FIT

Ventilation and emergency escape hatches

FIT ABS
FIT ABS Comfort
FIT Clear
FIT Clear Comfort
FIT ABS Transversal
FIT ABS Transversal Comfort
FIT Clear Transversal
FIT Clear Transversal Comfort

Workshop Manual

Rev. 09/2025
Id.No. DOK28112-001

SPHEROS

1 Introduction

1.1 Content and purpose

This workshop manual is used during service and repair of ventilation and emergency escape hatches (further referred to as roof hatches) of the FIT series with the following models:
– FIT ABS
– FIT ABS Comfort
– FIT Clear
– FIT Clear Comfort
– FIT ABS Transversal
– FIT ABS Transversal Comfort
– FIT Clear Transversal
– FIT Clear Transversal Comfort

1.2 Effectivity of the workshop manual

The workshop manual applies to roof hatches listed on the title page of this document.
It may be subjected to modifications and amendments. The respectively currently effective version is binding. This version can be found in the download center on www.spheros.com.

1.3 Meaning of highlighted content

Throughout this manual the emphasized words Warning!, Caution!, ATTENTION: and NOTE: used as follows:

Warning!	**Danger to life and health!**

This caption is used to indicate possible severe injuries or fatal accidents if instructions or procedures are carried out incorrectly or entirely disregarded.

Caution!	**Hazardous to health!**

This caption is used to indicate possible minor injuries if instructions or procedures are carried out incorrectly or entirely disregarded.

ATTENTION:

This caption points to actions which may cause material damage.

NOTE:

This caption is used to draw attention to an important feature.

1.4 Symbols

Symbol tightening torque value:
Identifies in graphics parts (eg nuts, bolts) that are to be mounted with a specific tightening torque. The torque values are shown at the symbol and are binding.

1.5 Further documentation to be used

The use of additional service literature is required. References are provided in the workshop manual at appropriate locations.
Use the following documents during operation and service of the roof hatches:
- Operating instructions
- Installation instructions
- Technical information (TI)
- Spare parts list

1.6 Safety information and regulations

Basically, general accident pevention provisions and the valid industrial safety directions must be adhered to. "General Safety Regulations" which exceed the framework of these provisions are listed below. The specific safety regulations which affect the present manual are issued highlighted in the individual sections or procedures.

1.6.1 General safety regulations

Warning!	**Danger to life and health!**

When working on the bus roof or on any hoisting equipment, scaffolding etc. suitable safety precautions must be taken to prevent falls.

Caution!	**Hazardous to health!**

Read the FIT Series Operating instructions before operating the roof hatch for first time.
Familiarize yourself with the FIT Series Installation instructions before you make any modifications to the existing roof hatch installation.

NOTE:

The FIT Operating Instructions contain safety instructions and regulations to be followed for safe operation of the roof hatch.

The FIT Installation instructions contain the statutory regulations and other safety hints and regulations for the proper installation of the roof hatch(es).

1.7 Suggestions for improvement and change

Please direct any complaints, improvement or modification suggestions regarding this manual to:

service@spheros.com

2 Technical data

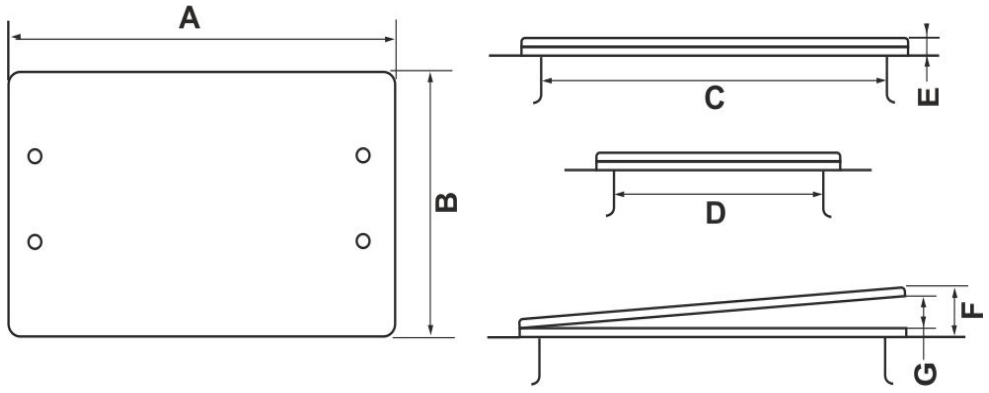
The following table contains the technical data of the individual versions of the FIT series.

Table 201 Technical data

	FIT ABS	FIT ABS Comfort	FIT Clear	FIT Clear Comfort
A x B (mm)	978 x 748		Glass: 910 x 690 outer frame: 936 x 676	
C x D (mm)	743 x 615			
E / F (mm)	front: 69.6 / 121 rear: 84.3 / 135.8		62.1	
G (mm)	23.4		42.4	
Operating voltage (V)	--	12 / 24	--	12 / 24
Control unit	--	integrated	--	integrated
Glass	--	--	4mm, ESG*, LT** approx. 16%	
Fuse (A)	-	5 (up to 2 hatches) 10 (3 to 4 hatches)	-	5 (up to 2 hatches) 10 (3 to 4 hatches)

	FIT ABS Transversal	FIT ABS Transversal Comfort	FIT Clear Transversal	FIT Clear Transversal Comfort
A x B (mm)	978 x 748		Glass: 910 x 690 outer frame: 936 x 716	
C x D (mm)	741 x 613			
E / F (mm)	front: 72.5 / 72.4 rear: 79.5 / 142.8		front: 66 / 72.9 rear: 62.1 / 126.8	
G (mm)	52.4		55,3	
Operating voltage (V)	--	12 / 24	--	12 / 24
Control unit	--	integrated	--	integrated
Glass	--	--	4mm, ESG*, LT** approx. 16%	
Fuse (A)	-	5 (up to 2 hatches) 10 (3 to 4 hatches)	-	5 (up to 2 hatches) 10 (3 to 4 hatches)

* ESG - Toughened safety glass, ** LT - Light transmittance



3 Description of assemblies and components

The roof hatches of the FIT series are used for ventilation of the interior in city buses, coaches and intercity buses as well as for the emergency exit of persons in case of danger.

The roof hatches essentially consist of
– the frame
– the seal
– the lifting mechanisms if applicable with electrical drive
– the control unit (electrical operated hatches only)
– the cover
– cover hinges (transversal hatches only) and
– the interior trim.

For arrangement of the individual components, see Fig. 301 and Fig. 302.
The ABS and Clear versions of the hatches differ in the design of the cover; in the comfort versions, the lifting mechanisms are each operated by an electric motor.

3.1 Frame

The frame (see Fig. 301 and Fig. 302), made of injection-molded plastic, is the main structural element of every roof hatch. It secures the roof hatch to the bus structure. The frame houses the lifting mechanisms, the roof hatch seal, and, in the electric versions, the control unit and wiring harness.

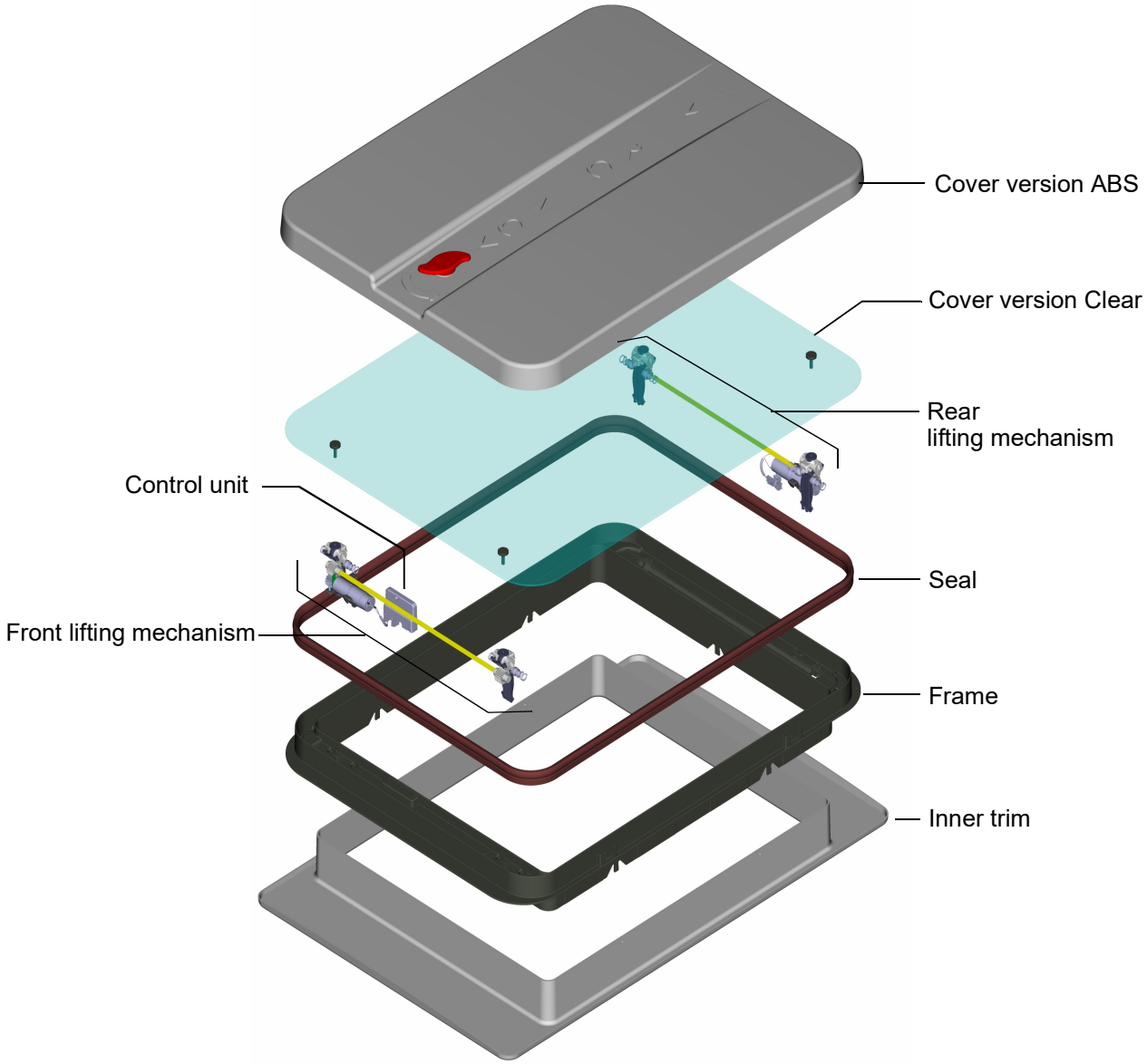


Fig. 301 Components FIT Hatches

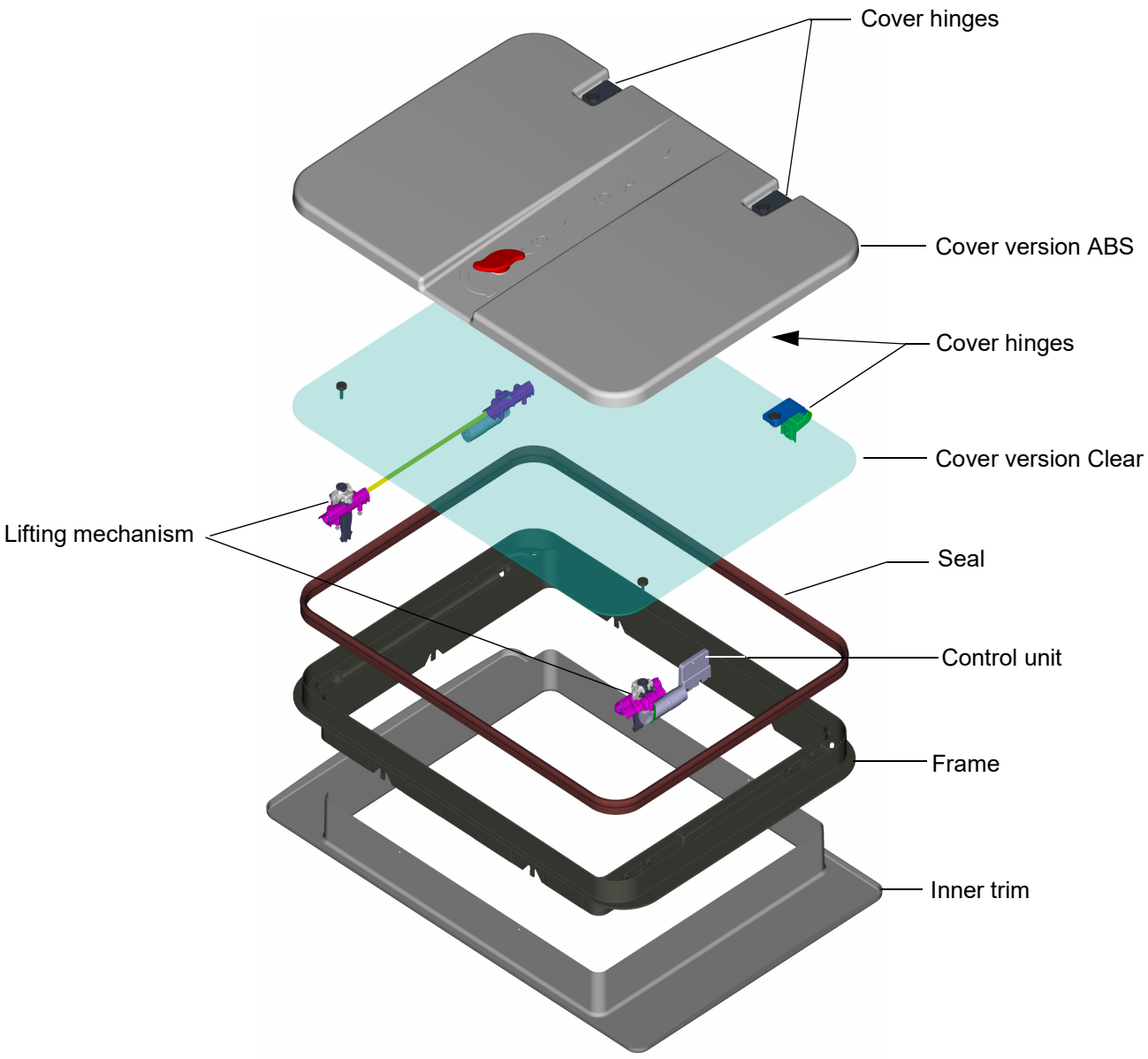


Fig. 302 Components FIT Transversal hatches

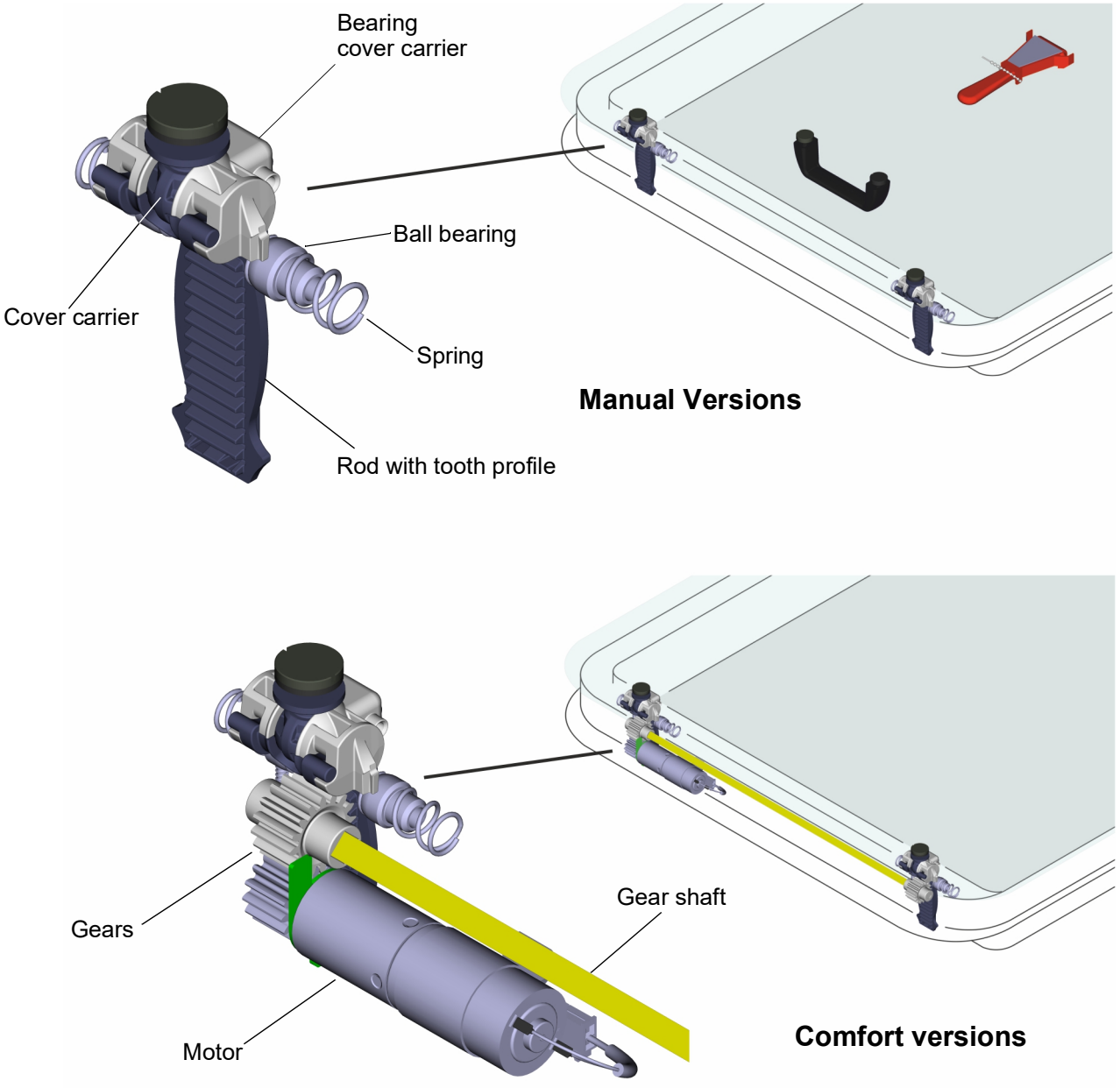
3.2 Lifting mechanisms

NOTE:
The lifting mechanisms of the longitudinally installed hatches are described below. The lifting mechanisms of the transversely installed hatches function according to the same principle. Their position is shown in Fig. 302.

The roof hatches each have two lifting mechanisms – one at the front and one at the rear.
Each lifting mechanism has two rods to which the hatch cover is attached.

A ball joint at the top of each rod ensures that the hatch cover can be tilted. This also allows the hatch to be opened from one side.
Spring-loaded balls acting on the specially shaped flanks of the rods, lock the rod and thus the hatch cover in the desired end position and provide the necessary closing or opening pressure.

Electrically operated hatches
Each lifting mechanism is driven by a motor. The motor's rotary motion is converted into a lifting motion via the gear teeth of the rods.
Two gears, connected by a shaft, transmit the motor's rotary motion to the rods.



NOTES:
Only the FIT Clear and FIT Clear Comfort versions are shown. The lifting mechanisms of other versions are equivalent.
Structural components (frames, housings, etc.) have been omitted for clarity.

Fig. 303 Lifting mechanisms - Overview

3.3 Control unit

The motors of the lifting mechanisms are controlled by the control unit (Fig. 304).

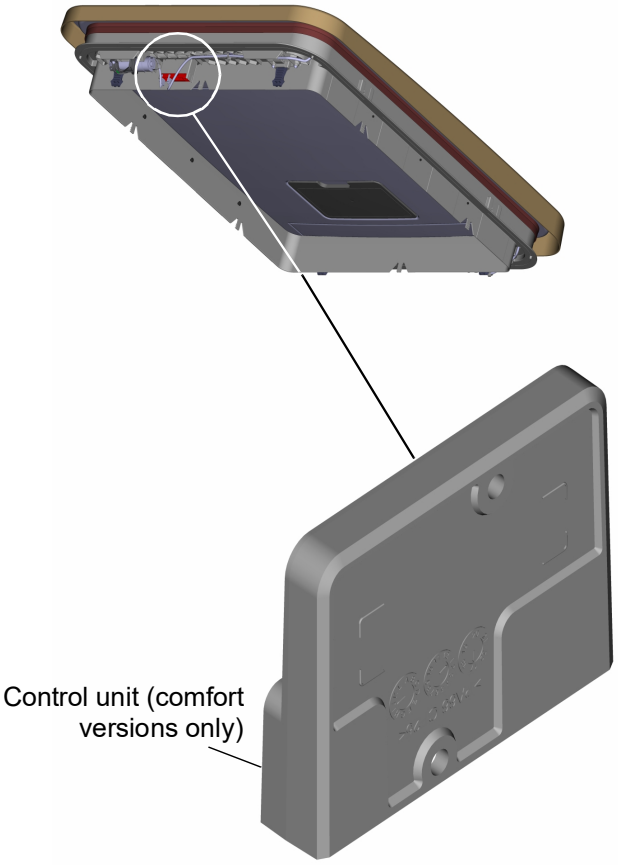


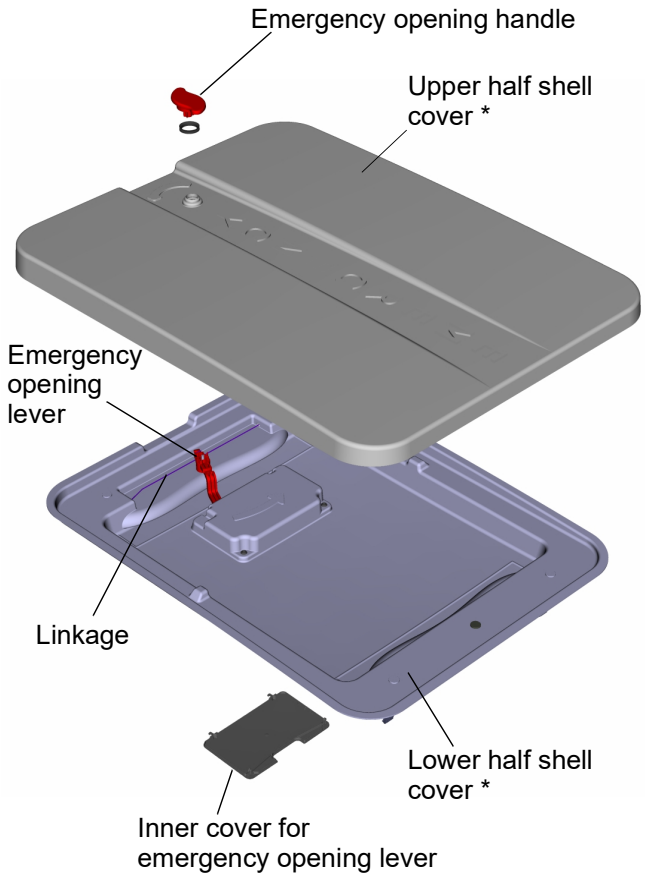
Fig. 304 Control unit

The control unit evaluates the current consumption of the individual motors and issues the corresponding switching signals. Versions for 12 V and 24 V on-board power systems are available for longitudinally and transversely mounted hatches.

NOTE:
For information on control unit connection, refer to 6.

3.4 Hatch cover

Plastic hatch cover
The cover consists of two half shells glued together. The underside has a compartment with a cover. In this compartment, behind the cover, is a red emergency opening lever. The emergency opening lever separates the bearing shells along with the cover carriers from the lifting rods at the front via a linkage. This disconnects the hatch cover from the lifting mechanism.
Furthermore, recessed handles are embedded in the lower shell at the front and rear.
The top has a recessed red rotary handle for emergency opening of the hatch from the outside.



* Upper and lower half shells of the cover are glued together.

Fig. 305 Plastic hatch cover

Glass hatch cover
The cover is made of toughened safety glass.
The bracket for the emergency hammer is located in the center of the underside of the hatch cover (only versions with an emergency hammer).
The manual version has a handle screwed to the front and rear of the underside of the hatch cover.

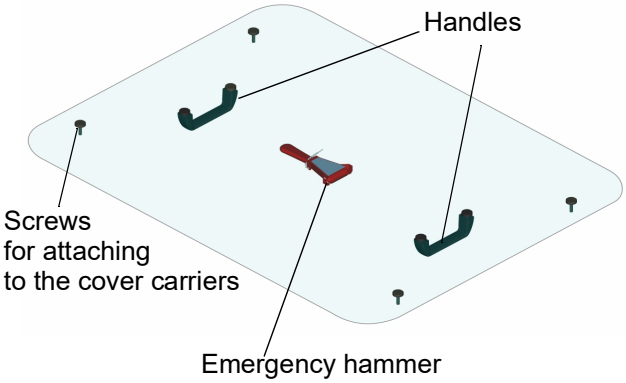
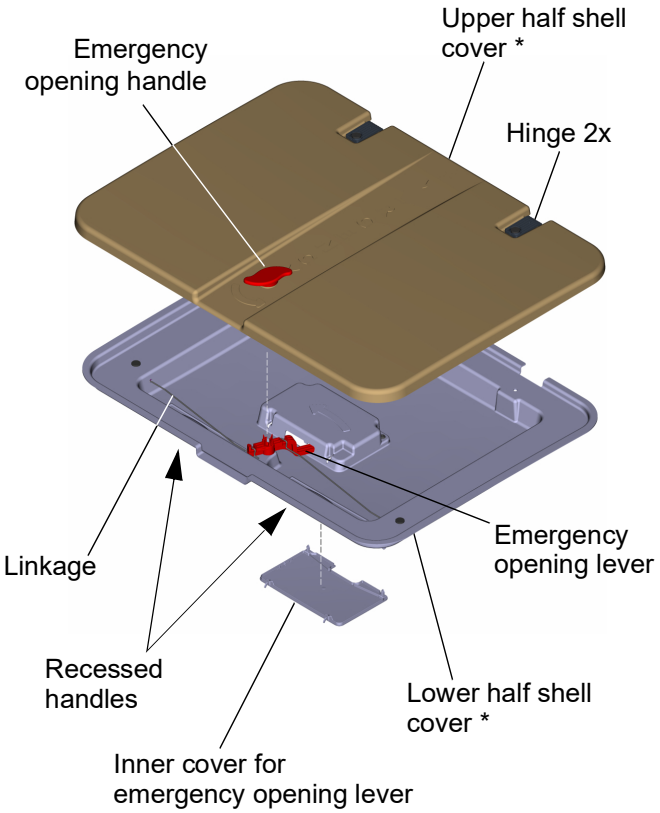


Fig. 306 Glass hatch cover

Plastic hatch cover (transversal hatches)
The cover consists of two half shells glued together. The underside has a compartment with a cover. In this compartment, behind the cover, is a red emergency opening lever. The emergency opening lever separates the bearing shells along with the cover carriers from the lifting rods at the rear via a linkage. This disconnects the hatch cover from the lifting mechanism.
Furthermore, recessed handles are embedded in the lower shell at the rear.
The top has a recessed red rotary handle for emergency opening of the hatch from the outside.
There are two hinges on the front of the hatch cover to attach the cover to the frame.



* Upper and lower half shells of the cover are glued together.

Fig. 307 Plastic hatch cover

Glass hatch cover (transversal hatches)
The cover is made of toughened safety glass.
The bracket for the emergency hammer is located in the center of the underside of the hatch cover (only versions with an emergency hammer).
On the manual version, a handle is screwed to the rear of the underside of the hatch cover.
There are two hinges on the front of the hatch cover to attach the cover to the frame.

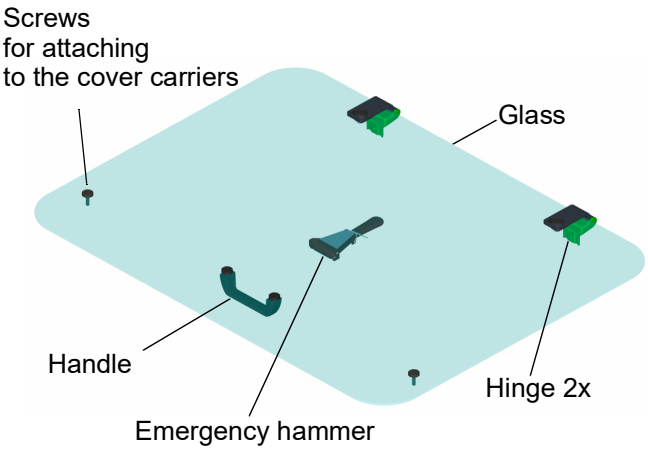
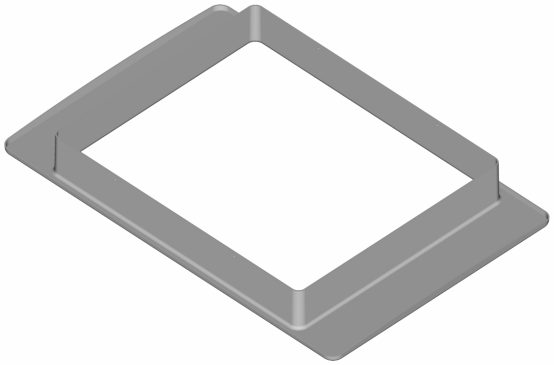


Fig. 308 Glass hatch cover

3.5 Inner trim

The inner trim serves to cover the roof cutout. It is screwed to the frame. It is removed for service and repair work on the hatch. The main components of the hatch are then accessible.



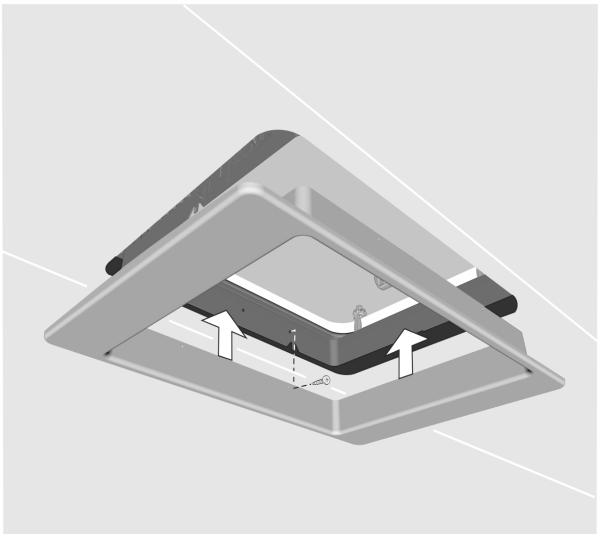


Fig. 309 Inner trim

4 Hatch functions

4.1 FIT ABS and FIT Clear

These hatches are operated by hand. They can be openend at the front side and / or at the rear. Transversely installed hatches are only opened at the rear

NOTE:
The FIT ventilation and emergency escape hatch Operating instructions contain safety instructions and other information about operating the hatch.

Manually operated opening mechanism, see Fig. 401.

NOTE:
Longitudinally mounted hatches are described. Transversely mounted hatches function in the same way.

When opening and closing the hatch, the handle on the hatch cover exerts tension or pressure on the cover carriers of the lifting mechanism. Each of the four cover carriers is connected to a specially shaped rod via a ball joint, see Fig. 401.
Spring-loaded balls acting on the sides of the rod lock the rod and thus the hatch cover in the desired end position and provide the necessary closing or opening pressure.

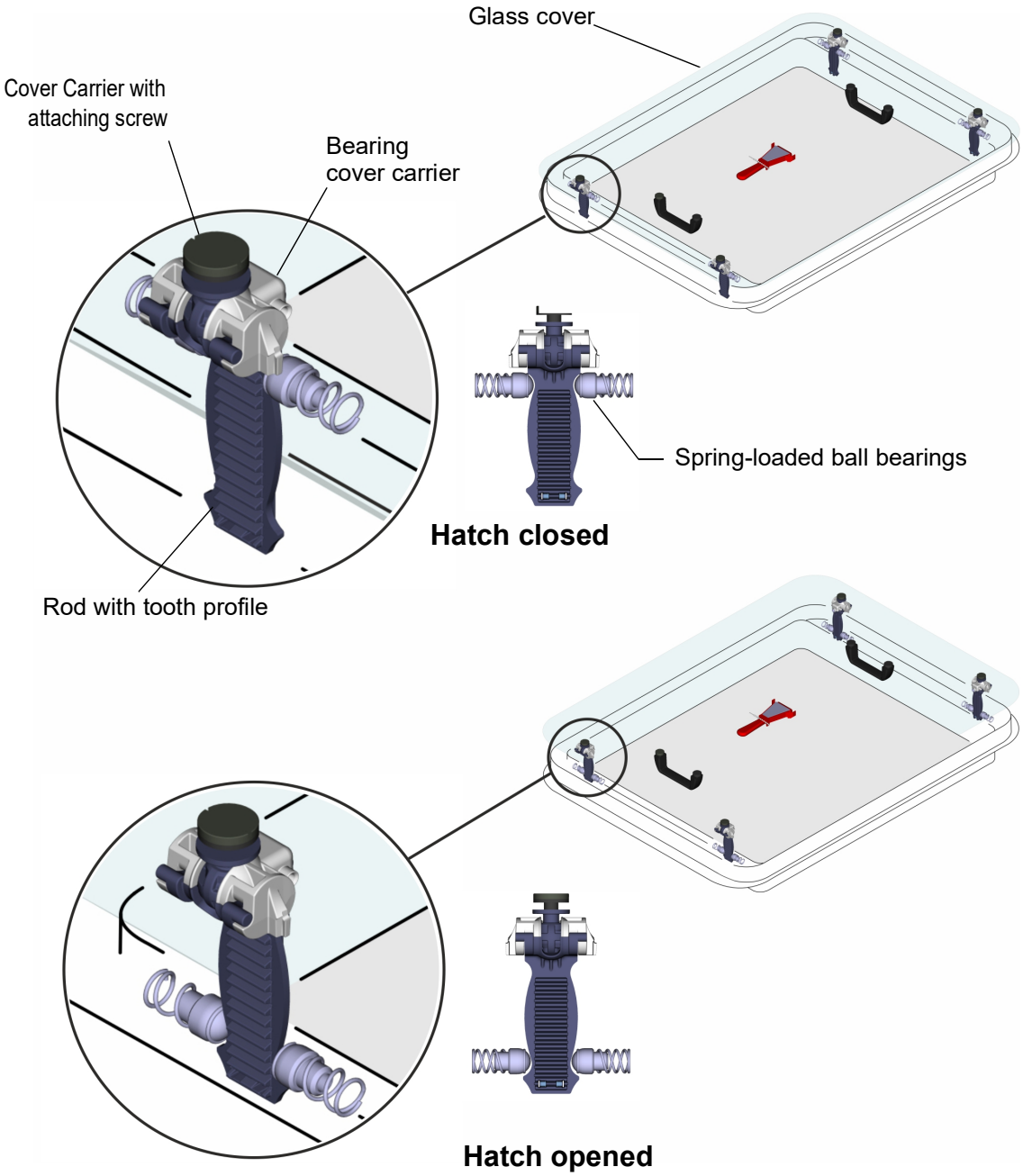


Fig. 401

4.2 FIT ABS and Clear Comfort

These hatches are electrically operated and controlled via a control panel (driver unit) or a switch with an operating indicator. They can be opened at the front and/or rear. Transversely installed hatches are only opened at the rear.

NOTE:
The FIT ventilation and emergency escape hatch Operating instructions contain safety instructions and other information about operating the hatch.

Electrically operated lifting mechanism, see Fig. 402.

NOTE:
Longitudinally mounted hatches are described. Transversely mounted hatches function in the same way.

The specially shaped rods, which are connected to the cover carriers via the ball joint, have a tooth profile.

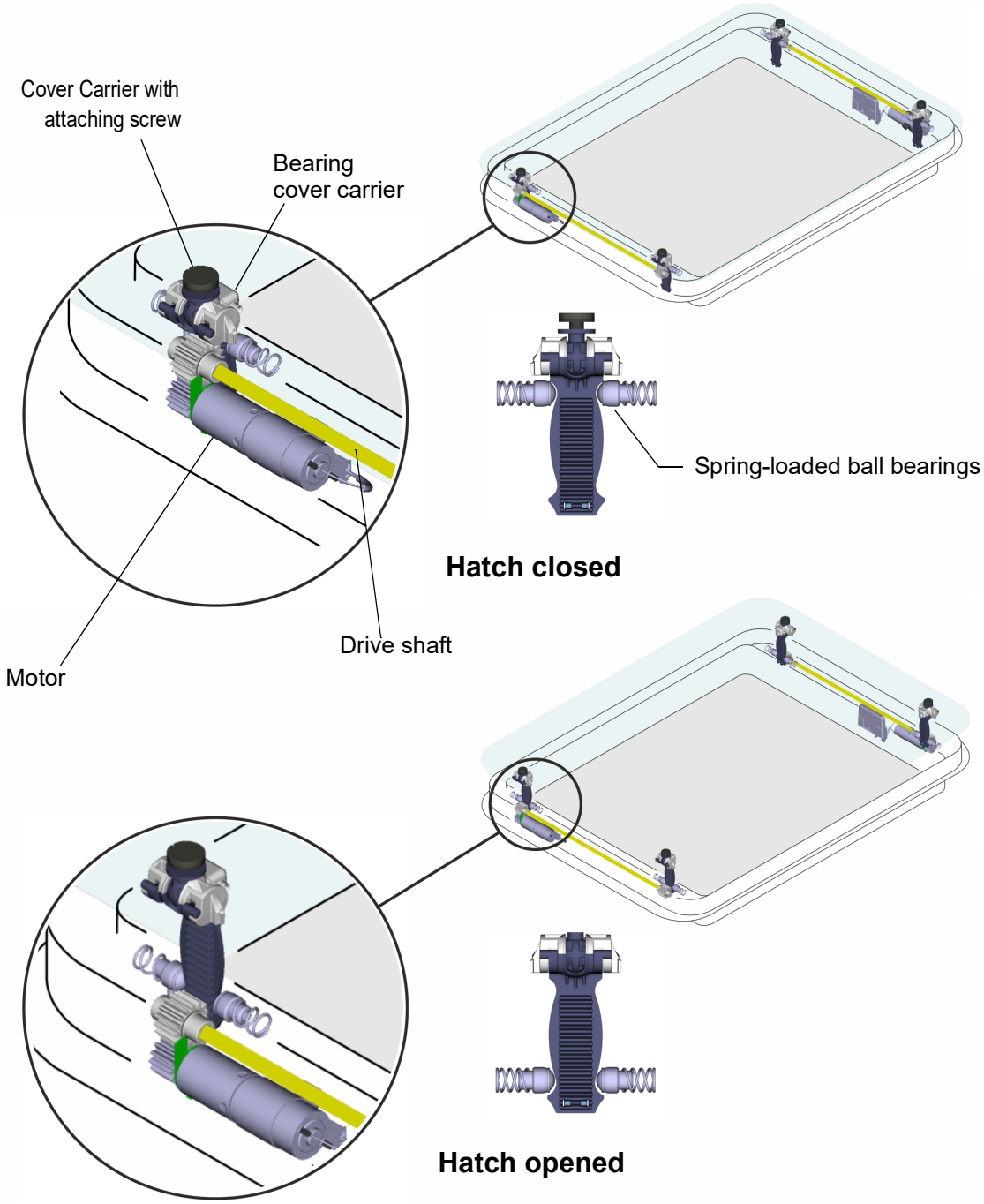


Fig. 402

In principle, the rotary motion of the drive motor of each of the two lifting mechanisms is converted into a linear lifting and lowering movement of the rods via gears.
The connecting shaft transmits the rotary motion to the gear of the second rod, thus ensuring a synchronous lifting and lowering movement.
Due to the special shape of the rods in conjunction with the spring-loaded balls on the flanks, the forces change continuously during the lifting and lowering movement of the rods. The control unit evaluates the motor's current consumption and issues the corresponding switching signals.

4.2.1 Control of the electric drive

The control unit controls the two independent lifting mechanisms, each with its own motor.
The following hatch positions are possible:


= closed


= opened at the front
(not at transversal hatches)


= opened at the rear


= opened at the front and at the rear
(not at transversal hatches)

Fig. 403

The motors are controlled sequentially. Opening or closing one side takes less than two seconds.
For transversal hatches, the two motors are controlled synchronously.

4.2.1.1 Control of the control unit with 2 switches

The switches should be rated for a minimum current of 16 mA.

The relationship between switch position and hatch status is shown in the following table. The following applies:
- Switch position 0 (contacts open) and
- Switch position 1 (contacts closed).

The wiring diagram for the switch version is included in Chapter 6.

Switch		Hatch position			
S1 (front)	S2 (rear)	closed	opened at the rear	opened at the front	opened at the front and at the rear
0	0	x			
1	0		x		
0	1			x	
1	1				x

4.2.1.2 Control of the control unit with one switch (transversal hatches)

Switch position 0 (contact open) -> hatch closed
Switch position 1 (contact closed) -> opened at the rear
If the hatch is not closed, the roof position indicator light (if connected) is illuminated.

The wiring diagram for the switch version is included in Chapter 6.

4.2.1.3 Control of the control unit with the Driver‘s Unit (DU)

The DU is used in buses to operate up to four hatches via the S-Bus instead of the switch version.

Fig. 404 Driver‘s Unit

For transversal hatches, the "Open front" button is not functional.

The wiring diagram for the version with driver‘s control panel is shown in Chapter 6.

4.2.2 Operating indication

The operating indicator lights up when the hatch is open. In the event of an error, it flashes with a specific flash code.

States of the lamp output

Hatch	Lamp output
closed	open circuit
open	ground (in error case blink code)

Maximum output current: 400 mA

The blink code consists of a burst of 5 short pulses and a number of long pulses corresponding to the error number. Then comes another burst and so on.

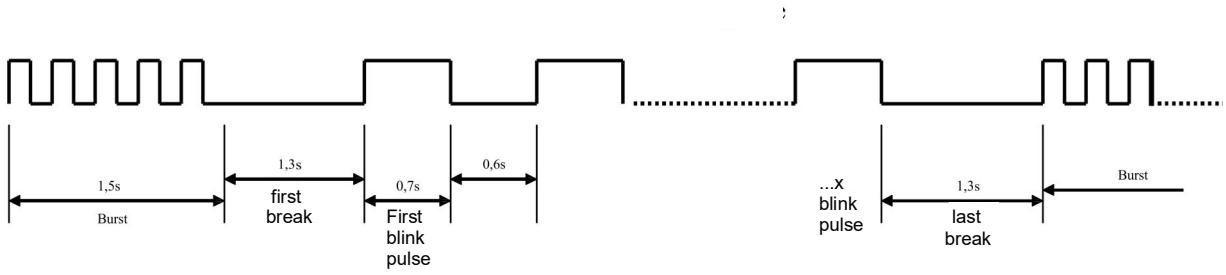


Fig. 405 Blink code at the operating indication

Blink code	Error	error description
0	ECU error	internal control unit error
1	error motor 1	motor 1 - interruption, short circuit
2	error motor 2	motor 2 - interruption, short circuit
3	low voltage	voltage too low
4	Motor 1: End position cannot be reached within a maximum time	End position cannot be reached within a specified time
5	Motor 2: End position cannot be reached within a maximum time	End position cannot be reached within a specified time

5 Troubleshooting

5.1 General

Warning!	Danger to life and health!

The safety instructions and regulations of Chapter 1 (see 1.6) must be observed.

This section describes troubleshooting and error correction for FIT ventilation and emergency escape hatches.

Error detection is usually limited to localizing the faulty component.

ATTENTION:

Prior to replacing a fuse, troubleshooting needs to be performed. The hatch must be disconnected from the vehicle electrical system
A properly dimensioned fuse must be inserted (see chapter 6 Wiring diagrams).

After each error correction a functional test must be performed in the vehicle.

5.2 General error symptoms

The following table lists possible, general error symptoms.

Fault symptom	Possible cause	Kind of Operation	Troubleshooting
hatch does not open / close	no power supply	electrically	– turn on the vehicle's main switch – check the fuse and replace it if necessary – check the contacts and repair if necessary – corrosion on the connectors – loose contact on the connectors – crimping errors on the connectors or contacts – corrosion on the cables and fuses – corrosion on the battery terminals – damage to the cable insulation – damage to the contacts due to frequent plug-ging and unplugging – measure the voltage at the ECU input
	a cable not connected		check the cable connection between the drive mo-tor and the control unit and restore/repair if neces-sary
	drive motor defective		replace drive motor
movement stops repea-tedly	mechanism is damaged or sluggish	electrically	– check the mechanism for damage and replace any damaged parts – check the fastening of the components and tighten screws/nuts if necessary
	plug connection to the drive motor defective		inspect plug connections and con-tacts, restore / repair if necessary
	cable dfective		check cables and replace if necessary
	sporadic power interrupti-ons, unstab-le power supply		– Check operating voltage – Check connectors and contacts, restore/ repair if necessary
	drive motor defective		replace drive motor

- continued on next page -

Fault symptom	Possible cause	Kind of Operation	Troubleshooting
hatch does not open / close	mechanism is blocked by an object	manually and electrically	remove the object
	mechanism is damaged or sluggish or stuck		– check the mechanism for damage and replace any damaged parts – check the fastening of the components and tighten screws/nuts if necessary – If the hatch is stiff or jammed, grease may be applied from both sides into the mechanism housing.
noises	defective mechanism or parts of it		
water ingress into the closed hatch	hatch seal defective, leaking or worn		replace seal
	water ingress via outer emergency handle		attach emergency handle correctly, replace seal ring if necessary
	rod mechanism is damaged		– check the mechanism for damage and replace any damaged parts – check the fastening of the components and tighten screws/nuts if necessary

5.3 Functional check of the hatch

5.3.1 Roof hatch - operated manually

1. Open hatch front side
   The hatch cover must be able to open at the front side evenly, without unilateral resistances, without abnormal noises and horizontally.
2. Open rear side
   The hatch cover must be able to open at the rear side evenly, without unilateral resistances, without abnormal noises and horizontally.
3. Close front side
   The hatch cover must be able to close at the front side evenly, without unilateral resistances, without abnormal noises and horizontally.
4. Close rear side
   The hatch cover must be able to close at the rear side evenly, without unilateral resistances, without abnormal noises and horizontally.
   After that the hatch cover sits evenly close on the hatch seal on all sides.

5.3.2 Roof hatch, transversal - operated manually

1. Open hatch
   The hatch cover must be able to open at the rear side evenly, without unilateral resistances, without abnormal noises and horizontally.
2. Close hatch
   The hatch cover must be able to close at the rear side evenly, without unilateral resistances, without abnormal noises and horizontally.
   After that the hatch cover sits evenly close on the hatch seal on all sides.

5.3.3 Roof hatch - operated electrically

1. Check the control sequence of the roof hatch. Pay attention to the following:
   – The hatch cover moves smoothly, without any stoppages and abnormal noises into the desired position.
   – The operating indication (depending on the variant) corresponds to the position of the hatch cover.
2. When closed, the hatch cover sits evenly close on the hatch seal on all sides..

5.4 Visual inspection of a lifting mechanism

5.4.1 Lifting mechanism - operated manually

1. Remove lifting mechanism from hatch (see 8.10).
2. Check all moveable parts for damage and their correct arrangement and bearing.

5.4.2 Lifting mechanism - operated electrically

1. Remove lifting mechanism from hatch (see 8.10).
2. Check all moveable parts for damage and their correct arrangement and bearing.
3. Are the plug and the cables to the motor visible damaged?
4. Check the condition of the gears of the transmission and the tooth profile of the rods (wear, mechanical damage, dirt deposits).

5.5 Checking the motor of a lifting mechanism

1. Remove the motor from hatch (see 8.11).
2. Test the motor by applying 12V DC with a duration of max. 5s (Attention, also the 24V variant).
   Check both directions of rotation by reversing the polarity. In the event of a malfunction, replace the motor.

6 Wiring diagrams

6.1 General

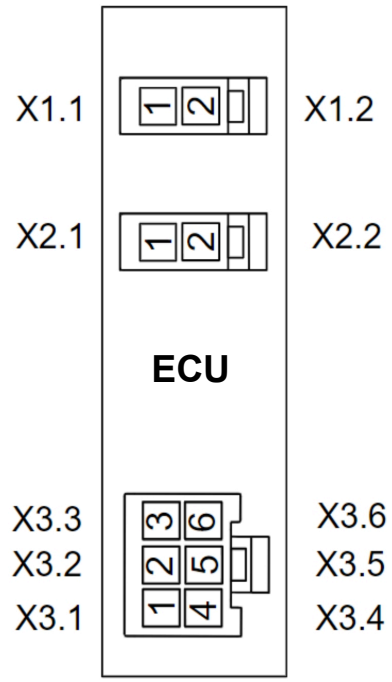
The following illustrations show the wiring variants of the electrically operated roof hatch to the vehicle electrical system as well as the connector pin assignment.

NOTE:
The FIT hatch is also available with a fan.
In these versions, the electrical connection of the drive is identical to that of the other hatch versions (see wiring diagrams).
The fan is connected separately to terminal 30 of the vehicle and controlled by a switch located near the driver.

Counterpart to X3:

6 pol. housing
Supplier: Molex
Supplier-No.: 39012065 (UL 94V-0)

Contact
Supplier: Molex
Insulation diameter: 1.3 - 3.1 mm
Cable cross section: AWG 18 (0.205 mm²),
20 (0.33 mm²),
22 (0.52 mm²),
24 (0.82 mm²)
Material: Phosphor Bronze / Tin
Supplier-No.: 0039000059

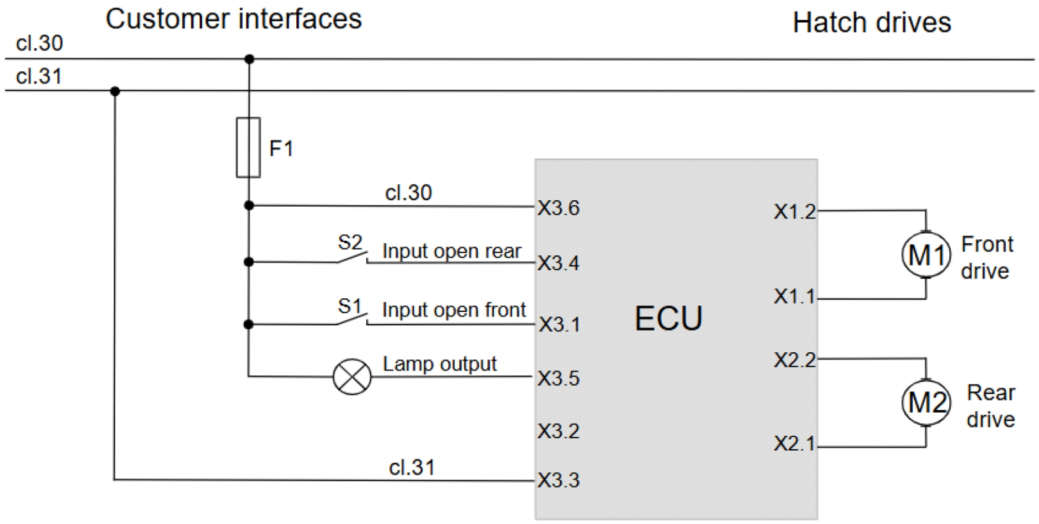


Legende:

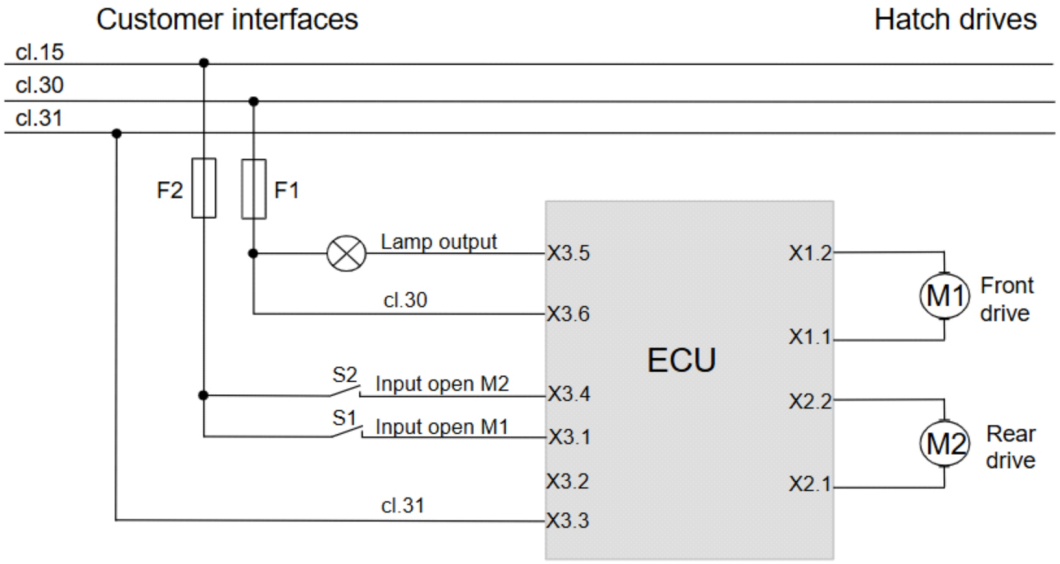
X1	Motor 1
X2	Motor 2
X3.1	Switch input 1 / S-Bus address A0
X3.2	S-Bus for connection with the Driver Unit
X3.3	Cl. 31, ground
X3.4	Switch input 2 / S-Bus address A1
X3.5	Lamp output
X3.6	Cl. 30, plus

Fig. 601 Connector and pin assignment of the ECU

Variant for terminal 30



Variant for terminal 15



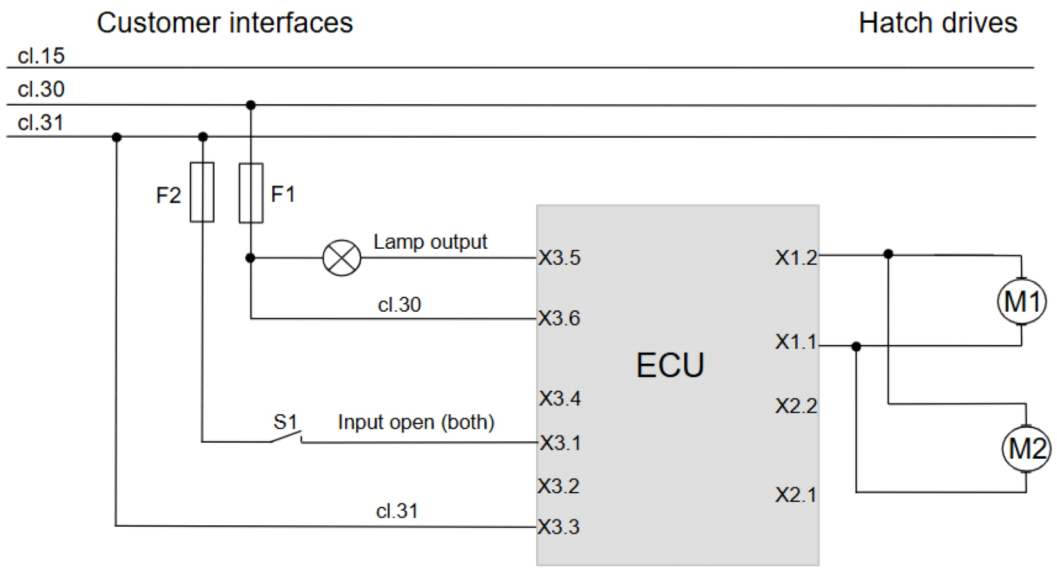
Legend:

F1	Fuse, ISO 8820-3.5A*
F2	Fuse,ISO 8820-3, Value depends on wire crosssection
S1	Switch, open front (for transversal option both)
S2	Switch, open rear
M1	Motor 1, front
M2	Motor 2, rear
cl. 15	Switched plus
cl. 30	permanent plus
cl. 31	Ground

* The maximum permissible fuse rating is:
5 A for each FIT hatch, or
1 x 5 A for 1...3 FIT hatches together, or
1 x 5 A for 4 FIT hatches together (if operated one after teh other), or
1 x 7.5 A for 4 FIT hatches (if operated simultaneously)

Fig. 602 Connection of the ECU - Switch version

Variant for transversal hatches



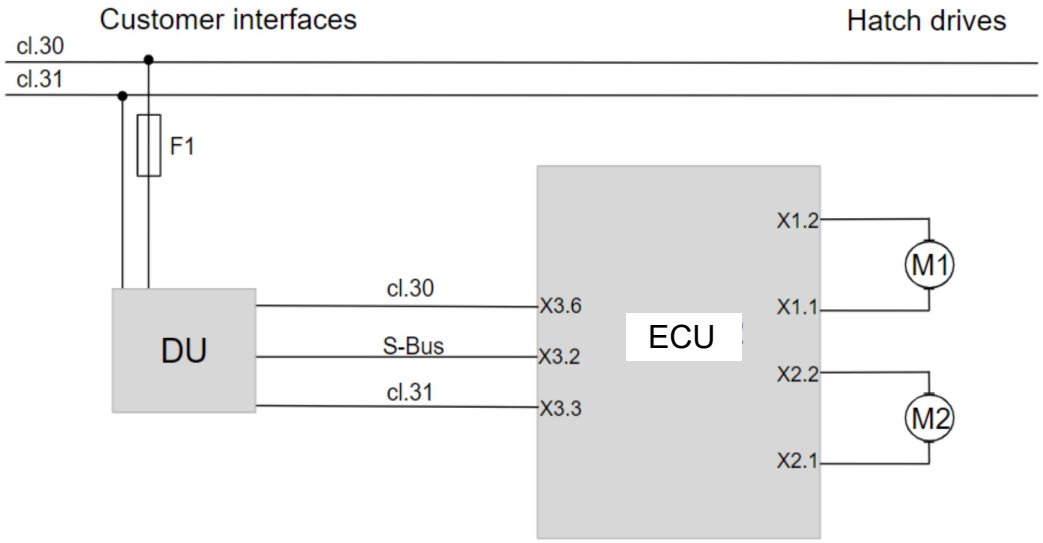
NOTE: Cl. 15 (switch operated) is also available.

Legende:

F1	Fuse, ISO 8820-3.5A*
F2	Fuse,ISO 8820-3, Value depends on wire crosssection
S1	Switch, open front (for transversal option both)
S2	Switch, open rear
M1	Motor 1, front
M2	Motor 2, rear
cl. 15	Switched plus
cl. 30	permanent plus
cl. 31	Ground

* The maximum permissible fuse rating is:
5 A for each FIT hatch, or
1 x 5 A for 1...3 FIT hatches together, or
1 x 5 A for 4 FIT hatches together (if operated one after teh other), or
1 x 7.5 A for 4 FIT hatches (if operated simultaneously)

Fig. 603 Connection of the ECU - Switch version (transversal hatches)



F1	Fuse, ISO 8820-3, 5 A*
M1	Motor 1, rear
M2	Motor 2, front
cl. 30	Permanent plus
cl. 31	Ground

* The maximum permissible fuse rating is:
5 A for each FIT hatch, or
1 x 5 A for 1...3 FIT hatches together, or
1 x 5 A for 4 FIT hatches together (if operated one after teh other), or
1 x 7.5 A for 4 FIT hatches (if operated simultaneously)

Fig. 601 Connection of the Driver‘s Unit (DU) and ECU

7 Servicing

7.1 General

Warning!	Danger to life and health!

The safety information and regulations in Chapter 1 (see 1.6) must be adhered.

The scope of service work on the roof hatches is limited to their cleaning.

7.2 Cleaning of the roof hatch

Before the roof hatch is cleaned from the outside, it is advisable to open and close the roof hatch completely to ensure that the roof hatch is completely closed.

The cleaning of the roof hatch may be carried out as for the other similar external surfaces of the bus and by the same means as e.g. for windows with seals.

Further information can be found in the section Exterior cleaning of the bus in the service documentation of the vehicle manufacturer.

7.3 Lubrication of the electric roof hatch

To ensure proper operation and long service life of the electric roof hatch, it is recommended to lubricate the mechanical components every 3 years.

With the hatch fully opened, apply grease from both sides into the mechanism housing using a spray can. Ensure that all moving parts are evenly coated.

NOTE:
Use a suitable grease that is compatible with the installed materials and covers the intended temperature range.

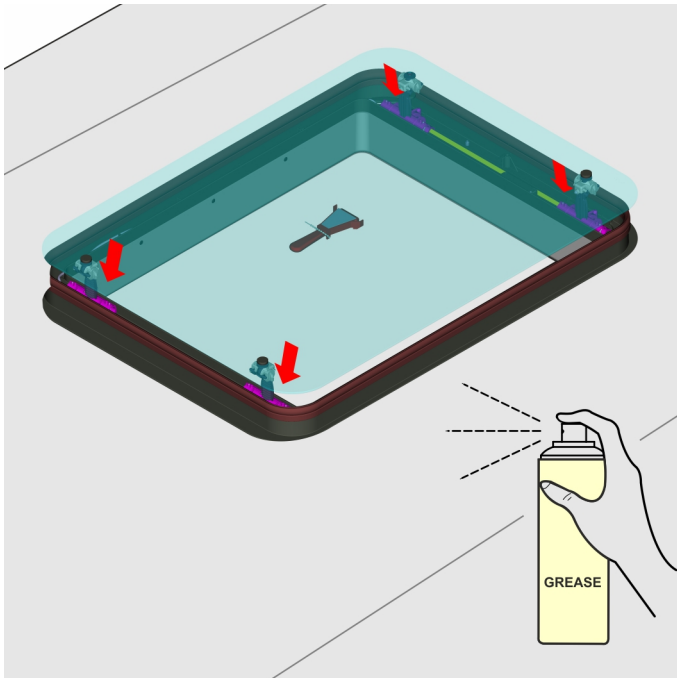


Fig. 701 Lubrication of the electric roof hatch

8 Components removal and installation

8.1 General

Warning!	Danger to life and health!

The safety information and regulations in Chapter 1 (see 1.6) must be adhered.

ATTENTION:
Prior to disassembling components the hatch must be disconnected from the vehicle electrical system (electrically operated hatches only).

NOTE:
If components are disassembled to a degree not covered in this workshop manual, any warranty claim shall be voided. Only genuine Spheros spare parts should be used.
The following symbol is used in the graphics of the procedures:

Symbol tightening torque value:
Identifies in graphics parts (eg nuts, bolts) that are to be mounted with a specific tightening torque. The torque values are shown at the symbol and are binding.

8.2 Removal and installation of the inner trim

Removal
1. Remove screws (3, Fig. 801).
2. Pull the inner trim (1) downwards.

Installation
1. Place the inner trim (1, Fig. 801) into the frame (2) and align it.
2. Attach the inner trim (1) to the frame (2) with 2 screws (3) on each side.

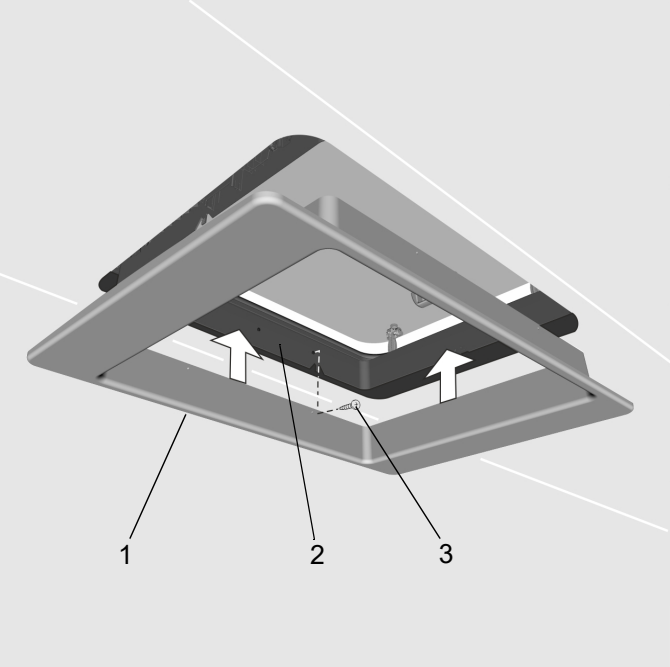


Fig. 801 Einbau Innenrahmen

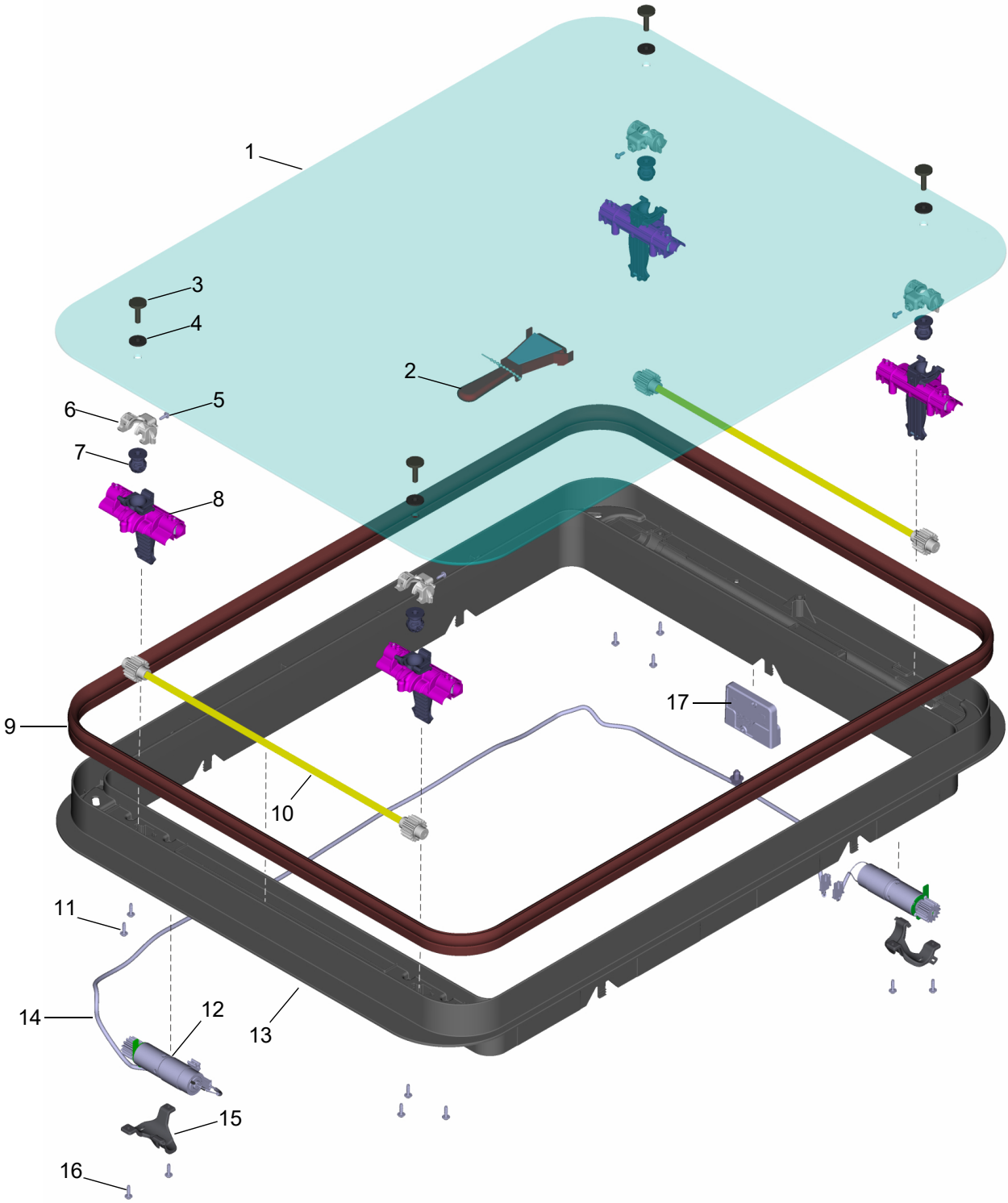
8.3 Removal and installation of the hatch seal

Removal
1. Open the roof hatch completely.
2. Remove the rubber seal (9, Fig. 802) by pulling it upward all around the hatch from the frame (13).
3. Lift one end of the seal loop onto the top of the cover and remove the seal from the roof hatch.

Installation
1. Clean the frame.
2. Pull the new rubber seal (9, Fig. 802) over the hatch cover.
3. Slide the seal (9) in the 4 corners onto the frame (13) so that the seal is evenly distributed.
4. Slide the remaining seal (9) onto the frame (13).

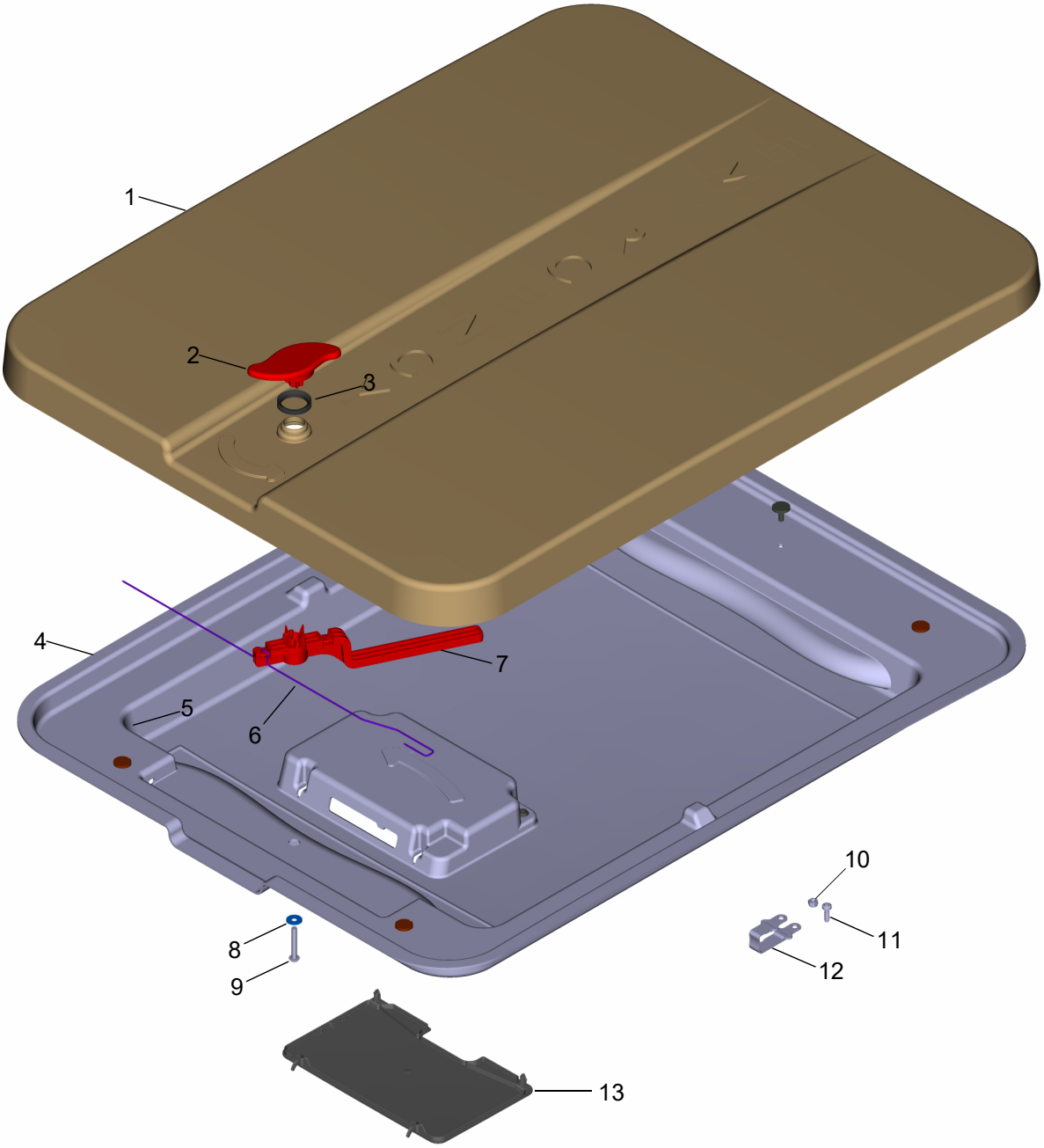
NOTE:
Make sure that the seal is pressed all the way to the edge of the frame.

NOTE:
After installing a new seal, it is recommended to carry out a water tightness test.



1	Glass cover	7	Ball 4x	13	Frame
2	Emergency hammer	8	Rod assembly 4x	14	Wiring harness
3	Cover screw 4x M6x25	9	Rubber seal	15	Motor bracket 2x
4	Rubber washer 4x	10	Gear shaft with gears 2x	16	Screws, motor bracket 4x
5	Safety screw 4x	11	Screws, housing 8x	17	Control unit
6	Bearing shell 4x	12	Motor		

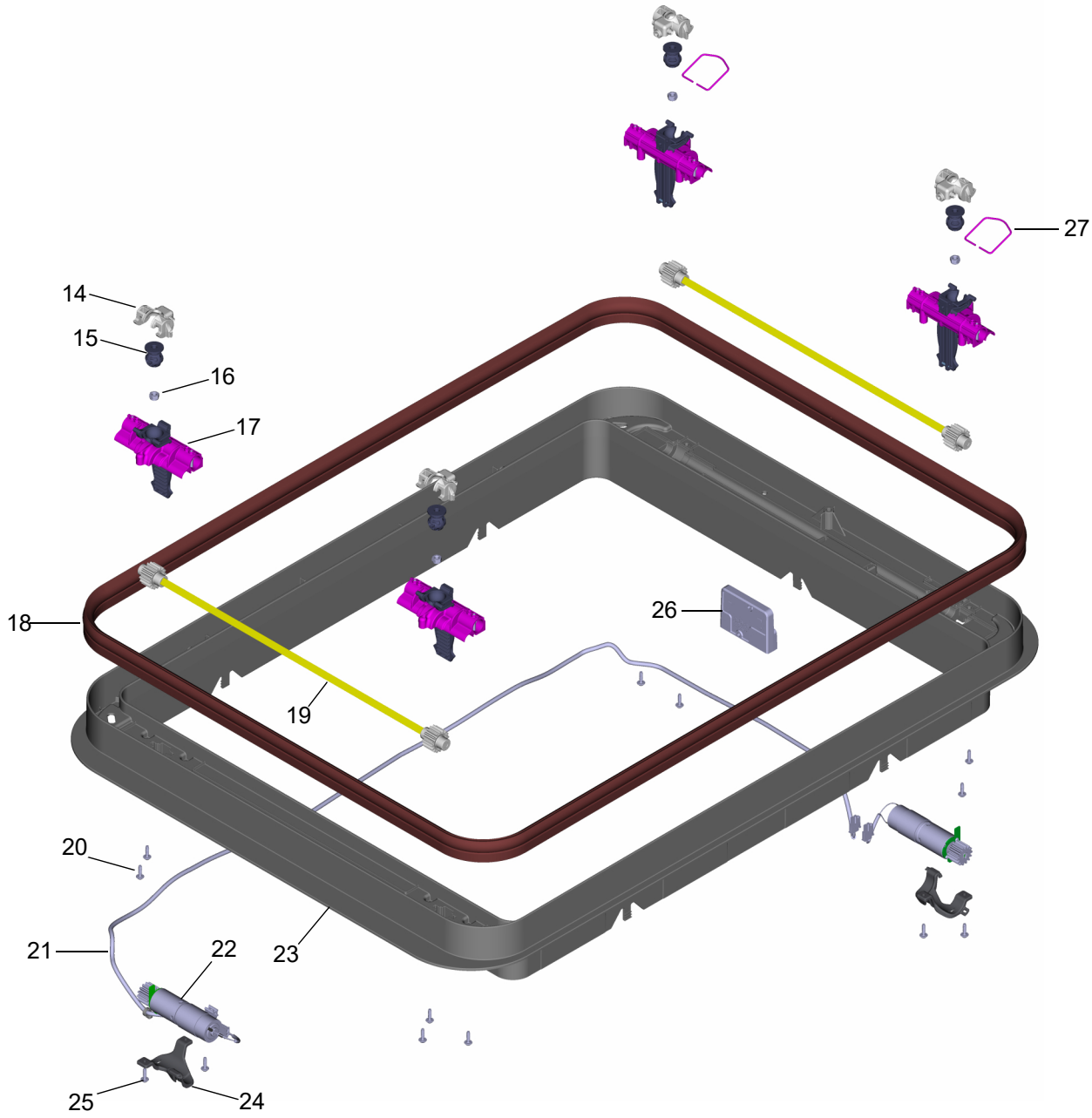
Fig. 802 FIT Hatches Clear - Components



NOTE: The upper ABS cover shell and lower ABS cover shell are glued together. The separate illustration is for clarity.

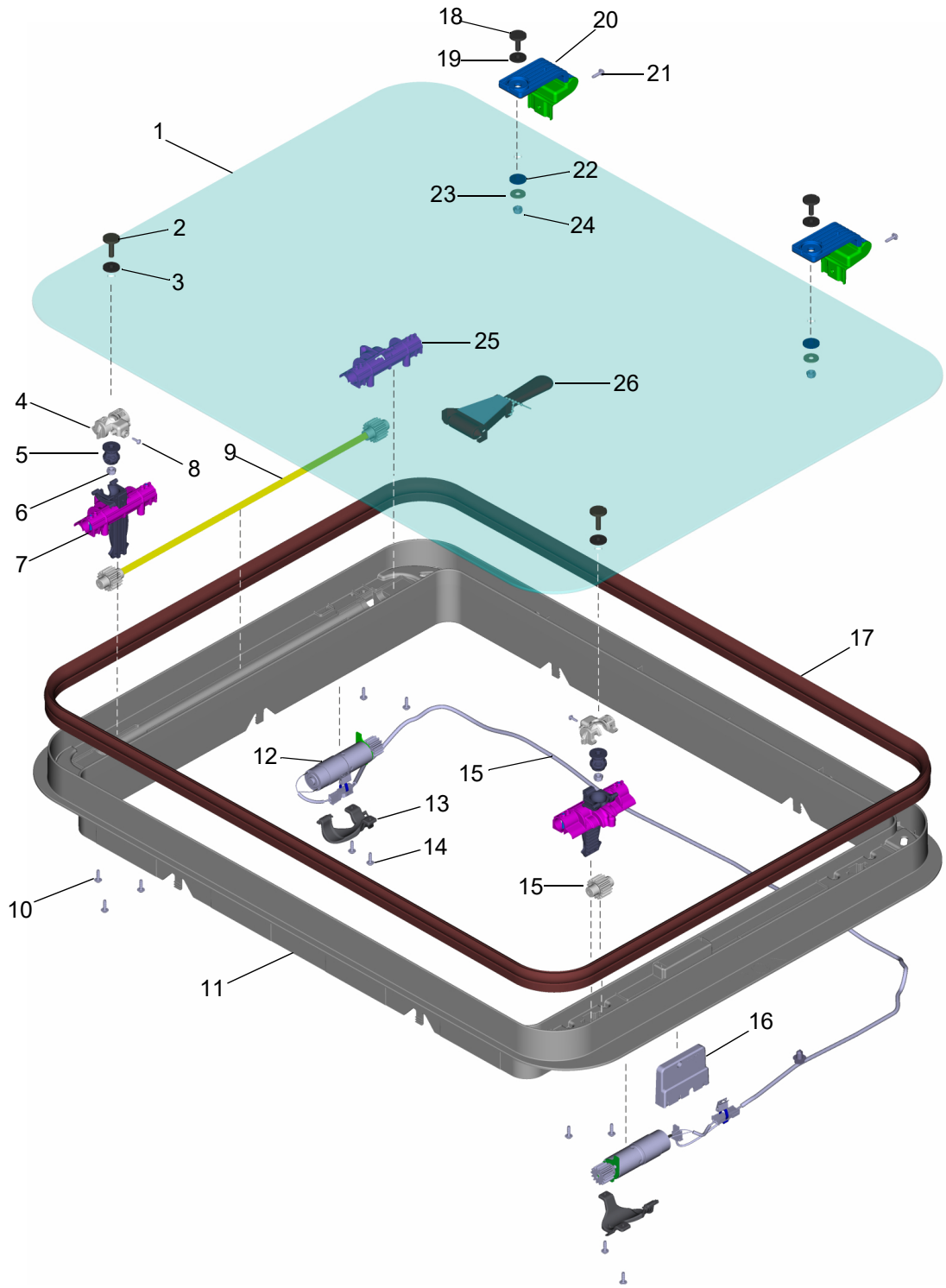
1 Cover ABS, upper shell
2 Emergency opening handle, outer
3 Seal ring
4 Cover ABS, lower shell
5 Cover screw 4x
6 Linkage, emergency opening
7 Emergency opening handle, inner
8 Washer
9 Screw, emergency opening handle
10 Nut
11 Screw
12 Safety line
13 Cover

Fig. 803 FIT Hatches ABS - Components (part 1)



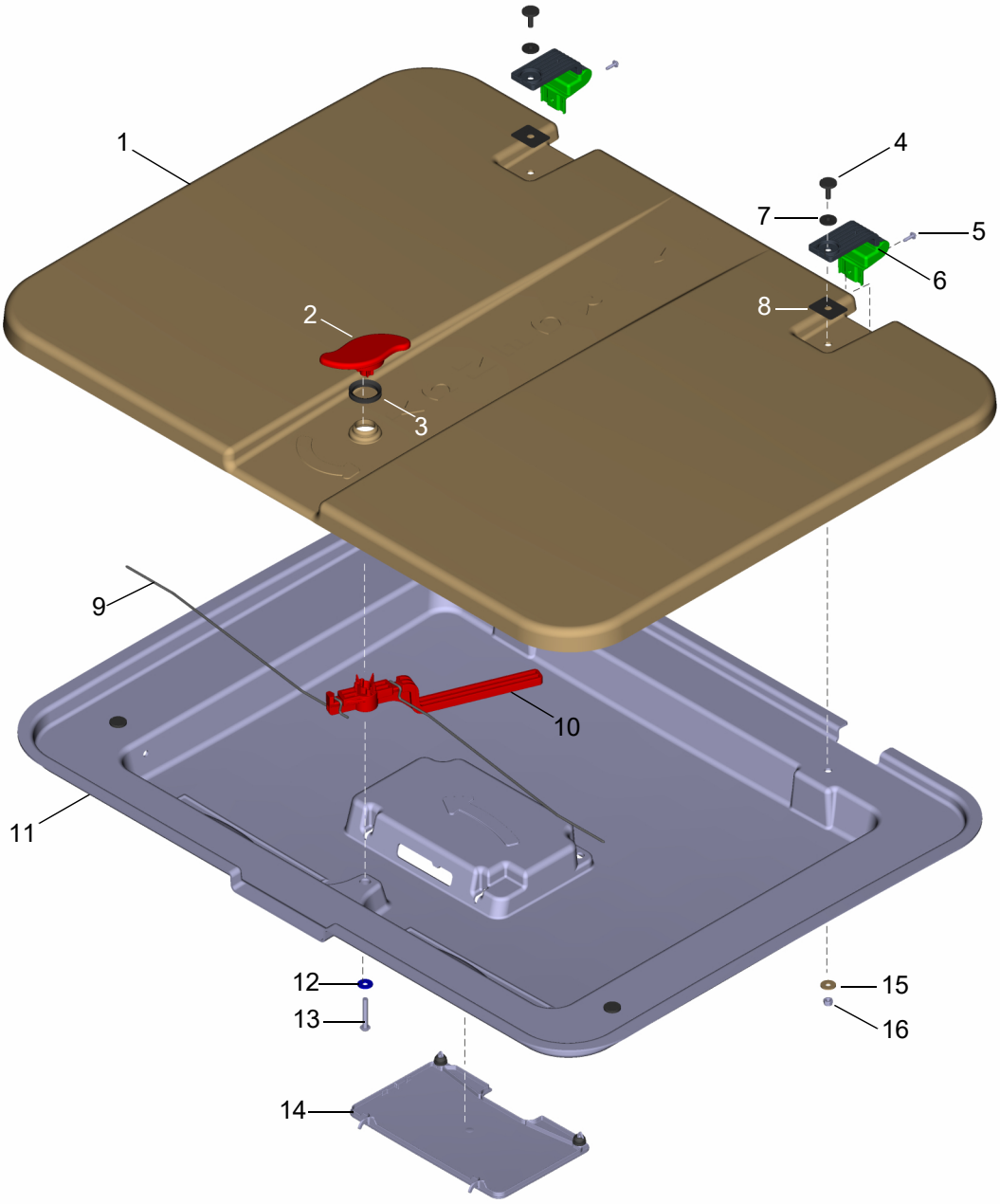
14 Bearing shell 4x
15 Cover carrier 4x
16 Nut M6 4x
17 Rod assembly 4x
18 Rubber seal
19 Gear shaft with two gears 2x
20 Screws, housing 8x
21 Wiring harness
22 Motor 2x
23 Frame
24 Motor bracket 2x
25 Screws, motor bracket 4x
26 Control unit
27 Emergency opening clamp 2x

Fig. 803 FIT Hatches ABS - Components (part 2)



1	Glass cover	10	Screws, housing 7x	19	Rubber insert, upper 2x
2	Cover screw 2x M6x25	11	Frame	20	Hinge 2x
3	Rubber washer 2x	12	Motor 2x	21	Screw, hinge 2x
4	Bearing shell, cover carrier 2x	13	Motor bracket 2x	22	Rubber insert, lower 2x
5	Cover carrier 2x	14	Screws, motor bracket 4x	23	Washer 2x
6	Nut M6 2x	15	Wiring harness	24	Nut M6 2x
7	Rod assembly 2x	16	Control unit	25	Housing
8	Safety screw 2x	17	Rubber seal	26	Emergency hammer
9	Gear shaft with gears	18	Cover screw 2x		

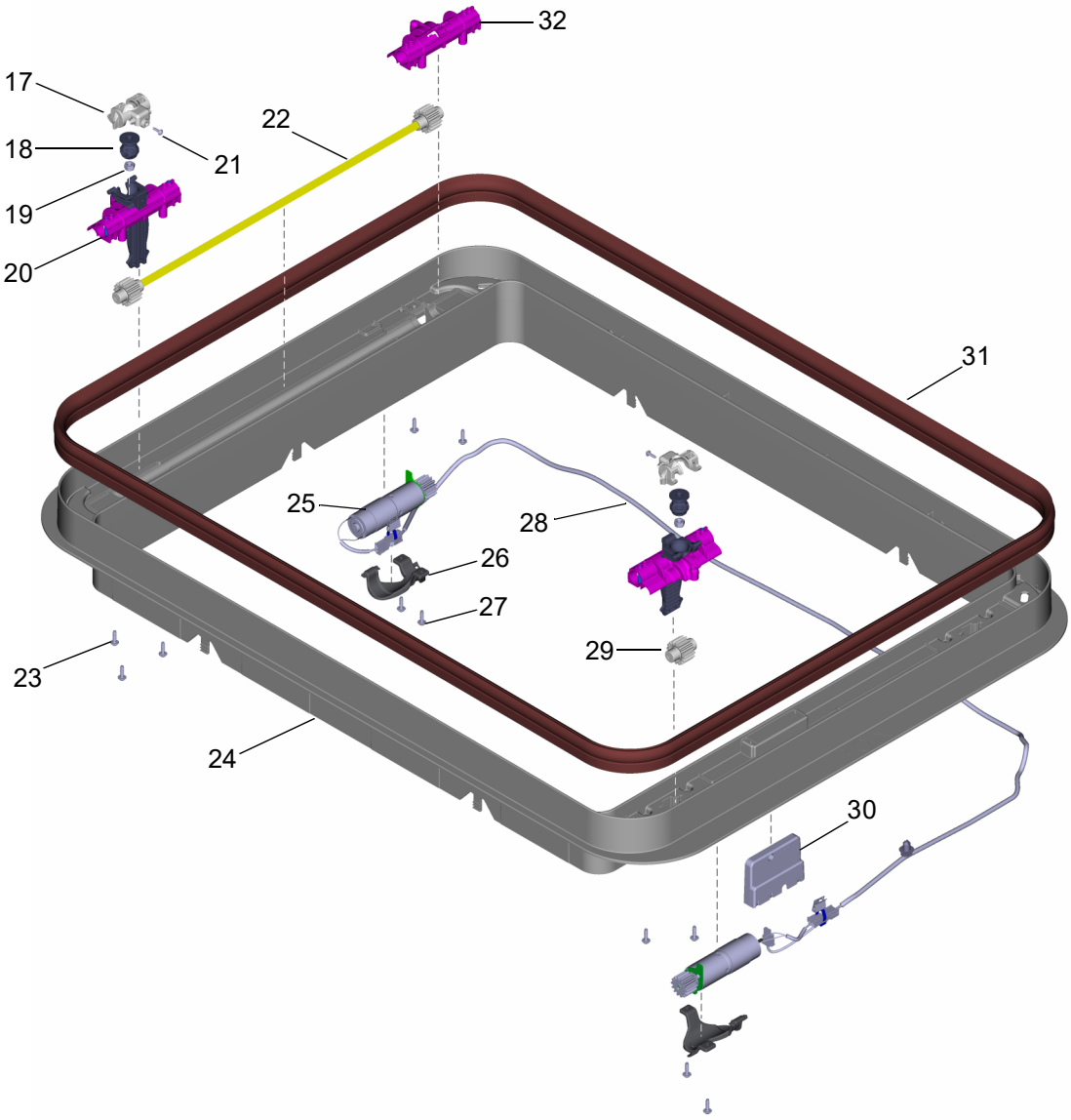
Fig. 804 FIT Hatches Clear Transversal - Components



NOTE: The upper ABS cover shell and lower ABS cover shell are glued together. The separate illustration is for clarity.

1 Cover ABS, upper shell
2 Emergency opening handle, outer
3 Seal ring
4 Cover screw 2x
5 Screw, hinge 2x
6 Hinge 2x
7 Rubber insert, upper 2x
8 Rubber insert, lower 2x
9 Linkage, emergency opening
10 Emergency opening handle, inner
11 Cover ABS, lower shell
12 Washer
13 Screw, emergency opening handle
14 Cover, emergency opening handle
15 Washer 2x
16 Nut M6 2x

Fig. 805 FIT Hatches ABS Transversal - Components (part 1)



17 Bearing shell, cover carrier 2x
18 Cover carrier 2x
19 Nut M6 2x
20 Rod assembly 2x
21 Safety screw 2x
22 Gear shaft with gears
23 Screws, housing 7x
24 Frame
25 Motor 2x
26 Motor bracket 2x
27 Screws, motor bracket 4x
28 Wiring harness
29 Gear
30 Control unit
31 Seal

Fig. 805 Hatches ABS Transversal - Components (part 2)

8.4 Removal and installation of the hatch seal (plastic cover, transversal hatch)

Removal

1. Open hatch.
2. Operate the emergency opening handle (2, 10, Fig. 805).
3. Fold the cover completely forward.
4. Pull the rubber seal (31) around the hatch off the frame (24).

Installation

1. Clean the frame.
2. Slide the new rubber seal (31, Fig. 805) onto the frame in the four corners so that the seal is evenly distributed.
3. Slide the remaining seal onto the frame.
4. Fold the cover back and position the pre-assembled cover carriers (18) and bearing shells (17) onto the rod assemblies (20).
5. Fit the bearing shells (17) into the rods (20).
6. Carefully turn the emergency opening handle into the initial position. During that, the linkage (9) for emergency opening must be pushed with its rods synchronously with both ends into the funnel openings of the bearing shells.
7. Close the hatch.

NOTE:

Make sure that the seal is pressed all the way to the edge of the frame.

NOTE:

After installing a new seal, it is recommended to carry out a water tightness test.

8.5 Removal and installation of the hatch seal (glass cover, transversal hatch)

Removal

1. Open hatch.
2. Unscrew the screws (2, Fig. 804) from the two cover carriers (5).
3. Remove the rubber washers (3).
4. Fold the cover completely forward.
5. Pull the rubber seal (17) around the hatch off the frame (11).

Installation

1. Clean the frame.
2. Slide the new rubber seal (17, Fig. 804) onto the frame in the four corners so that the seal is evenly distributed.
3. Slide the remaining seal onto the frame.
4. Fold the cover back so that it rests on the cover carriers (5).
5. Secure the cover to the cover carriers using the screws (2) and rubber washers (3).
6. Close hatch.

NOTE:

Make sure that the seal is pressed all the way to the edge of the frame.

NOTE:

After installing a new seal, it is recommended to carry out a water tightness test.

8.6 Removal and installation of the glass cover

Removal

1. Open the roof hatch completely.
2. Unscrew the screws (3, Fig. 802) from all four cover carriers (7).
3. Remove the rubber washers (4).
4. Remove the glass cover (1).

Installation

1. Position the glass cover(1, Fig. 802) onto the cover carriers (7).
2. Secure the cover to the cover carriers using the screws (3) and rubber washers (4).
3. Close hatch.

8.7 Removal and installation of the cover assembly (glass cover, transversal hatch)

Removal

1. Unscrew the screws (2, Fig. 804) from the two cover carriers (5).
2. Remove the rubber washers (3).
3. Loosen and remove the hinge screws (21).
4. Remove the cover assembly (1).
5. If necessary, remove the hinges (20) and emergency hammer (26) from the glass cover (1).

Installation

1. If necessary, install the hinges (20, Fig. 804) and emergency hammer (26) to the glass cover (1).
2. Screw the cover assembly (1) to the frame (11) using the hinge screws (21).
3. Secure the cover (1) to the carriers (5) using the screws (2) and rubber washers (3).

8.8 Removal and installation of the cover assembly (plastic cover)

Removal

1. Open the roof hatch completely.
2. Unscrew the nut (10, Fig. 803) from the hatch cover and detach the safety strap (12) from the hatch cover (1, 4).

3. Turn the emergency opening handle (7 or 2) until it stops.
4. Detach hatch cover at the front along with the cover carriers (15) and the bearing shells (14) from the rod assemblies (17).
5. Tilt the hatch cover backward until the clamps (27) on the bearing shells (14) open and the bearing shells can be released from the rod assembly (17).
6. Release the rear cover along with the cover carriers (15) and bearing shells (14) from the rod assembly (17) and remove the hatch cover (1, 4) upwards.

Installation

1. Pre-assemble the cover carriers (15, Fig. 803) with the bearing shells (14) on the hatch cover.
2. Move the rod assemblies (17) to the "fully extended" position.
3. Position the cover assembly with the pre-assembled cover carriers (15) and bearing shells (14) onto the rod assemblies (17).
4. Fit the bearing shells (14) into the rods (17).
5. Carefully turn the emergency opening handle (7 or 2) into the initial position until it stops. During that, the linkage (6) must be pushed synchronously into the funnel openings of the bearing shells with both rod ends.
6. Insert the clamps for emergency opening (27) at the rear into the bearing shells (14).

NOTE:
Ensure that the clamps for emergency opening (27) are correctly seated. Their front ends must be fully seated in the bearing shells on both sides (see Fig. 806).

7. Attach tether (12) using nut (10).

NOTE:
Other hatch components have been omitted for clarity.

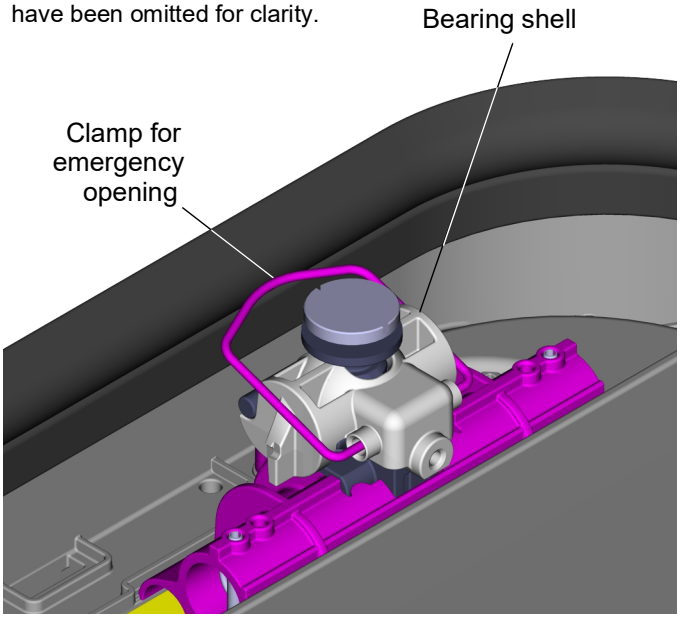


Fig. 806 Clamp for emergency opening in position

8. Attach cover (13) to the hatch.
9. Close hatch.

8.9 Removal and installation of the cover assembly (plastic cover, tranversal hatch)

Removal

1. Open roof hatch.
2. Turn the emergency opening handle (10, Fig. 805 or 2) until it stops.
3. Remove the hinge screws (5).
4. Loosen the cover along with the cover carriers (18) and bearing shells (17) from the rod assemblies (20) and remove the hatch cover with hinges (6).

Installation

1. Pre-assemble the cover carriers (18, Fig. 805) with the bearing shells (17) and if necessary hinges (6) on the hatch cover.
2. Position the cover assembly with the pre-assembled cover carriers (18) and bearing shells (17) onto the rod assemblies (20).
3. Fit the bearing shells (17) into the rods (20).
4. Carefully turn the emergency opening handle (10 or 2) into the initial position. During that, the linkage (9) must be pushed synchronously into the funnel openings of the bearing shells with both rod ends.
5. Attach hinges (6) to the frame (24) using hinge screws (5).
6. Close hatch.

8.10 Removal and installation of the lifting mechanism

NOTE:
Using the FIT hatch Clear as example. The procedure is principally the same for other hatch versions.

Removal

1. Remove the hatch trim, see 8.2.
2. Remove the cover assembly (see 8.6 thru 8.9).
3. For electrically operated hatches, remove the appropriate motor (see 8.11).
4. Remove the screws (11, Fig. 802) securing the rod assemblies (8) to the frame (13).
5. Remove the rod assemblies (8) and the gear shaft with gears (10) upwards.

Installation

1. Pre-assemble the rod assemblies (8, Fig. 802) and the gear shaft with gears (10).

NOTE:
Ensure that the left and right rod assembly are in exactly the same position.

2. Insert the rod assemblies (8) and the gear shaft with

gears (10) into the main frame (13) from above.
3. Secure both rod assemblies (8) with screws (11) to the frame (13).
4. For electrically operated hatches, install the appropriate motor (see 8.11).
5. Install the cover assembly (see 8.6 thru 8.9).
6. Perform a hatch function test (see 5.3).
7. Install the inner trim (see 8.2).

8.11 Removal and installation of a motor

NOTE:
Electrically operated hatches only.

NOTE:
Using the FIT hatch Clear as example. The procedure is principally the same for other hatch versions.

Removal
1. Disconnect the hatch from the vehicle electrical system, for example pull the F1 fuse (see chapter 6).
2. Remove the inner trim (see 8.2).
3. Disconnect the motor (12, Fig. 802) from the control unit (17) or from wiring harness (14).
4. Unscrew the screws (16) of the motor bracket (15) while holding the motor (12).
5. Remove motor bracket (15) with motor (12) from hatch.

Installation
1. Place the motor (12, Fig. 802) with motor baracket (15) into the installation position.
2. Secure the motor (12) and motor bracket (15) to the frame (13) using screws (16).
3. Reconnect the motor (12) to the control unit (17) or to the wiring harness (14).
4. Perform a hatch function test (see 5.3).
5. Install the inner trim (see 8.2).

8.12 Removal and installation of the control unit

NOTE:
Electrically operated hatches only.

NOTE:
Using the FIT hatch Clear as example. The procedure is principally the same for other hatch versions.

Removal
1. Disconnect the hatch from the vehicle electrical system, for example pull the F1 fuse (see chapter 6).
2. Remove the inner trim (see 8.2).
3. Unplug both motor connectors from the control unit (17).
4. Using a screwdriver, for example, press the locking lugs on the left and right of the control unit holder outwards and pull the control unit (17) out downwards.

Installation
1. Push the control unit (17, Fig. 802) upwards into its holder until it clicks audible into the place.
2. Plug both motor connectors into the control unit (17).
3. Perform a hatch function test (see 5.3).
4. Install the inner trim (see 8.2).

8.13 Removal and installation of the wiring harness

NOTE:
Electrically operated hatches only.

NOTE:
Using the FIT hatch Clear as example. The procedure is principally the same for other hatch versions.

Removal
1. Disconnect the hatch from the vehicle electrical system, for example pull the F1 fuse (see chapter 6).
2. Remove the inner trim (see 8.2).
3. Unplug the wiring harness (14, Fig. 802) from Motor (12).
4. Unplug the wiring harness (14) from control unit (17).
5. Thread the wiring harness (14) through the openings in the frame (13).

Installation
1. Connect the wiring harness (14, Fig. 802) to the Motor (12).
2. Route the wiring harness (14) through the designated hole from the bottom of the frame (13) to the top of the frame.
3. Route the wiring harness (14) along the long side at the top of the frame (13).
4. Route the wiring harness (14) through the designated hole from the top of the frame (13) to the bottom of the frame.
5. Connect the wiring harness connector to the control unit (17).
6. Perform a hatch function test (see 5.3).
7. Install the inner trim (see 8.2).

8.14 Removal and installation of the emergency hammer

This procedure is only necessary if the hammer bracket is damaged or missing.

Removal
1. Remove the seal.
2. Take the hammer from its bracket.
3. Remove bracket from hatch cover.
4. Remove adhesive residue from the hatch cover.

Installation

1. Remove the protective foil from the adhesive surface on the bracket bottom of the emergency hammer set.
2. Identify the glue mark for the hammer set on the hatch cover.
3. Press the hammer set with at least 100N for at least 3s onto the cover.

9 Modifications and retrofits

For further optimization the roof hatches are continuously improved. Units in the field can usually be upgraded or retrofitted. For this purpose respective modification kits will be available. Information can be found in the download center on www.spheros.com.

10 Packing/storage/shipping

10.1 General

The roof hatch or its components, which are sent to Spheros for inspection or repair, must be cleaned and packaged to ensure that handling, transport and storage will not damage them.

memos

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