highest position and secure it.

⚠️ **WARNING** Risk of crushing!
Secure the swinging structure with suitable spacers on the front plastic rollers in the lower part of the spring system.

4 Pull off the circlip (4) from the upper part of the spring system (1) and remove the stud (7).

5 Pull off the circlip (6) from the upper part of the spring system (8) and remove the stud (6).

6 Remove vertical shock absorber (3).

7 Re-install the components in the reverse order of their removal.
## 2.3 Weight display – removal, installation of the entire assembly

### REMOVAL/INSTALLATION

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<td>(10)</td>
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2.3 Weight display – removal, installation of the entire assembly

Removal, installation

1. Remove the bellows (9) from the lower part of the spring system (see chapter 2.1.1 or 2.1.2), push them upwards and fix them to the upper part of the spring system (10).

2. Unhook tension spring (4) from the weight indicator ribbon (5).

3. Unhook the tension spring (4) from the swinging system (1).

**Installation note:**
Attach the tension spring (4) between the first and the third spiral.
4. Remove the locking plug (3) from the spring bracket (2) and pull it out of the weight indicator ribbon (5).

**Installation note:**
For the installation of the locking plug (3), knock on the spring bracket (2) diagonally from above.

5. Remove display window (7) from the lower part of the spring system (8), remove roller (6) and weight indicator ribbon (5).

**Installation note:**
Grease running surfaces (F) for the locking plug (3) and opening (F) for the display window (7) in the lower part of the spring system with an acid-free multi-purpose lubricant.

6. Re-install the components in the reverse order of their removal.
2.4 Weight adjustment – removal, installation of the entire assembly

(1) Spring bracket
(2) Flange nut
(3) Axial ball bearing
(4) Plastic washer
(5) Right spring
(6) Left spring
(7) Fork
(8) Lower part of the spring system
(9) Rubber plate .... replace if necessary
(10) U-profile
      ............ grease and replace if necessary
(11) Blind rivet
(12) Plastic bushing ................. grease
(13) Dowel pin
(14) Adjusting spindle ............... grease
(15) Toggle grooved pin
(16) Toggle ................. replace if necessary
2.4 Weight adjustment – removal, installation of the entire assembly

REMOVAL
1. Remove the lower part of the swinging structure (8) (see chapter 2.15).

2. Remove the locking plug from the spring bracket (1) (see chapter 2.3).

INSTALLATION

(17) Adjusting spindle with crank
(18) Adjusting spindle with knob
2.4 Weight adjustment – removal, installation of the entire assembly

Removal

3 Knock dowel pin (13) out of the adjusting spindle (14).

4 Remove fork (7) and dowel pin (13).

5 Screw out the adjusting spindle (14) with the toggle (16) and remove it.

6 Replace toggle (16):
   Knock out toggle grooved pin (15) from the toggle (16), and lift off toggle (16) from the adjusting spindle (14).

   **Delivery option:**
   Adjusting spindle with crank (17) and adjusting spindle with a knob (18) can only be replaced in total (not dismountable).
2.4 Weight adjustment – removal, installation of the entire assembly

REMOVAL

7 Relieve right spring (5) and left spring (6) by lifting the spring bracket (1), remove spring bracket (1), flange nut (2), axial ball bearing (3) and plastic washer (4).

8 Take off and remove the right spring (5) and the left spring (6).

9 Remove plastic bushing (12).

10 Replace U-profile (10):
   Bore out two rivet heads and drive out blind rivets (11). Remove U-profile (10).

11 Replace rubber plate (9):
   Remove rubber plate (9) from the lower part of the spring system (8).

INSTALLATION
2.4 Weight adjustment – removal, installation of the entire assembly

Installation

1. Fasten U-profile (10) with two blind rivets (11).
   Note:
   Apply an acid-free multi-purpose lubricant to the U-profile (10) on the lateral contact area and on the rolling surface of the fork (7).

2. Glue on the rubber plate (9).

3. Install plastic bushing (12).
   Note:
   Apply an acid-free multi-purpose lubricant to the complete inner surface of the plastic bushing (12).

4. Assemble toggle (16) and adjusting spindle (14) and drive in toggle grooved pin (15).
   Note:
   Drive in the toggle grooved pin (15) until the front surface is flush with the outer surface of the toggle (16).
5 Push adjusting spindle (14) through the plastic bushing (12).

6 Push spring bracket (1) and flange nut (2) over the adjusting spindle (14) and screw the adjusting spindle (14) into the flange nut (2).

**Notes:**
- Apply an acid-free multi-purpose lubricant to the complete thread surface of the adjusting spindle (14).
- Screw the adjusting spindle (14) home until its thread is flush with the flange nut (2).

7 Push axial ball bearing (3) and plastic washer (4) over the adjusting spindle (14).
8 Push the adjusting spindle (14) through the spindle guide in the lower part of the spring system (8), and push the fork (7) onto the adjusting spindle (14).

**Note:**
The step (arrow) in the bearing of the fork (7) must point downwards.

9 Hang in the left spring (6) into the spring bracket (1) and the locking plug of the lower part of the spring system (8).
2.4 Weight adjustment – removal, installation of the entire assembly

10 Hang in the right spring (5) into the spring bracket (1) and the locking pin of the lower part of the spring system (8).

Notes:
- In case of short springs, the right spring (5) must be attached over the spring bracket (1) and lifted over the locking pin in the lower part of the spring system (8) taking a screwdriver as a lever.
- The leg of the right spring (5) must point inwards when it is installed.

11 Assemble the locking plug to the spring bracket (1) (see chapter 2.3).
2.4 Weight adjustment – removal, installation of the entire assembly

12 Screw the adjusting spindle (14) into the fork (7) and push in the dowel pin (13).

**Notes:**
- Screw in the adjusting spindle (14) with an initial tension of 60 to 70 kg.
- Drive in the dowel pin (13) in dead center of the adjusting spindle (14).

13 Install the lower part of the spring system (8) (chap. 2.15).
2.5 Fore/aft isolator unit – removal, installation (delivery option)

REMOVAL/INSTALLATION

- (1) Upper part of the spring system
- (2) Hook
- (3) Axial locking rings
- (4) Clamp
- (5) Fore/aft isolator unit
- (6) Bushing
- (7) Buffer
Removal, installation

1. Move the seat to the highest position and secure it.

⚠️ **WARNING** Risk of crushing!
Secure the swinging structure on the front plastic rollers in the lower part of the spring system with suitable spacers.

2. Turn the spring system by 180 degrees and place it onto the upper part (1).

3. Take off the hook (2) on the left and right side and remove it.

4. Lever clamp (4) from the tube of the swinging system.

5. Remove the two locking rings (3).

   **Note:**
   Renew locking rings (3).
6 Remove fore/aft isolator unit (5) with bushings (6) and buffer (7).

**Installation note:**
Hang in fore/aft isolator unit (5) at one side of the bushing (without buffer). Tension spring and hang in a second buffer with bushing.

7 Re-install the components in the reverse order of their removal.
2.6 Longitudinal horizontal shock absorber – removal, installation (delivery option)

REMOVAL/INSTALLATION

(1) Longitudinal horizontal shock absorber
(2) Swinging structure
(3) Circlip
(4) Upper part of the spring system
Removal, installation

1 Remove longitudinal horizontal shock absorber (1) from the swinging structure (2).

2 Detach the circlip (3) and remove the longitudinal horizontal shock absorber (1) from the upper part of the spring system (4).

3 Re-install the components in the reverse order of their removal.
2.7 Locking element of the longitudinal horizontal shock absorber, right, left – removal, installation (delivery option)

REMOVAL/INSTALLATION

1 Remove upper part of the spring system (chap. 2.12).
2.7 Locking element of the longitudinal horizontal shock absorber, right, left – removal, installation (delivery option)

Removal, installation

2 Remove metal rollers (2) from the swinging structure (3).

3 Remove the complete left locking element (4) and the complete right locking element (5) from the swinging structure (3).

4 Dismount the complete left locking element (4):
   4.1 Take off the guide (8).

   **Installation note:**
   The guide (8) must lock properly into the locking plate (6).

   4.2 Take off the bearing ring (10).

   **Installation note:**
   The bearing ring (10) must lock properly into the locking plate (6).
5 Dismount the complete right locking element (5):

5.1 Take off the guide (9).
**Installation note:**
The guide (9) must lock properly into the locking plate (7).

5.2 Take off the bearing ring (10).
**Installation note:**
The bearing ring (10) must lock properly into the locking plate (7).

6 Re-install the components in the reverse order of their removal.
2.8 Linking rods and levers for the horizontal spring unit –
removal, installation (delivery option)

REMOVAL/INSTALLATION

(1) Bellows
(2) Torx screw
(3) Lever
(4) Dowel pin
(5) Linking rod
(6) Tension spring
(7) Bracket
(8) Upper part of the spring system

1 Remove the upper part of the spring system (chap. 2.12).
2.8 Linking rods and levers for the horizontal spring unit – removal, installation (delivery option)

Removal, installation

2 Screw out Torx screw (2). Installation note: When you have tightened the torx screw, it must be loosened a little to allow turning.

3 Take off the lever (3) from the upper part of the spring system (8).

4 Take off the tension spring (6) and the linking rod (5) of the longitudinal horizontal spring unit from the bracket (7) and remove it with the lever (3).
5 Knock out the dowel pin (4) and take the lever (3) off the linking rod (5).

**Installation note:**
Drive in the dowel pin (4) only so far (see arrow) that front surface is flush with the outer surface of the handle.

6 Re-install the components in the reverse order of their removal.
2.9 Checking the fore/aft isolator

(1) Upper part of the spring system
(2) Bellows
(3) Lever for fore/aft isolator
(4) Left locking element
(5) Hook
(6) Fore/aft isolator unit
(7) Right locking element

1 Remove upper part of the seat (see repair manual upper seat part).
2 Take off bellows (2) from the upper part of the spring system (1) and put them down.
2.9 Checking the fore/aft isolator

Checking

3 Operate the lever for fore/aft isolator (3) several times and check the following:
   - Check lever (3) for easy running
   - Locking in both direction (front (B): “ON”, back (A) “OFF”)

4 Lock the lever for the fore/aft isolator (3) in front (“activate” fore/aft isolator):
   - Locking elements on the left side (4) and the right side (7) are unlocked.
   - The upper part of the spring system (1) can move lengthwise.
2.9 Checking the fore/aft isolator

5 Lock the lever for the fore/aft isolator (3) at the back (“deactivate” fore/aft isolator) and move the upper part of the spring system (1) lengthwise.

? The hook (5) is hung in correctly between the fore/aft isolator unit (6) and the left (4) and right (7) locking elements and presses them into the bracing (see arrows).

? Any lengthwise movement of the upper part of the spring system is prevented.
2.10 Seat fore/aft adjustment, complete – removal, installation (delivery option)

REMOVAL/INSTALLATION

(1) Upper part of the spring system with screwed bellow

(2) Upper part of the spring system with bellows hung in (and fore/aft isolator, if applicable)

Note:
The assembly of the seat fore/aft adjustment varies depending on the upper part of the springs system and the upper part of the seat installed (see repair manual upper seat part).
2.11 Webbing – removal, installation

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2.11.1 Webbing for spring system without height adjustment (static belt) – removal, installation (delivery option)
2.11.2 Webbing for spring system with height adjustment (secondary belt) – removal, installation (delivery option)
2.11.1 Webbing for spring system without height adjustment (static belt) – removal, installation (delivery option)

REMOVAL/INSTALLATION

(1) Webbing (static belt)
(2) Swinging structure
(3) Tube (swinging structure)
(4) Leg (swinging structure)

1 Dismount upper part of the seat (see repair manual upper seat part).

2 Dismount upper part of the swing system with swinging structure bearing bolts (chap. 2.12.3).

3 Dismount swinging system (2) without height adjustment (chap. 2.13.1).
2.11.1 Webbing for spring system without height adjustment (static belt) – removal, installation (delivery option)

Removal, installation

4 Pull the big loops of the two belts (1) over the tube (3) of the swinging structure (2) to the left and right and remove them over the legs (4) of the swinging structure (2) to the front.

5 Re-install the components in the reverse order of their removal.
2.11.2 Webbing for spring system with height adjustment (secondary belt) – removal, installation (delivery option)

REMOVAL/INSTALLATION

1. Remove upper part of the seat (see repair manual upper seat part).

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(1) Upper part of the spring system
(2) Blind rivet
(3) Strip
(4) Webbing (secondary belt)
(5) Strip
(6) Blind rivet
(7) Lower part of the spring system
Removal, installation

2 Bore out rivet head and drive out blind rivet (2). Pull strip (3) out of the loop of the webbing (4).

Installation note:
The strip (3) can either be riveted to the left or right mounting bores in the upper part of the spring system (1).

3 Pull down the webbing (4) through the longitudinal hole in the upper part of the spring system (1).

4 Turn the spring system by 180 degrees and place it onto the upper part (1).
5 Bore out rivet head and drive out blind rivet (6). Pull strip (5) out of the loop of the webbing (4).

**Installation note:**
The strip (5) can either be riveted to the left or right mounting bores in the lower part of the spring system (7).

6 Pull the webbing (4) through the longitudinal hole in the lower part of the spring system (7).

**Installation note:**
When you pull the webbing (4) through the longitudinal hole in the lower part of the spring system (7), it must point inwards.

7 Re-install the components in the reverse order of their removal.
2.12 Upper part of the spring system – removal, installation

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2.12.1 Upper part of the spring system with roller bearing and fore/aft isolator – removal, installation (delivery option)
2.12.2 Upper part of the spring system with fixed bearing of the swinging structure – removal, installation (delivery option)
2.12.3 Upper part of the spring system with swinging structure bearing studs – removal, installation (delivery option)
2.12.1 Upper part of the spring system with roller bearing and fore/aft isolator – removal, installation (delivery option)

REMOVAL/INSTALLATION

(1) Upper part of the spring system
(2) Hexagon nut
(3) Buffer
(4) Micro-encapsulated pan-head screw ................................replace, 25 Nm
(5) Steel roller
(6) Plastic roller
(7) Swinging structure
(8) Guiding rail ......................... grease

1 Remove upper part of the seat (see repair manual upper seat part).

2 Remove the bellows pins (1) and lay down the bellows (see chapter 2.1.1).
2.12.1 Upper part of the spring system with roller bearing and fore/aft isolator – removal, installation (delivery option)

3 Upper part of the spring system with separating piston shock absorber:
Remove the vertical shock absorber from the upper part of the spring system (1) (see chapter 2.2.2).

Removal, installation

4 Move the spring system to the highest position and secure it.

**WARNING** Risk of crushing!
Secure the swinging structure on the front plastic rollers in the lower part of the spring system with suitable spacers.

5 Unscrew the hexagon nut (2) and take off the buffer (3) with the micro-encapsulated pan-head screw (4).
**Installation note:**
Replace the micro-encapsulated pan-head screw (4), 25 Nm.
6 Remove hooks and clamps of the fore/aft isolator unit (see chapter 2.5).

7 Lever out longitudinal horizontal shock absorber from the swinging system (7) downwards (see chapter 2.6).

8 Unhook locking mechanism of the fore/aft isolator at the right and left side (see chapter 2.7).

9 Push the upper part of the spring system (1) backwards and lift it off the swinging structure (7) by turning it sideways.

**Installation note:**
Apply an acid-free multi-purpose lubricant to the four guiding rails (8) of the upper spring part surface on the bearing surface (F) of the two steel rollers (5) and plastic rollers (6).

10 Re-install the components in the reverse order of their removal.
2.12.2 Upper part of the spring system with fixed bearing of the swinging structure – removal, installation (delivery option)

REMOVAL/INSTALLATION

(1) Groove screw ............................ 11 Nm
(2) Upper part of the spring system
(3) Fixed bearing of the swinging structure
(4) Bushing ................ replace if necessary
(5) Swinging structure
(6) Plastic roller
(7) Guiding rail .............................. grease

1. Remove upper part of the seat (see repair manual upper seat part).

2. Remove the bellows pins (2) and lay down the bellows (see chapter 2.1.1).
3 Upper part of the spring system with separating piston shock absorber:
Remove vertical shock absorber from the upper part of the spring system (2) (see chapter 2.2.2).

Removal, installation
4 Move the spring system to the highest position and secure it.

WARNING Risk of crushing!
Secure the swinging structure on the front plastic rollers in the lower part of the spring system with suitable spacers.

5 Remove the four groove screws (1).
Installation note:
Groove screws (1), 11 Nm.
6 Push the upper part of the spring system (2) backwards and lift it off the swinging structure (5) by turning it sideways.

Installation note:
Apply an acid-free multi-purpose lubricant to the two guiding rails (7) of the upper spring part (2) on the bearing surface at the side (F) of the plastic rollers (6).

7 Remove the two fixed bearings (3) from the swinging structure (5).

8 Replace the bushings (4):
Remove the two bushings (4) from the fixed bearings (3).

9 Re-install the components in the reverse order of their removal.
2.12.3 Upper part of the spring system with swinging structure bearing studs – removal, installation (delivery option)

REMOVAL/INSTALLATION

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(1) Upper part of the spring system
(2) Swinging structure
(3) Bushing ............. replace if necessary
(4) Stud ......................... grease
(5) Plastic roller
(6) Guiding rail ................. grease

1 Remove upper part of the seat (see repair manual upper seat part).

2 Remove the bellows pins (1) and lay down the bellows (see chapter 2.1).
2.12.3 Upper part of the spring system with swinging structure bearing studs – removal, installation (delivery option)

Removal, installation

3 Upper part of the spring system with separating piston shock absorber:
   Remove the vertical shock absorber from the upper part of the spring system (2) (see chapter 2.2.2).

4 Unlock stud (4) and remove it to the right from the swinging system (2) and the upper part of the spring system (1).
   **Installation note:**
   Apply an acid-free multi-purpose lubricant to the complete circumference (F) of the stud (4) in the width of a brush.

5 Replace the bushings (3):
   Remove two bushings (3) from the swinging structure (2).
2.12.3 Upper part of the spring system with swinging structure bearing studs – removal, installation (delivery option)

REMOVAL/INSTALLATION

6 Push the upper part of the spring system (1) backwards and lift it off the swinging structure (2) by turning it sideways.

**Installation note:**
- Apply an acid-free multi-purpose lubricant to the two guiding rails (6) of the upper spring part (1) on the bearing surface at the side (F) of the plastic rollers (5).

7 Re-install the components in the reverse order of their removal.
2.13 Swinging structure – removal, installation

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2.13.1 Swinging structure with bearing studs without height adjustment (static belt) – removal, installation (delivery option)
2.13.2 Swinging structure with roller bearing/fore-aft isolator with height adjustment (secondary belt) – removal, installation (delivery option)
2.13.3 Swinging structure with fixed bearing with height adjustment (secondary belt) – removal, installation (delivery option)
2.13.4 Height adjustment of the swinging structure – removal, installation
2.13.5 Checking the height adjustment of the swinging structure
2.13.1 Swinging structure with bearing studs without height adjustment (static belt) – removal, installation (delivery option)

REMOVAL/INSTALLATION

TABLE OF CONTENTS

(1) Swinging structure bearing stud in the upper part of the spring system
(2) Swinging structure bearing stud in the lower part of the spring system
(3) Plastic roller, top
(4) Plastic roller, bottom
(5) Swinging structure
(6) Webbing (static belt)
(7) Bushing............ replace if necessary
2.13.1 Swinging structure with bearing studs without height adjustment (static belt) – removal, installation (delivery option)

REMOVAL/INSTALLATION

1. Remove upper part of the seat (see repair manual upper seat part).

2. Remove the bellows (see chap. 2.1).

3. Remove the upper part of the spring system with the swinging structure bearing stud (1) (see chapter 2.12.3).

4. Unhook tension spring from the weight indicator ribbon (see chapter 2.3).

5. Remove the upper part of the spring system with the swinging structure bearing stud (2) (see chapter 2.15).

Note:
The vertical shock absorber can stay mounted to upper part of the spring system.
2.13.1 Swinging structure with bearing studs without height adjustment (static belt) – removal, installation (delivery option)

Removal, installation

6 Take off the upper plastic rollers (3) from the inner sides of the swinging structure and the lower plastic rollers (4) from the outer side of the swinging structure (5).

**Installation note:**
Apply an acid-free multi-purpose lubricant to the bearing surfaces (F) of the upper and lower plastic rollers.

7 Remove static belt (see chapter 2.11.1).

8 Re-install the components in the reverse order of their removal.
2.13.2 Swinging structure with roller bearing/fore-aft isolator with height adjustment (secondary belt) – removal, installation (delivery option)

REMOVAL/INSTALLATION

(1) Swinging structure bearing stud
(2) Metal roller
(3) Fore/aft isolator - right locking mechanism
(4) Fore/aft isolator - left locking mechanism
(5) Plastic roller, bottom
(6) Plastic roller, top
(7) Washer compensation for clearance
(8) Spacer collet
(9) Washer compensating for clearance
(10) Bushing..............replace if necessary
(11) Swinging structure
2.13.2 Swinging structure with roller bearing/fore-aft isolator with height adjustment (secondary belt) – removal, installation (delivery option)

REMOVAL/INSTALLATION

1. Remove the upper part of the seat (see repair manual upper seat part).

2. Remove the bellows (chap. 2.1).

3. Remove the upper part of the spring system with the roller bearings (see chapter 2.12.1).
   **Note:**
   The upper seat part can stay mounted to the upper part of the spring system. Then, the bellows need not be removed completely, but only have to be pushed upwards and secured.

4. Disassemble vertical shock absorber from the swinging structure (see chapter 2.2).
   **Note:**
   The vertical shock absorber can stay mounted to lower part of the spring system.
5 Unhook tension spring from the weight indicator ribbon (see chapter 2.3).

6 **Seat with secondary belt:**
   Remove secondary belt (chap. 2.12.2).

7 Remove the swinging structure bearing stud (1) from the lower part and of the spring system, and remove the lower part by turning the swinging structure sideways (see chapter 2.15).
2.13.2 Swinging structure with roller bearing/fore-aft isolator with height adjustment (secondary belt) – removal, installation (delivery option)

Removal, Installation

8 Remove the two plastic rollers (5) at the lower part of the swinging structure (11).

9 Remove two plastic rollers (6), two spacers (8) and a compensating washer (7), if necessary, from the front top axle of the swinging structure (11).

**Installation note:**
Check lateral clearance of the rollers (chap. 2.14) and install compensating washers (7) if necessary.

10 Remove the two bushings (10) from the lower part of the swinging structure (11).
11 Remove two metal rollers (2) with the compensating washers (9) and the fore/aft isolator locking mechanisms (3 and 4).

**Installation notes:**
- Check lateral play of the rollers (chap. 2.14) and install compensating washers (9) if necessary.
- For the installation of a new swinging structure: Convert assemblies that do not belong to the scope of delivery of the swinging structure.

12 Re-install the components in the reverse order of their removal.
2.13.3 Swinging structure with fixed bearing with height adjustment (secondary belt) – removal, installation (delivery option)

REMOVAL/INSTALLATION

TABLE OF CONTENTS

(1) Stud
(2) Plastic roller, top
(3) Washer compensating for clearance
(4) Spacer collet
(5) Plastic roller, bottom
(6) Groove screw .........................11 Nm
(7) Bearing stud
(8) Spacer collet
(9) Bushing................. replace if necessary
(10) Swinging structure

1 Remove the upper part of the seat (see repair manual upper seat part).
2 Remove the bellows (chap. 2.1).
3 Remove the upper part of the spring system with the bearing stud (see chapter 2.12.2).
   **Note:**
   The upper seat part can stay mounted to the upper part of the spring system.

4 Disassemble vertical shock absorber from the swinging structure (see chapter 2.2).
   **Note:**
   The vertical shock absorber can remain fixed to lower part of the spring system.

5 Unhook the tension spring from the weight indicator ribbon (see chapter 2.3).

6 **Seat with secondary belt:**
   Remove secondary belt (chap. 2.12.2).
7 Remove bearing stud (1) from the lower part and of the spring system, and remove the lower part by turning the swinging structure sideways (see chapter 2.15).

Removal, installation

8 Remove the two plastic rollers (5) at the lower part of the swinging structure (10).

9 Remove two plastic rollers (2), two spacer collets (4) and a compensating washer (3), if any, from the front, top axle of the swinging structure (10).

Installation note:
Check lateral clearance of the rollers (chap. 2.14) and install compensating washers (3) if necessary.
10 Remove the two bushings (9) from the lower part of the swinging structure (10).

**Installation note:**
For the installation of a new swinging structure: Convert assemblies that do not belong to the scope of delivery of the swinging structure.

11 Re-install the components in the reverse order of their removal.
2.13.4 Height adjustment of the swinging structure – removal, installation

REMOVAL/INSTALLATION

(1) Swinging structure
(2) Curved lever
(3) Locking mechanism
(4) Tension spring
(5) Strip
(6) Hexagon stud
(7) Disconnecting plate

1. Remove the swinging structure (chap. 2.13).
2.13.4 Height adjustment of the swinging structure – removal, installation

Removal

2. Place the swinging structure (1) on its top.

3. Take off and remove the two tension springs (4) in the back from the locking mechanisms (3).

4. Remove the strip (5) from the curved lever (2).

5. Lift the lever (2) and remove the hexagon bolts (6).

6. Tilt the lever (2) backwards and remove the two disconnecting plates (7).
2.13.4 Height adjustment of the swinging structure – removal, installation

Installation

1. Place the swinging structure (1) on its top.

2. Tilt the lever (2) backwards.

3. Apply an acid-free multi-purpose lubricant to the leadthrough for hexagon studs (6) in the curved lever (2) and the noses of the locking mechanisms (3) for hanging in the disconnecting plates (7) (F).

4. Hang in the two disconnecting plates (7) with the noses (arrow) backwards on the inner sides of the locking mechanisms (3) and fix them in parallel.

5. Tilt the lever (2) forwards between the two disconnecting plates (7).
6 Push the hexagon studs (6) into the disconnecting plates (7) and the lever (2) until they are flush, and lay down the lever (2) in the front.

7 Place and center the strip (5) of the longitudinal hole in the lever (2) with the grooves to the front.

8 Hang in two tension springs (4), first in the strip, then in the holder (3) on both sides.

**Notes:**
- Hang in one tension spring (4) over and one under the strip (5).
- When the hooks of the tension spring (4) for hanging in the locking mechanism (3) are overstretched, the springs (4) must be replaced.
2.13.5 Checking the height adjustment of the swinging structure

CHECKING

(1) Upper part of the spring system
(2) Bellows
(3) Locking mechanism
(4) Strip
(5) Tension spring
(6) Locking steps 1-3 for the height adjustment

1 Take off bellows (2) from the upper part of the spring system (1) and put them down (see chapter 2.1).
2.13.5 Checking the height adjustment of the swinging structure

Checking

⚠️ **WARNING** Risk of crushing!
Do not put your hands into the swinging system while you lift or lower it.

2 Lift the upper part of the spring system (1):
   ▪ The strip (4) is disengaged and must lock into the next step independently.

3 Lift the upper part of the spring system (1) from the top step to the endstop.
   ▪ Strip (4) is disengaged
   ▪ It must be possible to lower the spring system completely down.
2.13.5 Checking the height adjustment of the swinging structure

CHECKING

4 Lift the upper part of the spring system (1):
   ? The strip (4) must lock in the first step.

5 Checking the height adjustment in general:
   ? Check locking for easy-running:
     apply lubricant to the respective parts of the adjustment system if necessary
     (see chapter 2.13.4)
   ? Move the curved lever to check for easy-running:
     Remove dirt such as welding beads.
2.14 Lateral clearance of the rollers in the upper part of the spring system (roller bearing) – checking, adjusting

**CHECKING**

1. Metal roller
   - Maximum clearance 0.3 mm

2. Disk compensating for clearance thickness
   - 0.2 or 0.5 mm

3. Swinging structure

4. Plastic roller, top
   - Maximum clearance 0.8 mm

5. Ring compensating for clearance thickness
   - 0.8 mm

6. Spacer collet

7. Upper part of the spring system
2.14 Lateral clearance of the rollers in the upper part of the spring system (roller bearing) – checking, adjusting

Checking

1. Check the maximum clearance (A) between the front upper plastic roller (4) and the upper part of the spring system (7) over the complete adjustment distance.

2. Check the maximum clearance (B) between the metal plastic roller (1) and the upper part of the spring system (7) over the complete adjustment length.
2.14 Lateral clearance of the rollers in the upper part of the spring system (roller bearing) – checking, adjusting

Adjusting

1. Remove swinging structure (chap. 2.13.2).

2. Place a clearance ring (5) between the plastic rollers (4) and the spacer collet (6) onto the axle of the swinging structure (3) if necessary.
   **Note:**
   The compensating ring (5) is included in the wear and tear spare parts kit.

3. Place a compensating disk (2) between the metal rollers (1) and the axle of the swinging structure (3) if necessary.
   **Note:**
   Clearance disks (with thickness of 0.2 and 0.5 mm) are included in the wear and tear spare parts set.

4. Install swinging structure (chap. 2.13.2).
2.15 Lower part of the spring system – removal, installation

REMOVAL/INSTALLATION

(1) Stud
(2) Swinging structure
(3) Rubber buffer
(4) Rubber buffer
(5) Lower part of the spring system
(6) Plastic roller

1 Remove the bellows from the lower part of the spring system (5) (see chapter 2.1), push it upwards and fix it to upper part of the spring system.

2 Turn the seat by 180 degrees and place it onto the seat pad.

Note:
For removing the lower part of the spring system (5) it is not necessary to remove the upper seat part.
3 Move the spring system to the highest position and secure it.

**WARNING** Risk of crushing!
Secure the swinging structure on the front plastic rollers in the lower part of the spring system with suitable spacers.

4 Remove the vertical shock absorber from the lower part of the spring system (5) (see chapter 2.2.1 or 2.2.2).

5 **Spring system with height adjustment:**
Remove webbing for spring system with height adjustment from the lower part of the spring system (5) (see chapter 2.11.2).

6 Unhook tension spring from the weight indicator ribbon (see chapter 2.3).
Removal, installation

7 Disengage stud (1) and pull it out to the right of the swinging structure (2) and the lower spring system (5).

**Installation note:**
Apply an acid-free multi-purpose lubricant to the complete circumference (F) of the stud (1) in the width of a brush.

8 Remove lower part of the spring system (5) from the swinging structure (2) by turning it sideways.

**Installation note:**
Apply an acid-free multi-purpose lubricant to the two guiding rails of the lower part of the spring system (5) on the bearing surface (F) of the plastic rollers (6).

9 Remove the weight display completely (chap. 2.3).
2.15 Lower part of the spring system – removal, installation

10 Remove the weight adjustment completely (chap. 2.4).

11 Remove the rubber buffer (3) and the two rubber buffers (4). **Installation note:**
   Installation of the buffer (4) into hole A in the swinging structure (2) with 4-fold height adjustment.
   Installation of the buffer (4) into hole B in the swinging structure (2) with 3-fold height adjustment or without a height adjustment.

12 **Replace U-profiles and rubber plate:**
   Remove U-profile and rubber plate (see chapter 2.4).

13 Re-install the components in the reverse order of their removal.
2.16 Spring system – removal, installation

REMoval/INSTALLATION

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1. Remove lower part of the spring system (1) from the swinging structure (see chapter 2.15).

2. Remove the locking plug from the spring bracket (5) (see chapter 2.3).
Removal, installation

3 Screw back the adjustment spindle (3) with the toggle (4) until maximum relieve of the springs (6) and (7).

4 Hang out the right spring (6) and the left spring (7) on the spring bracket (5) and the holder plug (2) and remove them.

Note:
In case of short springs, the right spring (6) must be lifted over holder plug (2) using a screwdriver:
Installation notes:
• In case of short springs, the left spring (7) must be attached to the spring bracket (5) and holder plug (2). Then the right spring (6) must be hung in into the spring bracket (5) and lifted over the holder plug (2) with the help of a screwdriver.
• The leg of the right spring (6) must point inwards when it is installed.
5. Re-install the components in the reverse order of their removal.
2.17 Seat switch with cable – removal, installation (delivery option)

REMOVAL/INSTALLATION

(1) Lower part of the spring system
(2) Seat switch complete
(3) Cable (seat switch)
(4) Connectors
(5) Cable ties
(6) Groove screw ...............11 Nm
(7) Spring (seat switch)
(8) Contact bracket

1 Remove the bellows from the lower part of the spring system (1) (see chapter 2.1.1 or 2.1.2), push them upwards and fix them to upper part of the spring system.
2.17 Seat switch with cable – removal, installation (delivery option)

Removal, installation

2 Move the spring system to the highest position and secure it.

⚠️ **WARNING** Risk of crushing!
Secure the swinging structure on the front plastic rollers in the lower part of the spring system with suitable spacers.

3 Mark places where cable (3) is fastened with the two cable ties (5) and remove the cable ties (5).
2.17 Seat switch with cable – removal, installation (delivery option)

REMOVAL/INSTALLATION

4 Remove the two groove screws (6), and remove the seat switch (2) completely.

**Installation notes:**
- Groove screws (6), 11 Nm.
- Spring (7) in the seat switch must be pretensioned against the contact bracket (8) according to the Seat Switch Checking/Adjusting by a defined distance (A) (see chapter 2.18).

5 Open the cable (3) and release it from the switch (4).

6 Re-install the components in the reverse order of their removal.
2.18 Seat switch – checking, adjusting

(1) Lower part of the spring system
(2) Seat switch
(3) Groove screw .........................11 Nm
(4) Upper part of the spring system
(5) Gauge

1 Move the spring system to the highest position and secure it.

⚠️ WARNING Risk of crushing!
Secure the swinging structure on the front plastic rollers in the lower part of the spring system with suitable spacers.

2 Push the bellows upwards on the left side and secure them (see chapter 2.1).

3 Set/pretension weight adjustment of the spring to 70 kg.
2.18 Seat switch – checking, adjusting

CHECKING ADJUSTING

CHECKING

4 Place the gauge (5) as an endstop between the lower part of the spring system (1) and the upper part of the spring system (4).

Notes:
The distance between the gauge and the upper part of the spring system (4) (without load) should be selected in such a way that the free lift of the springs system is compensated and a spring difference of 15 to 20 mm is observed before the endstop is reached.

5 The switch must contact shortly before the endstop (switching sound).
2.18 Seat switch – checking, adjusting

CHECKING

Adjusting

1. Unscrew groove screws (3).

2. Place a gauge (5) as an endstop between the lower part of the spring system (1) and the upper part of the spring system (4) and load until the endstop is reached.

3. Move the seat switch (2) in the indicated direction (arrow) until you can hear the switching sound.

4. Tighten the switch with the two groove screws (3) in the “switching spot”. **Installation note:** Groove screws (3), 11 Nm.

5. Relieve spring system and remove gauge (5).

6. Install the bellows (see chapter 2.1).
2.19 Heater cable – removal, installation (delivery option)

REMOVAL/INSTALLATION

(1) Upper seat part
(2) Spring system
(3) Heater cable
(4) Cable ties
(5) Upper part of the spring system
(6) Bellows
(7) Lower part of the spring system

Note:
The installation of a heater cable has been described in the repair manual for the upper seat part.

1 Unhook off the bellows (6) from the back of the upper spring part (5) and the lower spring part (7) (see chapter 2.1).
Removal, installation

2 Remove two cable ties (4) from the upper (5) and the lower part of the spring system (7).

Installation note:
Fasten heater cable (3) and cable tie (4) to the upper part of the spring system (5) and the lower part of the spring system (7) in the marked spots.

3 Pull out the heater cable (4) behind the bellows (6).

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

Note:
Stick the switch of the heater cable under the bellows for transport.